# Technical Assistance Consultant's Report

Project Number: PAK 37188
December 2005

# Pakistan: Sindh Coastal and Inland Community Development Project
(Financed by the Japan Special Fund)

Prepared by ANZDEC Limited Consultants

ANZDEC Limited, New Zealand

in cooperation with

Resource Monitoring and Development Group, Pakistan and

SEBCON (Pvt) Limited, Pakistan



Asian Development Bank


# PAKISTAN
## SINDH COASTAL AND INLAND COMMUNITY DEVELOPMENT PROJECT
**ADB TA 4525-PAK**

# INTERIM REPORT
## Volume II – Appendixes (Background Documents)

***December 2005***

*Prepared for the*

**Government of Sindh**
*and the*
**Asian Development Bank**

*by*
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# Appendixes

# Appendix 1 - Overview of Fisheries and Aquaculture

## DRAFT REPORT
## Asian Development Bank
## Project Preparatory Technical Assistance
## No TA 4525 – PAK

## Sindh Coastal and Inland Community Development Project

## Overview of Fisheries and Aquaculture in Sindh Province

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**December 2005**

### FINDINGS

This overview of Aquaculture and Fisheries in Sindh Province of Pakistan has one main finding; weakness in the institutions that administer and manage fisheries in the Province is a major cause of a failure to maximise returns from the sector. A very great potential is being missed.

There is one recommendation:-

**…. that institutional strengthening is undertaken, to overcome the lack of management of fisheries resources in Pakistan, and this to concentrate on Sindh, where the project area is located and many of the opportunities exist.**

### INTRODUCTION

This overview is intended to give a snapshot of the fisheries and aquaculture of Sindh Province, particularly those areas covered by the ADB Sindh Coastal and Inland Community Development project[1] .

An extensive series of field visits and interviews has enabled some ground truth and reality to be bought into the overview, given that the statistics on the fisheries of the Province are acknowledged to be very inaccurate.

## SOURCES OF DATA ON FISHERIES

The Federal Marine Fisheries Department has produced a compendium of statistics called the "Handbook of Fisheries Statistics of Pakistan Volume 18 (1993-99)". This document gives statistics of Fish Production of Marine and Inland for the whole of Pakistan. This is a detailed book with much information; local, scientific and English names for all the common species and catches by province by species name. During interviews as part of this study the data contained in this book as variously been described by government officials as:- "useless", "just made up", "inaccurate since 1985 when FAO stopped doing it" and most damningly by a senior official, who will remain un-named, as "I make it up in my office and they publish it !". The

[1] The Talukars of Thatta, Shah Bandar, Keti Bandar, Jaki, Goorabari and Kharochan in Thatta District, and Shahid Zazu Rahu and Badin in Badin district.

individual concerned did add later, in mitigation, that he used his judgement and a series of multipliers to estimate the figures to the best of his ability. The official statistics are however very useful as they give the official picture, are based on what data is collected, are quite up to date and are produced relatively regularly.

Marine fisheries statistics from the majority of landings and from export data, both of which activities are concentrated in Karachi, the one requiring the input of the local Fisheries Cooperative Society which runs the Karachi Fish Harbour, and takes 3.175% of all auctioned prices in the market, (another 3.175% goes to the auctioneers) and the latter which requires export paperwork and records, are probably more reliable than for other areas. The consolidated figures from Karachi Fish Harbour have been provided to this study by the Fisheries Cooperative Society who run the auctions. (The unreliable nature of anecdotal data in Sindh was well illustrated during interviews with officials who gave estimated 2005 landings at the Karachi Fish Harbour as 400 tonnes daily with a peak of 600 tonnes daily (as being a justification for building new wharves and auction houses) and 40 tonnes/day rising to peaks of 70 tonnes per day at busy periods (given to illustrate the "terrible" state of the fishing industry in 2005); two supposedly accurate figures from separate well placed officials being provided during this study within 24 hours of each other).

Theoretically specific export data should be available from export companies, though this was not obtained directly in a usable form. Gross figures are available from the Government Statistics Department and the State Bank (see below, this shows that fisheries is a small contributor to GDP, and that exports are declining and form a very small part of the export economy). The State Bank of Pakistan consolidates the figures for the whole country and publishes data on the economy on its web site and in reports.

FAO has produced statistics for Pakistan which are available on Fishbase[2] giving imports and exports, fish catch by species and aquaculture production. Figures have been extracted and are given in Annex I and II. It is these figures and others from Fishbase that are generally being used most in this report. The FAO figures are provided to FAO by the Federal Government.

Sindh Provincial Fisheries Department also produces statistics, and these are collated in the annual compendium of statistics for Sindh, the "Development Statistics of Sindh", published annually by the Bureau of Statistics in Sindh, and which are also provided to the Federal Fisheries Department. The latest edition is for 2004 and gives data to 2003 for the fishery, including the inland fishery and aquaculture. This data has been roundly condemned by everyone interviewed during the PPTA for its inaccuracy, particularly relating to the delta and inland sea area - the project area. Since fishermen interviewed in the delta and in the inland sea reported that they had rarely seen a Sindh Fisheries Department field officer, one saying that he had not met anyone from Fisheries[3] for more than 5 years, it is not surprising that the veracity of the statistics is being called into doubt by those closely acquainted with the situation. This is not a new situation. Apparently[4] 82 years ago in 1923, the local colonial administration called for better collection of statistics in Sindh.

[2] Fishbase is the publicly accessible FAO database of fish production statistics
[3] He actually said "Fisheries", which would include the District Fisheries as well.
[4] Dr Bax Muhammad A Junejo. *Pers comm.*

District Governments produce data in occasional reports covering their specific districts. Once again this data is subject to some doubt as to its accuracy, since the mechanisms to collect the data, including basic things such as field allowances for enumerators, transport and staff are not available to collect it at the district level. Recent data (2004) from Thatta & Badin Districts has been produced and commented on below.

Some short studies on fish production have been done in individual places for projects or organisations pursuing some local objective. A particularly informative source of data is the ESCAP Coastal Management Plan for Pakistan published in 1986, which although now nearly 20 years old does contain a good overview of scientific work on the Pakistan coast at that time. The same applies to the ADB Sector Study of the same year.

A whole host of NGOs, conservation organisations and development agencies produce their own statistics, usually garnered from one of the above sources, though often of opaque lineage. Since many of the NGOs and conservation organisations have their own narrow agendas, their tendency has been to emphasise particular statistics relevant to their causes, sometimes distort them, and then pin activities to specific identified problems to be addressed by them. Much of the data available from these sources must therefore be viewed with some circumspection.

Another factor affecting the statistics on fisheries in the delta and inland sea area in Thatta and Badin is that in 1999 there was a cyclone. The size of the aid distribution to fishermen and fishing communities was estimated, inter alia, on fishing village size, numbers of boats, and numbers of fishermen affected. These figures were inflated by various agencies and individuals involved with the distribution of aid, so as to obtain the maximum handout possible (which often did not reach the people affected), due partly to the aid agencies' insistence on speed in assessment of needs. These inflated figures have somehow entered the assemblage of statistics available, and are still being quoted extensively, despite the fact that they are patently suspect. The exaggeration in boat numbers and numbers of fishermen in the deltaic area is quite large in some cases and could give a very wrong picture of fishing activity in parts of the project area.

Yet another constraint to the accuracy of the statistics is that the population and environmental situation in the delta area and inland sea area has changed quite considerably and very rapidly in recent years. Irrigation has caused salt build up in some agricultural areas, salt water intrusion has made other previously fertile land barren, whole areas, particularly some important dhands[5] which were previously fresh or slightly brackish, have become flooded with salt water. There has been a 5 year drought (1999-2005). The population has become more mobile and the ESCAP report, ten years ago in 1996, says – "the old social order is dead". Traditional ties within communities have broken down. Parts of the population have found it to be unsustainable to remain in the now marginal lands that characterise parts of the project area. Incomes from agriculture, and the lack of general infrastructure (water (most particularly), health and transport, being the three main needs) and the general economic situation make it difficult to live there. Whole areas which were once (thirty years ago) densely inhabited are now empty. This has altered the structure of the communities that live there, as many have simply moved away from their old locations and either gone to Karachi or

[5] Freshwater lake

district towns. The Pakistan Fisherfolk Forum[6] describes Keti Bandar; once a major port; once the epicentre of a thriving agricultural economy; once a major fish landing site:-

> "….. now looks haunted and devastated. The area was home to a vibrant network of small-scale coastal fisheries and farms, but the economy that once supported the town has fallen apart. With no freshwater left in the rivers and wells, the town and surrounding homesteads no longer have access to drinking or irrigation water. The farmers inland have mostly packed-up and left since the elevated salinity levels made it impossible to grow crops."

the article goes on

> "As one villager put it, "What are we to do when the land and waters become a desert? Where should we go, and how can we feed our families..?"."

Many more fishermen now work as labourers on boats based in Karachi and commute on a six or three monthly basis to their villages, remitting their income to their families. Many have moved inland and travel to the coast to fish. Once again these rapid changes have not been properly enumerated, which makes work based on older statistics for the project area, and sweeping generalisations on fisheries or social issues based on a few brief field visits somewhat nebulous.

It was noted during this study that there is a general reluctance amongst Federal and Provincial officials to provide accurate statistics and information to outsiders, even if the statistics exist. The reasons for this are numerous, and probably include the underlying realisation that much of the data is not up-to-date or has not been collated into a usable form.

One further point needs to be commented on in any discussion of statistics of the fisheries of Sindh: this is that many statistics are quoted in reports and are then re-quoted again and again in subsequent studies without going back to the original source. It is possible that misquotes and figures given originally as estimates with extensive "caveats" or explanations, are taken as accepted facts and then passed down further, eventually becoming almost folk lore when fisheries are discussed.

No detailed Sector Study has been done since 1986.

Samples of all the various statistics are referred to, and quoted in the text of this report. The published statistics are, however, the only ones available, and cannot just be discounted out of hand. They do show trends and reflect the opinions of the organisations and individuals who complied them. It is with caution that any numbers are used, since none can be considered totally authoritative.

In short there is a paucity in accurate published information on the fisheries of Sindh. This makes a brief snapshot of Aquaculture and Fisheries in Sindh, and in particular the remote project areas of Badin and Thatta, particularly difficult to present; and the component facts to be stated with any great degree of confidence.

[6] In an article in its magazine "Fisherfolk" Feb 2005.

Evidently the Sindh Fisheries Department, the Federal Fisheries Department and the Karachi fish Harbour Authority should improve their data collection system, so that data on which to base management and development decisions is robust.

This is hardly a new observation. The ESCAP Coastal Environmental Plan for Pakistan in 1996 stated that:-

> "for the planning and management of fisheries resources, strengthening of information system and development of data base is a pre-requisite. Information regarding demersal, pelagic and mesopelagic resources, commercially important species and other marine life needs to be collected on scientific basis and made available for research, planning and programme formulation"

The ESCAP plan did not go so far as to indicate how this should or could be done; nor do most of the multitude of reports that have commented similarly.Ten years before the ESCAP recommendation, the ADB in its 1986 Sector Review[7] stated:-

> "An essential requirement for planning development in the fisheries sector is good statistics on the fish resources. In Pakistan…….. such statistics do not exist".

It goes on to suggest that there should be an effective federal and provincial fisheries statistics service.

Realistically improving the statistics collection and other activities of the Sindh Fisheries Department cannot be done when the effectiveness of the existing Department is so low. It follows therefore that tangible inputs must be made to the Fisheries Department of Sindh to improve its data collection and other activities. It is proposed (see below) that this be part of the TA and other assistance provided to the Sindh Fisheries Department by the Sindh Coastal and Inland Community Development Project (SCICDP). This is the major and only recommendation of this study.

And it was because there was no fisheries data that one of the terms of reference (calculate a maximum sustainable yield for the fishery) was not undertaken. Such an activity would normally require access to an extensive collection of data, compiled over many years and with a high degree of accuracy. The fact that such information has not been collected points unerringly to profound failings within the Department of Fisheries.

## FISHERIES OF SINDH PROVINCE – ARABIAN SEA.

The most significant feature of marine fisheries in Pakistan and in Sindh, is that it is an open entry system. Anyone can start fishing. Anyone can buy a boat and gear, obtain a permit, get a crew together and enter the fishery[8], thus increasing effort. The only control is economics. If it is unprofitable to go fishing then the fishermen will leave the fishery, thus reducing effort. According to classical resource economics, since the point of unprofitability lies beyond the point where the fishery is at it Maximum Biological Sustainable Yield, there will be overfishing in a common property resource with open entry. This is exactly what has happened in Pakistan, the catch is declining and incomes are reducing. Additionally, making the situation more complex, nobody is measuring or monitoring the decline accurately.

[7] This review concentrated on Industrial fisheries
[8] It is not quite that simple, but almost

**Contribution to the Economy and GDP (Pakistan)**

The latest data from the State Bank of Pakistan[9] states that

> "the share of fisheries in GDP is only 0.3 percent while its share in agriculture is 1.3 percent during FY05. It also has a 0.9 percent share in total exports earnings. The growth in this sector remained almost unchanged –2.1 percent during FY05 as compared to 2.0 percent in FY04. The release of larger quantity of fresh water into the sea will increase the reproduction of fishes due to the expected growth of mangrove forest in the delta. At the same time, the start of fish and fish preparations exports to EU in FY06 would most probably increase the value addition of this sector in FY06".

Fisheries is thus not a great contributor to national wealth, and its contribution has declined in the last year. The expectations of growth given by the bank relate to extra fresh water being released into the Indus, which appears to be optimistic. Similarly exports of shrimp, the major export product, are declining and unlikely to increase. Comparisons, with the rest of the economy, again from the State Bank of Pakistan are given below

**Real GDP Growth PSB DATA 2005**
**percent; at constant prices of 1999-2000**

| | | | FY05 | |
|---|---|---|---|---|
| | FY03 | FY04 | Target | Provisional |
| Commodity producing sector | 4.4 | 6.9 | 7.0 | 8.9 |
| Agriculture | 4.1 | 2.2 | 4.0 | 7.5 |
| Crops | 5.5 | 2.1 | 3.5 | 13.5 |
| Major crops | 6.8 | 1.9 | 3.5 | 17.3 |
| Minor crops | 1.9 | 2.6 | 3.5 | 3.1 |
| Livestock | 2.6 | 2.8 | 4.4 | 2.3 |
| Fishing | 3.4 | 2.0 | 3.2 | 2.1 |
| Forestry | 11.1 | -5.5 | 4.0 | 0.4 |
| Industry | 4.7 | 12.0 | 9.8 | 10.2 |
| Manufacturing | 6.9 | 14.1 | 10.2 | 12.5 |
| Large-scale | 7.2 | 18.2 | 12.0 | 15.4 |
| Small, household & slaughtering | 44.5 | 6.2 | 6.4 | 6.2 |
| Mining and quarrying | 16.1 | 3.8 | 5.5 | 5.0 |
| Construction | 4.0 | -6.9 | 9.5 | 6.2 |
| Electricity & gas distribution | -11.7 | 21.1 | 10.0 | 2.1 |
| Services sector | 5.2 | 6.0 | 6.2 | 7.9 |
| Wholesale & retail trade | 6.0 | 8.1 | 8.4 | 12.0 |
| Transport storage & comm. | 4.3 | 5.5 | 4.5 | 5.6 |
| Finance and insurance | -1.3 | 4.5 | 3.5 | 21.8 |
| Ownership of dwellings | 3.3 | 3.5 | 3.8 | 3.5 |
| Public admin. & defense | 7.7 | 4.2 | 6.5 | -0.8 |
| Community, social & personal services | 6.2 | 5.2 | 5.1 | 5.4 |
| Gross domestic product (GDP) | 4.8 | 6.4 | 6.6 | 8.4 |

[9] Annual Report 2004 - 2005

The gross figures for exports also show the decline.

| Exports and Imports by Commodity Group. Pakistan 2003-5 (US$ Millions) | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Commodity Groups/Commodity** | **Exports** | | | **Imports** | | |
| **Agriculture** | **FY03** | **FY 04** | **FY 05** | **FY03** | **FY 04** | **FY 05** |
| | | | | | | |
| Live animals, animal products | 176 | 189.4 | 163.7 | 17.1 | 15.8 | 26.9 |
| Live animals | 21.9 | 7.5 | 4.2 | 1.9 | 1.7 | 1.7 |
| **Fish, crustaceans and mollusks etc.** | **123** | **138.8** | **111.7** | **0.2** | **0.7** | **1.2** |
| Dairy produce, birds' eggs and natural hc | 7.6 | 12.7 | 13.2 | 14.5 | 12.9 | 22.3 |
| Products of animal origin, not elsewhere | 13.5 | 15.5 | 16.2 | 0.1 | 0.1 | 0.7 |
| Others | 10 | 14.9 | 18.3 | 0.3 | 0.4 | 1 |
| | | | | | | |
| Data from State Bank of Pakistan (2005) | | | | | | |

The area of the offshore resources of Pakistan is between 12 and 200 miles offshore in Balochistan and Sindh. Some fishermen who work on offshore boats are from the project area. The effects of overfishing or declining incomes from fisheries in the offshore zone will be felt in the project area in Badin and Thatta :-

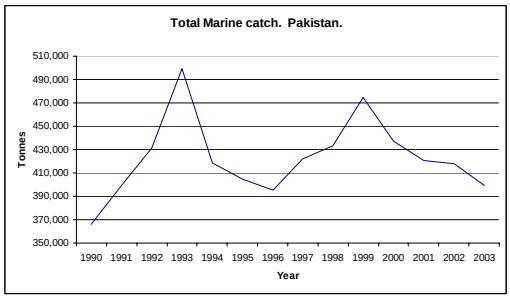



Figure 1 Marine Fisheries Catch. Pakistan 1990-2003

- by the reduction of remittances of fishermen/crew (known as Khalasi) to their families in the project area.
- by reduction in catch of coastal resources which depend on some of their lifecycle for the offshore zone
- by illegal fishing in the 0-12 mile zone by vessels licensed to fish in the 12-200 miles zone.

There has been no work on the estimation of fish stocks within the 12-200 mile zone for 20 years. Figures quoted by ESCAP from 1987, of unknown provenance, give the MSY estimates in the EEZ as

| | |
|---|---|
| Small pelagics | 350,000 tonnes |
| Large pelagic species | 30,000 tonnes |
| Demersal fish | 189,000 tonnes |
| Shrimp | 35,000 tonnes |
| Cephalopods | 5,000 tonnes |
| Molluscs | 200 tonnes |
| Crabs | 50 tonnes |
| Lobster | 150 tonnes |
| Mesopelagic species | 2,000,000 tonnes |

This gives a total of more than 2.5 million tonnes of which all but 23% is mesopelagics. The total for the rest being 606,400 tonnes. Allowing for the catch at that time, there was room for an increase of catch of more than 100,000 tonnes in non-mesopelagic fishes. These estimates where made during a period when Mesopleagics were considered to have huge worldwide potential, and vast resources were presumed in

many regions. The estimates of this untapped potential appear, with the benefit of 20 years of hindsight, to have been optimistic to say the least.

Fortunately the data for catches and for exports for Pakistan as a whole is available from FAO[10] FishStat in consolidated form and is given in Annex I. These figures are for Pakistan and Sindh. The Sindh portion seemingly relates to the Karachi area particularly, and even more specifically to the commercial fishery based around Karachi Fish Harbour and a few major landing sites in West Karachi.

The total marine catch figures show a decline since 1999 from 474 thousand tonnes total catch to 399 thousand tonnes in 2003. See Figure 1 This is a decline of more than 15% over the last 5 years and would indicate that there should be some concern regarding overfishing, since declining catches, with either stable or rising effort are often early indicators of such. The share of this catch that is reported to be in Sindh Provincial Waters is 333 thousand tonnes (70% of total). Figures from the Fishermen's Cooperative Society in Karachi Fish Harbour who control the auctions of fish here indicated that the catch for the first 6 months of 2005 was 71 thousand tonnes (extrapolated to 142 thousand tonnes/year in 2005), which would indicated that slightly less than half of the Sindh catch passes through the fish harbour at Karachi. (of this 30% was reported to go for fish meal).

There is repeated reference in reports and pamphlets to declining catches in the artisanal fishery and the industrial fishery, though these are usually based on anecdotal evidence in selected areas, and "noise" from pressure groups. The official figures presented here tend to bear out the general observation.

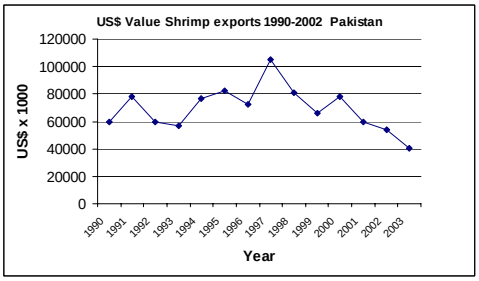



Figure 2 US$ Shrimp Exports. Pakistan 1990-2002

For exports, the major fishery is for prawns caught by trawlers operating from Karachi (and Balochistan ports). The bulk of the catch (19,000 tonnes – 2003 FAO data) is landed in Karachi where there are export facilities, which have been approved by the EU, and where the competent authority (the Federal Marine Fisheries Department) is based. Exports are mainly to the EU, and the 1999 data from the Marine Fisheries Department[11] indicates that the most important importing countries were The UK (2,625 tonnes worth 953,000,000PRs), Netherlands (2,430 tonnes) and Belgium (1,842 tonnes), followed by USA (1,547 tonnes) Japan (1,325 tonnes) and Dubai (753 tonnes), out of a total of 13,111 tonnes in that year.

There is a closed season for two months of the year (in most years), but this is resented by trawler owners as it interferes with their cash flow, and they claim that it does nothing to help shrimp breeding. Naturally they blame the shrimp fishermen of the delta for

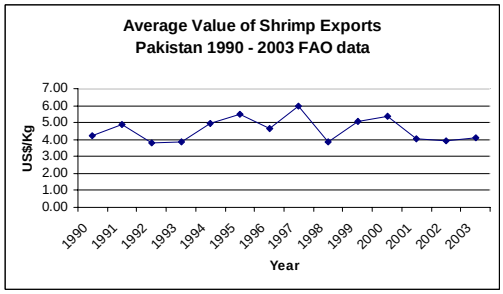



Figure 3 Value US$/kg. Pakistan Shrimp Exports 1990 - 2003

[10] FAO uses official Government figures
[11] Handbook of Fisheries Statistics

overfishing juveniles, particularly in the closed season, as a cause of any decline in catches.

The reported decline in the catch of shrimp over the same period has been far less than for fish, less than 5%. Export data shows a considerable decline in the export value of shrimp since 1994, of more than 60%, from a peak of more than US$100 million to less than US$40 million. See Annex II. Reasons for this apparent discrepancy between the sustained catch and the decline in the value of exports are not immediately obvious, though explanations proffered have included declining size of the individual shrimp due to overfishing, declining quality, poor reputation for Pakistani product, declining markets, bans by the EU on shrimp exports due to declining quality, and poor statistics of the catch which do not reflect its decline. The latter is probably the main cause.

It is interesting to note that in 1986 (nearly 20 years ago !) the ADB in a Sector Survey[12], commenting on overcapacity in the shrimp fleet, stated that:-

> "…it is unlikely that there will be any reduction in the number of shrimp trawlers until the financial returns from the fishery fall below the break even level of profitability. This point is likely to be reached within the next 2 years."

The report goes on :-

> "….recommends that the Sindh Government issues licenses to the 1000 operational shrimp trawlers based in the harbour and not issue any further licenses.."

In 1999 there were recorded 2,564 trawlers in the fleet (Federal Marine Fisheries Department Figures)

**Fish consumption in Pakistan.**

Fish consumption in Pakistan is one of the lowest in the world. The population of Pakistan is increasing rapidly, like other countries in the region. According to FAO[13] in 2001-2002, the population was 142 million and fish production for human consumption was 413 000 tonne, giving a per capita fish consumption of about 1.8 kg/year. FAO in the same article gives a consumption of 2.9kg/year for 2003 and a prediction of per capita consumption based on trends for 2011 – 2020 of 3.7kg/year, which greatly exceeds the MSY of the marine resources, so must presumably include a large proportion of farmed fish. Pakistani people tend to appreciate meat more than fish.

Much fish goes to fishmeal which could be eaten directly. This fishmeal is converted to (mainly) chicken, which is very popular. It is however inefficient to convert the fish to chicken and then consume it, and efforts should be made by the Sindh Fisheries department to rectify this; though at the moment there are no efforts being made to

Figure 4 Boats in crowded Karachi Fish Harbour

[12] This Survey concentrated on Industrial Fisheries
[13] Information on Fisheries Management in the Islamic Republic of Pakistan (2003) Web based article

do this. There are a variety of ways that fish consumption could be enhanced. Improving overall fish quality and preservation, from catch to retailer, will be an essential component of improving fish consumption.

To meet protein shortages in the future more emphasis could also be made on aquaculture.

**Joint ventures**

Foreign trawlers and long liners, operate in the 200 mile EEZ under an arrangement whereby they are "locally flagged". This is allowed under the Federal Governments' "Deep Sea Fishing Policy" of 1980. The flagged vessels are supposed to pay a fee and a royalty. Details of their numbers, catch, fishing methods and other parameters of their operation have been difficult to obtain. Apparently, and this is recorded with caution, there are 58 trawlers licensed in 2005 by the Federal Marine Department of Fisheries. They operate through local agents who are very reticent to reveal their affairs. Even the local trawler owners association cannot find out how exactly many are licensed. What is abundantly clear is that since they tranship at sea, much of the catch goes unreported, and that in general their activities are unsupervised. In addition they discard much "trash" fish. Each boat is supposed to have an observer on board, though the effectiveness of this system is unknown. It is suggested that far more than the licensed 58 trawlers are actually operating, without the knowledge, or possibly even with the knowledge and connivance of, the authorities. They are not now supposed to enter within 20 miles of the coast, but are reported to do so. (Originally this was within 35 miles of the coast).

**Boats in the Sindh fishery.**

Marine Department Figures for 1999 show that there are 14,982 registered vessels in the marine fishery. These are 2,564 trawlers, 2,305 gill netters, 3,755 mechanised sail boats, 6,358 sail boats and no row boats. (No figures are given for later years). The Fishermens Cooperative Society at Karachi Fish Harbour has 11,179 members, all of which should be vessel owners.

Boats landing to the harbour are mostly wooden, from 12 to 35m length. Some second hand trawlers have entered the fleet and are steel. Most boats in Karachi harbour and other landing sites round Karachi are trawlers and gillnetters, with inboard diesel engines. In the season many of these boats target pelagics with seines for fishmeal. Deck gear and equipment is limited to the bare essentials and usually no mechanisation except for winches, net haulers and main engines is found. Everything considered superfluous or un-necessary is discarded, including most, if not all, of the safety equipment that would usually be found on such ocean going vessels. Many do not have insulated holds, though those targeting shrimp usually do. Ice is carried. Trips vary from 5 to 20 days. Vessels can travel as far away as Somalia, with no papers, safety equipment, fishing licenses or qualified crew. On trips of this length the catch is usually salted. Lifeboats (mostly fibreglass) derived from the commercial scrap industry have also entered the fishery. They are 8 -12m long and presently there are reported (FAO) to be more than 2000 operating in the Karachi area including Karachi Harbour. They have inboards, a crew of 6 and undertake gillnetting trips of up to two weeks.

Generally quality control aboard is poor, and the trips too long for the amount of ice carried. The first caught fish is often used for fishmeal as it is rotten by the time the vessel gets back to port. Many times the whole catch is condemned (to fishmeal).

Larger boats (trawlers) in the prawn fishery tend to be owned by rich boat owners who are based ashore and run their boats as a business, similar to any other. In the usual pattern of diversification to reduce risk, these vessel owners often have other businesses as well, which may or may not be related to fishing. Some of the owners are "moles" [14], and control other vessels through debt obligations.

Smaller local boats in the fishery land to "moles" or "moleholders", who are moneylenders and fish marketers. The moles are also members of the Fishermens Cooperative Society (FCS) which runs the market. Money advanced to boats owners is deducted from their catch value after auction costs of 6.25% which are split between the FCS and the moles. Vessel owners have to sell to a particular mole who has advanced money to fund the voyage. Since the moles also control the auction much fish is condemned for fishmeal (and then sold for human consumption but meaning that the moles do not have to pay the fishermen so much), or sold at "reduced" values to other moles or marketers., the balance being made up later, away from the auction. Khalasi and vessel owners may also be in debt to other, non mole, moneylenders as well, who also need to be paid off after a trip. All of this debt reduces the vessel skippers income and the labourer crew/fishermen (Khalasi) incomes. The system is condemned by social pressure groups as being grossly unfair to the vessel owners and crew, as perpetuation of a bonded labour scheme. It certainly does seem to have the effect of keeping the boat crews perpetually poor.

Boats from Karachi Harbour do travel long distances, some as far as Somalia on the East Coast of Africa. Maintaining the quality of the catch on trips of such length requires that salting is used as a preservative for the catch.

**Laws**

The Constitution actually defines the EEZ which divides it up between Federal and Provincial Authorities.

The most important subsequent legislation is the Exclusive Fishing Zone (Regulations of Fishing) Act, 1975, which has subsequently been amended. This is the Federal Law controlling the 200 mile zone and confirming the 0-12 miles zone to Sindh Province for Management. It is under this law (amended) that the FFVs obtain access. It does also cover illegal fishing methods and, closed seasons and areas and navigation/safety requirements for fishing boats in the EEZ.

The Government of Sindh has passed the Sindh Fisheries Ordinance (1983) which gives the Sindh Government extensive powers to regulate Fisheries in Sindh, including banning illegal gears, closed areas and seasons. Various amendments have been made covering, most recently, mesh size regulations and licenses for inland water fisheries. Between the two acts/ordinances there are general powers to regulate the fisheries of Sindh, though both pieces of legislation require urgent updating to reflect modern approaches and changes in international laws and agreements.

If the current laws were enforced then it would be a great step forward in management of the fisheries resources of Pakistan. Unfortunately enforcement is barely noticeable.

[14] An obscure word, apparently in use in other countries in the region also, and indicating (in Karachi) a moneylender who controls vessels & sales through debt obligations.

A list of the laws[15] affecting Fisheries in Pakistan/Sindh is given below.

- 1937 Agriculture Produce (Grading and Marketing) Act, 1937. This act provides authority and control for the grading and marketing of agricultural produce. Dry fish, shellfish and fishmeal are graded under the provision of this act.
- 1957 Food and Agriculture Department (No. IV/(5)/17-SOA-VII-F and A/58) Rules for the Protection of Fish in the Waters of Shikarpur District (Preceded by a Provisional Order, 1957)
- 1961 The Pakistan Fisheries Ordinance 1961
- 1965 West Pakistan Fisheries Rules, 1965
- 1972 Sindh Wildlife Protection Ordinance, 1972
- 1975 Exclusive Fishing Zone (Regulation of Fishing) Act, 1975, as amended 1993 This extends to the whole of Pakistan and to waters within the exclusive fishery zone of Pakistan beyond the territorial waters. It regulates the management of fishing in the EEZ of the country. The provisions of the law are in accordance with the provisions provided for in the Law of the Sea Convention, and cover: Licensing and management of fishing operation in the EEZ of the country. Fishing craft subject to navigational regulation. Prohibition of illegal, dynamite and poisoning fishing. Closed seasons and prohibited areas.
- 1977 Pakistan Fish Inspection and Quality Control Act, 1997. This law deals with the registration of fish processing plants and fish exporters, and constitutions and functions of the inspection committee. The function of the committee includes inspection of fish processing plants, fish exporters, and handling of fish and fishery products. It also defines the powers, duties and functions of fishery officers and penalties for contravention by processors and exporters.
- 1979 The Pakistan Animal Quarantine (Import and Export of Animal and Animal Products) Ordinance, 1979 This law provides for control of the import and export of animals and animal products, and the issue of health certificates to regulate the trade and to prevent the introduction or spread of diseases. The Federal Government, vide Notification No.F.272/FDC/99 dated 6 April 1999, in exercise of the power conferred by Section 12 of the Pakistan Animal Quarantine Ordinance, exempts the export of fish and fishery products from all the provisions.
- 1980 Sindh Fisheries Ordinance, 1980 This law provides rules and regulations for marketing, handling, transportation, processing and storage of fish and shrimp for commercial purpose and sale of fish used for domestic and inter-provincial trade in the Province of Sindh. Contravention of this Ordinance is punishable by imprisonment up to six months or by a fine of PRs 10 000, or both. A provision also been included for a total ban on the use of destructive fishing gear, and for a closed season for shrimp during June and July.
- 1982 Convention on Biological Diversity, (Rio Declaration) 1992
- 1982 UN Convention of the law of the Sea (1982)
- 1984 Karachi Fisheries Harbour Authority Ordinance No.11, 1984 This law provides the legal basis to carry out efficient operation of harbour facilities and for periodic inspection of hygienic conditions of processing plants, ice plants, cold storage and other related activities.
- 1988 Agreement on the Network of Aquaculture Centres in Asia and the Pacific 1998

[15] FAO data with additions

- 1994 Coastal Development Authority Act Sindh, Act No. XXVIII, 1994 This law provides the legal basis for planning, development, operation, management and maintenance of coastal areas, including development of fisheries, livestock, horticulture and agriculture.
- 1998. Pakistan Fish Inspection and Quality Control Rules, 1998. This law provides a detailed description of conditions required for registration of processing plants for export, ice factories, fish handling on board fishing vessels, landing places, and fish processing establishments. It also provides provisions for registration of testing laboratories for seafood products, and notification of approved cleaning materials, etc.
- Balochistan Sea Fisheries Act No. IX, 1971 This law provides authority for control of fishing craft, fishing licences and processing of fish and fishery products in the territorial water of Pakistan along the coast of Balochistan. Contravention of any provision of the Ordinance is punishable by one month imprisonment or PRs 5 000 fine, or both.
- Unknown. Pakistan Environmental Protection Ordinance No. XXVII This law deals with protection, conservation and improvement of the environment for the prevention and control of pollution, including biodiversity, ecosystems, effluent, hazardous substance emission and water pollution. It also provides a provision to make rules for implementing the provisions of international environmental agreements.

Various orders, declarations etc

- Conservation of fisheries resources S. R. O. 329(1)/79. In exercise of the powers conferred by section 6 of the Exclusive Fishery Zone (Regulation of Fishing) Act, 1975 (XXXII of 1975), the Federal Government declared the period commencing on 1 June and ending on 31 July to be the period during which catching of shrimps shall be prohibited within the entire area of the zone. This will reduce fishing pressure on the shrimp resources and provide an opportunity for juveniles to grow before becoming subject to fishing.
- The Provincial Government of Sindh, vide section 4 of Sindh Fisheries Ordinance, 1980, declared a ban on catching of shrimp during the period of June and July.
- S. R. O. 332 (1)/79. This law stipulate that no holder of a licence, fishing permit or identity card shall engage himself in catching female lobsters loaded with eggs (berried lobsters) and lobsters of 15 cm or less, and, if caught, such lobsters shall be immediately released back into the sea alive and shall not be landed or marketed.
- Notification No.DD-75/98/3342-48 dated 24-07-1999. Federal Government prohibition against catching of marine turtle of all types in the EEZ beyond 12 n.mi. from the shoreline.
- Notification No.3(5)SO (Fish)/91 dated 15-06-1999. Government of Sindh has made it mandatory for all shrimp trawlers having a crew of more than six persons onboard to install Turtle Excluder Devices (TEDs) in their trawl nets, to minimize the accidental entrapment of turtle in shrimp trawl nets.
- Notification No. SO(Fish)5(6) /AL&F/2000. Government of Sindh has authorized the Marine Security Agency (MSA) to check the use of TEDs in the provincial territorial waters and to take action upon non-compliance.
- S. R. O. 739 (1)/98 The Federal Government totally forbids the export and domestic consumption of aquatic turtles and tortoises.

- Notification No 5(3)SO (FISH)/FL&F/2003 covering licensing of inland fishing waters
- Notification No 5(3) SO (FISH)/2003 which specifies minimum mesh sizes for various gears

**Manpower and Training**

The number of marine fishermen in Sindh is given as 85,105 (1999, Marine Department figures). Of these 62,744 are full time and 18,220 part time. The balance are "occasional" fishermen.

Vessel operators are supposed to be licensed to operate in the fishery. This involves getting a PRp15 form endorsed by the Karachi Fish Harbour Authority, with a recommendation from a mole and a fishermen's Cooperative Society director. He also requires insurance which requires a National Identity Card, approval from the Karachi Port Trust, a photo of the fishing vessel owner and approval from the Mercantile Marine dept., to take a boat to sea. The crewmen are uneducated labourers. Everybody has to have a crew card, which is issued by the Fishermens Cooperative Society, and is supposed to cost 16 PRp, but bribes may have to be paid to obtain one. There is a training institute at the Karachi Fish Harbour, run by the Federal Marine Fisheries Department, but it is defunct, though the FCS has used it for fishermen training in the past. There is no general training programme in fisheries at all. The vessel owners and moles complain that their crews are uneducated and untrained, and blame them for many of the shortcomings of the industry, from poor quality control at sea, to wasted fuel and discarded fish. The lumpers[16] in the market are labourers. The processing staff in the fish factories similarly.

**Port Facilities**

Karachi Fish Harbour is in West Karachi near the main port. It is relatively well supplied with facilities, with two large auction halls which whilst not ideal could be made presentable at little cost, a smaller improved auction hall for export fish, a landing area for fish intended for fishmeal, one 40 tonne flake ice machine (most ice used is block ice and bought in by truck from outside the harbour area), an unloading wharf next to the market hall and export processing factories. Boatbuilding facilities and a slipway are on the creek side of the harbour. A satellite photo of the harbour from 1.5km eye height, suitably annotated is in Figure 5. The harbour is extremely crowded, but still functions. Many of the vessels that contribute to the crowding are not operating, and "parking facilities" elsewhere would be useful.


Figure 5 Karachi Fish Harbour

Korangi Harbour, in East Karachi, is a relatively new harbour, originally built to take pressure off the Karachi fish harbour. It was also to serve the boom in fisheries

[16] Hired fish handlers & unloaders

production as a result of expansion offshore, which never occurred locally, and for large trawlers and processing vessels. It was supposed to have a large cold store, ice machine, three jetties, and all necessary facilities, and cater for the needs of 1,500 fishing vessels and handle a catch of 162,000 tonnes annually. It is currently used occasionally by Joint Venture vessels, but remains empty most of the time. The wharf structures are too high for the size of boats presently using Karachi Fish harbour so it has not relieved the pressure for space there. It is run and owned by the Federal Marine Fisheries Department.

The most important other harbour area in Karachi is Ibrahim Hydari, where large numbers of boats land on 9 solid jetties. Each jetty is controlled by a "mole" (moneylender and fish trader) who thus controls the price and destination of the fish landed there. In season large amounts of small pelagics are delivered by seine netters and converted to fish meal, in both modern and ancient fish meal plants. Large fish drying areas lie adjacent (to the NE) to fish landing area. The general situation reflects landing areas elsewhere in the fishing industry in Pakistan, being unhygienic, verminous, and with low regard for fish quality. Again in keeping with recent experience, statistics on landings and numbers of boats and fishermen are lacking.

Other commercial landing areas in the Karachi area of Sindh are to be found, again in East Karachi, and westwards along the coast towards Balochistan.

In the project area of Badin and Thatta there are no significant port facilities. Keti Bandar, once a thriving fishing port and agricultural epicentre is now a shadow of its former self, being deprived of fresh water by lack of discharges from the Indus and the shifting pattern of the Indus itself, meaning it now has no direct connection to the river. Shah Bandar similarly is in decline. Badin, the District town of Badin has not been a significant port for more than a millennium, and is now miles from the sea.


Figure 6 fish displayed uniced on the floor at Karachi Fish Harbour

**Fish Quality. Karachi Fish Market and elsewhere**

The wholesale market area in Karachi and its surroundings are unclean, rank and vermin infested. Just outside the wholesale market is a squalid retail market. Basic fish quality control measures seem practically non-existent. Fish and prawns are displayed in the sun without ice. Retailers' vans and incoming and outgoing fish lorries use inadequate ice and are not properly cleaned. Fish are left un-iced on the floor. The EU has helped fund a separate market area for export fish, and although it could be said that it is "as good as it gets" regarding market facilities in Pakistan, it still falls well short of what should be expected from an approved[17] facility, as even the briefest of inspections reveals.

[17] Shrimp & fish processing units in Karachi which wish to export to the EU have been inspected by inspectors from the Competent Authority to ensure that they pass basic hygiene and HACCP standards.

Whilst some of this is due to the infrastructure, which could be easily fixed, either through local initiatives or foreign pressure coupled with financial and technical assistance, the fundamental problems relates to a complete lack of will to change the situation. A few basic measures, at relatively low cost, could be implemented and enforced which would make huge improvements to the handling, display and processing of fish both at sea and in the market area, without the addition of further expensive infrastructure. Additionally there is no training of operatives, which in theory could be easily solved, were the training school open and staffed.

This study has been unable to discover why a system persists in Karachi Fish Harbour and elsewhere in Sindh that perpetuates such remarkably poor quality fish and lack of hygiene, and thus reduces catch values; apparently to the benefit of nobody. Enquiries with the authorities, senior moles and vessel owners drew evasiveness and a refusal to confront the situation. Even visiting the fish auction halls and facilities appeared to be difficult, although they are technically open to the public. It no doubt relates to a conflict with some of the perceived ($) interests of the members of the FCS. This is however a serious impediment to taking any action to rectify the situation.

[The only answer given (October 2005), by vessel owners and moles alike, and the various officials involved with the fish market, is that on-board ice machines would solve the problem of poor quality landed fish. This response was repeated so many times by so many separate people that it can be no mere coincidence that everybody has come to the same conclusion. Whilst on-board ice machines may ameliorate some of the problems, it is unlikely that they alone will solve the fish quality problem, and it is significant that nobody has actually gone out and bought one to place on a vessel to test the hypothesis].

Local retail marketing of the catch is done through small retail markets throughout Karachi, and by mobile fish sellers with carts and bicycles. The local retail markets are universally filthy, almost beyond description. Flies, rats and domestic animals abound, no ice is used and the surfaces are soiled. The local markets are the responsibility of the local municipality; who do not appear to take their responsibilities seriously.

As long as the institutional inertia against change remains there will be little chance in the short term of improving the value of the catch through improvements in quality in the marketing chain in Karachi. Other initiatives in marketing, such as promoting fish to a Pakistani population with one of the lowest per capita fish consumption rates in the world, developing new products, emphasising the healthy aspects of fish eating and improving the distribution system in towns relies on having an uncontaminated and attractive product in the first place.

The ADB Sindh Coastal and Inland Community Development Project cannot expect results impacting on the rate of poverty in the project area of Badin and Thatta, from direct investments in marketing in Karachi, and so should not make any. This is unfortunate because increasing the value of the catch could have offered opportunities for poverty reduction. The bodies responsible for controlling fish quality and hygiene in Karachi fish markets, both wholesale and retail, should implement existing rules and regulations, make appropriate investment and undertake appropriate training programmes to rectify the situation. (Sindh Fisheries Department is not directly responsible for either the wholesale market or the retail market).

**Fishmeal**

There is a large poultry industry in Sindh, and chicken is a preferred protein source for the population. This has created a large demand for fishmeal. The major fish source for fishmeal is the Indian Oil Sardine which is seasonally plentiful in shallow water between August and February.

Federal Marine Department statistics show that (1999) 167 thousand tonnes of the 333 thousand tonnes of catch were reduced to fishmeal (50%)[18]. Anecdotally much of the fish that is condemned for fishmeal is then sold for human consumption (to reduce the price paid to fishermen). The FCS figures for the first 6 months of 2005 show that 30% of the fish passing through the Karachi Fish Harbour went to fishmeal.

Much of the fishmeal is of species that could be used for human consumption, were quality not an issue, but Pakistanis seem to prefer chicken in their diet and no attempts are being made to alter this predilection.

Fishmeal quality and production is covered in the legislation, but the legislation is not enforced. Exports have virtually ceased due to quality issues.

The range of fishmeal plant in use is wide. Some fish is merely dried on sandy drying meadows and ground up. Some fresh (usually spoiled) fish is delivered to plants that cook it, and then lay it out on meadows to dry. Yet other plants are modern and produce fishmeal in modern methods. At Ibrahim Hyderi near Karachi in the sardine season all three methods co-exist. The scale of the industry indicates that the small pelagic catch is probably larger than the statistics indicate.

**Exporting.**

Exporters have to be registered and approved with the Federal Fisheries Department, (the competent authority) which costs PRp25,000 initially than PRp1,000 annually renewal. This indicates that the plant is up to standard. Supporting documentation is identification, a letter from the Chamber of Commerce and details of the processing unit. Pakistan has a

**Comments on the capture fisheries of Sindh based in Karachi**

From written accounts, statistics, interviews and visits it is apparent that, regarding the fishing industry based in Karachi.

- The marine capture fisheries in Sindh are open entry fisheries. There is no control or cap on effort.
- Rules and regulations regarding fisheries (gear restrictions, closed areas, seasons, safety regulations, health and hygiene rules and others) are not enforced, and are widely disregarded.
- The legislation on fisheries matters requires updating
- Serious overfishing of both fish and prawn is occurring in the 12 – 200 mile zone, some of which overfishing is occurring within the 12 mile zone, probably in the SCICDP area, though is recorded for catch purposes by the Federal Marine department at Karachi Harbour.
- Foreign “joint venture” vessels catch and discard much “trash” fish. To this waste, and the general activities of the foreign trawlers is attributed a decline in the catch of demersal fish. There is little technical reason why these vessels cannot rapidly be substituted with truly local vessels.

[18] Federal Marine Fisheries Department Figures

- Anecdotally the shrimp catch is declining by the year, and this is attributed to overfishing of the fish stocks, and has been so attributed for more than 20 years. The statistics bear this out.
- The livelihoods of fishermen in the project area, the Indus delta and inland sea of Thatta/Badin are threatened by overfishing of some resources on which they rely by vessels fishing in the Arabian Sea, both legally and illegally.
- Value of shrimp exports had slumped in the last 5 years
- Quality control on board the vessels and at the fish market is dreadful, by any standards. Much fish (more than half by some accounts) goes to fishmeal that could be suitable for human consumption if treated properly at sea and in the market. (fortunately the EU is bringing pressure to bear for this to be rectified, though the pressure so far has not had the desired effect).
- The Competent Authority[19], as defined by the EU, is the Federal Government Marine Fisheries Department, which, along with the local Karachi Harbour, Fishermens' Cooperative Society, (a group of merchants, boat owners and others who run the harbour), and the Sindh Trawler Owners & Fishermen Association is not moving quickly to implement changes which will improve fish quality.
- There is presently some concern, particularly amongst trawler operators, in that the returns from fishing have not kept pace with the increase in costs, particularly those costs associated with fuel. Gloom and despondency permeate the industry. Currently the trawler owners wish for on board ice machines which are seen as a panacea for their woes; but nobody is installing them.
- Marketing at Karachi Harbour is controlled by the powerful vested interests, which includes vessel owners, and money lenders (the "moles"), the latter also being auctioneers and fish traders, some of whom own boats. Any change will require their willing assent, since they are politically powerful enough to block changes they consider threaten their interests. Their willing assent will be difficult to obtain if their interests are not fully accounted for in any intervention.

Overall the offshore fishery, and the fishing industry based in Karach, is not being managed conscientiously. The catch is declining. The value of the catch is not maximised. Vested interests control resource allocation. The returns from fishing do not permeate down to the poorest of the poor, in this cast the Khalasi (fishermen/crew) on the boats, and the livelihood of the fishermen who come from the project area in Badin and Thatta is threatened.

In the absence of institutional strength and will, there are few direct interventions that the SCIDDP can realistically propose which are likely to succeed. It is up to the Government of Sindh, through the Fisheries Department of Sindh, and the Federal Marine Fisheries Department to take action on quality control, export certification, the management of the resources, and the management of the harbours and landing areas. Since the Sindh Department of Fisheries cannot presently do this, due to institutional malaise, the logical support mechanism would be to alter and improve the institution so that it can, and this is proposed as an activity of the project (see below). The results will, however take some time to filter down into improvements in the lives of the fishermen in the project area.

[19] Commented upon by one boat owner as "The *Incompetent* Authority"


Figure 7 Coastal Zone Sindh with Thatta & Badin

## DELTAIC AND INLAND SEA, CAPTURE FISHERIES IN THE PROJECT AREA

### Coastal Zone

The coastal zone stretches from Karachi eastwards and enters the Runn[20] of Kutch. Most of the Runn of Kutch lies in India. The area used to be much larger, with Badin reported to be a port used by Arab sailing Dhows in the 8th Century, (it is now very distant from the sea). The Runn has filled in since ancient times with sediment from the Indus and the entrance is now much restricted. Nowadays with reduced sedimentation and flow from the Indus River, the area is slowly reverting back to the old situation and many areas of Thatta and Badin are receiving seawater intrusion, with the accompanying loss of agricultural land and less access to fresh water.

The project area[21] is about 300 km long and extends 50 Km inland. The area of the delta near to Karachi is characterised by mangrove along creeks and mudflats, with permanent villages and a settled population. The area of the inland sea, near the Runn of Kutch, is mostly a barren wasteland, unsuitable for agriculture, with the coastal areas flat, almost featureless and devoid of large settlements near the coast. Those settlements near the sea suffer from lack of fresh water and rarely include any large permanent buildings.


Figure 8 Satellite view of Coastal Zone of Sindh

### Resource estimates and fishery profile

No recent work has been done on fish stocks in the project area, nor in the delta region generally. Estimates of catches, actual abundance, MSY or TACs are vague. Brandhorst (1986) estimated the demersal resources of the creek areas and mangrove swamps as 58 thousand tonnes, and the pelagic stocks as 77 thousand tonnes. No estimates of MSY were given.

Many of the fishermen of the Delta fish in the 12-20 mile coastal zone offshore land to coastal landing centres as they have access down creeks to the sea. Keti Bandar in Thatta is a good example of this sort of landing area. Their catch, though coming from the "sea", is not measured at all in the figures for landing in Pakistan as this reflects the estimates of what is passing through Karachi Fish Harbour and Karachi landing sites, and not the remote ones in the delta.

[20] Or "Rann"
[21] The Talukas of Thatta, Shah Bandar, Keti Bandar, Jaki, Goorabari and Kharochan in Thatta District, and Shahid Zazu Rahu and Badin in Badin district.

The catches throughout the project area are not now measured[22], except by moles and middlemen, and this information is confidential, scattered and not in accessible form. Similarly the estimates of the numbers of vessels involved in the fisheries of the Coastal, Indus Delta and Inland Seas of Badin and Thatta are sweeping and not based on actual enumeration, and the numbers of fishermen similarly hazy.

The FAO statistics (Annexes I & II) covering marine and inland fisheries overlap into the coastal zone, in that many of the commercial vessels operating out of Karachi Harbour, and other sites in Karachi where the FAO data is derived from, are operating within the 12 mile zone offshore of the delta, where boats based in the delta region also operate.. These statistics do not cover the numerous landing sites outside the Karachi area. Thus published statistics do cover some of the species which occur in the deltaic and inland sea areas, and with regard to the effects of overfishing, are important to the deltaic and inland sea area. This shows up in the catch of prawns, which are persecuted by both the artisanal fishermen of the project area with access to boats and landing sites, and the vessels operating out of Karachi in the Arabian Sea.

The prawn catch in the project areas of Badin and Thatta is variously claimed to be affected by, or affect, the offshore prawn fishery, depending on which authority one listens to. Prawn trawler operators claim that the overfishing of the small juvenile shrimp in the delta region, particularly by fishermen using small mesh nets, has a deleterious effect on recruitment to the mature stock offshore. This is refuted by deltaic fishermen and some officials, who complain that the offshore fishery is destroying the adult stocks, so there are inadequate prawns to breed anyway, and the shrimp being caught by the small scale artisanal fisherman in the delta is of species that do not grow to any great size. The destruction of mangroves between 1960 and 1990 has probably had a negative effect, in that mangroves provide a nursery area for shrimp postlarvae and juveniles. Some fishermen have commented that the shrimp catch, particularly in the Inland Sea areas, has improved as the salt water intrusion has increased the area available. The truth of the matter is difficult to gauge.

Table showing catches of shad in Pakistan (1953-2003)

| 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 |
|---|---|---|---|---|---|---|---|---|---|
| 10,000 | 11,000 | 12,000 | 13,000 | 6,000 | 8,000 | 8,000 | 8,800 | 7,800 | 2,700 |
| **1963** | **1964** | **1965** | **1966** | **1967** | **1968** | **1969** | **1970** | **1971** | **1972** |
| 3,800 | 4,800 | 5,500 | 7,500 | 6,500 | 8,200 | 9,900 | 12,700 | 11,100 | 10,800 |
| **1973** | **1974** | **1975** | **1976** | **1977** | **1978** | **1979** | **1980** | **1981** | **1982** |
| 11,800 | 9,098 | 9,474 | 9,545 | 9,129 | 4,813 | 9,036 | 4,427 | 3,923 | 6,032 |
| **1983** | **1984** | **1985** | **1986** | **1987** | **1988** | **1989** | **1990** | **1991** | **1992** |
| 1,592 | 1,527 | 2,078 | 1,975 | 1,843 | 1,528 | 875 | 935 | 861 | 823 |
| **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** |
| 796 | 658 | 476 | 562 | 597 | 611 | 502 | 190 | 170 | 174 |
| **2003** | | | | | | | | | |
| 156 | | | | | | | | | |

FAO Fishstat data (2005)

Figure 9 Shad Catches 1953 - 2003

[22] Many reports use the total catch of Sindh as an indicator of deltaic catch, which may or may not be appropriate.

The building of various barrages, most particularly the Kotri barrage, on the Indus has altered the general situation as regards anadromous fish, particularly a shad, the "Palla" (*Hilsa tenualosa* (mostly) *& Hilsa ilisha*), which travels up the river to breed. Catches (in tonnes) are given in figure 10.

Its numbers have declined dramatically (>90%) from historical peaks, though the FAO catch data (in tonnes) shows little change in the last 10-15 years. It would appear that the damage had been done some time ago. Calls for fish weirs and ladders to be put in to allow the fish to regain its spawning grounds upstream seem optimistic to say the least. Figure 11 below shows the catch of shad from 1955 to 1998 compared to discharges from the Kotri Barrage (the limits of the data are acknowledged) and there appears to be little correlation between discharges and shad catches. If the catch data is anywhere near a true reflection of the truth, then it may well be that the decline in the catch has other causes; and the possibility that gross overfishing may be a culprit seems to have been overlooked by commentators who have different agendas. What is clear though, is that the catch is now very low, has been for 20 years, and shows no signs of recovery. This was a staple food fish for many deltaic people in the past. Now it is no longer important.

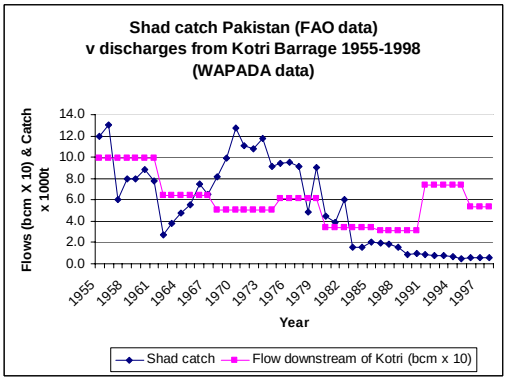



Figure 10 Palla catch v Kotri discharges 1955-1998

Large numbers of small pelagic fish (*Sardinella spp*, predominantly the Indian Oil Sardine *Sardinella longiceps*) are caught in the deltaic creeks near the sea and in the shallow water just offshore. This is a seasonal fishery which peaks in October and lasts from August to January/February. In the delta area the fish is caught by seines in shallow water and sun dried on drying meadows, which are just bare areas of vegetation free sand and mud. The fish is then transported to upstream landing centres, such as Kharo and Dhando, and collected by middlemen from Karachi. The fish is used for fishmeal for chicken production. It is contaminated with sand and other detritus, and infested with Dermestes and other insect pests: but quality is not paramount, and the technology is suitable for both the producers and the purchasers.

It is interesting to note that despite the acknowledged paucity of recent hard data on the state of the fishery in the delta, and of marine fisheries offshore of the delta, and the miserable existence of an unknown number of fishermen, fisheries is used as a justification for many development interventions in the Thatta and Badin areas. The miserable condition of the fishermen is inescapable. The state of the resources in the delta and offshore is basically unknown and the catch figures are elusive. Neither is it clear that the claimed links between the three are as strong as often made out to be.

**Numbers of fishermen**

The number of fishermen in the delta and inland sea area remains a bit of a mystery. Estimates vary, with distortions intervening where political objectives rather than facts are sought.

Recent published figures on population from The Forest and Wildlife Department of Sindh are given below. These are a compilation of data derived from the Sindh Coastal Development Authority -2001, Sindh Revenue Department – 2003 and World Bank – 1999.

| District Badin | Taluka | Area (Ha) | Population |
|---|---|---|---|
| | Badin | 437120 | 12125 |
| | Golarehi | 48650 | 5268 |
| District Thatta | Mirpur Sakro | 736541 | 198852 |
| | Ghorabari | 231980 | 105482 |
| | Keti Bandar | 152542 | 25700 |
| | Shah Banda | 734879 | 100575 |
| | Jati | 875376 | 123957 |
| | KaroChaan | 235484 | 25656 |
| | TOTAL | 3452572 | 597615 |

Most of these people live in the agricultural lands inland of the coast so they cannot be considered to be full time fishermen, even if they fish occasionally

In the marginal lands bordering the sea, many of the inhabitants and their families have just packed up and gone to live in Karachi or further inland, due to the lack of fresh water, amenities, education, health facilities and job opportunities. The salinization due to irrigation and waterlogging has made life difficult since agriculture is no longer a viable proposition in large tracts of coastal land. With the decline in agriculture numbers continue to decline on the coastal belt.

This PPTA has calculated that there are about 100,000 individuals in the project area who depend on fishing. With a family size of about 10 this gives about 10,000 people directly fishing, with the rest reliant in some way or another on the lead household member. Most of these are concentrated in the delta area, and the remoter parts of Thatta and Badin on the Inland Sea are in places almost deserted.

**Catch.**

In the project area the gross catch is almost completely unknown. The ESCAP overview of 1986 referred to the project area as “a number of small fishing centres in the Indus Estuarine areas”. The project areas in districts of Thatta and Badin do not measure their marine catch. Statistics for catches for Badin and Thatta tend to be production from inland water bodies

Figure 11 Seine netter. Small pelagics. Ibrahim Hyder

Much seasonal sardine is caught and landed at various landing sites on the Indus and at Keti Bandar and Shah Bandar (for fishmeal - convoys of trucks loaded with dried sardine pass along the Badin/Thatta main road to Karachi every evening in the season). There are several hundred boats, but again nobody has counted them recently. Unfortunately the time for observation and recording catches under this PPTA were limited, and no recent reliable data is available.

Men using staked bag nets in Badin and Thatta drainage channels and the inland sea area catch shrimp and small fish, including gobies juvenile flatfish, Gerres sp and the occasional shad. Dragged seines with bag catch similar species but with crabs also present. Cast nets are used for mullets. Most of these fish are autoconsumed. Quantities of other fishes caught by gill nets and are bought by middlemen who deliver ice boxes with ice to the fishermen using pick up trucks.

**Boats**

All the boats in the small scale fishery in the delta and the inland sea are wooden. Large steel vessels, and large wooden inboard gillnetters or trawlers do not use deltaic landing areas due to the low draught available there and in the Indus itself. The lifeboats converted to gillnetters, seen in Karachi and along the coast are not common in the delta. Large numbers of seine netters exist in the Deltaic area near the Arabian sea where small pelagics can be targeted. Motorised boats in the delta and inland sea have long tail motors, enabling the propeller to be raised in shallow water and when in port when the tide leaves the boats resting on the deltaic mud.

There are basically 4 types of vessel, small non motorised paddle boats 6-8 m, small sail powered boats 6 – 10 m, the same sail powered vessels with a small petrol long tail and larger vessels with long tail diesel water cooled (radiator) longtails of up to about 15m maximum. Inboards are not found up the delta and true “outboards” are rare. The further away from the coast the smaller the vessels get, with smaller engines and smaller gears. This is to be expected since the depth decreases, the fish quantities are smaller and the people are poorer. In the Inland Sea areas of Badin and in the drainage channels, the boats become more and more modest, with small paddle boats predominating; reflecting declining wealth and opportunity for income earning. In very restricted channels no boats are used or needed.

Figure 12 Sail/Motor hybrid. Thatta district

The boats are universally hardwood carvel construction on hardwood frames, with the timber predominantly imported from Indonesia and Burma. Larger boats have more or less decking, usually consisting at least of a covered forecastle and stern, but sometimes extending to the whole deck area with hatches. Steel nails are used. The standard of construction is adequate, if not finely finished. The boats have fine lines and the boat builders have adequate skills to produce the boats. Boatbuilding in the project area is apparently declining due to the difficulty of transporting wood long distances, where it is cheaper to make the boats in Karachi and sail them round to their destination when complete. Very few new small boats were observed during the PPTA in the project area. Repair of boats is carried out in situ in the project area at landing sites. No attempts to introduce other

boat materials such as fibreglass[23] or cement have been noted, and if so they have been unsuccessful.

Engines are water cooler (with radiator) truck engines attached to long tail shafts, jointed to allow the shafts to be raised (see photo). Smaller engines are two stroke air cooler petrol engines, similarly attached to long tail shafts.

**The Contract System**

The contract system was introduced in Badin District on the inland sea in 1977 and was intended to cover the areas close to the Indian Border. It expanded until it covered large tracts of land and many water bodies, some in Thatta. Under the contract system the fishermen were obliged to sell their catch to powerful men who had bought contracts from the Rangers[24]. The Rangers were meant to pay for their rights to the Sindh Fisheries Department, but apparently did not. Contractors paid as little as 7% of the retail value of the product (usually small shrimp). The system was enforced by the Rangers.

This system was seen a very unjust and following agitation by the Pakistan Fisherfolk Forum the system was supposed to be abolished in 2005. It will be replaced by a license system, and it remains to be seen how many of the existing fishermen will obtain licenses, and to what degree their situation will be alleviated.

**Methods used in the fishery**

The methods used for fishing in the project area[25] are deemed to be "traditional", in that they have been used for a long time. Mechanisation of boats, by the addition of long tail motors, increased the range of the vessels and enabled them to tow trawls, which was not widespread until motorisation arrived. Similarly nearly all natural fibres have disappeared.

From observation[26] and Marine Fisheries Department Reports[27] the gears in use are:-

- Trawl ** – with otter boards. Target shrimp shallow waters. Very important economically.
- Trawl ** – pair, No boards. Target shrimp, shallow waters. Not common but locally important economically, particularly in the target area.
- Gillnet** – staked - fish. Important subsistence
- Gillnet** – bottom set. Target fish. One of the commonest gears. Most important economically in the project area.
- Gillnet – bottom set - entangling (less common now). Target shrimp
- Gillnet** – encircling. Target fish. Not common
- Seine net** – dragged. With bag (2 man). Target shrimp and fish
- Cast net** – Target fish (mullet/*Gerres spp/Leiognathidae spp* predominating). Shallow water. Important subsistence

[23] In Karachi Harbour and in Balochistan many (= 2-3 thousand) ships lifeboats from scrapped larger boats have entered the fishery after modification.
[24] a paramilitary force with, since they are no longer protecting Pakistan from Indian invasion, no defined jurisdiction or function, but armed.
[25] The Talukars of Thatta, Shah Bandar, Keti Bandar, Jaki, Goorabari and Kharochan in Thatta District, and Shahid Zazu Rahu and Badin in Badin district.
[26] Seen during the PPTA = **
[27] Van Zalinge 1987

- Beach seine – target fish (Small pelagics).
- Seine** – no pursing mechanism. Shallow water, less than the depth of the net. Target small pelagics. Very important for fishmeal. Large catches in rural areas, dried for fishmeal.
- Seine – ringed. No bag. Target small pelagics.
- Bag net** – staked. Target shrimp & fish. Used in drains and irrigation channels. Important for very poor fishermen in salt encroached areas.
- Hook & Line** – with pole. Used by children for fish. Auto-consumption.
- Hook & Line** – hand. Used off wharves, jetties and drains
- Longline – bottom set (reported to be quite common)
- Cover pot** – used in shallow waters of the delta and inland sea area for fish
- Collecting** with out gear or with extensions to the hand. Opportunist & sedentary organisms
- Barrier/labyrinth traps** – used in drainage channels. With or without lifting chamber
- Lift nets** - used in drainage channels

It is not known if poisons or stupifiers are used, nor explosives; though it is possible that they are.

The materials for all these gears are petrochemical derived and mostly imported, except cover pots, which are local woven basket material, and some poles and timber. Lead is used for weights and floats usually polypropylene, or polystyrene, often large floats cut into smaller pieces. Ropes are PVA, polypropylene or polyethylene and twines multifilament nylon or monofilament nylon, or in some cases polyethylene, particularly in trawls and for lashings. Some natural fibres are used for lashings. The fishermen are aware of the deleterious effects of sunlight on man made fibres and tend to cover their nets when in long term storage aboard or ashore.

All necessary gears can be obtained locally from small outlets that are found either at the landing sites or in the nearby towns. Apart from the ever increasing price, gear availability is not a constraint to fisheries development in the project area.

**Cooperatives, and Credit to the Artisanal fishery**

There is one cooperative, the Fishermens Cooperative Society, that operates in Karachi Fish Harbour. All fishermen, moles and traders operating in the Harbour have to be members and they pay a yearly due. This is the only Cooperative operating in fisheries in Sindh. It is a welfare society and collects 50% of the auction dues as its income. Fishermen in the project areas of Badin and Thatta are not members of any cooperative.

Formal credit is only available to people who can provide assets as collateral which are not related to fisheries, since banks and formal lending institutions consider fisheries to be very high risk.

All others get credit from moles of middlemen. The real interest rates tend to be very high (the repayments usually are in reduced catch price realised by the fishermen rather than in repayments) and many fishermen are subsequently bound to middlemen to whom they owe money. This is seen as a very unjust system by many, benefiting the

money lender and enslaving the fisherman. There is usually a complete lack of paperwork to formalise the loans.

Ensuring recovery of debts from defaulters is similarly informal, but reported to be very efficient.

Debt can be passed down generations. An indebted father can pass his loan down to his son. The middleman thus has some security should there be a death of a borrower.

**FISHERMAN AND MIDDLEMEN IN THE COASTAL AREA OF SINDH.**

Generalisations are far too easy to make. Regarding the ownership and management of the boats in the fisheries of Sindh they are in some way necessary because the permutations are endless. What is apparent is that there are very few fishermen, probably none, working on boats or catching fish commercially in Sindh who are well off and live a comfortable life. There are, however, a considerable number of people living a comfortable life from the proceeds of fishing, and these people tend to live in Karachi and not go to sea often, if ever.

**BIG MEN**

**Fishing boat owners. (mainly Trawler owners).**
Boat owners own vessels fishing to Karachi Fish Harbour. They tend to be members of the Sindh Trawler Owners and Fishermen's Association. They own boats (usually trawlers) and operate them as a business, just as any other business. Trawlers usually target prawns, which is the main fisheries export commodity. The owners usually have other significant business interests outside the fishing industry. The skippers and crew of the vessels are hired hands. These vessel owners reside predominantly in Karachi.

**Moles (Moleholders).**
These are businessmen who operate in Karachi fish harbour. These individuals lend money to private vessel owners and reclaim the debt from the proceeds of the sale of the catch. A fisherman wishing to go out to sea will seek an advance from a moleholder, who will provide what is required (but not in cash, the fisherman will usually receive a written chit to the fisherman who has to get his supplies from a supplier in league with or even owned by the moleholder). On return from fishing the catch is auctioned by the moles in Karachi Fish Market and from the proceeds is deducted commission 6.25% of the value which is split up 50/50 between the Fishermens Cooperative Society[28] (FCS) and the Moles who get 50% auctioneers commission. (Karachi Fisheries Harbour who own the harbour premises get 10 million rupees rent annually from the moles, or not as the case is most years.). From the proceeds of the auction after deduction of the 6.25% commission the moles deduct their pre trip advances, and the rest is split up amongst the crew (who divide it up amongst themselves on a separate share system) and the boat owner. If the boat owner is the mole himself then he takes the share destined for the boat owner. A powerful mole may own several boats himself, and also have several other fishing directly to him, bonded by debt to allow him to do the auctioning, so that he can regain the debt owed.

[28] A benevolent institution dedicated to the welfare of its members

"Official" Moleholders, are sanctioned by the Sindh Fisheries Department, and are usually also members of both the Fisheries Cooperative Society (which runs the auctions but is a charitable organization), and sometimes the Trawlers Owners Association as well.

There are about 30 official Moles operating in Karachi harbour. They reside in Karachi.

They may also have interests in other landing areas near to Karachi such as Ibrahim Hyderi and Rehri.

Some middlemen (see below) are bound to senior moles through debt obligations, and sell the proceeds of the catch they deal with to the moles.

There are various ways the moles can enrich themselves beyond that which is generally considered "fair". These include:-

- Selling supplies to the vessel operators at inflated prices, or selling substandard supplies at normal prices, through their system of advancing loans in kind to finance trips.
- Their 50% share of the 6.25% auction fee
- Under weighing the catch, because no trusted weighing system is currently enforced at the auction. Much fish is sold by heap or basket.
- Adjusting the auction price, since they do the auctioning. Either in collusion in the buyers, to obtain low prices at auction which are made up later out of sight of the public auction, or though condemning fish for fish meal which is subsequently sold for human consumption.
- Their portion of the catch that goes to pay back the loan of supplies, fuel and ice for the last trip – often valued at more than it cost with a percentage addition for interest.
- If they own the boat, through the proportion that goes to the owner
- Personal loans to fishermen working on the boats (not related to the fishing operation).

According to the pressure group Pakistan Fisherfolk Forum, the deductions at the harbour and the loans etc from the middlemen account for 60% of the income from catches.

Overall there is no realistic system to replace the moles. They provide an efficient loan service to fishermen, quickly, without lengthy paperwork, where no alternative exists. The loans they make have little collateral, are very high risk and based on a degree of trust that shows a benign dispensation toward fishermen not generally acknowledged or appreciated by outsiders. The situation is accepted by fishermen and administrators alike. It is unlikely that the set up could have remained for so long in such a metropolitan city such as Karachi, for so long, if it did not bring benefits to both sides. This does not stop NGOs and others agitating, and condemning the mole/middleman system. They have so far failed, and continue to fail, to provide or even suggest an workable alternative.

The Karachi moles' pervasive influences control major commercial fishing in the Karachi area and their influence even extends to some areas of Badin and Thatta.

No development affecting their interests is likely to succeed unless the senior moles approve of it. They must be consulted, and their support guaranteed, before inputs changing the structure of the fishery are applied. If they do not approve an intervention then so many impediments will be created that the intervention is likely to fail. They are powerful men. They are also politically active at high levels. Any suggested inputs by the SRCCDP will have to allow for this.

**Middlemen**

Other middle men are also called "Moles" and are not "Official", in that they do not operate in the Karachi Fish Harbour area or are not members of the FCS or are not sanctioned by the Sindh Provincial Fisheries Department. They operate generally throughout the landing areas and are more properly called "middlemen" or locally "bayparis". They do not generally own boats in their own right. They lend money/materials to private vessel owners who are bound by the debt to land their fish to them. They also buy fish from independent operators. They operate throughout Badin & Thatta (the project area) and in the lesser landing sites round Karachi (not officially in Karachi Harbour).

Middlemen deliver ice, ice boxes, gear repair materials and fuel, as well as fresh water to some of the remoter areas. The cost of this is set against the catches of the vessels with which they are associated. Middlemen generally use (4 wheel drive) pick up trucks for valuable fish and prawns and hire in labour and 10 tonne trucks to load and carry bulky produce such as dried pelagics destined for fishmeal.

Middlemen also provide loans for personal use, such as for weddings, funerals, large purchases, in times of hardship such as when the shrimp fishery is closed (two months of the year) and for a miscellany of other purposes. These loans go to vessel owners, fishermen, labourers and others who become reliant on the middlemen and bound to them.

There are all sorts of size of middlemen, and they have differing relationships with the vessel owners, who in some cases are not bound by debt to particular middlemen.

Some middlemen "own" or control landing areas, such as the wharves at Ibrahim Hyderi near Karachi, where fishermen landing at particular wharves are obliged to sell through a particular middleman. Some other middlemen have developed virtual control over fishing in particular creeks and areas, particularly in the Western area of the Delta, between the Indus and Karachi.

Middlemen are often involved in local politics and seek to place their men in local and district councils. They often have other businesses associated with fishing such as gear stalls and ice factories. The also may have other businesses not associated with fishing.

Some of the middlemen are in debt themselves to larger and more powerful middlemen or entrepreneurs in Karachi, who in turn may be bound to Moles operating in Karachi Harbour. The complexity of the situation is made more intricate because almost nothing is written down in a formal manner.

The majority of the money lenders are not generally from Sindh, as they mostly come from other regions of Pakistan or Afghanistan. This adds an ethnic dimension to the middleman debate which can lead to far more than mere righteous indignation about their lending policies and interest rates.

**LITTLE MEN**

**Independent Vessel Owners (bonded)**

Independent vessel owners (which are usually whole families) work their own boats and are theoretically free agents. They are not generally, however, free to sell their catch to anyone since they have become indebted to middlemen, both for the construction/purchase of the boat and for running costs and living expenses incurred day to day.

In addition the boats may be, particularly if large, be "owned" by a group of investors, who also receive a portion of the catch. One may own the hull, another the engine, and yet another the net. The division of the proceeds of the catch after repayments is (in Keti Bandar), ESCAP (1996), reported to be:-

| | |
|---|---|
| Net | 6 shares ("patti" or "pati") |
| Boat | 2 shares |
| Engine | 6 shares |
| Owner | 1 share |
| Khalasi | 1 share (Crew/labour) |

Similarly, and illustrating the variety of systems, the shares after an 8 day trip are also described[29] as being fivefold with two shares to the boat owner, and 3 to the crew, the catch being owned by the middleman.

Another variation, reported by Sindh Forest and Wildlife Department[30] in 1999 for large gillnetters and trawlers of 9 to 15 m length with 6 to 15 crew was:-

| | |
|---|---|
| Engine owner | 2 patis |
| Net owner | 2 patis |
| Boat owner | 1 patis |
| Driver/captain | 1.5 patis |
| Crew | 7.5 patis divided equally |

The same reference comments that on larger trawlers and gillnetters there is a system of at least 60 pattis (shares) with 50% to the owner, 6 patis to the captain and his assistants and the rest divided equally among the crew.

In short the system of dividing up the catch proceeds amongst the crew is varied.

Fishermen report being harassed by customs officials, the coastguard, the navy, American Naval boats undertaking anti terrorist operations and the Karachi Port Trust. These organizations merely add to their problems.

[29] Forest and Wildlife Department of Sindh. Statistial Data Collection of Coastal Belt of Sindh, 2004
[30] Sindh Forest and Wildlife department & World Bank (1999) Diagnostic Study of Indus Delta Mangrove Ecosystem

The IUCN in 1994[31] wrote a situation report on Rehri Village near Karachi and concluded that almost all the families who owned boats in the village were in debt to middlemen. The debt varied from 15 to 600 thousand rupees amongst those who had borrowed money to finance their boats. In essence all but 1% of the mechanized boats were bound by debt through either construction costs or subsequent running cost loans to middlemen and about 95% of the non mechanized boats were similarly bound.

Vessel owners tend to accept debt as part of life. Whilst acknowledging that the interest rates may be usurious, they also endure the situation without protest, for they know that they are not in a strong position. Nobody else, particularly banks and formal institutions, will lend in such a risky business environment and it is a traditional service bond which has served well for a long time.

It is difficult to assess the interest rate on the "loans" given to fishing vessel owners operating in Karachi Harbour and the areas surrounding Karachi. Figures of an effective annual compound rate of 180% are spoken of, but no hard data is available. Nothing is usually written down, many of the loan advances are in kind (fuel, ice, food etc) and the repayments are usually in reduced fish prices rather than in cash.

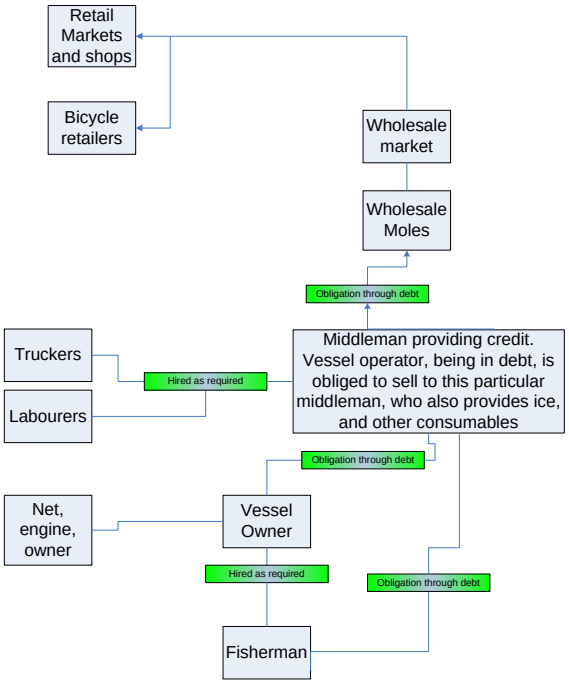
The Pakistan Fisherfolk Forum suggest that the monthly rate of interest charged by moles is 10% per month, rising to 11-12% for emergency loans. They go on to comment[32] that:-

> "The informal credit system in fisheries is the most exploitative system, depriving the indigenous fishermen of the major share of their earnings."

which reflects the general opinion of most NGOs on the informal credit sector in fisheries.

From the above it can be seen that middlemen, through the control of running costs and investment funds, have a pervasive control on fish landings by most "private" fishermen owning boats, more particularly in the urban areas. The position could be compared to European Countries where the retail banks are sometimes considered to hold the same role for small businesses, and to be exploitative, the only difference being that the exploitation is instutionalised.

Model of the position of a fisherman working in the Deltaic region of Sindh




[31] ICUN Pakistan Programme. Rehri Situation Report. Coastal Village Development 1994
[32] PFF. (Undated) SPRIDER study. The Indus delta. Environmental assessment.

**Independent Vessel Owners (not bonded to middlemen)**

The pervasiveness of debt does not reach to all. Some vessel owners did not build their boats and kit them out with borrowed money. Some also do not have debts to middlemen. Although they make up a minority these people do exist, particularly in the Delta region. Some have access to vehicles to market the catch to Karachi. Family members may be used as the crew so minimize costs and provide security of employment to them.

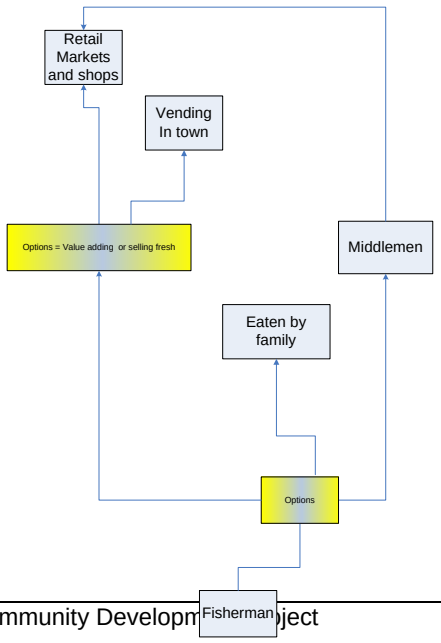
These fishermen sell to whoever they can, though they find it advantageous to associate with a middleman, who can market the fish for them, and as a source of loans if necessary.

**Fishermen labourers**

Fishermen who work on the boats as hired labour are locally called "Khalasi" and are merely labourers. 70% of the fishing population are khalasi. They receive(see above) a proportion of the value of the catch (after deductions, loans to middlemen, diesel etc) between them[33]. This is not usually a lot of money[34], and they tend to get into debt independently with the moneylenders and middlemen, though they do not particularly resent this. They are, in effect, desperately poor, the "poorest of the poor" and since they have no other skills are trapped in their occupation. That said, when there were large numbers of people in the coastal towns of the Indus Delta there was considerable migration around, following the fish, and there still is to a certain extent. Many fishermen (Khalasi) from Badin and Thatta work on boats in Karachi, other ones move to the delta coast during the sardine fishery periods (August –January) and during the prawn fishery peaks (mid-year). When there used to be a run of Shad up the Indus (now ceased due to barrages and over fishing) fishermen would concentrate there.

Many of these fishermen own their own paddle boats which they can use for fishing and they also have the possibility to fish using small gears in the creeks and channels nearby, though this does not often provide a livelihood.

Model of a fisherman working in the Badin Inland Sea region of Sindh with no contracts and no debt




**Other types of fishermen**

By no means everyone who fishes is "downtrodden" and "exploited". Many people take to fishing if their agricultural land becomes salt intruded and their incomes fall, but they do not become indebted, some are just small time fishermen who have not become indebted but do not own a boat, or own a boat that is very small. Many just take the opportunity to fish to supplement household protein, particularly in irrigation canals or drainage ditches. Some of these fishermen make a comparatively good income, since they retain all they can catch, consuming some and retailing the rest. If the

[33] ESCAP figures 1996
[34] About US$100 a year

catch contains prawns small scale value adding can be done by marinating with spices and selling the product retail. Although these people are on the edge of commercialization their contribution to the economy is significant, if not measured. Many men and children, for instance, fish as both an entertainment and to obtain protein for the family, with hook and line on a pole. They catch may be small in size and in numbers, but it makes a contribution, and there are a lot of people doing it.

**Women in fishing communities.**

There is very little information on women and fishing. Women do not generally fish, except inland in enclosed waters, though they may take part in preparing fish for drying, and occasionally in other activities such as marketing. The Chairman of the Pakistan Fisherfolk Forum did however have something to say[35] about the state of women in fisheries at the 2005 Fisherwoman Convention:-

> "The PFF chairman said that hundreds of thousands of fisherwomen in Sindh are living their lives like animals. He said even though their male members are also leading inhuman lives, the condition of women is much miserable. For example he said the male members are somehow boldly facing the challenges and problems of daily life but the women, who not only work in their homes and rear their children, but they have to share the work with make partners in their fishing etc"

Much of this reflects the general position of women in society, but the marginal state of many of the fishing households must contribute to their tribulations.

**SITUATION ANALYSIS - THE EFFECT OF THE MIDDLEMEN**

The conclusion of nearly all NGOs and some of the international conservation and social development agencies is that the middlemen are evil exploiters of downtrodden fishermen, perpetuating a system whereby the fishermen are mere exploited bondmen, and live in wretched poverty. Fishermen are portrayed as being unable to escape their plight. Another quote from the NGO Pakistan Fisherfolk Forum 2004 report illustrates this view:-

> "The poverty is in its severe form among the Fisherfolk communities, due to reduction in per boat/per trip fish catch, exploitative traditional fisheries marketing as well as informal credit system operated by the middlemen. The terms and conditions of repayment are through "bondage". The fishermen are bound to supply fish to the middleman at a price much lower than the market prices. In such a situation, the middleman takes the lions share of the fish harvest"

In the same vein the report of the Forest and Wildlife Department of Sindh, (2004) Statistical Data Collection of Coastal belt of Sindh suggests:-

> "Due to being in the grip of informal loans the small growers and fishermen of the area have virtually become slaves of the middlemen. To break such shackles it is important that the government or NGOs sector should initiate a scheme of small loans. These loans should be provided to fishermen on easy terms and

[35] as he does about most things to do with fishing

> conditions to purchase inputs as well as to meet their other pressing economic needs."

The report goes on to suggest boat insurance as a means of guaranteeing the loans, though the mechanisms remain unclear.

Some NGOs have attempted to bypass the middlemen and give loans to fishermen directly. These attempts have been significant merely by their diminutiveness, both in quantity and effect.

The major micro credit organization in Pakistan is the NRSP (National Rural Support Programme), who acknowledge in their 2003-4 progress report[36] that one of their major challenges is "operational and financial self sufficiency of the rural credit system". NRSP are not particularly active in the fisheries sector. It is also interesting to note that NRSP, whilst not directly referring to fishermen make the comment regarding labourers that escaping the ties of the bond system does not for most:-

> "…..mean they were no less vulnerable to risks and economic shocks, and no more able to meet their economic needs. With no material possessions, no assets, unsophisticated knowledge about the labour market and urban life, no marketable skills and no access to the amenities the Government provides to citizens, the bonded labourers, were in no position to plan for their future or that of their children".

It is apparent therefore, that well meaning but ill thought out interventions to break the bond between fishermen and his financier, a bond created by mutual needs, the one for credit, and the other for supplies of fish, may not have the desired effects.

It is also apparent that any interventions to disassociate the fisherman and middleman/mole in coastal Sindh will have to:-

- Provide for the bondsman, and his families' security after the break is made. A long term commitment, involving retraining (if he is to leave fisheries), health, housing, employment and food security.
- Provide a means for the fishermen to sell their catch
- Provide a regular "meet the boats", all weather, no holidays, transport system to get the fish to market from numerous remote landing sites, some of them 150 km from Karachi. Fish is a very perishable produce and has to be got to market quickly.
- Break the power of the politically and economically well positioned moles in the Karachi fish market
- Deliver drinking water, food, fishing supplies ice and basic transport needs to remote areas
- Provide quick, elastic lending on a needs basis, without lengthy application lead times.

[36] NRSP (2005). Meeting the Challenge of Poverty Alleviation. 10th Progress Report. 2003-4

In all a long term integrated expensive programme, and one that is unlikely to have the wholehearted support of the middlemen, who are amongst the most powerful local people.

When looked at this way the services provided by middlemen can be seen to be remarkably comprehensive, and at no direct cost to government. For the government currently to provide such services is out of the question, particularly since presently the government cannot even supply drinking water to the people in question, and do not even know how many of them there are. NGOs and other bodies are not financially nor logistically equipped to do so either. Large international aid agencies are not usually in the business of challenging whole traditional marketing or social structures. Success in Sindh with fisheries, even for a relatively well thought out and well funded programme, is far from guaranteed, and the agencies with adequate funds available are most unlikely to approve such an intervention.

Bearing this in mind it SCICDP should not implement any programme that directly challenges the activities of the middlemen or moles, but instead attempts to co-op them to assist in any changes which will bring benefits to fishermen. Moles and middlemen are astute businessmen and properly rewarded will be prepared to cooperate. Their rewards could come from higher turnover, increases in the catch value, or reduced costs, all of which are achievable in the long term with proper management of the resources and through the provision of extension services (neither of which are currently being provided by any Government Agency involved in fisheries in Sindh).

## AQUACULTURE AND INLAND FISHERIES, SINDH.

A discourse on Aquaculture and Inland fisheries of Sindh, if to be based on hard facts and accurate statistics, must be, almost by definition, short. The incomplete and out of date data that characterises information on marine fisheries appears like an embarrassment of riches compared to the meagre pickings available about Aquaculture and Inland fisheries in Sindh, and in particular in the project area in the South of Badin and Thatta. What can be said is reduced to a series of subjective observations and vignettes from field visits, and what little can be garnered from the literature.

### Basic Statistics.

The catch of inland fisheries & aquaculture is covered in the statistics produced by the Federal Marine Department of Fisheries and given in their Handbook of Fisheries Statistics of Pakistan (2002).

This gives the catch and aquaculture[37] production in Pakistan & Sindh as:-

| | Pakistan | Sindh | % increase (Sindh) |
|---|---|---|---|
| Year | Tonnes | Tonnes | on year before |
| 1993 | 122,536 | 60,270 | |
| 1994 | 139,525 | 71,848 | 19% |
| 1995 | 136,425 | 75,380 | 5% |
| 1996 | 160,092 | 91,367 | 21 % |
| 1997 | 167,530 | 102,508 | 12 % |
| 1998 | 163,524 | 106,611 | 4% |

[37] Capture and aquaculture are lumped together

| | | |
|---|---|---|
| 1999 | 179,865 | 113,082 | 6.5% |

The data given in the FAO Fishstat files for Aquaculture is given below in figure 15 for the whole of Pakistan.

FAO Data of Aquaculture production. Pakistan

| Year/Species/Fresh or Marine | | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cyprinids nei | Freshwater culture | 560 | 600 | 650 | 700 | 750 | 810 | 870 | 940 | 1,010 | 1,090 |
| Marine crustaceans nei | Mariculture | . | . | . | . | . | . | . | . | . | . |
| Year | | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
| Cyprinids nei | Freshwater culture | 1,170 | 1,270 | 1,360 | 1,470 | 1,580 | 1,700 | 1,840 | 1,980 | 2,130 | 2,300 |
| Marine crustaceans nei | Mariculture | . | . | . | . | . | . | . | . | . | . |
| Year | | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
| Cyprinids nei | Freshwater culture | 2,500 | 2,700 | 2,900 | 3,100 | 3,300 | 3,600 | 3,900 | 4,200 | 4,500 | 4,800 |
| Marine crustaceans nei | Mariculture | - | - | - | - | - | - | - | - | - | - |
| Year | | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
| Cyprinids nei | Freshwater culture | 5,200 | 5,600 | 6,000 | 6,500 | 8,500 | 8,500 | 8,500 | 8,500 | 6,797 | 9,710 |
| Marine crustaceans nei | Mariculture | - | - | - | - | - | - | - | - | 40 | 40 |
| Year | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
| Cyprinids nei | Freshwater culture | 10,000 | 12,754 | 12,566 | 13,351 | 14,622 | 14,800 | 13,500 | 15,400 | 17,300 | 23,000 |
| Marine crustaceans nei | Mariculture | 41 | 41 | 38 | 38 | 42 | 48 | 57 | 64 | 69 | 76 |
| Year | | 2000 | 2001 | 2002 | 2003 | | | | | | |
| Cyprinids nei | Freshwater culture | 12,400 | 16,405 | 12,368 | 11,992 | | | | | | |
| Marine crustaceans nei | Mariculture | 85 | . | 72 | 69 | | | | | | |

FAO Fishstat Data (2005)

Figure 13 Aquaculture production 1950-2003 (nei=not elsewhere included)

It has been impossible to ascertain what the marine "crustaceans (nei)" are, since there is no marine aquaculture presently being practiced in Sind or Balochistan.

The two figures are very different because one includes inland capture fisheries and the other does not.

The Marine Department Handbook gives the numbers of fishermen in Sindh involved in Inland Fisheries as

| Year | Sindh Total | Full Time | Part time | Occasional |
|---|---|---|---|---|
| 1993 | 27,130 | 20,725 | 6,405 | None |
| 1994 | 49,246 | 33,711 | 15,536 | |
| 1995 | 113,775 | 81,180 | 32,599 | |
| 1996 | 113,617 | 80,346 | 33,271 | |
| 1997 | 115,270 | 81,260 | 34,010 | |
| 1998 | 118,436 | 82,826 | 35,610 | |
| 1999 | 74,286 | 49,475 | 24,811 | |

These figures show that the majority of the people making a living from inland fisheries (aquaculture and capture) are full time fishermen. The figures would also indicate that the numbers involved are similar, though slightly lower, than those engaged in marine fisheries.

**Area and number of fish ponds.**
The area of ponds and water bodies in Sindh and in the project area of Badin and Thatta is unknown with any degree of accuracy.

FAO figures state that "aquaculture in Sindh involves mainly the farming of major carps in 168 fish farms with an area of 28 000 ha (70 000 acres). Fish farms are either natural depressions in waterlogged areas or excavations filled with water. Pond management is minimal and yield, even from well-constructed ponds, is low. The average annual production of fish is about 1 500-2 500 kg/ha (600-1 000 kg per acre)".

**The Project Area of Badin and Thatta**
Data from Thatta,, provided by the Thatta District Fisheries Officer is given below:-

Total of 233 public waters in the district. District controls 130 waters. Province controls 103 along the Indus River and Keenjheer Lake.
Nearly all of these are fresh water as salt water areas are not auctioned. The Thatta district obtained 186,100Rp from leasing fishing rights from 47 District Public water areas in 2004-5.

310 fish farms of varying sizes are established in Thatta.

Total fish production is about 1176 tonnes with a reported value of 21,756,000 PRp (an average of 18.5Pr/kg[38]) (This figure is presumed to be freshwater fish from the leased waters).

Figure 14 Thatta carp farm

23 of the 52 posts in fisheries department in Thatta are vacant

The problems for the District Fisheries Department identified in Thatta Districts are

- a lack of travelling allowance for field staff
- Lack of Uniforms, weapons[39] and motorbikes
- Accommodation for staff and officers
- No office space at Talukas (in the field that is)
- Widespread locations of public waters, coupled with the auction system, mean that the problems of fishermen are not being addressed.
- The staff cannot recover revenue or implement regulations

There is a hatchery at Chilya in Thatta, which is part of the Sindh Fisheries Department. This is still functional and produces carp fry in the season. It is unfortunately starved of resources. There is accommodation for students, classrooms, laboratories, demonstration ponds (including buffalo/fish mixed culture), a hatchery, adult stew ponds, fingerling grow out cement tanks and necessary piping and air supply. A very small input of funds and expertise could rejuvenate it, and it could make a most important contribution to the inland aquaculture of Thatta and those areas of the SCICD project area without salt intrusion. Such an intervention should be included in any greater aquaculture input.

The data for Badin, quoted in the IUCN report on the State of Environment and Development of Badin District, though of uncertain origin is:-

[38] This appears to be an underestimate
[39] If Thatta District Fisheries Officers require weapons then the problems being faced in administering the inland fisheries of Thatta are evidently more complex than at first appears

Badin 2002 production 14,512 tons which is 17.5% of all Sindh
Decrease in catch/production due to sea water intrusion
100 public areas in the district comprising a network of 28 canals/distribution channels, 39 drains and sub drains, 24 dhands and dhoras[40] and 9 major depressions. In addition 21 water areas with key potential for fish, prawns and lobster under the possession of the Rangers.
350 recorded fish ponds with a total acreage of 16500 acres (6,677 Ha)
Many fish farms established by influentials on government land, natural depressions and lakes are not included in the figures. The Government of Sindh Hatchery has not worked properly since its establishment in 1998.

The Sindh Fisheries Department fish farm at Badin is a shining example of what can be achieved even with little support or resources. Indeed it is one of the few really functioning parts of the Sindh Fisheries Department. The small staff, dedicated and hard working, produce more than 5 million carp fry every year, and could probably produce 4 times that amount if given some working capital and budget. A very small amount of assistance could make this a very valuable asset to the district. As a facility to backup future aquaculture developments, in both fresh and brackish water aquaculture developments, it would be most useful.


Figure 15 Badin carp facility

150,000[41] people are reported to be active in the inland fishery. None of the larger inland freshwater lakes are in the project area. Those that were, such as the large freshwater dhands near the Indian border are now increasingly saline.

**Target Species. Inland fisheries & Aquaculture.**

The species farmed and caught are those:-

1) carps and euryhaline species that enter the ponds and water bodies through drainage and irrigation canals.
2) Are spawned in fish farms and stocked. These are carps of various species
3) Occur naturally in the Indus and adjoining waters. The major species, the anadromous Shad, is now no longer important above Kotri as its breeding opportunities[42] have been destroyed by barrage building on the Indus and lack of downstream flows.
4) Exist in brackish water near the sea and are caught in drainage and irrigation channels.
5) Shrimp. Intensive farming of shrimp in brackish/salt water ponds has been attempted but so far has not been successful.

[40] A small dhand
[41] Forest and Wildlife Department Figures, 2002
[42] Catastrophic overfishing may have more to do with its decline, but this possibility is generally ignored.

There are no statistics that split up the catch by species or catch location.

The carps found naturally[43] and farmed are mainly *Labeo rohita, Labeo calbasu, Catla catla* and *Cirrhina mrigala*, the "Major Carps" all of which are prized eating fish. Farmed carp are mainly the common carp *Cyprinus carpio carpio* and the Grass carp *Ctenopharyngodon idellus*.

Tilapia (*T. mossambicus*) are also widely found in Sindh, but are generally said to be disliked, though they can be found in markets for sale throughout the project area, so they have certainly received some acceptance among the fish eating public. Tilapia are blamed by many as predators on fry of other more useful/valuable species.

Farmed fresh water fish production in Sindh suffered a severe setback due to a long dry spell and shortages of water during the past 4 years (1999-2005), resulting in closure of many fish farms.

**Commercial farming of shrimp in brackish & salt water**

Currently the Sindh Government owns and operates a hatchery at Hawkes Bay in Karachi. The express purpose of this hatchery is to provide shrimp post larvae to kick start large scale intensive farming of shrimp in Sindh province, particularly in the Indus Delta area where there are considered to be many thousands of hectares of suitable land available for investors. A previous attempt by the ADB (in the 1970s/80s) to develop shrimp farming in Thatta was a signal failure, and it has not operated except as an experimental unit (at 5% capacity) since 1989. With hindsight the project failed because:-

Figure 16 The "ADB" Fish Ponds at Gharo

- The species targeted (*Penaeus monodon*) were not suitable to the wide range of high salinities and temperatures which were experienced
- Wild fry did not supply adequate numbers of the correct species, and the imported ones were expensive (and of the wrong species)
- No hatchery was provided with the project
- The ponds were raised and porous requiring constant pumping, instead of using tidal rises and falls
- There was no locally available food
- Lack of trained manpower

A plan[44] to start marine shrimp farming in Balochistan has been prepared by the Federal Marine Fisheries Department. The total cost is expected to be PRp28.7 million (US$478,000). This proposes to overcome all the identified failures of the ADB project in Sindh, starting by using *P indicus*, the Indian "White" Shrimp, which is tolerant of high temperatures and salinities and has been successfully used in Iran, where shrimp

[43] According to the IUCN, Sindh. State of the Environment & Development Report (2005)
[44] Khan. M. M. (2005) Action plan for immediate start of Shrimp Farming in Balochistan. Marine Fisheries Department, Karachi. August 2005.

production now exceeds 10,000 tonnes[45] (2004) annually, most of it *P indicus*. The plan seems optimistic, in that it forecasts production of 15 tonnes in the first year from a 10Ha unit.

The Sindh Fisheries Department has a modern hatchery in Hawkes bay in East Karachi which with some equipment and expertise inputs could well provide seed stock for both commercial fish farming and other initiatives in aquaculture. Indeed its main aim is to prove commercial shrimp culture using the ADB fish pond complex (at Gharo on Indus); so that the private sector will invest.

Superficially at least there appears to be vast potential for farming shrimp in areas adjacent to the inland sea in Badin and Thatta, and in parts of the Indus delta area, particularly on the mud flats and agricultural land that is now salt water intruded. Nobody has done detailed surveys but figures of 70,000 Ha of suitable area have been mentioned.

Whilst it is the governments responsibility to encourage this sort of development, provided that it is done responsibly and with regard to environmental and social constraints, it is not the governments responsibility to invest in commercial shrimp farming, and fortunately it has not done so. Neither has there been any private investment in shrimp farming, though much stated interest. The reasons for this are probably:-

- It is not proven. Conservative Pakistani investors are unlikely to invest in unproven technologies with large up front infrastructure costs. Compare with chicken farming, or sunflower growing, a relatively new crop. Both work and are profitable, and have been successful. Investors will invest if they think they will get reasonable returns without too much risk.
- There is no supply of seed. The Hawkes bay hatchery is not producing sufficient seed to guarantee supply, and few local or overseas investors would be prepared to invest in an industry reliant on a Government owned hatchery, given the Governments record on just about everything.
- There is a question about the supply of feed. Quality feeds for aquaculture are currently not available in Sindh. The experimental work done by the Sindh Fisheries Department relies on imported feed. In addition, intensive aquaculture demands a high quality feed with high protein content, most of the ingredients of which would have to be imported.
- There is a problem associated with land in the region, in that ownership matters are opaque and corruption[46] rampant. Government land “set aside” for aquaculture (=intensive shrimp farming) is currently allocated not for shrimp farming but merely as a “land grab” by influentials who are not interested in shrimp farming.
- Land issues and corruption naturally put off overseas investors with the money and skills to put together a realistic investment package. Without this sort of large Agribusiness input it is unlikely that intensive shrimp farming in Sindh will expand rapidly. Substantial investment is required for the infrastructure, pond construction and hatcheries that the large scale intensive systems will require.

[45] According to the proposal
[46] Results of a household survey in 2002 by Transparency International showed that in Pakistan, 100% of respondents with experience with the land administration authorities reported corruption

Similarly large Agribusiness will bring with it the skills and technical expertise that is required.

- There remain some technical problems related to temperatures, salinities, water quality and pollution of water sources.

All of these constraints can be overcome, but they require government will and organisational capacity that does not presently exist.

**Provincial and District owned waters . Capture fisheries**

In Sindh, on 1209[47] inland waters, the right to fish an area for a period is sold, without any reference to the traditional fishermens' rights, to "influentials" on a contract system. The contractor then fishes the water body to gain as much return as possible for the period of the contract, (usually a year). The contract is sold again after it runs out, to either the same contractor or another.

Apart from the fact that the system is wide open to abuse and corruption, it also has the effect of:-

- alienating and impoverishing the traditional fishermen, who may not even be allowed to fish the water, and if they do have to sell their catch to or through the contractor
- encouraging a contractor to introduce as much effort as possible to the fishery so as to maximise returns during the period when he has the contract
- encouraging the capture of young, juvenile and breeding stock so as, again, to maximise the return to the contractor during his short period of contract

Figure 17 Carps for sale in Thatta town

As a fisheries management tool for enclosed waters the contract system as practiced in Sindh must rank as one of the least appropriate; particularly when there is no enforcement of mesh regulations, size limits or restrictions on the size of the catch by the district or provincial administrations. It seems designed to minimise long term returns.

The contract system is generally accepted as unfair to the fishermen. It is seen as imposing a feudalistic system on the fishermen who have no say in their present nor future lives. The Pakistan Fisherfolk Forum (PFF) has as usual been in action, agitating against its imposition. They claim, with more than a little justification that:-

> "The fishermens villages along the coast as well as along the lakes and other water bodies are in a shambles, where there are no basic facilities. There is no education, health, sewerage system for fishermen anywhere in Sindh. They are considered third class citizens. In such a pathetic living condition, the fishermen are already fighting hard for their survival. Their entire lives are spent fighting with mighty rivers and seas. Despite doing all hard work and facing hardships,

[47] PFF Figures

> the fishermen get much less remuneration. In the contract system, the government gives powers to influential contractors to unleash a reign of terror with poor fishermen."

In 2005 The PFF initiated a series demonstrations against the contract system for inland waters and the Sindh Government agreed to introduce a "mole" or license system. PFF and fishermen have no confidence that the system will be changed, and it is unlikely that, even if it occurs, it will make much difference anyway. Fishermen have not enough financial resources to buy licenses; and unless the licenses are given away to them through cooperatives or community groups, which seems unlikely, will not be able to acquire them.

From the point of view of maximising production (either economic or the catch) the inland fishery is being managed extremely badly through the contract system, with catches not maximised, effort uncontrolled, a total lack or responsibility being shown by the administration and with an almost total disregard for the welfare of the fishermen.

This system will only change when there is an acknowledgement of the rights of ownership of the resources by the people who depend on them for their livelihood. This is unlikely to occur without rapid social changes which are outside the scope of the SCICD.

**Capture fisheries. Privately owned waters**

Many inland water bodies are owned by individuals ("influentials"[48]). They employ fishermen or bondsmen to fish them. No others are involved. The fish is retailed locally, without ice, sometimes through middlemen. The fisherman gets very little of the proceeds. The catch is predominantly carp, which live a long time out of water, so can reach the market alive, or only just dead. Quality is relatively good when compared to the marine catch, due to the shorter times between capture and market and because the fish are fresh fish and spoil in a different manner[49] to marine species.

**Aquaculture ponds (privately owned)**

Ponds are usually on land owned by a landowner. The landowner will maintain the ponds and stock them with fingerlings from one of the many private hatcheries in Thatta and Badin, one of which may be his own. Other fish such as tilapia and mullets enter the pond, either because they are already there (tilapia are fairly ubiquitous in Sindh) or they come in when the pond is filled. Feeding is through fertilisation of the pond with manures and vegetable detritus. In very rare cases some "fish food" is given, this typically being by-products from rice or cereal production (bran & husks), or oilseed cake.

Aquaculture ponds are often placed near to or alongside porous irrigation canals, which keep the ponds filled through seepage. Few ponds can be drained completely, so the fish are usually caught by netting.

This area of inland aquaculture offers great scope for increased production, but Sindh Fisheries Department and the Districts are doing little to promote it.

**Publicly owned drains, ditches, irrigation (Capture fisheries)**

[48] A term often used synonymously with "robber baron", "feudalist" and other such epithets.
[49] They take longer to develop "off" flavours & smells.

These are open access. They are fished by people with hook and line, cast nets, staked gillnets, fixed bag nets, barrier nets with chambers, lift nets and with cover pots. There are no restrictions on mesh size or gear enforced. The catch is therefore not large in size, though can make a good contribution to a households protein intake. Children are often involved, as an activity to keep them busy, when they are not at school (many do not go to school at all).

**Paddies and temporary water bodies**

There is no formal aquaculture in paddies or temporary water bodies. Opportunities for rice/fish culture have not been developed, possibly because of the difficulty in securing a financial return to the landowner (in other countries where the paddy is owned by the farmer, the returns, some fish/prawns, go to the farmer). The peculiar land tenure system in Sindh means that the landowner is unlikely to make investments that will only benefit the bonded farmer).

Some fish fry enter paddies and temporary water bodies through irrigation water and grow there. They are harvested when the water dries out or recedes, usually with small nets, cover pots or opportunistically by hand or with extensions to the hand.

Due to a 5 year drought, only alleviated in mid 2005, there have recently been few rain fed temporary water bodies in Sindh, either inland or on the Indus floodplain.

**Government Support to Inland Fisheries**

The government provides little support to inland fisheries in the project area. There are two hatcheries, one near Thatta and one near Badin. These produce carp fry for sale to the local fish farmers. Neither has been particularly active and both have been described as "failing" by District officials. Both could be turned around simply, with some skills and materials investment, and make a very real and valuable contribution to aquaculture in Sindh. (The major hatchery in the area, the Sindh Provincial Fisheries Department hatchery in Hawkes Bay in Karachi is not producing fresh water species and concentrates on shrimp (*P. indicus*), partly because it has no access to large quantities of fresh water). No serious aquaculture extension work is carried out by the Provincial or District administrations.

**Opportunities.**

There are many opportunities in the Inland Fisheries and Freshwater Aquaculture sector in the project area. Some possibilities[50] are summarised in the table below:-

| Sector | Possible opportunities |
|---|---|
| Freshwater Aquaculture, Privately owned ponds | Improved husbandry through improving knowledge amongst the "influentials" and those that work with them. This would take the form of improving feed, fish varieties (particularly through intercropping with various species of carps so as to take advantage of all available ecological food niches in the ponds), intercropping with chicken or duck, disease management & recognition.<br>Probably a very rewarding intervention. |

[50] By no means an exhaustive list

| | |
|---|---|
| Freshwater capture fisheries, province or district owned water bodies | Substitute a sensible management system for the contract system of resource allocation. (Possibly through community bodies).<br>Ranching and stock enhancement.<br>Fish shelters.<br>Closed areas & seasons. |
| Paddy and seasonal pond culture | Rice/fish culture systems to improve protein production & consumption in agricultural districts |
| Freshwater/brackish water open entry fisheries. | Ranching<br>Stock enhancement by release of suitable species. |
| Marine/Brackish areas | Extensive brackish water aquaculture. (this is covered in great detail elsewhere in the PPTA)<br>Intensive prawn farming.<br>Extensive shellfish culture (probably not for direct human consumption)<br>Brine shrimp (for the emerging aquaculture industry and exports) |

All the opportunities listed above depend on the effectiveness of the Sindh Fisheries Department, and the District Fisheries administrations. These are currently far from effective, indeed they appear to be hindering many of the opportunities for improvements by maintaining the contract system in inland capture fisheries, failing to maintain inputs to their hatcheries or extension services and not collecting any statistics on the inland fisheries and aquaculture.

## GOVERNMENT & ADMINISTRATION

### Federal Fisheries

According to the Ministry of Food Agriculture and Livestock website

> "…..the Federal Fisheries Marine Department has three divisions, each headed by the Director.
>
> These divisions are:
>
> 1. Research & stock assessment;
> 2. Planning & Development
> 3. Fishing technology & Training
>
> The Research & stock assessment Division has three units, the Deep-sea fishing, Hydrological Research and Biological Research units. A Deputy Director heads each unit. The Deep-sea fishing unit is responsible for management of deep sea fishing vessels operation in Exclusive Economic Zone of the country. The Hydrological research unit is engaged in data collection of physico-chemical parameters such as salinity, temperature, dissolved oxygen, pH, suspended matter and nutrients etc. Assessment of physico-chemical properties of sea

water is an indispensable part of fisheries research. The occurrence of many fish species, and their migration paths are determined by such ecological factors. The Biological research unit has under taken research relating to biology, distribution, food & feeding habits, breeding and migration pattern of commercially important finfish and shellfish inhabiting the coastal and offshore waters of the country.

The Planning & Development Division has two subdivisions, the Planning & Development and the Statistics subdivision. The Planning and Development subdivision is responsible for the development of fisheries policies, identification of new development projects and co-ordination with the various governmental and non-governmental organizations. The Statistics section is collecting and compiling the fisheries statistics, collected from provincial fisheries departments and publishing in the form of annual publication namely Handbook of Fisheries Statistics of Pakistan .

The Fishing technology & Training Division has three subdivisions, the Gear technology, and Quality control and Training subdivisions. The Gear technology section entrusted to study the locally employed fishing gear and fishing vessels and to develop modern fishing gear and its commercial application.

The Quality control section is responsible of standardization and quality control of fish and fisher products. The section manages quality control laboratories, which are equipped with instruments for determination of chemical composition, microbiological analysis and Atomic absorption spectrophotometer for heavy metal detection.

Training section has own separate two-storied building, which is equipped with modern training equipments. The building also possesses lecture halls, workshops, laboratories and a dormitory. So far Centre is providing short-term training courses on various fields of fisheries.

The department also possess a biological museum where a large number of duly identified specimens of marine fauna have been housed for ready reference and comparison for marine scientist, students and others stakeholders of fisheries.

The Marine Fisheries Departments' Library containing fair collection of important Journals, Books, Magazines, FAO Publications on various fishery subjects such as fishing crafts, gears, fish biology, fish handling, processing and preservation technology etc. This Library is useful for fishery scientists, students as well as fish industrialist for consultation and fishery research."

The observation of this study has been that whatever is described above does not function effectively, and the facilities described do neither work efficiently nor could be made to do so rapidly.

It must be said that it is difficult to ascertain what exactly the Federal Fisheries department does on a day to day basis that is beneficial to the fisheries of Sindh. Certainly statistics are produced, but their accuracy is in serious doubt, as is admitted by senior staff in the department. Certainly they license foreign fishing vessels to fish the 200 mile EEZ, but data on their activities in kept secret and the vessels are claimed to

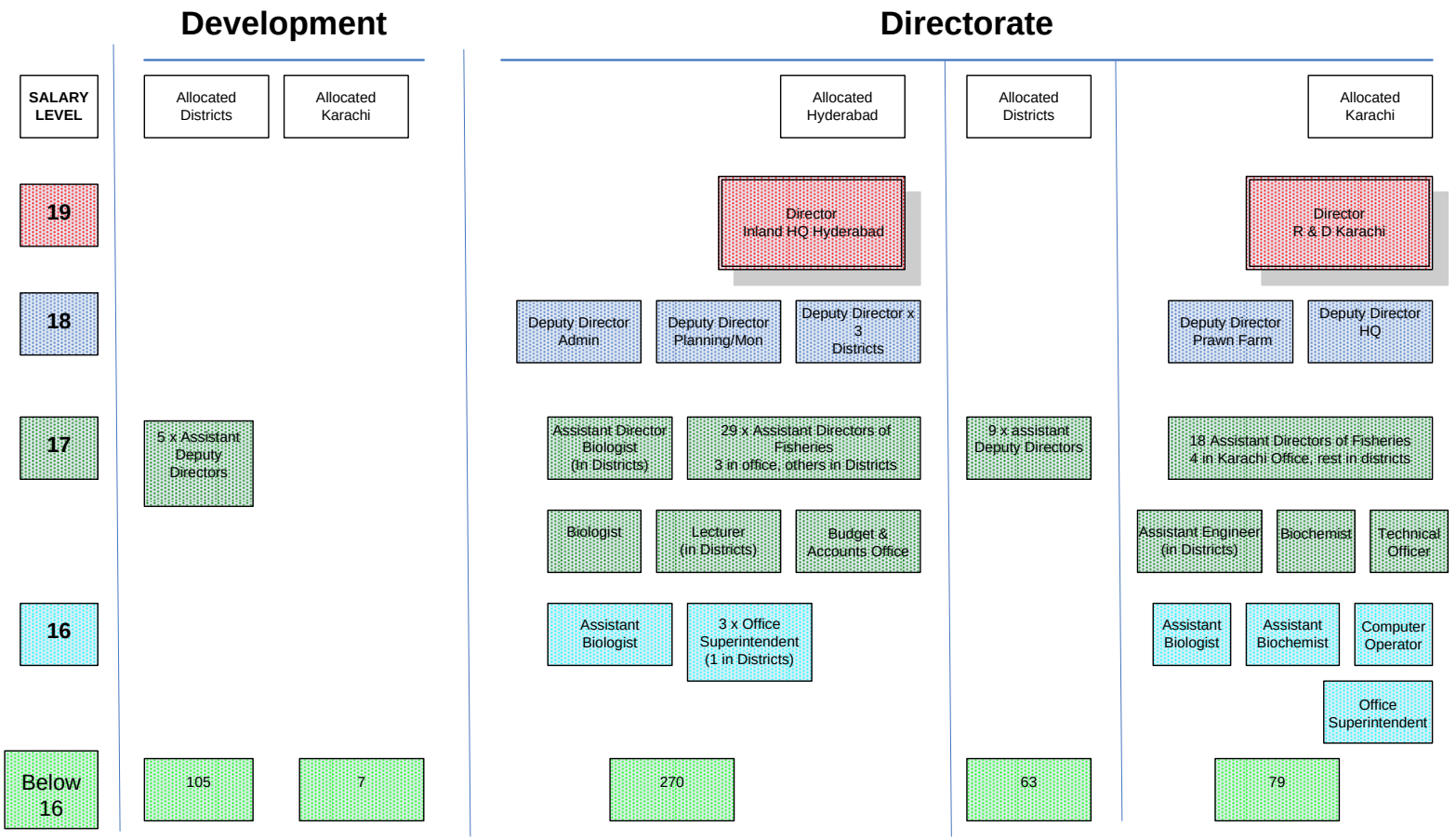
be a major destructive for the resources of the country. Certainly they "own" and oversee Korangi Harbour and Karachi Fish Harbour, the one empty and the other filthy and rank. What they do not do, which needs to be done, is legion. Inputs to change this situation are sorely needed. This PPTA does not address the shortcoming of the Federal Marine Fisheries Department.

**Provincial Fisheries Department Sindh**

Unfortunately the same malaise affecting the Federal Fisheries Department can be attributed to the Fisheries Department of Sindh Province, which has two divisions, Directorate and Development. The Directorate is divided into Provincial Government consisting of Hyderabad, Karachi Research & Development; and District Government. Development is divided into District and Provincial, with two divisions, R&D Karachi and District Government.

The Department employs more than 600 staff, mostly of low rank, but with 55 Assistant Fisheries Directors.

**Distribution and numbers of posts under devolution of responsibilities between Districts and Province. Sindh Fisheries Department. 2005.**
**(Numbers in bottom row = numbers below salary Scale 15)**



Despite its more than 600[51] staff it remains unclear what is actually being achieved by most of the people in this organisation. No meaningful statistics are collected; nothing is being done to develop the fisheries in most of the project area; extension services do not exist. Apart from a hatchery which has produced some prawns for on-growing in the old ADB ponds and a couple of CDA funded barramundi experimental fenced cages in Thatta run by the Research and Development Division no research is being carried out. The hatcheries at Thatta and Badin are running, but only just and only at a fraction of their capacity. The administrators in the Department admit as such. The government is often considered as both a means to enrichment and as a way of providing employment to as many people as possible. Staff performance and effectiveness is not measured in any meaningful way.

**Other Organisations involved with marine and inland fisheries[52]**

| Institution | Responsibilities |
|---|---|
| National Institute of Oceanography | Based in Karachi. Does oceanographic works and is supposed to cover parameters affecting fish |
| Centre for Excellence in Marine Biology | Part of the University of Karachi |
| Department of Zoology | |
| Karachi fish Harbour Authority | Part of Federal Department of Livestock and Agriculture, Livestock and Fisheries. Runs the Karachi Fish Harbour in West Karachi |
| Korangi Fisheries Harbour Authority | Runs the almost unused Korangi Fish Harbour in East Karachi |
| Fishermens Cooperative Society | Based in Karachi fish Harbour. Welfare society that obtains funds from a levy on the sale of the catch |
| National Fisheries Development Board | New body (2002) that is supposed to formulate national fisheries policy. |
| The Water and Power Development Authority (WAPDA) | Has a Directorate of Fisheries to manage and develop fisheries in the six major reservoirs under its control, with a total surface area of 250 000 acres ( 100 000 ha). |
| The Export Promotion Bureau (EPB) | Responsible for formulation of export policies and supervising their implementation through other government agencies. |
| The Federal Bureau of Statistics (FBS) | Empowered to conduct national demographic and socio-economic surveys. Its statistical division compiles and analyses national statistics. |

**Institutional failures**

Institutional failure is, unfortunately, synonymous with all the Government institutions acting in the field of fisheries in Sindh[53]. It is also an inescapable conclusion that nothing significant that the SCICD project (or any other project) wishes to achieve in fisheries will succeed in the long term unless there is strengthening of the institutions that are responsible for the sector[54].

No Government run institution involved in fisheries is doing its work efficiently or effectively, either at National, Provincial or District level. Individuals that do wish to act honourably are starved of resources, both human and financial, by those less inclined to the public good.

[51] more than 20% of posts are vacant
[52] Adapted and espanded from IUCN. (2005) Sindh. State of Environment and Development. Given as a list of "Stakeholders" in fisheries, which did not actually include "fishermen" !
[53] Nowhere is this more amply demonstrated than the Karachi Fish Harbour
[54] Or the intervention provides itw own staff, skills, funds and equipment

This is catastrophic for the fishery. Returns are not maximised, the fish stocks are declining and nothing is being done about it: inland fisheries are not serviced: statistics are not collected: regulations are openly flouted: vested interests control resource allocation: bonded labour systems pervade the fishing fleet: quality control of the catch and in markets is atrocious. In short the system has failed.

This has most serious ramifications as are alluded to in the sections above:-

1. Fish catch from the Arabian Sea is declining, probably far faster than official statistics show. Pakistan is thus failing to maximise its returns from its natural resources.
2. The shrimp catch, the most valuable sub-sector of the marine capture Fisheries, is declining, affecting export earnings.
3. The resources on which the fishery depends are being adversely affected by the activities of barely controlled foreign fishing vessels, with no interest in the long term.
4. The inland fisheries of Sindh are being badly managed through the contract system, leading to a decline in returns
5. The opportunities for employment in fisheries among nearly 100,000 coastal inhabitants in Badin, Thatta and Karachi Districts are under threat from a depletion of resources
6. The value of the catch is not being maximised due to a complete failure to promote fish quality. Nearly 50% of the catch goes to fishmeal.
7. Aquaculture is almost totally neglected, both for marine and freshwater species

The costs to the country of this neglect are difficult to calculate, since much is related to forgone benefits. Conservatively however:-

| **Sub-sector** | **Broad Assumptions** | **Approx average value lost (US$) to Pakistan annually[55] due to failure to maximise fish production through bad management** |
|---|---|---|
| Marine Fisheries (Fish) | Presently declining at 20,000 tons per year to 399,000 tons/year when it should be nearer 600,000 tonnes. Overfishing, foreign fishing boats, waste, illegal gears etc. | 436,500,000 |
| Shrimp | Maximised at 30,000 tonnes/year from current catch of less than 20,000 tonnes. Mainly overfishing. Some increases in value if shrimp size and quality improved. | 81,843,780 |
| Fishmeal | Half of the fish presently sent to fish meal goes could go for human consumption (25% of the total catch), which is much higher value. | 40,000,000 |
| Inland Aquaculture and Capture fisheries | Present production is 50% of total possible (country wide)[56] | 537,000,000 |
| Intensive Marine Shrimp culture | Presently zero. 20,000 ha suitable land available[57] | 60,000,000 |
| Extensive Marine and Brackish Culture | Presently zero. 50,000 ha suitable land available | 106,000,000 |
| **Average annual loss to the Pakistan economy if proper management is not effectuated.** | | **1,261,343,780** |

[55] Fish for human consumption is assumed to have a value of US$1.50/kg. Export prawn US$4/kg.
[56] Some studies have been made which conclude that aquaculture could produce 20 times more than currently in Pakistan (*Akhtar Hai. Pers comm*.)
[57] *(Ahmed Wahid. Pers comm.)*

Potential resources, such as the clam in the Inland Sea, the mesopelagics identified by FAO in the 1980s and other unproven resources have been ignored in the calculation above. In addition the livelihoods of about 100,000 coastal people (10,000 families) in the project area together with more than 30,000 (household heads) employed in the Karachi area from Karachi Fish Harbour, Ibrahim Hyderi and other landing centres in Korangi creek and elsewhere near Karachi, depend on fisheries. If management does not turn around the decline in fisheries production (caused by bad management) the costs of finding alternative occupations and providing social services for these people would be a heavy burden on an already overstretched state apparatus.

From this very simple calculation[58]it can be seen that Pakistan is losing a huge potential by its failure to manage its marine and inland fisheries resources.

The amount of this potential production loss that can be attributed to Sindh, and the project areas of Badin and Thatta[59] is less, but still high. Most of marine production is landed in Sindh; 60% of the present aquaculture production of Pakistan is in inland waters in Sindh. Most of the Brackish and Marine Aquaculture potential (some potential is in Balochistan), is attributable to Sindh. Similarly Sindh will benefit from all the fish landed in Karachi, and from improvements in quality and utilisation that are implicit in the table above. It is safe to say that at least 60% (US$ 700,000,000/year) of the potential is attributable to Sindh, and probably 30% of that (US$230,000,000/year) to the Delta and Inland Sea in the project area.

Many of the technological answers to answering the question of how to realise the untapped potential from fisheries and aquaculture in Sindh are well know; indeed many have been mentioned elsewhere in this study and are often put forward by International Aid Agencies, Conservation Organisations and NGOs when they comment on Fisheries in the Delta Area and Karachi. The technology exists to improve the quality of fish, both at sea and after capture and through the supply chain to the consumer or for export. Aquaculture (marine, brackish and freshwater) is a mainstay of many Asian countries economies, and the same techniques and processes could be applied throughout Pakistan and in Sindh in particular, where the brackish water and marine potential is greatest. Management of fish resources, whilst not an exact science, could be improved greatly through controls on mesh sizes, seasons, use of closed areas, and restrictions on effort and entry to the fisheries.

Why therefore is remedial action not being effected, for it appears to benefit everyone ? It is easy to blame the moles, the zamindars, trawler owners and middlemen, the “usual suspects”, who are generally the first held responsible for development failures[60]. It is particularly easy to plan; on a grand scale or at a micro level; indeed policies and plans are the one resource in the Fisheries Sector in Pakistan that is not declining.

All lead to a root problem, which is institutional weakness. The reasons that plans, development projects and policies do not happen, or if implemented do not work, is due to institutional failures. The institutions responsible for fisheries, at Federal, Provincial and District level are weak. They cannot manage the fisheries. They have plenty of staff (more than 600 in the case of Sindh Fisheries department), most of whom are not properly trained or proficient; they have plenty of plans and policies, but no resources to carry them out. They have no political clout, to enforce the law and the regulations.

[58] which is admittedly based on statistics of which the accuracy is questioned at length in this report, and hence is somewhat speculative
[59] The Talukars of Thatta, Shah Bandar, Keti Bandar, Jaki, Goorabari and Kharochan in Thatta District, and Shahid Zazu Rahu and Badin in Badin district.
[60] Though there have been precious few attempts to date to engage them in the development process

The key then, to maximising the benefits from the fisheries resources to the country, much of which is presently lost, is strengthening the institutions charged with their management. Only these institutions can engage the zamindars, influentials and moles; only these institutions can enforce laws and rules and regulations; only these institutions can effectively implement policies and plans on a scale which is necessary for management of widespread common property resources.

At the present time it would be unwise to attempt to change the whole structure of fisheries institutions throughout the country. The majority of the marine resources, and many of the missed potential returns (brackish and marine aquaculture, marine fisheries, fish quality, exports) from the fisheries of Pakistan are concentrated in Sindh, and it makes senses to start with this Province and the Districts in the Delta and Inland Sea area (Thatta and Badin) if any interventions are made.

**It is therefore a recommendation, indeed the main and only recommendation of this overview, that institutional strengthening is undertaken, to overcome the lack of management of fisheries resources in Pakistan, and this to concentrate on Sindh, where the project area is located and many of the opportunities exist.**

# Annex I. FAO Catch Statistics for Pakistan 1990 to 2003

| Group/Species & year | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anchovies, etc. nei | 11,650 | 10,325 | 14,544 | 29,260 | 19,098 | 17,564 | 14,091 | 16,113 | 13,165 | 15,154 | 15,191 | 15,001 | 15,400 | 16,029 |
| Barracudas nei | 1,254 | 1,401 | 1,578 | 2,485 | 2,923 | 2,324 | 2,878 | 2,683 | 2,664 | 3,520 | 3,981 | 3,889 | 3,900 | 3,869 |
| Barramundi(=Giant seaperch) | 312 | 250 | 237 | 210 | 193 | 187 | 214 | 209 | 196 | 204 | 0 | 0 | 0 | 0 |
| Black pomfret | 694 | 800 | 1,295 | 1,961 | 2,199 | 3,066 | 2,221 | 2,322 | 2,109 | 2,917 | 2,027 | 1,975 | 2,002 | 2,880 |
| Bombay-duck | 210 | 200 | 187 | 170 | 121 | 98 | 101 | 95 | 91 | 72 | 65 | 55 | 64 | 67 |
| Butterfishes, pomfrets nei | 3,183 | 3,082 | 2,552 | 3,103 | 2,985 | 4,156 | 2,799 | 3,786 | 4,089 | 4,605 | 3,945 | 3,454 | 3,500 | 4,531 |
| Carangids nei | 10,833 | 9,750 | 9,628 | 13,111 | 13,760 | 16,495 | 15,957 | 19,002 | 18,689 | 17,779 | 16,545 | 15,988 | 16,400 | 11,047 |
| Clupeoids nei | 43,838 | 42,084 | 42,141 | 43,475 | 18,111 | 31,426 | 27,576 | 26,650 | 25,487 | 26,934 | 24,810 | 24,306 | 24,500 | 23,700 |
| Cobia | 802 | 1,066 | 1,281 | 1,459 | 1,541 | 2,306 | 1,574 | 1,449 | 1,254 | 1,136 | 2,896 | 2,797 | 2,808 | 2,225 |
| Common dolphinfish | 1,297 | 1,300 | 1,577 | 1,875 | 2,054 | 2,570 | 1,841 | 1,658 | 1,892 | 3,109 | 1,954 | 1,869 | 1,875 | 3,742 |
| Croakers, drums nei | 12,270 | 14,449 | 16,606 | 19,740 | 22,808 | 25,201 | 19,934 | 20,428 | 19,625 | 24,665 | 21,976 | 21,725 | 22,886 | 19,737 |
| Cuttlefish,bobtail squids nei | 2,254 | 2,424 | 2,507 | 2,945 | 3,356 | 2,455 | 3,308 | 4,528 | 3,225 | 5,146 | 5,307 | 5,256 | 5,302 | 5,105 |
| Dorab wolf-herring | 766 | 888 | 865 | 1,070 | 1,204 | 2,289 | 1,580 | 1,931 | 2,051 | 2,266 | 2,775 | 2,604 | 2,720 | 2,118 |
| Emperors(=Scavengers) nei | 767 | 1,027 | 1,010 | 1,466 | 1,660 | 1,643 | 1,549 | 1,911 | 2,334 | 3,323 | 5,173 | 5,044 | 5,100 | 2,626 |
| False trevally | 0 | 0 | 2 | 3 | 2 | 3 | 2 | 4 | 5 | 0 | 0 | 0 | 0 | 0 |
| Fourfinger threadfin | 435 | 590 | 512 | 753 | 653 | 812 | 516 | 1,783 | 969 | 0 | 63 | 55 | 60 | 69 |
| Freshwater fishes nei | 103,158 | 103,153 | 109,087 | 109,185 | 118,703 | 121,405 | 142,092 | 167,530 | 163,524 | 179,865 | 176,468 | 180,100 | 181,000 | 165,703 |
| Frigate and bullet tunas | <0.5 | 1 | 2 | 2 | 36 | 36 | 49 | 54 | 56 | 59 | 42 | 52 | 31 | 35 |
| Giant tiger prawn | 127 | 151 | 124 | 157 | 138 | 132 | 141 | 140 | 122 | 138 | 139 | 140 | 155 | 171 |
| Greater lizardfish | 71 | 81 | 82 | 96 | 67 | 43 | 45 | 28 | 22 | 0 | 0 | 0 | 0 | 0 |
| Groupers nei | 2,908 | 3,621 | 4,863 | 6,255 | 7,617 | 8,600 | 9,793 | 10,474 | 13,991 | 17,355 | 16,012 | 15,928 | 16,000 | 14,415 |
| Grunts, sweetlips nei | 4,252 | 4,929 | 4,491 | 5,417 | 4,849 | 5,537 | 5,268 | 6,010 | 6,221 | 8,147 | 9,961 | 9,752 | 9,850 | 5,186 |
| Guitarfishes, etc. nei | 1,156 | 1,241 | 1,438 | 1,500 | 1,442 | 1,208 | 1,422 | 1,481 | 1,564 | 1,643 | 2,185 | 1,944 | 2,004 | 840 |
| Hilsa shad | 935 | 861 | 823 | 796 | 658 | 476 | 562 | 597 | 611 | 502 | 190 | 170 | 174 | 156 |
| Indian oil sardine | 63,743 | 65,858 | 74,553 | 92,704 | 65,050 | 55,177 | 52,290 | 51,930 | 44,079 | 30,629 | 31,167 | 31,201 | 31,600 | 32,939 |
| Indo-Pacific sailfish | 642 | 691 | 998 | 731 | 855 | 910 | 980 | 41 | 45 | 46 | 0 | 0 | 0 | 0 |
| Jacks, crevalles nei | 2,223 | 2,651 | 2,852 | 3,933 | 4,003 | 4,631 | 3,972 | 5,391 | 6,523 | 8,407 | 9,111 | 8,928 | 9,200 | 31,126 |
| Kawakawa | 1,884 | 1,798 | 1,812 | 1,933 | 1,716 | 1,449 | 2,351 | 2,571 | 2,684 | 2,715 | 2,340 | 1,817 | 1,210 | 1,400 |
| Largehead hairtail | 2,474 | 4,123 | 4,755 | 3,474 | 6,320 | 6,093 | 9,073 | 11,583 | 12,337 | 31,623 | 28,754 | 27,355 | 28,440 | 25,660 |
| Longtail tuna | 6,052 | 4,962 | 2,770 | 2,510 | 5,807 | 5,006 | 4,121 | 5,360 | 5,220 | 5,600 | 5,315 | 4,735 | 4,466 | 5,454 |
| Mangrove red snapper | 938 | 1,108 | 1,222 | 2,178 | 2,524 | 3,145 | 2,002 | 2,394 | 3,192 | 3,195 | 3,003 | 2,900 | 3,000 | 2,198 |
| Marine crabs nei | 364 | 390 | 437 | 480 | 650 | 877 | 3,200 | 3,989 | 5,680 | 5,109 | 5,187 | 5,099 | 6,060 | 4,619 |
| Marine fishes nei | 68,559 | 64,079 | 54,764 | 31,359 | 40,725 | 14,742 | 16,311 | 21,042 | 35,352 | 39,473 | 36,451 | 35,450 | 31,769 | 35,509 |
| Marlins,sailfishes,etc. nei | 1,290 | 2,357 | 2,400 | 2,245 | 2,932 | 2,684 | 2,834 | 2,198 | 2,264 | 2,340 | 2,215 | 1,122 | 995 | 1,004 |
| Metapenaeus shrimps nei | 8,750 | 9,080 | 8,238 | 9,468 | 7,120 | 6,981 | 7,602 | 6,801 | 6,204 | 6,791 | 7,126 | 7,246 | 6,555 | 7,121 |
| Mullets nei | 6,017 | 6,751 | 10,176 | 22,485 | 19,039 | 17,280 | 17,631 | 18,935 | 17,580 | 12,336 | 9,618 | 9,723 | 9,900 | 10,316 |
| Narrow-barred Spanish mackerel | 5,941 | 6,272 | 12,133 | 12,252 | 7,157 | 8,618 | 10,108 | 12,009 | 12,232 | 11,734 | 9,366 | 8,455 | 7,922 | 8,628 |
| Parapenaeopsis shrimps nei | 13,666 | 16,406 | 12,693 | 18,632 | 16,023 | 12,919 | 14,047 | 16,722 | 14,689 | 12,889 | 11,945 | 11,576 | 10,222 | 12,019 |

# Annex I. FAO Catch Statistics for Pakistan 1990 to 2003

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parapenaeopsis shrimps nei | 13,666 | 16,406 | 12,693 | 18,632 | 16,023 | 12,919 | 14,047 | 16,722 | 14,689 | 12,889 | 11,945 | 11,576 | 10,222 | 12,019 |
| Penaeus shrimps nei | 5,378 | 6,423 | 5,273 | 6,663 | 5,883 | 5,591 | 5,982 | 5,975 | 5,189 | 5,874 | 5,920 | 5,974 | 5,600 | 5,100 |
| Pike-congers nei | 1,890 | 7,389 | 8,335 | 9,484 | 5,725 | 4,692 | 4,904 | 5,637 | 5,627 | 8,377 | 5,937 | 5,834 | 5,940 | 4,545 |
| Porgies, seabreams nei | 2,885 | 3,332 | 3,284 | 3,939 | 3,866 | 3,358 | 3,097 | 3,058 | 1,255 | 4,220 | 4,510 | 4,411 | 4,430 | 2,687 |
| Rays, stingrays, mantas nei | 15,665 | 17,498 | 16,532 | 16,093 | 18,481 | 16,445 | 15,563 | 15,769 | 17,576 | 20,780 | 20,740 | 20,801 | 20,900 | 13,711 |
| Requiem sharks nei | 23,138 | 26,338 | 27,773 | 28,780 | 30,226 | 32,288 | 34,447 | 31,179 | 35,357 | 32,535 | 28,245 | 26,524 | 27,000 | 18,697 |
| Sawfishes | 84 | 21 | 2 | 32 | 28 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Scads nei | 1,648 | 1,110 | 1,200 | 1,675 | 1,875 | 1,920 | 1,010 | 1,225 | 3,505 | 4,661 | 4,600 | 4,355 | 4,400 | 3,561 |
| Sea catfishes nei | 14,550 | 27,253 | 27,648 | 37,840 | 42,112 | 45,444 | 49,428 | 54,437 | 55,934 | 51,665 | 39,168 | 38,215 | 38,500 | 30,339 |
| Sillago-whitings | 280 | 320 | 317 | 321 | 365 | 423 | 289 | 266 | 218 | 201 | 194 | 204 | 210 | 401 |
| Skipjack tuna | 7,555 | 7,511 | 8,200 | 8,950 | 8,134 | 7,089 | 4,140 | 4,480 | 4,372 | 4,505 | 4,308 | 3,405 | 3,102 | 3,062 |
| Threadfin breams nei | 122 | 324 | 368 | 526 | 752 | 952 | 825 | 884 | 3,192 | 7,166 | 8,940 | 8,466 | 8,600 | 8,363 |
| Tonguefishes | 1,373 | 1,589 | 2,041 | 2,024 | 1,963 | 1,982 | 2,205 | 2,390 | 2,149 | 2,037 | 2,124 | 1,915 | 1,980 | 1,369 |
| Torpedo scad | 2,400 | 2,550 | 4,525 | 5,863 | 3,369 | 6,511 | 3,000 | 2,100 | 1,100 | 1,450 | 2,017 | 1,825 | 1,950 | 2,070 |
| Tropical spiny lobsters nei | 470 | 799 | 502 | 507 | 669 | 615 | 724 | 765 | 782 | 1,077 | 807 | 756 | 802 | 749 |
| Tuna-like fishes nei | 1,092 | 458 | 500 | 635 | 0 | 0 | 1,990 | 1,500 | 1,592 | 4,610 | 4,240 | 2,775 | 2,480 | 2,505 |
| Various squids nei | 1,635 | 3,148 | 3,225 | 3,317 | 3,126 | 2,832 | 2,600 | 4,460 | 3,300 | 5,062 | 4,070 | 4,024 | 3,200 | 2,130 |
| Yellowfin tuna | 3,156 | 6,480 | 23,394 | 30,817 | 4,604 | 5,140 | 5,250 | 3,838 | 3,795 | 8,884 | 4,946 | 3,603 | 2,940 | 3,210 |
| TOTAL | 469,036 | 502,743 | 540,354 | 608,344 | 537,277 | 525,849 | 537,489 | 589,795 | 596,980 | 654,530 | 614,069 | 600,798 | 599,104 | 564,743 |
| % increase/decrease on previous year | | 7% | 7% | 13% | -12% | -2% | 2% | 10% | 1% | 10% | -6% | -2% | 0% | -6% |
| Of which Freshwater fish (% of total) | 22% | 21% | 20% | 18% | 22% | 23% | 26% | 28% | 27% | 27% | 29% | 30% | 30% | 29% |
| Of which freshwater fish (tonnes) | 103,158 | 103,153 | 109,087 | 109,185 | 118,703 | 121,405 | 142,092 | 167,530 | 163,524 | 179,865 | 176,468 | 180,100 | 181,000 | 165,703 |
| % increase/decrease on previous year | | 0% | 6% | 0% | 9% | 2% | 17% | 18% | -2% | 10% | -2% | 2% | 0% | -8% |
| Marine Total | 365,878 | 399,590 | 431,267 | 499,159 | 418,574 | 404,444 | 395,397 | 422,265 | 433,456 | 474,665 | 437,601 | 420,698 | 418,104 | 399,040 |
| Of which Prawns (tonnes) | 27,921 | 32,060 | 26,328 | 34,920 | 29,164 | 25,623 | 27,772 | 29,638 | 26,204 | 25,692 | 25,130 | 24,936 | 22,532 | 24,411 |
| Of which small clupeids = fishmeal | 120,879 | 119,377 | 132,438 | 167,114 | 104,134 | 106,087 | 94,967 | 95,918 | 86,236 | 77,378 | 75,768 | 74,863 | 75,900 | 76,229 |
| % of marine catch = fishmeal species | 33% | 30% | 31% | 33% | 25% | 26% | 24% | 23% | 20% | 16% | 17% | 18% | 18% | 19% |

Annex II FAO fisheries Commodities Import and Export 1990 – 2003 Major Imports and Exports only

(See next page)

FAO Fisheries Commodity Imports & Exports. Pakistan. From FAO Fishstat data

| Quantity/value | Commodity | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Export Quantity | Fish products (not fillets), dried, salted or in brine | . | . | . | . | . | . | . | . | . | . | . | . | . | 13918 |
| Export Value | Fish products (not fillets), dried, salted or in brine | . | . | . | . | . | . | . | . | . | . | . | . | . | 7312 |
| Export Quantity | Shrimps and prawns, canned | 92 | 1 | 16 | 33 | 18 | 8 | 8 | - | - | - | - | - | - | 1555 |
| Export Value | Shrimps and prawns, canned | 403 | 4 | 50 | 132 | 59 | 31 | 27 | - | - | - | - | - | - | 5947 |
| Production Quantity | Shrimps and prawns, canned | . | 14 | 33 | 20 | 40 | 8 | - | - | - | - | - | - | - | - |
| Export Quantity | Tunas nei, frozen | . | . | 6605 | 23835 | 4866 | 50 | - | - | - | - | - | - | - | - |
| Export Value | Tunas nei, frozen | . | . | 9883 | 50915 | 14079 | 158 | - | - | - | - | - | - | - | - |
| Production Quantity | Tunas nei, frozen | . | . | 6605 | 23835 | 4866 | 50 | 80 | 95 | 80 | 102 | 206 | - | - | - |
| Export Value | Shrimps and prawns, frozen | 59953 | 78023 | 59717 | 57034 | 76465 | 82092 | 72404 | 105379 | 81074 | 66193 | 77896 | 59433 | 53639 | 40819 |
| Production Quantity | Oily-fish meal, nei | 34571 | 35918 | 37140 | 39250 | 40256 | 37097 | 37837 | 38455 | 39285 | 43122 | 32277 | 38000 | 34000 | 33580 |
| Export Value | Marine fish, frozen, nei | 483 | 3399 | 3023 | 4777 | 10764 | 9406 | 9150 | 13246 | 11476 | 17360 | 19165 | 21756 | 32957 | 58028 |
| Export Quantity | Marine fish, frozen, nei | 293 | 3091 | 2177 | 2966 | 6926 | 6665 | 7859 | 11314 | 12102 | 16645 | 16969 | 19190 | 27628 | 53312 |
| Production Quantity | Sharks, dried, salted or in brine | 5310 | 6044 | 9000 | 9800 | 10355 | 12480 | 15563 | 18975 | 20504 | 21144 | 22322 | 20000 | 22000 | 23250 |
| Production Quantity | Marine fish, frozen, nei | 5307 | 4320 | 15149 | 2966 | 2738 | 6687 | 12647 | 12889 | 10256 | 12123 | 12300 | 19190 | 20204 | 20606 |
| Production Quantity | Tunas nei, salted or in brine | 4600 | 4008 | 20478 | 27622 | 19560 | 15325 | 18881 | 19475 | 19700 | 22240 | 21104 | 20000 | 19400 | 25100 |
| Export Quantity | Fish nei, salted and dried | 19329 | 18611 | 21313 | 22773 | 20526 | 17144 | 18336 | 21275 | 15413 | 23368 | 21104 | 17743 | 16454 | - |
| Export Quantity | Shrimps and prawns, frozen | 14134 | 15926 | 15640 | 14851 | 15535 | 14868 | 15558 | 17721 | 20843 | 13108 | 14580 | 14638 | 13588 | 9902 |
| Export Value | Marine fish, fresh or chilled, nei | 4491 | 1176 | 2168 | 2813 | 2628 | 5369 | 5169 | 4617 | 5328 | 5514 | 8137 | 9582 | 11022 | 12016 |
| Production Quantity | Shrimps and prawns, frozen | 15255 | 16827 | 14098 | 16886 | 13783 | 14848 | 16792 | 17717 | 15900 | 13140 | 14621 | 14638 | 10533 | 10960 |
| Export Value | Fish nei, salted and dried | 12102 | 14014 | 15299 | 14999 | 11724 | 13271 | 12468 | 13548 | 10707 | 11968 | 10604 | 8966 | 8792 | - |
| Production Quantity | Fish livers, frozen | 627 | 2733 | 4409 | 5002 | 3489 | 5356 | 10300 | 10780 | 8905 | 9124 | 8800 | 7003 | 7600 | 7855 |
| Export Quantity | Fish meal fit for human consumption, nei | 1058 | 734 | 2907 | 2954 | 1709 | 1368 | 1228 | 1527 | 1308 | 2305 | 3981 | 5056 | 6464 | 4918 |
| Export Quantity | Marine fish, fresh or chilled, nei | 3119 | 717 | 1419 | 1909 | 2094 | 2931 | 3309 | 3201 | 3602 | 3889 | 5088 | 5373 | 5553 | 5597 |
| Production Quantity | Flatfishes nei, frozen | 1660 | 2092 | 2831 | 4130 | 5086 | 5970 | 6210 | 6340 | 6220 | 8155 | 8302 | 5102 | 5400 | 5432 |
| Export Value | Fish livers, frozen | 995 | 4648 | 5622 | 11017 | 5959 | 6819 | 7786 | 6915 | 7801 | 10462 | 8777 | 7321 | 5380 | - |
| Export Value | Flatfishes nei, frozen | 3059 | 3276 | 4033 | 9371 | 9397 | 9212 | 5729 | 12349 | 2353 | 9820 | 5196 | 5554 | 5238 | 306 |
| Export Quantity | Fish livers, frozen | 627 | 2733 | 4409 | 5002 | 3489 | 5332 | 6553 | 5689 | 7678 | 10149 | 8958 | 7003 | 5044 | - |
| Export Quantity | Flatfishes nei, frozen | 1660 | 2092 | 2831 | 4130 | 5086 | 5970 | 4721 | 9456 | 1657 | 7512 | 4371 | 5102 | 4229 | 214 |
| Production Quantity | Fish products (not fillets), dried, salted or in brine | 2640 | 2392 | 2550 | 2730 | 2805 | 2987 | 3042 | 3115 | 3072 | 3114 | 3228 | 3100 | 3122 | 2398 |
| Export Value | Fish heads, tail, maws etc., dried, salted, or in brine | 1118 | 931 | 1547 | 1605 | 1563 | 3232 | 3162 | - | 1669 | 2032 | 2987 | 2086 | 2446 | - |
| Export Quantity | Fish waste, nei | . | . | . | 98 | 495 | - | - | - | - | - | - | - | 2359 | 1804 |
| Export Value | Fish meal fit for human consumption, nei | 367 | 223 | 760 | 715 | 417 | 476 | 417 | 446 | 402 | 651 | 949 | 1354 | 1851 | 1521 |
| Export Value | Cephalopods nei, frozen | 4837 | 4009 | 6442 | 11498 | 16132 | 11305 | 8119 | 10572 | 6154 | 9388 | 7541 | 6149 | 1801 | - |
| Export Quantity | Cephalopods nei, frozen | 2731 | 2369 | 5380 | 6932 | 7709 | 5629 | 4949 | 7968 | 5024 | 9440 | 6326 | 5982 | 1741 | - |
| Export Value | Shark fins, dried, salted, etc. | 2572 | 2720 | 3596 | 4090 | 2493 | 3923 | 2812 | - | 1877 | 1713 | 2145 | 1633 | 1704 | - |
| Export Quantity | Fish nei, dried, unsalted | 1 | 282 | 321 | 38 | - | 632 | 274 | - | 34 | - | - | 1323 | 1575 | - |
| Production Quantity | Crabs nei, frozen | 295 | 86 | 332 | 356 | 464 | 1130 | 2767 | 3013 | 4037 | 3494 | 2642 | 157 | 1458 | 1733 |
| Export Value | Crabs, peeled or not, fresh or chilled | 24 | 128 | 103 | 199 | 117 | 805 | 1499 | - | 4018 | 3437 | 2165 | 1486 | 1158 | 1040 |
| Export Value | Crab meat, frozen | 374 | 367 | 280 | 265 | 140 | 393 | 234 | - | 595 | 962 | 1485 | 1103 | 1072 | - |
| Export Quantity | Crabs, peeled or not, fresh or chilled | 18 | 95 | 86 | 193 | 183 | 856 | 1522 | - | 4058 | 3308 | 1968 | 1277 | 969 | 906 |
| Export Value | Fish nei, dried, unsalted | 1 | 306 | 184 | 27 | - | 444 | 185 | - | 22 | - | - | 720 | 873 | - |
| Production Quantity | Anchovies nei, dried, salted or in brine | 260 | 270 | 300 | 350 | 390 | 410 | 450 | 465 | 370 | 415 | 511 | 500 | 480 | 499 |
| Export Value | Crabs nei, frozen | 800 | - | 207 | 117 | 19 | 8 | 133 | - | 16 | 111 | 708 | 55 | 467 | 771 |
| Export Value | Fish waste, nei | . | . | . | 23 | 137 | - | - | - | - | - | - | - | 455 | 421 |
| Export Value | Lobsters nei, meat or tails, frozen | 233 | - | 54 | 12 | 2 | 37 | 28 | - | - | - | - | 443 | 453 | - |
| Export Quantity | Crabs nei, frozen | 278 | - | 87 | 43 | 12 | 6 | 133 | - | 10 | 64 | 377 | 36 | 331 | 404 |
| Export Quantity | Fish live, nei | 36 | - | - | - | | 47 | - | 79 | - | 10 | - | 1 | 327 | 604 |
| Export Value | Fish live, nei | 154 | - | - | - | | 178 | - | 308 | - | 65 | - | 2 | 314 | 717 |
| Production Quantity | Cephalopods nei, frozen | 2731 | 2369 | 5380 | 6932 | 7709 | 5629 | 5138 | 8074 | 5806 | 9441 | 6325 | 5982 | 234 | - |
| Export Value | Shrimps and prawns, fresh or chilled | 3 | 13 | 71 | 75 | 155 | 73 | 76 | - | 38 | 37 | 75 | 651 | 196 | 308 |
| Export Quantity | Fish heads, tail, maws etc., dried, salted, or in brine | 106 | 100 | 157 | 154 | 126 | 177 | 168 | - | 73 | 106 | 152 | 95 | 102 | - |
| Export Quantity | Oily-fish meal, nei | 1071 | 1715 | 3325 | 2847 | 962 | 1367 | 897 | 1507 | 1568 | 2306 | 1600 | 4300 | 100 | 2600 |
| Export Value | Crustaceans nei, frozen | 99 | 45 | 118 | - | 7 | 64 | 232 | 1336 | 114 | 9 | 271 | 61 | 95 | 171 |
| Export Quantity | Crab meat, frozen | 64 | 65 | 49 | 114 | 66 | 279 | 318 | - | 115 | 122 | 298 | 121 | 94 | - |
| Export Quantity | Crustaceans nei, frozen | 59 | 29 | 24 | - | - | 26 | 144 | 190 | 70 | 8 | 227 | 113 | 93 | 44 |
| Export Quantity | Shark fins, dried, salted, etc. | 240 | 237 | 327 | 328 | 174 | 190 | 140 | - | 87 | 85 | 105 | 88 | 89 | - |
| Import Quantity | Oily-fish meal, nei | 82 | 1 | . | 21 | 44 | 21 | 63 | 63 | 41 | - | 41 | 42 | 88 | 88 |
| Export Quantity | Shrimps and prawns, fresh or chilled | 1 | 4 | 37 | 43 | 67 | 21 | 27 | - | 22 | 12 | 28 | 240 | 71 | 100 |
| Import Quantity | Fish body oils, nei | 112 | 124 | 119 | 185 | 114 | 31 | 58 | - | 61 | 91 | 56 | 63 | 59 | 79 |
| Production Quantity | Shark fins, dried, salted, etc. | 236 | 261 | 333 | 278 | 123 | 191 | 108 | 89 | 73 | 85 | 106 | 88 | 55 | 52 |

# Appendix 2 Fisheries Sector Survey

**SUMMARY REPORT**
**Asian Development Bank**
**Project Preparatory Technical Assistance**
**No TA 4525 – PAK**

**Sindh Coastal and Inland Community Development Project**
**Institutional Strengthening of the Sindh Fisheries Department**

**December 2005**

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## FINDINGS

This output recommends that:-

**A Fisheries Sector Survey is carried out under SCICDP to guide the Institutional Strengthening of the Sindh Fisheries Department[61]**

The sector survey will cover the Fisheries of Sindh Province, describe the present situation, opportunities and threats and identify the needs of the fishing and aquaculture industry in Sindh. It will also propose a detailed structure for the Fisheries Department of Sindh to satisfy the identified needs and functions of the Department. The proposal will include methodology to achieve the reorganisation of the department, a detailed cost estimate and a schedule.

Implementation the Sindh Fisheries Department strengthening will be based on the outputs of the Fisheries Sector Survey.

## INTRODUCTION

In the Overview of Fisheries and Aquaculture, the weakness of the various institutions charged with the management and development of the fisheries of Sindh Province in Pakistan are identified as contributing to a serious failure to take advantage of opportunities in the sector. These are in wild capture fisheries, inland fisheries, fresh, brackish and marine aquaculture. The unutilised opportunities add up to more than US$700,000,000 per year for Sindh alone. Whilst it is nowhere suggested that this whole potential can quickly be realised, there is no doubt that stronger management would at least stop the current decline (from overfishing of marine and freshwater resources, and poor quality control) and probably spur production and investment in other sectors, such as coastal marine and brackish water aquaculture.

The only recommendation of the Overview on Fisheries and Aquaculture is:-

[61] recommended in the Overview of Fisheries and Aquaculture

> "……. that institutional strengthening is undertaken, to overcome the lack of management of fisheries resources in Pakistan, and this to concentrate on Sindh, where the project area is located and many of the opportunities exist."

Fundamental to any reform process is the belief that the Sindh Fisheries Department can be made to achieve a higher standard of performance. This belief that improvements in performance will eventuate from reform is based on the supposition that the following effects of reform will contribute to performance:-

- an appropriate structure for the Department with adequate numbers to carry out the tasks
- well qualified and trained staff
- good leadership within the new structure
- resources to undertake their tasks (a function of less staff and relatively more financial resources)
- a pleasant working environment
- "esprit de corps" throughout the organisation, motivating all
- outsourcing of some of the more routine and mundane tasks

If Sindh Fisheries Department cannot improve, due to pervasive government malaise or lack of cooperation with the reform process, then other pathways to changing the management of the fisheries resources of Sindh will have to be considered. This is a real possibility and must be borne in mind at all times during the reform process.

The key to achieving a programme of institutional strengthening, in this case in the Department of Fisheries[62] in Sindh, is through defining exactly what the department should be doing, and then designing the department around these functions. Currently it is impossible to define exactly what the fisheries department should or could be doing as there is a distinct lack of detailed information on:-

- Strengths and weaknesses of the existing staff and administration. It is not clear what all the existing staff do, where they are based and what training they have. TORs for some of the staff are not fully defined.
- The fisheries of the province, marine, brackish and coastal marine, particularly their size, species involved,, numbers of fishermen, interaction with other fisheries (offshore for instance) and basic trends.
- Aquaculture activity particularly inland freshwater, some sections of the aquaculture and Research and Development Directorate are working relatively well, though the potential remains huge.
- The legal basis for the fisheries departments activities particularly relating to enforcement, relationships with other bodies (National and International), other legal obligations under the constitution, state and provincial laws.
- Research and development needs
- Activities which could be privatised
- Data collection, collation and dissemination
- Opportunities and threats
- Funding and costs estimates

[62] Fisheries Department refers to Sindh Fisheries Department unless otherwise indicated.

Currently the primary institutions involved in fisheries in Sindh, in particular the Sindh Fisheries Department, Federal Marine Department and Karachi Cooperative Society are too weak admistratively to undertake such an exercise. There is much talk of "reform" but the institutional inertia, lack of will, vested interests and lack of funding has not made it possible to proceed. Even the proposals produced have so far been proposals for mere tinkering – changing department heads, moving sections from one administrative unit to another, splitting up sections, writing a new policy about one aspect or another.

The continuing failure to reform so far merely makes the need for reform more critical as the fish stocks decline and increased population demands more employment, food and amenities.

It is necessary therefore to

- define the role of the Department of Fisheries in Sindh (relate this to the roles of the other stakeholders)
- identify the needs of the fishery, a regards development and management
- identify the activities that have to be undertaken by the Department of Fisheries
- enumerate the staff levels necessary to carry out these functions
- assess the skills levels needed by the staff
- develop an appropriate intervention to alter the present structure and operations of the Department from its present form to the one that addresses the identified needs

All of these could be easily achieved if there was sufficient accurate and up to date information regarding the fisheries sector on which to base decisions. At present this sort of data is not only inaccurate, because it has not been collected and collated in an accessible form, but in some cases does not exist at all[63].

It follows that it is a recommendation that

**A Fisheries Sector Survey is carried out under SCICD**

**Sector Survey**

To overcome the shortage of accurate data on fisheries which to base decisions on the restructuring of the Department of Fisheries in Sindh, it is necessary to undertake a detailed Sector Survey. The Sector Survey should be carried out by a competent external body which will be able to independently establish the necessary functions of the Fisheries Department from the point of view of the needs of the fisheries resources of Sindh. The Sector Survey will

- firstly enumerate the state of the resources, exploitation levels, the structure and staffing of the Department of Fisheries in Sindh, define opportunities and undertake some basic studies to put figures on hazy areas.
- from this assessment of the existing situation, analyse the needs of the fishery
- design a structure, skills levels and a legislative basis for the Fisheries Department that will ensure that the department is capable of satisfying these expressed needs.
- Make other recommendations as required

[63] The overview of Fisheries and Aquaculture in the PPTA for the SCICD details these failings in more depth.

The Fisheries Sector Study will have to examine in great depth, describing the present situation, identifying institutional needs, and addressing constraints and opportunities, the following arenas:-

- The institutional base for the Sindh Fisheries Department, its relationship with other organisations and the ideal role and function of the organisation. Skills analysis for management of the fisheries of Sindh. Geographical spread and administrative strengths and weaknesses. Training requirements both in the Department of Fisheries and in the private sector.
- The legal basis for fisheries management in Sindh and Pakistan. Necessary changes to the legislation and any updating that is required. The legislative challenges of the Department of Fisheries.
- The fisheries resources available to, and under the management of the Fisheries Department of Sindh, including resources not presently enumerated and those shared with other jurisdictions either nationally or internationally. (The Inland Sea of Badin and Thatta has resources that are potentially very large but about which little is known, for which a resource survey under this component is required). Means and methods for long term enumeration and monitoring of fisheries resources.
- The capture fisheries of Sindh, and particularly the capture fisheries of the zone to 12 miles, the Indus Delta, the Indus River and the inland sea of Thatta and Badin. (This will require establishing community run monitoring stations and data collections points in Badin and Thatta for (relatively short) periods during the study duration). Means and methods for long term enumeration and monitoring of fisheries catches, fishing vessel activity, landing sites and other parameters. Extension services, public and private training. Safety at sea in the industry, crew certification and legal aspects of this.
- Freshwater, marine and brackish water aquaculture inland in Sindh, particularly in the Inland Sea area of Badin and Thatta and in the Indus delta region. Opportunities and environmental constraints to development. Research and development needs and the role of the Department of Fisheries.
- Fish quality, exports and the fishmeal industry in Pakistan. Present situation, the role of middlemen moles and processors. The causes of post harvest losses in Pakistan fisheries.
- Cooperatives, credit and the role of the middleman and “moles” in the economics of the fishing industry. Alternatives, strengths and weaknesses, womens’ development and gender issues.

The proposed TORs for the Sector Study are in Annex I. Draft TORs for the proposed individual consultants are also provided there.

**Subsequent Institutional Strengthening**

Based on the results of the Sector Survey, and in particular the analysis of the institutional structure and effectiveness of the Department of Fisheries it will be possible to start an institutional strengthening phase.

The Sector Survey will have developed a series of focal activities that the department has to carry out will be developed.

These might include, inter alia:-

1. Administration of the Department
2. Data Collection, collation and interpretation
3. Extension and training
4. Research and development activities
5. Relations with other organisations
6. Enforcement and licensing

Recommendations for institutional strengthening from the Sector Study, and subsequent implementation, will have to take into account the lessons from the process of reform attempted or undertaken in other institutions in Sindh and Pakistan, notably that:-

1. reforms should be done in a coherent and integrative way and suit the broader social and political policies of the country.
2. priorities will have to be set and a sequence of actions to suit those priorities.
3. reforms that are not politically or socially acceptable will not work
4. reform must be a participatory process, so as to avoid a situation of information asymmetry; where a small group are privy to information that is not available to the rest of the stakeholders
5. Vested interests and special interest groups must be included but must not hijack the process.
6. Reforms must avoid confusing the roles of resource management and regulation (government responsibility) and service provision (public or privately operated utilities)

**The Reform Process**

Once the Sector Survey has presented its findings and these have been accepted the SCICDP can proceed to implement the reform process. The reform process will have to receive wholehearted support from the institutions that it will affect or it will fail. It would be better to abandon reform at this stage than to proceed with a half-hearted effort that will not alter fundamentals.

The reform process, based on the recommendations of the Sector Survey and the TA expertise provided under the process will include[64]:-

- Redundancy of those not considered necessary to the effective operation of the new structure for the Department. (to be carried out according to Government Regulations, perhaps with further incentives)
- Recruitment of skilled and qualified staff for those posts either newly created, or not filled, or vacant due to redundancy. This to be done using a Pakistan based, but internationally renowned recruitment agency (to ensure fairness and even-handedness in recruitment)
- Appropriate training programmes and on the job training for the new and retained staff.

The reform process will turn the Sindh Fisheries department into an organisation that:-

- Is high-quality, knowledge-intensive, widely respected and influential.

[64] Since the form of the Department recommended by the Sector Survey is unknown, it is difficult to be precise as to exactly what steps will be needed to complete reform.

- is able to base policies on a technically sound assessment of fish stocks and economic values, the Precautionary Approach to Fisheries[65], environmental prudence, and
- Develop policies through a broad consultative process with the fishing industry, artisanal fishermen and other stakeholders, both governmental and non-governmental
- implement policies by contracting-out execution to specialised agencies wherever possible
- support initiatives in rural production and food security by providing or organising technical assistance to Districts and Union Councils, Municipal authorities, NGOs and community based organisations.
- set and maintain high standards of accountability and transparency

[65] As advocated by FAO and enshrined in the Rio Declaration.

**Annex 1**

**SECTOR STUDY. FISHERIES AND AQUACULTURE OF SINDH AND THE INDUS DELTA**

**TERMS OF REFERENCE, BUDGET AND TIMETABLE**

Technical Assistance (TA) will assist the Government of Sindh Fisheries Department to undertake a analytical and diagnostic exercise as well as a consultative process to arrive at a concise review of Fisheries and Aquaculture in Sindh and in particular the Indus Delta and Inland Sea area of Badin and Thatta. The review will allow the Government of Sindh to decide on the most appropriate assistance that will strengthen the institutions responsible for management and development of the sector.

International consultants, assisted by counterparts from the Department of Fisheries of Shindh Province, and using other bodies as and when necessary, will carry out the necessary analyses and prepare a report to be discussed by the Government and ADB.

The consultants will comprise 7 specialists[66].

1. Fisheries Institutions Specialist. Team Leader. (10 man months)
2. Fisheries Resources Specialist (5 man months)
3. Coastal Fisheries Specialist (5 man months)
4. Aquaculture Specialist (2 man months)
5. Fisheries post harvest and quality control specialist (2 man months)
6. Cooperatives and Credit specialist (1 man month)
7. Legal Specialist (Fisheries) (1 man month)

The Fisheries Institutions Specialist will act as team leader and perform the necessary coordinating and management tasks as well as the specific tasks in the TORs.

Local counterparts from the Fisheries Department of Sindh will be allocated by the Government of Sindh.

The team will report to the Director of Livestock and Fisheries through the Coastal Development Authority and the Planning and Development section of the Sindh Department of Fisheries.

The report with recommendations will cover:-

A. a detailed review of the whole fishing and aquaculture industry in the Province of Sindh[67]
B. a comprehensive need analysis of the fishery regarding its management and development.
C. necessary interventions particularly for institutional strengthening, include the specific tasks to be carried out by the Fisheries Department of Sindh and the District

[66] No specific Environmental Specialist is included as there is already a plethora of information on the general environment in the Indus Delta
[67] and in the project area of the Indus delta and the Inland Sea area of Badin and Thatta

D. propose a future staff structure for the Department of Fisheries
E. a costed plan for the implementation of a programme of institutional strengthening of the Department of Fisheries.
F. terms of reference and detailed costing for any subsequent TA to implement these changes.

The study will cover, inter alia,

a) Institutions. Management and administration of the fisheries of Sindh, including training, skills and the legislative basis for the management and administration of the fisheries of Sindh. Methodology for change and improvement.
b) Resources: those available in the 200 mile EEZ of Sindh and in the Indus delta, including those resources of the inland sea area of Badin and Thatta.
c) Capture Fisheries: A quantified survey of the industrialised fishery centred on Karachi Fish Harbour, (including the joint venture vessels presently operating in the Paksitan 200 mile EEZ) and the Artisanal Fishery, scattered in the Indus Delta and the Inland Sea of Badin & Thatta. Inland capture fisheries in lakes and irrigation.
d) The present marketing system for export fish and prawns, local marketing and the fishmeal industry. Quality control and maintenance of fish quality in the marketing chain.
e) Cooperatives, credit and micro-finance in the Fishing and Aquaculture Industry in Sindh
f) Aquaculture, Fresh Water, Brackish water and Marine. Present situation, lessons learnt from past interventions, and future possibilities.
g) The laws and regulations relating to fisheries, the need for amendment or reform of the legislative basis for fisheries management.

**SPECIALIST RESEARCH AND DATA COLLECTION**

The review team will undertake, as indicated in the outline TORs above, two community based data collection exercise which are necessary to a thorough understanding of the fisheries of Sindh Province. These are:-

1. A limited area resource survey of the delta and in the Inland Sea area of Badin and Thatta, targeting the marine and brackish water resources and of the Delta Region. Predominant amongst these resources are the clam and other shellfish species that are known to live there in abundance but the numbers of which have not been measured. These resources are known to be seasonal and the survey will have to encompass the time that the shellfish are accessible (mid-year). It is important that these resources are measured, since they offer a significant opportunity to the people living in the inland sea area, both as a source of protein for aquaculture or chicken feed, and as an income source. The survey will be accomplished by detailed experimental fishing, covering species, sizes and abundance. Due to the seasonality of the resources the survey will have to be lengthy and cover both dry seasons (low water discharges from the Kotri Barrage and low rainfall, and wet seasons, rainfall and higher discharges from the Kotri barrage). The work in the Indus Delta region will be concurrent with the work on the Inland Sea, but concentrate more on the estimation of species abundance through the monitoring of catches which can be achieved by working in conjunction with the fisheries monitoring exercise (described below) where the two areas of investigation overlap. Some of the work will be carried out with the

assistance of the staff of the R & D section of the Fisheries Department of Sindh; some could conceivably be sub-contracted to suitable NGOs and some carried out by the specialist himself. The collection of this data can, in many instances, be in close cooperation with the coastal fisheries surveys being undertaken by the Coastal Fisheries Specialist in Sindh under the Sector Survey.

2. A participatory fisheries monitoring exercise, involving the communities of the Inland Sea and Indus Delta in the collection of data on landings (quantity, species, origin, marketing etc). (This would include routine data collection in Karachi Fish Harbour and Ibrahim Hyderi of species, origin and prices). Generally the programme will be a very simple data collection exercise, though extensive, which will be undertaken with the support of an suitable NGO and some minor funding; but will provide excellent information on fishing activity in these remote areas to provide a basis for decision making, where no accurate data exists at all at the moment. The data collection exercise should extend over the period of one dry season and one wet season, with appropriate supervision by the specialist, though the majority of the data collection itself will be subcontracted.

## Consultants deployment and timetable of activities and reporting

| | TECHNICAL ASSISTANCE | Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INTERNATIONAL CONSULTANTS | | | | | | | | | | | | | MM |
| | Fisheries Institutions Specialist & Team Leader | | | | | | | | | | | | | 9.0 |
| | Fisheries Resources Specialist | | | | | | | | | | | | | 5.0 |
| | Coastal Fisheries Specialist | | | | | | | | | | | | | 5.0 |
| | Aquaculture Specialist | | | | | | | | | | | | | 2.0 |
| | Fisheries Post Harvest and Quality Control Specialist | | | | | | | | | | | | | 2.0 |
| | Cooperatives and Credit Specialist | | | | | | | | | | | | | 1.0 |
| | Legal specialist | | | | | | | | | | | | | 1.0 |
| | | | | | | | | | | | | | | |
| | TA timings are deliberately slanted towards the beginning of the Sector Survey to allow for slippage | | | | | | | | | | | | | 25.0 |
| | Total Man Months | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | **ACTIVITIES** | **Month** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| | ACTIVITIES AND MEETINGS | | | | | | | | | | | | | |
| 1 | Inception phase. Preparation of detailed work programme. | | | | | | | | | | | | | |
| | Preparation of detiled work programme. | | | | | | | | | | | | | |
| | Presentation of Inception Report | | | | | | | | | | | | | |
| | Scoping meeting | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| | Review role of sector in national economy, surveys, roundtable meetings, literature search | | | | | | | | | | | | | |
| | Review needs of the Sindh Fisheries Department | | | | | | | | | | | | | |
| | Public onsultation, participatory surveys etc | | | | | | | | | | | | | |
| | Resource surveys, fish catch monitoring and | | | | | | | | | | | | | |
| | Briefings for government agencies and legislators | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 3 | Reporting | | | | | | | | | | | | | |
| | Prepare sector study report and reform process recommendations | | | | | | | | | | | | | |
| | Presentation of draft final report | | | | | | | | | | | | | |
| | Review meeting | | | | | | | | | | | | | |
| | Period for report review and comments | | | | | | | | | | | | | |
| | Report finalisation | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 4 | Outputs | | | | | | | | | | | | | |
| 4.1 | Inception report. End week 3 | | | | | | | | | | | | | |
| 4.2 | Internal TA project reports | | | | | | | | | | | | | |
| 4.3 | Draft final report Month 10 | | | | | | | | | | | | | |
| 4.4 | Final report 3 weeks after comments received | | | | | | | | | | | | | |

**REPORTS AND MEETINGS**

The consultant team will report on their findings and recommendations according to the following schedule:

(i) an Inception Report, within three weeks of mobilization;
(ii) a brief mid-term Report, at the end of the third month of the TA, indicating progress to date;
(iii) a Draft Final Report, at the end of the ninth month of the TA;

and

(iv) a Final Report incorporating the comments and suggestions of the Fisheries Department of Sindh, the Government and ADB on the Draft Final Report, three weeks after receipt of said comments.

Review meetings will be held after submission of the inception and draft final reports. In addition, the consultants will receive periodic feedback and guidance from the SCICDP TA, the SCICDP Steering Committee and ADB. The team will organize workshops with stakeholders to ensure an ongoing participatory approach to the survey, sector strategy formulation and institution building.

## Costs and Budget

### Fisheries Sector Survey

### Outline budget

| | Months | Rate | Subtotals |
|---|---|---|---|
| **INTERNATIONAL CONSULTANTS** | | | |
| Fisheries Institutions Specialist & Team Leader | 9 | 25,000 | 225,000 |
| Fisheries Resources Specialist | 5 | 25,000 | 125,000 |
| Coastal Fisheries Specialist | 5 | 25,000 | 125,000 |
| Aquaculture Specialist | 2 | 25,000 | 50,000 |
| Fisheries Post Harvest and Quality Control Specialist | 2 | 25,000 | 50,000 |
| Cooperatives and Credit Specialist | 1 | 25,000 | 25,000 |
| Legal specialist | 1 | 35,000 | 35,000 |
| **SUBTOTAL TA** | | | **635,000** |
| **Surveys and consultations** | | | |
| Surveys Inland Sea & other resources | | | 120,000 |
| Coastal fisheries surveys | | | 180,000 |
| Office equipment | | | 25,000 |
| Workshops | | | 40,000 |
| **Sub-total surveys and consultations** | | | **365,000** |
| **Contingency** | 10% | | **100,000** |
| **Grand total** | | | **1,100,000** |

## TERMS OF REFERENCE FOR THE EXPERT TA

### Team Leader and Institutions Specialist (8 person months)

Regarding the management of the TA Sector Study:-

1. Leadership of the Sector Study including mobilization, supervision, performance of all supporting Technical Assistance and organisation of counterparts or research assistants provided by the Department of Fisheries in Sindh.
2. Ensuring coherence of the study; including decisions on methodology and approach, including defining the work plan, within the agreed terms of reference, budget, timeframe and the analytical framework for the study
3. Assist with organisation and conduct of meetings with other government agencies, stakeholder consultations, technical workshops and other consultative processes;
4. ensure adequate participation of all concerned stakeholders in the sector analysis and the needs and strategy formulation;
5. Consolidate the findings of the TA to develop a cost-effective, and fisheries sector-wide training and capacity-building program for implementation over next 6-10 years.
6. Ensure quality and timeliness of project technical reports, and other outputs produced by the project; including finalisation of, and final decisions on the content of the final report, including the findings and recommendations

Regarding institutional strengthening and the possible reorganisation of the Sindh Fisheries Department

7. review current sector policies and strategies, including relevant international policies for marine and fisheries development and management and identify areas of national policies requiring modification or strengthening and the implications of decentralized (to the districts) of natural resource management.
8. clarify which results the Sindh Fisheries Department is expected to produce, with respect to coastal fisheries development and medium-term impacts,
9. Identify the resources available to the Sindh Fisheries Department in the form of skills, equipment, and operating budget
10. analyze the institutional infrastructure, in form of systems, structure, and strategy, necessary for the Sindh Fisheries Department to facilitate its resources into results.
11. the personnel and skills mix and equipment needed to achieve the mandate for fisheries development and management as specified by the Sindh Fisheries Ordinance.
12. Produce a profile of the human resources pool available to the sector, primarily in Sindh Fisheries Department and its directorates-general and secondarily in a sampling of District Fisheries Services, notably in Karachi, Badin and Thatta Districts of Sindh.
13. evaluation of the skills mix required and whether the present staff possess these and, if necessary, suggest a realistic program to achieve the appropriate skills level required, with associated costs;
14. develop the most suitable structure, strategy, and system for the Sindh Fisheries Department to foster transparency, accountability, quality, efficient and effective processes, as well as incentives and motivation for staff;

15. analyze the required routine work relating to e.g. fisheries policies, regulations, data collection and their analysis, to be carried out and the necessary training in priority areas and the corresponding terms of reference;
16. produce outline written terms of reference for priority positions needed in Sindh Fisheries Department to carry out their stipulated mandate;
17. develop a time-bound action plan the institutional strengthening of the Sindh Fisheries Department, with detailed costing of all activities.

**Profile of the Specialist**

I. At least ten years experience at senior policy level in tropical developing countries, preferably with some experience in South Asia
II. Proven management skills, with good capacity for technical, on-the-job training.
III. Excellent interpersonal skills and proven ability to manage teamwork in international development projects.
IV. Fluency in English and ability to write reports and project management plans in English.
V. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
VI. Familiarity with ADB processes and procedures;
VII. Demonstrated organisational and personnel management capabilities;
VIII. Experience in the public sector at management level, with experience in the private and NGO sectors being an advantage

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**Legal Specialist (Fisheries) (One person month)**

1. review and assess major legislation covering the marine and fisheries sector, as well as coastal resource laws, international treaties, national Marine Affairs Law,
2. review relevant laws to determine the implication of decentralizing responsibilities for Fisheries and Districts, including the need for legal instruments at District and Union Council level for managing fisheries and to give effect to local fishery management arrangements
3. identify weaknesses in existing major pieces of legislation and propose appropriate amendments to such laws, in the light of recent international treaties, agreements and law.
4. identify weaknesses in the enforcement of laws and regulations and prepare recommendations to address such weaknesses;
5. recommend policy, strategy, legal, and law enforcement measures to support sustainable sector development.
6. develop a staff profile for the department of Fisheries in Sindh covering the needs of the Department regarding legal matters (present and future)
7. consolidate the findings of the TA into a report covering the legal situation regarding fisheries in Sindh and current and future needs of the Sindh Fisheries Department
8. any other duties as requested by the Team Leader

**Profile of the Specialist**

I. Experience in legal drafting and interpretation, with suitable recognised qualification
II. Understanding of technical fisheries law.
III. Knowledge of Pakistan law would be an advantage

**Fisheries Resources Specialist (6 person months)**

1. review and assess the status of the coastal and marine resources in fresh, marine, brackish and offshore waters and determine any available potential for the capture fisheries production
2. work with provincial and national fisheries staff, research agencies and other institutions as appropriate to compile fishery resource inventories
3. with the Coastal Fisheries Specialist assess the degree and manner of resource exploitation
4. together with the Coastal fisheries Specialist review the sector's research and development capabilities, including marine fisheries and aquaculture, and dissemination activities and their relevance to sector development and to the practical needs of coastal communities, fishers, fish farmers, and fish processors;
5. prepare a medium to long-term strategy for marine and deltaic fisheries resource management in Pakistan for incorporation into the development objectives of the Fisheries Department of Sindh.
6. prepare, with the Team Leader and the Department of Fisheries, detailed terms of reference and implementation guidelines for NGO selection for basic research work on the resources of the Inland Sea area of Badin and Thatta, and the Indus Delta region
7. coordinate basic research work on the resources of the Inland Sea area of Badin and Thatta and the Indus Delta, particularly those areas influenced by in creased salinisation or saltwater intrusion
8. identify key research priorities for future research in fish resources; resources and budgets; in support of sector goals
9. together with the Coastal Fisheries Specialist and the Institutional Specialist develop a proposed staff profile for the Department of Fisheries in Sindh covering the needs of the Department related to resource assessment and monitoring of the fisheries of Sindh.
10. consolidate the findings of the TA into a report covering Fisheries Resources in Sindh and current and future needs of the Sindh Fisheries Department
11. any other duties as requested by the Team Leader

The Resource Specialist will be expected to undertake at least 4 visits to Pakistan. During the first visit he/she will, in as part of the TORs above establish a programme, using an appropriate body such as an NGO or Community Group in the Inland Sea region, to assess the resources of the Inland Sea Area of Badin and Thatta, particularly those underexploited and un-assessed such as bivalve molluscs, shellfish, and euryhaline fishes. This programme will ideally cover some of the period of May – August when some of these resources are at peak abundance. During subsequent visits the results of the research will be analysed and the findings, particularly the potential for large scale exploitation, included in the report.

**Profile**

I. Background in fisheries science, biology and management with suitable recognised qualifications
II. Broad knowledge of coastal fisheries management and development in tropical developing countries;
III. Fluency in English and ability to write reports and project management plans in English.

IV. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
V. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
VI. Prior work experience in South or South East Asia

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**Coastal and Inland Fisheries Specialist (4 person months, 2 x 2 month visits)**

1. conduct a detailed analysis of fishing operations in Sindh (boats, engine and gears etc.), using existing data and newly acquired data
2. collect the recent and historical information, from as many sources as are available on the size and value of the fisheries in the Sindh coast and Indus delta.
3. assess the current policies and strategies on marine and fisheries sector and historical role and contribution of the sector to the national economy and make sector contribution projections
4. review current MCS initiatives and programs in marine and inland water areas, and with the legal specialist determine the needs of the sector for an improved system for natural resource sustainability and environmental protection in Sindh;
5. review extension organization, objectives, and delivery and assess efficiency of extension, linkages between research and extension, and the adequacy of staff at both Provincial and District level.
6. identify, with the Marketing Specialist, development options for the sector, including export potentials, taking into account the roles of public and private sector entities and developments in the international arena, particularly in world trade of marine and aquatic products
7. examine fisheries management, development and extension programs, plans and strategies, results and constraints and propose revisions where necessary, so as to develop an outline medium to long-term strategy for the Sindh Fisheries Department
8. develop the design, and conduct participatory surveys in Badin, Thatta and the Indus delta to gather baseline information on catches and landings and the circumstances of the fishermen in those areas
9. preparing of detailed terms of reference and implementation guidelines for NGO selection for the surveys and community level data gathering programmes in Badin and Thatta and the Indus Delta.
10. develop a working relationship with Sindh Fisheries Department staff, examine activities and assess skills levels of representative fishing communities, fishing groups, private entrepreneurs involved in artisanal and small-scale fishing, fish purchasing, processing and marketing; and together with the Fisheries Resources Specialist and the Institutional Specialist develop a proposed staff profile for the Department of Fisheries in Sindh covering the needs of the Department related to Data Collection, Extension and Training in Sindh.
11. consolidate the findings of the TA into a report covering Coastal Fisheries in Sindh and current and future needs of the Sindh Fisheries Department
12. any other duties as requested by the Team Leader

The Coastal Fisheries Specialist will be expected to undertake at least 4 visits to Pakistan. During the first visit he/she will, in as part of the TORS above, establish a participatory community based programme, using an appropriate body such as an NGO,

to assess levels of fishing activity in the Indus Delta and the Inland Sea Area of Badin and Thatta. This programme will cover, inter alia, catches, effort, species persecuted, numbers of fishermen and vessels, gears and , During later visits the programme will be monitored and the results of the research will be analysed. The findings, and their ramifications for the Fisheries Department of Sindh Province and the Coastal Districts will be included in and guide the content of the report.

**Profile**

I. At least 10 years experience in Coastal and Inland Fisheries Background in fisheries science and management with suitable recognised qualifications
II. Experience in gathering and analysing landing and catch data from diverse communities
III. Experience in working in remote and something communities
IV. Fluency in English and ability to write reports and project management plans in English.
V. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
VI. Prior work experience in South or South East Asia

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**Fish Marketing Specialist (2 person months)**

1. examine existing processing operations, processing technology and quality control measures and regulations and identify processing and market issues
2. enumerate existing support infrastructure facilities and services, including ice plants, cold storages, canning, and other processing facilities, and their capacity and utilization as well as needs for future expansion. Recommend strategies to improve the operation and upkeep of fisheries marketing infrastructure facilities,
3. identify market opportunities, both local and international, and assess the quality and specific species of marine and aquatic products in demand in regional and international markets, identify key post-harvest issues including technology, facilities and infrastructure that act as constraints to marketing or product development, and recommend appropriate measures to address identified constraints
4. propose a strategy for increasing the consumption of locally produced fish in Pakistan and to create confidence in the quality of fish and fish products of Pakistan among consumers, including consumers in export markets
5. propose regulations to protect the health of the consumers by ensuring the safety of fish and fish products produced in Pakistan, or imported;
6. to assist the fishing industry in improving the quality of fish and fish products, and thereby contributing to the development of the fishing industry as a whole;
7. details the needs for the provision of the necessary training or technical support to enable producers and processors to meet market requirements in terms of quality, product form or volume.
8. together with the legal specialist review and recommend any necessary revisions to the regulatory framework associated with the processing and distribution of fish in Sindh.
9. develop a proposed staff profile for the Department of Fisheries in Sindh covering the needs of the Department related to Quality Control, Wholesaling and Retailing of fish in the Province

10. consolidate the findings of the TA into a report covering Fish Marketing and Quality Conttrol in Sindh and current and future needs of the Sindh Fisheries Department
11. any other duties as requested by the Team Leader

**Profile**

I. At least 10 years experience in experience in the operation or management of successful fish processing and export businesses with suitable recognised qualifications
II. Detailed knowledge of export markets, required product forms and quality criteria;
III. Experience in working in remote and something communities
IV. Fluency in English and ability to write reports and project management plans in English.
V. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
VI. Prior work experience in South or South East Asia

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**Aquaculture Specialist (1.5 person months)**

1. overview the existing aquaculture of Sindh, both fresh and marine, including the impacts of completed and ongoing aquaculture and inland fisheries projects and draw lessons for future project preparation.
2. review and assess aquaculture and inland fisheries policies, including relevant international policies and current status and potential of the country's aquaculture subsector and together with the Legal Specialist, propose changes to existing legislation as required.
3. identify issues, in particular the environmental, disease control, farming systems, extension, financing and marketing, which constrain the sub-sector
4. assess the potential of any new marine species considered for commercial aquaculture; and to improve existing farmed fish species;
5. assess potential environmental impacts arising from the culture of new marine species, e.g. nutrient inputs, escapes; waste water etc
6. to advise, on measures to attract more participants into aquaculture in Sindh
7. advise on strategies to endsure that the exploitation of development project and research outcomes will result in measurable benefits to marine, brackish and freshwater aquaculture in Sindh, leading to increased sustainability, competitiveness, enhanced wealth creation and expanded employment opportunities.
8. develop medium- to long-term strategies for aquaculture and inland fisheries development and resource management.
9. develop a proposed staff profile for the Department of Fisheries in Sindh covering the needs of the Department related to aquaculture in the Province
10. consolidate the findings of the TA into a report covering Aquaculture in Sindh and current and future needs of the Sindh Fisheries Department
11. any other duties as requested by the Team Leader

**Profile**

I. Background in aquaculture and fish farming systems with suitable recognised qualifications

II. Fluency in English and ability to write reports and project management plans in English.
III. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
IV. Prior work experience in South or South East Asia

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**Fisheries Credit and Cooperatives Specialist (1 person month)**

1. review existing channels for credit to fisheries (particularly the role of “moles” and middlemen, and identify any subsector or geographic constraints or gaps existing in the availability of credit to various groups in the sector
2. assess the credit requirement of the sector and the willingness to borrow and the repayment capacity of various groups in the sector
3. propose appropriate strategies and interventions to improve creditworthiness of coastal communities and increase access to credit by different groups.
4. assess ways of promoting the formation of stakeholder associations among coastal fishers and communities;
5. develop a proposed staff profile for the Department of Fisheries in Sindh covering the needs of the Department related to cooperatives and fisheries community management in the Province (and micro-credit if needed)
6. consolidate the findings of the TA into a report covering Credit and Cooperatives in Sindh
7. Any other duties as requested by the Team Leader

**Profile**

I. Background in credit and/or cooperatives with suitable recognised qualifications
II. Experience with Credit, Cooperatives and community development work in Asian countries;
III. Fluency in English and ability to write reports and project management plans in English.
IV. Willingness to participate in hard touring, field activities and travel to remote areas within the country.
V. Prior work experience in South or South East Asia

# Appendix 3 - Detailed Assessment of Agricultural Needs

## Project Area Profile

## 1. NATURAL RESOURCE BASE

### 1.1 Location

The coastal strip of Sindh stretches from Diplo to outskirts of Karachi. In Agriculture terms the Coastal Zone of Sindh consists of taluka Mirpur Sakro, Ghora Bari, Keti Bunder, Sujawal, Jati, Shah Bunder and Kharo Chahan of district Thatta; Badin and Golarchi of district Badin and sub-urban Karachi.

The present coastal zone of Sindh mainly consists of the Indus Delta, which is 356 km long and 50 km wide and extends over an area of 600,000 ha, and has 17 major creeks and extensive mudflats. The delta is characterised by fringing mangrove forests, which are under the control of the Sindh Forest Department (280,470 ha) and Port Qasim Authority (64,000 ha), and have been declared as protected forests. In the past limited efforts have been made to identify key issues and potentials relating to the coastal belt in Sindh, consequently the economic opportunities offered by this important region are not being optimally utilised. The general elevation of the project area is between sea level and 50 masl. One of the limitations has been the availability of quality data on the potentials of the coastal belt. It should be noted that the area offers wide ranging opportunities that could be tapped for improved livelihood of the people; it also generates substantial resources through wetlands, forests, agriculture, and fisheries, and from the environment in general.

The coastal and immediate inland area under the project includes 9 talukas of three districts of Sindh as detailed in Table C.1. There are a total of 5 Tehsils in Badin and 7 in Thatta. Total number of rural households in Badin District is 133,807 and Thatta District 64,713. Average household size is 8.5 persons

**Table C.1 Coastal Belt by District and Taluka Divisions**

| District | Taluka | Deh | Area (ha) | Population (x1,000) | Household No. (x1,000) |
|---|---|---|---|---|---|
| **Badin** | | | | | |
| | Badin | 174 | 176,972 | 500 | 58.8 |
| | Golarchi | 102 | 179,798 | 280 | 32.9 |
| **Thatta** | | | | | |
| | Mirpur Sakro | 80 | 298,195 | 280 | 32.9 |
| | Ghorabari | 61 | 93,919 | 148 | 17.4 |
| | Keti Bandar | 42 | 61,758 | 37 | 4.4 |
| | Shah Bandar | 82 | 297,522 | 153 | 18.0 |
| | Jati | 132 | 354,403 | 174 | 20.5 |
| | Karo Chan | 42 | 95,338 | 37 | 4.4 |
| **Karachi** | | | | | |
| Malir | Port Qasim | 2 | 3,619 | 1,379 | 162.2 |
| | | | | | |
| **Total Project** | | **631** | **1,401,422** | **2,988** | **351.5** |

Source: Development Statistics of Sindh 2004
Note: Data is for both rural and urban populations

The project area is located between latitudes 23°43' and 25°0'north, and longitudes 67°05' and 69°20' east. The area is bounded in the north by the remaining talukas of Thatta and Badin districts, to the east the districts of Mirpur Khas and Thar Mithi, to the south by the India and the Rann of Katch area, while on the west by the Arabian Sea. The total land area is 1.4 million ha.

The project area is a part of the lower Indus plain formed by the alluvial deposits of the Indus River. It is characterised as an extensive alluvial plain, where its land is highly uniform with no diversification of landform. The southern part of the area is close to the delta of the river Indus with an average altitude of about 50 masl. The apex of the delta is at the bifurcation of the Ochito and Haidari (Mutni) between Kotri Allah and Rakhio Shah in Ghorabari talukas in Thatta district. Between this point and the sea the area is bisected by a network of branches of the river, passing into creeks and connected by cross channels. Along the coast, a strip of land 8-10 km wide, which is liable to be submerged at high tides. This area supports a growth of small coarse grass and bushes. To the west in Thatta there are large tracts of wind blown sand, while in the southeast of the delta there are wide expanses of salt pans covering a large part of Shah Bandar, Jati talukas in Thatta, and Badin taluka.

## 1.2 Climate

The climate is sub-tropical arid with relatively mild temperatures and high humidity, and is tempered by an onshore sea breeze which blows for eight months of the year from March to October. During the monsoon period there is a lot of cloud cover and a small amount of precipitation (Table C.2). The climate in summer is generally humid. The hottest month of the year is May with maximum and minimum temperatures of 40°C and 25°C respectively. The cold weather starts from the beginning of November when the wind changes to a north easterly which is dry and cold. January is the coldest month (maximum and minimum 26°C and 9°C respectively). The annual average rainfall is around 220 mm but it fluctuated widely between years and during months. Sometimes the equivalent of a year's rainfall can fall in one day causing extensive flooding. About 90% of precipitation occurs during period July to September. Evaporation exceeds rainfall in every month and the total annual excess of evaporation over rainfall is in the range of 1675-1900 mm. It gradually increases from south-east to north-west.

Wind is variable and faster in the summer than in winter, with the highest wind speeds being observed during the monsoon. There is also diurnal variation of wind speed that increases during the day and dies down in the evening. During winter, northerly and north-easterly winds prevail in the morning hours, but for the rest of the year the direction is westerly and south-westerly. The wind speed is 7.4 – 20.5 km/hour during summer, but when tropical pressure depressions are created in the Arabian Sea, fast winds develop in cyclonic storms and bring rains. As a result, high tidal waves sweep over large areas. This phenomenon occurs from June to September.

**Table C.2 Climate Data for Project Area**

| Month | Mean Temperature (°C) | | Rainfall (mm) | Evapo-transpiration (mm) | Relative Humidity (%) |
|---|---|---|---|---|---|
| | Max | Min | | | |
| January | 25.7 | 8.7 | 1.0 | 111.6 | 50.4 |
| February | 28.6 | 11.6 | 3.6 | 126.0 | 48.8 |
| March | 34.0 | 16.8 | 2.3 | 176.7 | 48.4 |
| April | 38.4 | 21.8 | 2.5 | 219.0 | 49.0 |
| May | 39.9 | 25.5 | 0.7 | 272.8 | 53.1 |
| June | 38.0 | 27.5 | 10.8 | 234.0 | 60.7 |
| July | 35.1 | 27.0 | 70.5 | 158.1 | 69.6 |
| August | 33.6 | 26.1 | 89.4 | 136.4 | 72.6 |
| September | 34.4 | 24.9 | 34.4 | 156.0 | 68.8 |
| October | 35.8 | 21.7 | 3.2 | 207.7 | 58.2 |
| November | 31.9 | 15.9 | 1.7 | 144.0 | 53.9 |
| December | 26.7 | 10.1 | 1.1 | 117.8 | 52.2 |
| **Annual** | **33.5** | **19.8** | **221.2** | **2060.1** | **57.6** |

Source: Pakistan Metrological Department, Karachi; period 1961-1990. Data for Thatta and Badin

## 1.3 Geology

The coastal region is of tertiary and post tertiary origin dated as recent as Eocene. The region has been formed by the upheaval of land from the Tethys Sea, which once extended up to the northern border of Pakistan but, with the rising of the Himalayas, gradually withdrew. The underlying rocks are mostly of marine origin, highly folded, faulted and fissured everywhere. They consist mainly of limestone and clay.

## 1.4 Soils

The soils of the are is alluvium with plenty of clay derived from land drainage and river discharge. They are rich in salts like sodium chloride, sodium carbonate and nitrates with some calcium, which comes from shell fragments. The muddy and clay-based soil is poor in other mineral substances. It is very badly drained and is not permeable. The subsoil water table at a depth of 5-10 feet conforms to the sea. The subsoil water is completely brackish.

Deep alluvial deposits form the soils of the area. The soils are brown, moderately calcareous and pH mostly ranging between 8.0 to 8.4. The soils of river and estuary plains are suitable for the cultivation of a wide range of crops. Most of the soils in the project area (>80%) are clay and clay loams, while the rest are sandy and mixed soils. The drainage capability of the irrigated soils of Thatta and Badin is very low, as a result of which salinity and water logging are major problems. This has been further compounded by inadequate availability of irrigation water. Groundwater is largely saline. Due to the large storage dams constructed upstream on the River Indus, very little water flows below the Kotri Barrage into the sea. Sea intrusion is another related problem with unavailability of fresh water below the Kotri Barrage that has caused vast areas of agricultural land to disappear into the sea (e.g., Shah Bander and Keti Bander talukas and towns have been reduced to small fishing settlements).

The agricultural soils of Badin and Thatta are mainly loamy saline estuarine floodplain soils (Camborthids [Xerosols], saline and some Salorthids [othic Solanchak]). On the coastal lowlands the soil are tidal flats.

The presence of adequate quantities of essential nutrients and organic matter are the basic components of fertile soil. The soils in the project are deficient in nitrogen and phosphorus. Potassium levels are generally adequate in the majority of soils (60%). Levels of organic matter are very low (<1.0%), and frequently less than 0.5% in a majority (70-80%) of soils. Organic matter levels continue to decline due to limited or no recycling of organic residues, intensive cropping activities with heavy reliance on chemical fertilisers as well as a limited use of organic manures of plant or animal origin.

In Sindh, soil conditions and agronomic practices inducing micronutrient deficiencies in plants include: alkaline soil pH, soil calcareousness; low soil organic matter; micronutrient mining with intensive cropping; use of micronutrient-free N, P, and K fertilisers; decreased use of organic manures, removal of plant residues from soil almost after every crop; cultivation of marginal/light textured soils; and electro-chemical changes in flooded rice.

### 1.4.1 Soil Salinity and Sodicity

The problem of soil salinity and sodicity has often been ranked highest among the factors responsible for restricting the pace of agricultural development in the project area. It is generally considered to be related to the present system of canal irrigation. But the country-wide reconnaissance soil surveys have established that saline or saline-sodic soils occupy specific physiographic positions in the Indus plains, and are the result of long term natural processes. Hence most of the existing saline/saline-sodic soils are not related to the present irrigation system; and their formation is mainly the consequence of gradual redistribution of salts already present in the soil. Salinity must, therefore, be regarded as one of the products of soil-forming processes which have remained operative over several centuries. In Sindh it is estimated that the impact of soil salinity alone is responsible for between 40-60% reductions in the production of the major crops grown in recent years.

**Main Causes:** The salinity/sodicity problems vary, depending mainly on the soil parent material, landform, relief, climate and land use. Major roles in soil salinisation and sodication have been played by the calcareous parent material of most soils, the physiographic and hydrological interaction occurring in a landform (e.g., levees affected by long term ponding in adjoining areas; lateral seepage from streams/basins affected by a rising water table; and collected water run-off) and the micro relief of a site. Climate, however, has been the chief determinant of the kind and extent of salinity in different parts of the country. Salt composition, similarly, varies with climate, being dominated by carbonates in the sub-humid regions, by carbonates and sulphates in the semi-arid parts and by sulphates and chlorides in the arid areas.

A considerable area of cultivated land has undoubtedly been affected by this problem after the development of the canal irrigation system. This kind of salinity, identified as secondary salinity, is relatively temporary and can be easily eliminated by adopting appropriate rehabilitation measures. The important phenomena/activities which have contributed to the development of secondary salinity are:

- Lateral seepage of water from the canal system and its evaporation from the surface of adjoining soils, after dissolving salts in the lower parts of the soil profile - a situation commonly occurring in old river terraces (which generally have semi-

permeable layers and salt accumulations at around 1-metre depth) and in piedmont plains/basins which are underlain by impermeable bedrock within a 2-metre depth of the surface.

- A rising water-table due to excessive percolation of water from the canal system, and capillary rise and evaporation of saline groundwater — a situation commonly found in basins and abandoned channels of relatively recent river plains.
- Inadequate availability of water from rains or irrigation. If the leaching requirements of soils are not met, it results in the net upward movement or concentration within the soil profile, of salts liberated by the soil material or left as residue by irrigation water - a normal situation in cultivated (mainly clayey) arid and semi-arid parts of the Indus plains, where canal supplies are not commensurate with the irrigation requirements of annually cropped areas. Loamy soils are less affected by this situation as leaching requirements are better satisfied, especially when intensively irrigated crops like sugar cane and berseem are grown in rotation with other crops.
- Excessive irrigation of old saline soils located within cultivated fields (especially when surrounding fields are left fallow/unirrigated). This results in the lateral migration of salts, through irrigation water, towards relatively dry fields and their accumulation at the surface of these fields through evaporation - a common phenomenon in old river terraces, where efforts to reclaim severely saline/saline-sodic soils through additional water supplies is being made without prior provision of a drainage system.
- Irrigation through tubewell pumping of groundwater of poor/marginal quality with high salt concentration values, sodium absorption ratios (SAR) or residual sodium carbonates (RSC), causing gradual salinisation of soils - a situation commonly seen in some areas irrigated by private tubewells.
- Salt contamination by run-off passing over saline soils and ponding in, or being absorbed by, relatively low-lying soils - a situation generally seen when the embankments of fields located near saline soils are low and improperly maintained, especially common at the foot of escarpments of old river terraces.
- Salts from saline soils transported by winds and spread over the soil surface - generally occurring during the dry early part of summer, when salt efflorescence at the surface is maximum and windstorms are frequent in almost all of the Indus plains.

Although the canal irrigation system and the misuse or inefficient use of normal soils by people are the two major causes of secondary salinity in the Indus plains, human efforts to reverse salinisation through various reclamation measures cannot be ignored. Among these measures, the use of amendments (mainly gypsum which has been subsidised for this purpose), excessive irrigation for leaching of salts (through a highly subsidised supply of additional water) and drainage through open drains/tile drains/tubewells, are the most important ones. As a result of these measures, a considerable portion of soils affected by salinity, especially those affected by secondary salinity have been rehabilitated. The many types of saline and saline-sodic soils that occur can be classified on the basis of age, the nature of salinity, the severity of the problem and the ease/economics of reclamation.

Strategies for the control of salinity and sodicity are presented in Box 1 below.

**Box 1: Strategies for the control of salinity and sodicity**

**Canal-Irrigated Areas**

- Adequately meeting the water requirements of crops and soils, by limiting the cropped area to match available water supplies, fully satisfying their leaching requirements.
- Reclaiming saline and saline-sodic soils through the use of gypsum. Heavy irrigation should be used only when a drainage system exists or when natural drainage, a permeable substrata, is available. If these conditions cannot be met, biological measures i.e., growing salt tolerant plants, should be used.
- Temporarily embanking and slightly lowering the level of small saline patches within cultivated fields would effectively leach their excess salts; for the reclamation of slick spots, gypsum would have to be used (1-1.5 kilograms per square metre of the affected area) alongside the above practice.

**Tubewell (or Canal plus Tubewell) Irrigated Areas**

- Active guidance and supervision of farmers using tubewell water, by providing timely information e.g., on the quality of their tubewell water, as well as by explaining or demonstrating the consequences of using low-quality water for irrigation. The maximum permissible EC/salt concentration, SAR and RSC values of irrigation water for different kinds of soils may be standardised as given for the three soils types (electrical conductivity 0.75, 2.25 and 0.50 mmho/cm, for loamy, sandy and clayey soils respectively).
- Disposal of poor quality groundwater pumped by SCARP or private tubewells through drainage ditches or canals and distributaries, instead of use for irrigation; locally, such water may be used for the irrigation of sandy soils and for growing a few salt tolerant crops.
- Amelioration of soils affected by poor quality water through the application of gypsum (2-3 tonnes per hectare) since most of these soils are afflicted only by sodicity.
- Popularising the continuous use of gypsum on soils already affected by poor quality water or where irrigation with poor quality water is unavoidable.

**Uncultivated Areas**

- Proper embankment of uncultivated saline soils to check salt contamination, through run-off, of adjoining low-lying cultivated areas.
- Planting vegetation which could provide surface cover against salts blown by winds or which could improve soil fertility. Local plants, adapted to saline and drought conditions with some economic/social value in terms of forage, wood and shade, would be preferable.

### 1.4.3 Waterlogging

Waterlogging is limited mainly to a few specific areas because of their inherent hydrological characteristics. Though these areas may cover only a small fraction, say 5-10%, of a landscape most people generally visualise the whole of the landscape as being waterlogged. Such an understanding, when applied to the entire country, leads to alarming figures. Also, the concept of waterlogging is not well understood. Many people regard land as waterlogged if the water-table occurs within a 3-metre (10-foot) depth of the surface. The soil surveys found that almost no crop suffers from excessive moisture as long as the water saturation zone remains below a 1.5-metre depth in all, except sandy types of soil. In fact, crops on sandy soils benefit, rather than suffer, from a rise in the water-table to within 1 metre of the surface. The inherent dry condition of these soils is then offset by below-ground irrigation from groundwater, especially fresh groundwater from canal seepage, as is usually the case in the canal-commanded areas.

Like salinity, waterlogging is mainly a consequence of old hydrological processes — still operative in much of the area with specific geo-morphological and physiographic characteristics such as playas and closed basins in hilly areas, infilled glacial lakes in the mountains, lagoons and tidal areas along the coast, and oxbow lakes, back swamps and

open basins (channels) connected with active streams in the river plains. People have, nevertheless, aggravated the problem through various activities including the introduction of the canal irrigation system. The latter is of importance, since the bulk of waterlogged land currently falls within the boundaries of canal-command areas.

The major cause of recent waterlogging in the cultivated areas is excessive percolation from the canal system, which builds up the groundwater level. Other human activities which have significantly contributed towards a rise in the groundwater-table include:

- Cultivation of high-delta crops on moderately to highly permeable soils, resulting in excessive percolation of irrigation water.
- Obstruction of natural drainage channels (old river courses) through the construction of buildings, roads, embankments, etc. This restricts the flow of underground water through these channels, which in turn are effected by increased flow during the rainy season.
- Improper alignment and poor maintenance of artificial open-ditch drainage systems, which cannot efficiently remove excess water from the fields. Also, illegal embankments block the passage of storm water into the system — a situation found almost throughout the area where drainage ditches were constructed many years ago.
- Inefficient disposal of excess rainwater, collecting in low-lying areas, resulting in ponding and deep water percolation.

Estimates of waterlogged areas made in Sindh indicate that the total waterlogged area is in the region of 625,000 ha of which 81% is for non-saline soils. However, the extent of waterlogged area is said to have increased due to continual canal water seepage; it has decreased considerably in regions where groundwater is withdrawn, through tubewells, for irrigation and urban use or for drainage. Furthermore, there are yearly and seasonal fluctuations in water-tables, depending on the amount of precipitation received, river discharges, groundwater withdrawals, etc.

Strategies for the control of waterlogging are presented in Box 2 below.

**Box 2: Strategies for the control of waterlogging**

- Control of excessive water seepage by lining canals and distributaries in sandy soil areas.
- Encouraging the installation of small, shallow tubewells to pump groundwater, accumulated from canal seepage, for irrigation.
- Effective control of irrigation in the more permeable soil areas, by not allowing the cultivation of rice on loamy soils and of sugar cane on sandy or somewhat sandy soils, through acceptance of advice given by agriculture or irrigation extension staff; farmers need to know the value of light, but more frequent applications of water on relatively sandy soils.
- Provisions must be made for an effective drainage system (preferably with open ditches) in the waterlogged areas; the drains could be designed to keep the water-table below a 1.5-metre depth in areas growing cotton or fruit trees, and below 1 metre in other areas; improvement, realignment (where necessary) and proper maintenance of existing systems.
- Opening old natural drainage channels in urban areas by constructing bridges for roads, railways and other structures blocking these channels; planned diversion of sub-surface water through artificial drainage systems where the opening of natural channels are not feasible.
- Guiding farmers to adjust field size and irrigation timings according to the physical properties of the soil: a smaller field size for relatively sandy or more permeable soils and larger fields for clayey or less permeable soils; short watering periods to check flooding in the more permeable soils.

## 1.5 Land Use

For the most part the density of human habitation is sparse. Agriculture, followed by forestry, is the main land use in the project area as shown in Table C.3. Of the total geographical area 34% is cultivated. Furthermore, of the total cultivated area of 944,000 ha, a total of 644,000 ha are current fallows with only 300,000 ha net sown area. It is apparent from these data that there is substantial under-utilisation of cultivable land due to the lack of water, waterlogging and salinisation. The overall cropping intensity of cultivable land is low at 0.37.

**Table C.3 Land Utilisation by District in 2002-03 (x1,000 ha)**

| District | Geographical Area | Reported Area (4+12) | Cultivated Area | | | Cropped Area | | Uncultivated Area | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total (5+6) | Current Fallows | Net Area Sown | Area Sown >Once | Total (6+7) | Forest | Culturable Waste | Not Available for Cult'n | TOTAL (9+10+11) |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Badin | 672 | 673 | 464 | 273 | 191 | 24 | 215 | 9 | 68 | 131 | 208 |
| Thatta | 1,735 | 1,735 | 417 | 313 | 104 | 27 | 131 | 304 | 166 | 848 | 1,318 |
| Karachi | 353 | 353 | 63 | 58 | 5 | 2 | 7 | 71 | 66 | 153 | 290 |
| Total | 2,760 | 2,761 | 944 | 644 | 300 | 53 | 353 | 384 | 300 | 1,132 | 1,816 |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

## 1.6 Agro-ecology

The project area falls within the Indus Delta agro-ecological zone or Zone C (Source: Sindh Agriculture Extension and Research Report -1994). This zone consists of lower Sindh and is fed from the Kotri Barrage. It includes the Indus Delta and covers the districts of Thatta and Badin. Zone C is more saline than any other area in Sindh. Salinity and waterlogging are more severe in the zone where drainage is difficult due to the absence of a gradient (altitude 0-5 masl). The climate is mild and humid, and it has the highest rainfall in Sindh (180 to 250 mm per year). However, its agricultural production is low, due to the fact that the perennial water supply is only sufficient for only 18% of net area sown or 6% of total cultivable land area, and where the potential for tube wells is low. Furthermore, the main soil types are saline with 70% of soils with severe upper soil salinity problems. The main crops are rice and sugarcane in kharif, which is followed by wheat and vegetables in perennial areas. The main vegetables grown here are onion and tomato, and the zone also produces banana, *chiku*, papaya and coconut. Attempts have been made to introduce oil palm with little success.

## 1.7 Hydrology and Water Resources

Compared to its increasing needs, water availability to Sindh is being reduced every year. The situation worsens during period of drought. This is particularly apparent for the project area which is at the tail-end of the major irrigation command areas. Due to these factors migration from water deficit area is on the rise. It is useful to note that the total water requirement in Sindh is 17.401 MAF in kharif and 8.532 MAF during rabi.

Sindh is almost exclusively dependent on the Indus Basin Irrigation System (IBIS). Any disturbance in the flow of water in the IBIS adversely affects the agriculture, economy, ecology and drinking water supply in the province. The low efficiency of the IBIS and waterlogging and salinity pose serious threats to the sustainability of irrigated agriculture. These factors coupled with the defective irrigation practices (such as flood irrigation,

absence of properly organised management and distribution) and lack of drainage facilities, are responsible for the dire situation present in the project area.

The Indus basin is mainly alluvial and is underlain by an unconfined aquifer. The main sources of recharge are direct rainfall and infiltration through the alluvium from river Indus, canals and irrigated fields. In Sindh about 28% of the area is underlain by fresh ground water, which is mostly used as supplemental irrigation water and abstracted through tube wells. Nearly 10% recharge from rainfall, 15% from main canal system, 25% from fields, distributaries and watercourses, return flow from ground water 12%, recharge from river is about 0.30 MAF.

Badin District is irrigated by the water originating mainly from Kotri Barrage. The irrigation network mainly comprises Fuleh, Akram Wah (lined canal), and Pinyari main canals with a total length of 299 km. The Akram Wah is the only perennial canal providing water to the areas in rabi and kharif seasons. The other canals provide water for irrigation mainly during the kharif season. Since 1991 the average outfall to the sea below Kotri was around 36.3 MAF, with 33.9 MAF in kharif and 2.4 MAF in rabi. The outflow also varied over a wide range between a low of 0.7 MAF in 2000-01 and a high outfall of 91.8 MAF in 1994-95. In the last four years because of the drought conditions in the country, the flows below Kotri have been substantially reduced. The total irrigation supply, between 1977-78 and 1999-2000 has been on average of 10,590 cusecs to serve a command area of 1.1 million ha. Admittedly agriculture productivity and agriculture-based income has substantially increased in the upper part of the district and out of the project area. Since 1999 an irrigation reform has been introduced in Badin as part of the NDP project. NDP has organised an Area Water Board (AWB) to foster more participatory irrigation management systems. The AWB is fully functional and adopted as a policy not to allow new direct outlets in the system as well as conducting an anti-water theft campaign to ensure that scarce water reach the tail enders. So far 13 Farmers Organisations (FOs) have been formed and 46 unauthorised direct outlets have been closed with a total savings of 175 cusecs. Recovery of *abiana* or water tax was devolved to the AWB and improvements have been made in the Akram Wah canal. These institutional reforms are among the most advanced in Pakistan.

Most of the left Bank Canal system is served by an extensive surface drainage network that includes the Fuleli-Guni outfall drain, Nagan Dhoro outfall drain which discharges directly into the Shah Samando Creek and the dhands system. The Sirani Lowari, Tando Bago drains have been diverted to the KPOD interceptor drain which form part of the WB funded LBOD Stage 1, and which serves drainage areas in the Rohri and Nara Canals. The floods of 2003 have put in question the safe functioning of the outlet, causing extensive waterlogging and consequential salinisation of large areas of cultivated land.

In Thatta district the land is irrigated by the following main canals; Kelri-Baghar, Sattar, Kanto, Ghar, Kodario, Gungro, Saida, Mirza and Gungri. The areas within the protective banks of the Indus have fertile patches of land and these depend upon flood and lift water systems from barrage channels for irrigation purposes. In this district in the project area in particular, almost all areas are predominantly non-perennial. Due to the reduce water flows many areas have been completely inundated by sea intrusion and some of the thriving coastal villages like Shah Bandar and Keti Bandar are barely inhabited. The availability of sweet water is correlated strongly with irrigation canals. Some are non-perennial (typically only give water in spring), some are perennial. Where they are

perennial, there is prosperous agriculture. Included in the perennial belt are from west to east: Mirpur Sakro, Jangisar, Kharo Chan, Ghora Bari (marginal), Chaur Jamali and bit to the south of it, Sujawal, Ladiun, Jati, 5-10 km south of the main Thatta-Badin road near Shahid Fazal Rahu (Golarchi), and 25 km SSW and SE of Badin at Seerani and Kadhan. Bhogra Memon in Badin District is in the barren (no effective irrigation at all) area, as are Keti Bandar and Shah Bandar in Thatta District.

From Table C.4 it is apparent that canal irrigation is by far the most important source of irrigation water when compared to tubewells. When comparing the three project districts Badin has a much larger area irrigated by various means as compared to the other districts. It is interesting to not that an attempt is made by some farmers to rely on rainfed agriculture with a total of 20,000 ha (6.7%) of the total sown but un-irrigated area.

**Table C.4 Area Sown by District and Mode Irrigation in 2002-03 (ha)**

| District | Total Area Sown | Un-Irrigated | Irrigated | | | |
|---|---|---|---|---|---|---|
| | | | Total | Canal | Well | Tubewell |
| Badin | 190,922 | 12,726 | 178,196 | 169,020 | - | 9,176 |
| Thatta | 103,946 | 7,396 | 96,550 | 94,461 | - | 2,089 |
| Karachi | 4,799 | - | 4,799 | - | - | 4,799 |
| Total | 299,667 | 20,122 | 279,545 | 263,481 | 0 | 16,064 |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

The data presented in Table C.5 shows the areas affected by water intrusion by district and taluka, and indicates the extent to which land has been irrevocably lost in recent years. In this respect Thatta district has been especially hard hit where 43% of the total taluka area has been affected.

**Table C.5 Land Degradation due to Sea Water Intrusion**

| District | Taluka | No. of Dehs | Taluka Area (ha) | Areas Affected | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Dehs fully eroded by sea | Area (ha) | Dehs partially affected | Area (ha) | Total Area Affected (ha) |
| Thatta | Shah Bandar | 92 | 297,707 | 12 | 205,940 | 31 | 35,055 | 240,995 |
| | Ghorahari | 59 | 94,686 | 2 | 2,986 | 8 | 9,867 | 12,853 |
| | Karo Chan | 41 | 192,902 | 21 | 39,147 | 9 | 8,944 | 48,091 |
| | Mirpursakro | 90 | 300,629 | 3 | 4,503 | 17 | 20,057 | 24,560 |
| | Jati | 132 | 357,215 | 1 | 79,411 | 10 | 112,069 | 191,480 |
| | Keti Bandar | 42 | 81,467 | 28 | 46,106 | 1 | 408 | 46,514 |
| Sub Total | | 456 | 1,324,606 | 67 | 378,093 | 76 | 186,400 | 564,493 |
| Badin | Golarchi | 102 | 179,798 | 1 | 2,764 | 5 | 9,736 | 12,500 |
| | Badin | 140 | 143,951 | 4 | 11,831 | 6 | 8,242 | 20,073 |
| Sub Total | | 242 | 323,749 | 5 | 14,595 | 11 | 17,978 | 32,573 |
| | | | | | | | | |
| TOTAL | | 698 | 1,648,355 | 72 | 392,688 | 87 | 204,378 | 597,066 |

Source: IUCN 2003

It is extremely difficult to forecast the water needs of Sindh for the future due to several unpredictable and complex socio-economic and demographic factors and the non-availability of reliable data. There is also uncertainty regarding future economic development in Sindh in the coming 25 to 50 years. The four scenarios of water

availability to Sindh depicted in Table C.6 have been assumed considering the changing climatic pattern. The declining water availability in all scenarios is due to the fixed share of Sindh in the IBIS. More than 70 years of recorded data show that annually Sindh will not get more than 45 MAF.

**Table C.6 Future Availability of Water in Sindh**

| Year | Population (million) | Water flow to Sindh (MAF) Per Capita Water Availabity (Cubic metre) 45 | 40 | 35 | 25 |
|---|---|---|---|---|---|
| 1998 | 30 | 1852 | 1646 | 1440 | 1029 |
| 2002 | 34 | 1634 | 1452 | 1271 | 908 |
| 2010 | 43 | 1292 | 1148 | 1005 | 718 |
| 2020 | 56 | 992 | 882 | 772 | 551 |
| 2030 | 75 | 741 | 658 | 576 | 412 |

Note: Due to increasing migration and high birth rate, a growth rate of 2.8% for Sindh is assumed
Source: 25 years of Sindh in Statistics. GOS 1998

## 1.8 Biological Resources

The climate and soil of the project area limit the type of flora found in the district. While there are a considerable number of grasses, there are only about half a dozen species of trees. The *kikar*is common along the canals; it is a tree which has multiple uses; its timber is used for making agriculture implements, fuel, as a source of animal feed, and goats eat the seeds. Its bark can be used for tanning and for distillation of native spirits. The *babur* (*Acacia nilotica*) is also commonly found in agricultural fields and along the sides of canals. The *ber* tree (*Zizyphus jujube*) is also found in parts of the district, and is used for fuel wood. Other common species of trees and shrubs are the *pipal* (*Ficus religiosa*), *sohanjro* (*Hyperanthers ptery gosperma*) or horse radish tree, *tamarisk* or *jhau,* wild copper tree or *karib/neem* (*Azadirachta indica*), *acacia/siris* (*Acacia lebbek)* and *banyan* (*Ficus bengalensis).* Mangroves (*Avicennia marina* and *Rhizophora)* are particularly important along the coast; however these are greatly under threat. The total area under state forests in Badin district is about 12,000 ha in two irrigated plantations at Bukarki and Rarri. According to the Forest Management Plan of Badin (2001), these irrigated plantations are poorly stocked and only 4% or about 500 ha of their total land area has any trees. Large portions of public forest area are encroached and affected by salinity and water logging. The forestry development agenda includes plantations of public forests, reclamation of water logged and saline lands, block and community plantations such as coconut and oil palm, and sustainable management of forests through community awareness and participation. The total area under forest in Thatta for 1997-98 was 422,000 ha which produced 76,000 cubic feet of timber and 228,000 cubic feet of firewood. Most of the forest in the district are located along the banks of the Indus. Forest grow consists of four tree species namely: *Acacia arabica* or *babual*, *Prosopis specigera* or *kandi*, *Populus euphratica* or *bahan* and two species of *tamarisk*. *Babul* has high economic value. Another tree found occasionally in the forests is *Dalbergia sissoo* or *tali*, which is found near villages and wells and its timber is highly valued. In the swamps of the protected creeks and river estuaries, there are eight species of mangrove which were formally found in abundance. However, *Avicenna marina* is now the most abundant (95%) due to its high salt tolerance compared to the other species. Of the total forest mangroves account for around 73,000 ha.

Wild animals are almost extinct, where hyenas and wolves are seldom seen. However, jackals are fairly common and foxes are seen in the dry wastelands. The number of pigs has diminished as a result of defensive action of villagers protecting their crops. Hares are fairly common. The most common birds found in the district are black and grey partridge, white-cheeked nightingale, Indai goat horned owl and long billed vulture. Among wild fowls, great flamingo is found. Other migratory birds are tublet duck and lesser whining duck. A variety of reptiles are found including cobra, krait, rat snake dhaman and Indian shelled turtle.

## 2. SOCIO-ECONOMIC STATUS

In order to place the information presented in this Project Area Profile into perspective, especially as regards an analysis of the current livelihoods in the project area, it was considered essential to undertake a brief analysis of the socio-economic status of the three project districts. Further details on this topic will be included in the PPTA Community Development Specialists report.

### 2.1 Ethnicity

The majority (80%) of the local population living in the coastal belt of Karachi, Thatta and Badin districts, belong to the Muslim community. The Hindus are prominent minority community. Three categories of Hindu population are living there i.e. the business community called Lohana, Kolis are the middle class and have slightly higher living standard than the Mahadev Kolis and Mahadev Kolis the primitive class are also called Bhils.

The important tribes are Syed, Soomra, Talpur (Mir), Leghari, Memon, Mandhra, Sheedi, Khaskhali, Mallah and Bhurgri. The Balouch tribes are also settled on the belt of the coastal communities. New migrant settlers are also living in these districts ex. Punjabi, Balouchi, Afghani and Bengali, etc.

### 2.2 Education

The community has very little education capacity as is evident from low number of good schools, qualified tutors, and minimum enrolment of the local children. The literacy rate in Badin district has registered slight rise from 24.6% in 1998 to 27.5% in 2001. The literacy level for Thatta district was reported to be 22.1 percent in 1998. The male literacy ratio was about three times higher at 31.6% as compared to 11.4% for females.

### 2.3 Living standards

The majority of people living in the coastal belt of Karachi, Thatta and Badin fall below poverty line. The poor communities could be categorised in three groups;

1. The coastal & inland communities, which comprise of fishermen, farmers and people associated with animal husbandry i.e.( camels, cows and goats).
2. The agrarian communities living inland, away from the coast comprising mainly of sharecroppers, who also own some livestock.
3. Inland communities that subsist solely on fishing, agriculture as well as wage labour.

### 2.4 Poverty Status

Thatta and Badin are among least developed areas of the Sindh. Poverty is rampant in these districts and socio-economic opportunities scarce. SPDC formulated a Deprivation Ranking of the districts of Sindh in 2001 in which they have assigned 14$^{th}$ and 15$^{th}$ rank to Badin and Thatta respectively, higher only to poverty stricken Tharparkar district. Although there is no exclusive data available on economic standing of Kiamari and Bin Qasim Towns, but based on first hand data it could be easily concluded that poverty profile of these two areas is no better than other coastal areas of Sindh.

Like the absence of opportunities in these districts, the intensity of income poverty is also equally pronounced. Following data on rural wage rates portray a dismal picture of income generating scenario of the area. Routine rates of agriculture labour are as follows: harvesting sugarcane: PRs. 3 per 40 kg; picking chillies: PRs.40 per 40 kg; wheat/rice harvesting: 1/12 share of total harvested crop; and tomato harvesting: PRs. 2 per 12kg (one basket of 12 kg)

For the labourer working in other areas the situation is no better. According to the Sindh Development Studies Centre (SDSC) the daily wages of the beeri labourer is PRs.100 per 1000 beeris. A labourer makes an average of 700 to 1000 beeris a day. The daily wages of the woodcutters is PRs. 10 per 40 kgs. He pays PRs.2 to the oxen cart owner as fare and saves only 8 per 40 kg. A man sells about 7 to 10 maund (1 maund = 40 kg) per day. The daily wages of the construction labourer is PRs 80 to 100 per day but they do not get to do this job on a daily basis. The daily wages of the hawker is PRs. 50-100. A goat worth 1500 is sold at PRs.500 in the time of disaster. Milkman buys milk from the villages at the rate of 10 to 12 per kilogram and sells them in the market from 15 to 20 per kg.

## 2.5 Land Ownership

Overall, 64% of the rural households in Sindh are landless. The land ownership pattern in the coastal areas of Badin and Thatta is worse than the situation for the province as a whole. More than 80% of the land is owned by only 9% of the households in Badin district. Furthermore, over 65% of the rural households are landless and more than fifty percent are tenants who work on share crop basis. The household survey conducted by WB showed that about 88% of the households do not have irrigated land holdings, and that households spend close to 80% of their annual income on food. A similar study carried out in preparation for the Sindh Rural Development Project (Household Survey Report. Raasta Development Consultants and Agrodev Canada Incorporated – February 2000), showed that wheat and rice were purchased by 65% of the households in the districts of Thatta and Badin for consumption. This leaves little room for other consumption and asset creation as most families are unable to meet their daily subsistence needs for food.

The existing sharecropping tenancy system, concentrated in the canal-irrigated areas of the two districts, is historically deep-rooted and perpetuates the deeply entrenched poverty of tenants and agricultural labour through unbalanced revenue-sharing and cost-sharing arrangements and a complex system of dependencies. Changes over time, the influx of migrants, and the introduction of modern technologies have altered the relationship to the disadvantage of the *hari.* The landlord meets the *haris'* needs (e.g., for agricultural inputs, consumption, social events, emergencies) through advances, with the accounts of these transactions kept by him, and often not transparent. However, even if these accounts were managed openly, *haris*' extremely low literacy rate would inhibit their control over the entries. The debt accumulates over the years. *Haris* cannot leave the landlord without clearing their debt, and become bonded. The bonded labour issue is politically sensitive and discussing it has frequently been interpreted as threatening the existing power structure. Innumerable dialogues between various actors indicate some inclination to begin changing the system, however, whether this will change in the lifetime of the project is subject to doubt. Table C.7 compares the *haris* share of inputs and the produce specified by the amended STA with those in common practice. Currently the overall average payment that the *haris* make to the landlord is in the order of 60%.

**Table C.7 Comparison of Haris Current Rights and Obligations with those Specified by the Amended Sindh Tenancy Act**

| Rights and Obligations | Current Shares (%) | Shares as Envisaged Under Amended STA (%) |
|---|---|---|
| Produce | 50 | 50 |
| Seed | 50-100 | 0 |
| Fertilisers | 50 | 50 |
| Pesticides | 50 | 50 |
| Labour for Cultivation | 100 | 100 |
| Operations - Implements | 50-100 | 50 |
| Operations - Draught Power | 50-100 | 50 |
| Irrigation - Canal | 0 | 0 |
| Irrigation - Groundwater | 50-100 | 0 |
| Water Charges & Land Tax | 0 | 0 |

STA = Sindh Tenancy Act
Source: ADB estimate, Sindh RDP RRP (October 2002)

Farm size distribution has not changed much over the last three decades. Still nearly one quarter of farmland is owned by large farmers, who account for only 2.2% of total number of farmers. Compared to this the subsistence farmers (less than 2 ha) who cover only 9% of farm area account for over 33% of number of farms. Farms tend to be fragmented with farmers often having 4-6 small plots dispersed across a non-contiguous area. A subsistence farmer would consequently have plots sizes in the range of 0.2-0.4 ha, with an average farm size of 1.92 ha.

The landholding pattern for the number of farmers in 4 categories are as follows:-

- Subsistence farmers - less than 2 ha - 9% of total cultivated area
- Small farmers - between 2 ha and 6.5 ha – 34%
- Medium farmers - between 6.5 ha and 20 ha – 35%
- Large farmers - Above 20 ha – 23%

From the District Vision: Badin. The data on farm size reveals that the number of farms and farm area has increased considerably from the years 1990 to 2000. Maximum area now falls under farm size 10.1-20.2 ha (22.7%) followed by farm size 5.1-10.1 ha (18.6%), farm size >60.7 ha (15.0%), farms size 20.1-40.5 ha (14.1%) and 40.5-60.7 ha (6.1%). Among subsistence farms, the farm size 3.03 to 5.1 ha are 12.9%, 2.02-3.03 ha (5.1%) and 1.01-2.02 ha 4.8%. of the total number of farms.

## 2.6 Infrastructure

**Irrigation and Drainage Infrastructure:** The irrigation network mainly comprises of two perennial and two non-perennial canals in Badin district. Gunni and Phuleli canals are non-perennial while Akram Wha and Nasir Canal are perennial. Kalri-Baghar, Stta,Kanto, Ghar, Kodario. Gungro, Saida, Mirza and Gungri are the main canals of Thatta district. The irrigation infrastructure down stream Kotri comprises of more than 12,000 watercourses. Only 10% of these watercourses are lined to the length of 30%. This is the main cause of heavy conveyance losses and shortage of water at the tail end. The drainage infrastructure comprises of 13 main surface drains, two outfall drains namely the KPOD and the DPOD under the Left Bank Outfall Drain Phase-1 Project. 1500 sub-drains of 3200 km are in worst condition in the coastal districts.

**Electricity and Gas:** In Badin district, electricity is available in 35.1% while kerosene oil still used in 63.4% of housing units. Firewood is used as cooking fuel in about 91% of rural household as against 76% of urban houses. In Thatta district, electricity is available only in 26.9% housing units while kerosene is used in 72.9% of houses. Firewood is used in 90% rural housing units for cooking. The majority of rural housing units lack electricity and gas.

**Roads and Transport:** Badin district has about 1,030 km of *pucca* road and 1,100km of *katcha* roads. Badin town is linked with its taluka headquarters through metalled roads. The China Road and Bridge Construction Company Ltd has constructed a broad thoroughfare from Badin to Sujawal town of Thatta district (50km). The district is also served by a railway line which connects Badin with Hyderabad city passing through Matli town. Public as well as private transport facilities are available in small town and large village settlements. The metalled road system, as well as vehicular transport facilities, is not available in more than 200 typical coastal settlements.

Thatta town is well-linked through the National Highway with Karachi and Hyderabad cities. All major towns of the district are connected with metalled road of 1,585 km length. The district is also connected by main line with Karachi and Hyderabad through the Jungshahi Junction; which is not accessible to most of the irrigated and coastal areas. Steamer service is employed on river Indus and coastal areas for transportation purposes during the monsoon season. The pucca roads are not available to more than 500 or so coastal villages and larger settlements, except for Keti Bander town.

The *pucca* and *katcha* roads per 100 sq. km, area in Badin and Thatta district are 21.53 and 7.67km and 9.38 and 1.66km respectively. The number of cars and jeep per one thousand houses is 0.95 and 1.11 for Badin and Thatta districts, respectively. The data indicate that Badin district is comparatively better off in terms of roads but worst off in terms of private vehicles. This may not be an objective assessment keeping in view the fact that availability of public transport and railway may depress the demand for private ownership of vehicles in most families of average means. When compared to the corresponding figure of 40.04 and 7.4km of road per 100sq km. of geographical area and 23 vehicles per one thousand household in Hyderabad district, both Badin ad Thatta districts emerge as having inadequate road and transport infrastructure.

**Water Supply and Sanitation:** Majority of the coastal communities usually purchase water cans at heavy prices, which further eats into their earnings and makes them economically vulnerable. The fisher folk communities living inside the creeks in small fishing villages have to a waste a lot of energy, time as well as the cost of ensuring just a can of drinking water for themselves. Water supply schemes serve only 3.3% of rural population, the majority of whom (about 65%) are still fetching drinking water from wells, ponds, depressions and hand pumps installed outside their houses. Unreliable and decreasing flows of freshwater downstream Kotri barrage has created sever shortage of drinking water in many urban localities in Thatta and Badin districts in recent years.

Over 70% population in Badin coastal areas are devoid of any latrine/bathroom facility inside their housing units. In rural areas, most housing units have open air kitchens in which firewood is the main source of fuel. The smoke as well as the solid food wastes causes serious health and sanitation problems. Thatta district is very poor in terms of the indicator of piped water, which is available to only about 15% of housing units. About

13% rural households have hand pump inside the housing units; while 16% use outside ponds for fetching water and 6% of housing units use dug wells.

**Tourism Infrastructure:** The following coastal sites in Badin and Thatta districts hold great promise with respect to tourism: Dodo Soomro, Roopa Mari, Shah Yaqeeq (Shrine), Mughar Bhean (Shrine), Syed Noor Shah Shrine, Raja Nind Kot, Reri, Bijoro Lake near village Bhugra Memon, Tidal Lakes of Badin, Oranga Bander, Shah Bander, Keti Bander, Kharo Chhan (Island), Haji Yaqoob Murghar Baloch.

The following tourism infrastructure is needed: (a) motor-able roads to approach various sites; (b) mode of transport to access the sites; (c) safety of travel and transport facilities; (d) accommodation facilities for tourists; (e) communication facilities for tourists; (f) main skills/crafts of villagers; and (g) training and skill development centers.

Policy and development interventions in the project area are needed for infrastructure in following areas: (i) drainage and disaster control, (ii) rural infrastructure development, (iii) cold storage construction at Keti Bander and Shah Bander, (iv) construction of water supply reservoirs with provision of pipe-lines/hand pumps wherever necessary, (v) oil refinery in Badin district, (vi) construction of jetties at Shah Bander and Kharo Chhan, (vii) lining of minor canals and channels in the coastal belt, (viii) construction of coastal highway from Karachi to Sir Creek, and (ix) establishment of a milk plant at Sujawal

## 2.7 Coping Strategies for Communities in Disasters

The principal coping mechanisms of the poor in the coastal areas in dealing with disasters are as follows:

- The immediate short term response is reducing their food consumption. The poor spend more than 80% of their funds on food as a result one of the first adjustments made by them is in their food consumption.
- Households had absorbed the shock through the sale of livestock
- Seeking wage employment was also immediate and short-term and medium-term actions taken by households.
- Incurring debt is a key coping mechanism for both the farming and fishing communities, particularly for *hari* families who have limited capacity to deal with any reduction in current production. High interest rate credits (about 60% credit for their daily living in Sindh province at 2.5-10% per month).
- Sale of embroidery work/handicrafts and other personal items – mainly produced by women to generate household income.
- While the government has a program of social transfers through its system of *Zukat* and *Bait-ul-Mal*, this did not figure in the coping strategies of the households. Very few households have reported actually receiving these transfer payments
- Seasonal and permanent migration.

Longer term strategies in irrigated areas are: (a) groundwater development, (b) changes in cropping patterns, (c) reduction in cropped area, (d) availability of potable drinking water should be given priority, (e) infrastructure development and extending small credit facilities to drought-affected areas is a key for extending relief measures, (f) farmers should be educated to adopt water conservation strategies both at household and field level, (g) innovative rainwater harvesting techniques to store more rainwater should be introduced, (h) to strengthen anti-drought efforts, coordination between different NGOs and government agencies should be enhanced, and (i) farmers participation in drought relief efforts should be increased to address their concerns.

# 3. FARMING AND LIVELIHOOD SYSTEMS

## 3.1 Sources of Income and Livelihoods

In the past, the coastal villages in the project area used to rely on multiple sources of income depending on the household resources ownership. While fishing formed a major part of their livelihoods, cropping was also a key component as each family had access to some land, which they cultivated on a subsistence basis. Livestock ownership was an additional strategy for supplementing household consumption needs and as a source of value. Wood cutting enabled households to meet their fuel needs as well as supplement income for poorer households. As a result of decrease in water availability and increased salinity there has been a pressure on diverse types of livelihoods. The choice that was once available to households is gradually diminishing and households are increasingly becoming dependent upon one or two sources of income. Along the coast fishing has become the single source of income for many families; however, this income source is becoming increasingly more unreliable with much lower fish catches and lower returns, than were possible a decade ago. Similarly, traditional merchant clans in the coastal areas dealing with the purchase and sale as well as export of agricultural produce have also converted their livelihood to the fisheries sector.

The first change of livelihoods from crop and livestock farming towards the fishing sector coincided with the decrease in fresh water flows in the Indus Delta after the commissioning of various barrages, reservoirs and dams on the Indus River. As a result of this sea intrusion has inundated more than 500,000 ha of farmland in the coastal areas of Thatta and Badin. In addition sea water has intruded as far as 50 km up the sweet water channels downstream of the Kotri Barrage rendering thousands of hectares of farmland saline. Half of Keti Bandar and Shah Bandar talukas have been badly affected, as well as a number of Tapas in Ghorabari, Jati, Mirpur Sakhro and Karo Chan talukas.

The recent household survey conducted by the WB (Socio-economic Study and proposal for Livelihood Improvements – Badin and Thatta Districts, Sindh; April 25, 2005), indicated that presently 65% of the households along the coast depend upon fishing as their main source of income. Farming is the source of income for another 20% of households, and regular employment and wage labour for 6% and 5% of households respectively. About 4% of households did not have a primary occupation and source of income and had to rely on the extended family and other secondary activities such as wood cutting. In addition, about 62% of households were reliant on a single source of income. Supplementary income through wood cutting and wage labour are important sources and provide additional income for 12% and 10% of households respectively. Farming supplemented income for only 9% of households, livestock 2% and shop keeping 2%.

Furthermore, while the farming sector provides a major source of employment and incomes for the people in the project area, in coastal communities, the reliance on cropping is much lower than in other parts of Badin and Thatta districts. The WB survey indicated that in these coastal areas 81% of households earned no income from agriculture and only 11% earned more than 80% of their income from this source. An analysis of the degree of differentiation in agricultural production between the poor and non-poor shows that the poor not only tend to be landless or small landowners and work

under special contracts of share cropping, they also have more difficulty in managing risk and being unable to diversify their production.

While the project area consists of many small farms, a majority of the land holding is dominated by medium and large farmers as farm holdings above 10 ha constitute 57% of all land holdings. The key constraints in the agriculture sector include shortage of irrigation water, water logging and salinity, lack of marketing and storage facilities, lack of improved and certified seed, limited supply and non-availability of chemical fertilisers, poor quality and expensive pesticides, lack of farm machinery and tractors, lack of credit, poor research and extension services, and an inappropriate price policy.

### 3.2 Agriculture and Cropping Systems

After fishing agriculture is the main occupation in the project area, and farmers still use traditional methods. They have little awareness about modern techniques and no access to extension programmes and support services such as credit and marketing.

Like the rest of Pakistan there are two main cropping seasons, *kharif* or the monsoon season and *rabi* or winter season. A complex cropping pattern is practiced in this zone. The main crops grown in the project area during *rabi* are wheat, barley, gram and oilseeds. In the *kharif* the main crops grown are rice, maize, millet and jowar. Lack of irrigation water limits the amount of land that can be cultivated. Rice is the main crop of the project area, the other major crops are sugar cane, cotton, wheat and barley. There is a much higher degree of diversity in cropping pattern the further one goes from the coast. Close to the coast areas, the kinds of crops that can be grown are limited as they have to be salt tolerant. In the saline coastal areas, sunflower has become an important crop replacing sugarcane due to the shortage of irrigation water and price dispute within the industry. In addition vegetables such as green chilli, cucurbits, carrot, radish, onion and tomato are also grown. In Thatta district, the banana crop is commonly grown under saline soil conditions.

This zone is peculiar in production of banana, *chiku*, custard apple, beetle leaves (pan), papaya and coconut fruits. The oil palm plantations are being introduced. However, their success lies in doldrums. The main feature of the zone is successful intercropping of onion and sugarcane. The banana once the major crop of area has declined due to heavy attack by Banana Bunchy Top Virus (BBTV). In recent years the crop has shown a comeback. Another crop, which is very much cultivated in the zone, is musk melon, which is sold in the Punjab market and gives a sizeable income to the farmers.

A comparison of the area under different crops between 1998 and 2002-03 in the area of Badin district further away from the coast shows that the cultivation of rice, sugar cane and wheat has declined while the area under cotton has increased. This is being prompted by considerable price liberalisation in the recent past, leading to higher prices and greater production. Cotton is however not a particularly important crop in the project area. In the project area producers particularly small farmers and *haris*, find it increasingly uneconomic to grow most of the crops, mainly due to the adverse effects of trade for agricultural products, water logging and salinity.

**Table C.8 Area of Major Crops by District in 2002-03 (ha)**

| District | Rice | Wheat | Jowar | Bajra | Maize | Gram | Barley | Rapeseed / Mustard | Sesamum | Sugar cane | Cotton | Vegetables | Total Area |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Badin | 64,783 | 18,047 | 117 | 78 | 469 | 12 | 3,266 | 619 | 29 | 52,139 | 6,210 | | 145,769 |
| Thatta | 56,422 | 8,196 | 427 | 127 | 437 | 23 | 5,489 | 463 | 62 | 28,226 | 528 | | 100,400 |
| Karachi | - | 82 | 977 | - | 234 | - | - | - | 18 | - | - | | 1,311 |
| Total | 121,205 | 26,325 | 1,521 | 205 | 1,140 | 35 | 8,755 | 1,082 | 109 | 80,365 | 6,738 | 0 | 247,480 |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

**Table C.9 Production of Major Crops by District in 2002-03 (Metric Tons)**

| District | Rice | Wheat | Jowar | Bajra | Maize | Gram | Barley | Rapeseed / Mustard | Sesamum | Sugar cane | Cotton* | Vegetables |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Badin | 107,885 | 24,600 | 47 | 33 | 236 | 7 | 1,614 | 300 | 7 | 2,576,814 | 18,525 | |
| Thatta | 89,142 | 11,828 | 169 | 50 | 216 | 13 | 2,441 | 224 | 14 | 1,367,086 | 1,636 | |
| Karachi | - | 133 | 338 | - | 97 | - | - | - | 5 | - | - | |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.
* Production in bales

**Table C.10 Yield of Major Crops by District in 2002-03 (kg/ha)**

| District | Rice | Wheat | Jowar | Bajra | Maize | Gram | Barley | Rapeseed / Mustard | Sesamum | Sugar cane | Cotton* | Vegetables |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Badin | 1,665 | 1,363 | 402 | 423 | 503 | 583 | 494 | 485 | 241 | 49,422 | 3.0 | |
| Thatta | 1,580 | 1,443 | 396 | 394 | 494 | 565 | 445 | 484 | 226 | 48,434 | 3.1 | |
| Karachi | - | 1,622 | 346 | - | 415 | - | - | - | 278 | - | - | |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.
* Yield in bales

The total cultivated areas of Badin District are 313,100 ha. However, mainly because of shortage of irrigation water, net cropped area is about 156,764 ha. The areas under forest are estimated at 12,063 ha (1.73%). A total area of 184,080 ha is under field crops including cotton cultivation on 6,483 ha, sugarcane 31,126 ha, rice 60,640 ha, wheat 16,413 ha, sunflower 5,011 ha, traditional oilseeds 1,421 ha, chillies 1,692 ha, banana 2,662 ha, other gardens on 2,278 ha and vegetables >816 ha, in 2000-2001.

The general problems in crop production are: (a) acute shortage of water especially in non-perennial areas, (b) extreme saline soils especially near the coast, (c) high wind velocities, (d) non-availability of good quality seed and high yielding varieties, (e) lack of other good quality inputs (e.g., fertiliser, agro-chemicals, farm equipment), (f) kharif crop is vulnerable to the high rainfalls and floods, where in some years the entire crop has been lost, (g) poor network of roads and mode of transportation, and (h) lack of postharvest storage, processing and marketing facilities.

Overall strategies to improve livelihoods of farmers as regards crop production should include: (a) capacity building and skills training of farmers in agriculture techniques, (b) introduction of salt tolerant crops and varieties, and (c) crop diversification and alternative crops systems.

Details on the major crops cultivated in the project area are outline below.

**Rice (*Oryza sativa*)**

Rice is the most important crop of the area and a source of livelihood for the poor farming community.

It is mainly a kharif crop but is grown as a rabi crop in selected perennial area. An important food and cash crop, it is the third largest crop of Pakistan after wheat and

cotton. It is planted on an area of over 2 million ha and accounts for 18% of the area under cereals and 10% of the total cropped area. The annual production of milled rice is about five million tonnes and has constituted 17% of the overall output of cereals. Sindh (Zone III and IV) IRRI type long grain heat tolerant tropical rice are grown. Coarse rice is mainly grown, and IR-6, IR-8 and KS-282 are the dominant varieties. These varieties in pure form do not exist. The seed available with the farmers is the mixture of many types, so consequently the yields are low at 1,600 kg/ha. The extent of rice cultivation in the project area during 2001 is presented in Table C.11.

**Table C.11 Area of Rice by District and Taluka in 2001 (ha)**

| District/Taluka | Area (ha) |
|---|---|
| **Badin** | **60,958** |
| Badin | 12,048 |
| Golarchi | 23,265 |
| **Thatta** | **54,752** |
| Mirpur Sakro | 10,736 |
| Ghora Bari | 5,403 |
| Keti Bander | 186 |
| Jati | 7,625 |
| Shah Bander | 5,370 |
| Kharo Chhan | - |
| **Karachi** | **-** |

Mostly local farmers use old cultivation methods i.e. using bullocks and old implements for tillage practices rather than using modern mechanized cultural practices (tractors, cultivators, laser levellers and threshers, minimum tillage etc.). Improved traditional methods of rice cultivation: bring new innovations in varietal development, crop stand establishment, IPM, and harvest and post-harvest operations. With the mechanization in the harvest and post-harvest operations in rice and wheat crops the problem of crop residues is becoming very serious. Farmers generally burn the crop residues, which is a big loss of nutrients and causes environmental pollution. Efforts are underway for the proper management of crop residues mainly through the use of suitable machinery. Traditional method of harvest and post-harvest especially in Sindh causes substantial quantitative and qualitative losses. These operations are being mechanized to minimize these losses and improve rice quality. There are many marketing related problems faced by local farmers i.e. poor quality of the produce, seller staying powerless, lack of transportation facilities, markets are far away, critical examination of marketing system, lack of marketing intelligence, lack of credit facilities, a large number of middlemen, fraudulent practices in unregulated markets, poor performance of purchase centers, fraudulent practices in weights and measures, lack of gradation and standardization, absence of organized markets and defective revenue system.

There is potential in both districts to cultivate the rice crop extensively in the area where plenty of irrigation water is available, and locally all the essential pure inputs are easily available to the farmers including farm machinery etc. but currently farmers are facing acute shortage of irrigation water especially in the tail ends of the river system due to unlined channels system which causes the loss of water due to heavy seepage etc. and local non-availability of all the pure quality inputs i.e. seed, fertilizers, and pesticides. Proposed strategy for improvement of rice is firstly the initiation of Certified Seed Production. Rice Research Station is located in Thatta under provincial research system. This station is not effective in helping the farming community. It is envisaged to streamline the work of this station through budget provision, research planning and strict monitoring. The most limiting factor in rice production is availability of pure quality seed.

The Foundation Seed Cell will produce the disease free and good quality pure seed of new high yielding varieties including IR-6. The basic seed will be given to the private seed companies for further multiplication.

**Wheat (*Triticum aestivum*)**

Wheat is cultivated largely (80%), in perennial irrigated areas as a rabi crop. There are three kinds of wheat cultivars: long, medium and short duration varieties. The wheat yields usually start declining after 20th November sowing at the rate of 20 kg/day. Wheat yields in the project districts are low compared other areas of the country at 1.3-1.6 tonnes/ha. Mostly local farmers use old cultivation methods i.e. using bullocks and old implements for tillage practices rather than using modern mechanized cultural practices (tractors, cultivators, laser levellers and threshers etc.). There are many marketing related problems facing by local farmers which are similar to rice. There is potential in both districts to cultivate the wheat crop extensively in the area where irrigation water is available during the critical stages of the wheat crop, and locally all the essential pure inputs are easily available to the farmers including farm machinery etc. but currently farmers are facing acute shortage of irrigation water especially in the tail ends of the river system due to unlined of channels system which caused the loss of water due to heavy seepage etc. and locally non-availability of all the agricultural pure inputs.

**Sugarcane (*Saccharum officinarium*)**

The coastal zone is the most important sugarcane growing area of the province, and almost 60% sugarcane is grown here. Favorable coastal climate, long days, moderate summer and winter temperatures and well-drained alluvial soils are natural gift to sugar industry for cane and sugar yields. In this area, highest sugar recovery rates in Pakistan are obtained. Almost, half of the sugar mills in Sindh are found in this region or its vicinity. Intercropping with vegetables and occasionally wheat is a common practice. The taluka wise information of sugarcane cultivation is presented in Table C.12.

**Table C.12 Area of Sugarcane by District and Taluka in 2001 (ha)**

| District/Taluka | Area (ha) |
|---|---|
| **Badin** | **47,872** |
| Badin | 8,021 |
| Golarchi | 3,095 |
| **Thatta** | **26, 742** |
| Mirpur Sakro | 1,916 |
| Ghora Bari | 2,008 |
| Keti Bunder | 134 |
| Jati | 3,727 |
| Shah Bunder | 4,001 |
| Kharo Chhan | - |
| **Karachi** | **-** |

This area has a yield potential of 150 tones cane per hectare, but the actual average yield are low, around 50 tonnes/ha. The low yields do not match the over expanded industry in the province. The sugar recovery of this region has been recorded around 9.5 percent. The low cane and sugar yields tend to increase the manufacturing cost of sugar. The following socio-economic factors are responsible for low sugarcane production: (a) illiteracy and less awareness of the sugarcane growers about management practices; (b) discouraging attitude of sugar mills management and delayed payments to the growers; (c) high cost of inputs; (d) non-application of support price policy; (e) low yielding varieties; (f) natural calamities, (g) lack of irrigation facilities, (h) low cropping intensities, (i) harvesting over age canes and prolonged kill-to-mill

periods; (j) high dependence on ratoon crop; (k) inadequate research and development facilities; and (l) lack of a good seed source.

The difference in the use of inputs and cultural practices are distinctive among large, medium and small growers which is yet to be bridged. It is found that old sugarcane production system has been carried over from previous generations and is dominant among growers of the region. The sugarcane production process is not mechanized and most of the production process is labour intensive.

Proposed strategy for improvement of sugarcane is firstly the initiation of Certified Seed Production. The Sugarcane Research Institute (PARC) is located in Thatta and provincial Sugarcane Research Station at Sujawal. They will produce the disease free and good quality seed of new high yielding varieties (to be known as breeders seed). This seed will be multiplied at government farms as seed crop and dually inspected and passed by the Federal Seed Certification staff and breeder concerned (basic seed). The basic seed will be further multiplied with the registered growers. The prevalence insect pests and diseases will be regularly monitored. The list of registered growers will be widely publicised to take the Certified Seed. It is estimated that the 40% requirements of sugarcane crop will be fulfilled. In addition an IPM laboratory will be established at Sujawal to produce the *Trichogramma* and *Crisopa* cards. These predators effectively control sugarcane pyrilla and bores. These cards will be distributed among the growers at subsidised rates.

**Sunflower (*Helianthus annus*)**

Sunflower is gaining popularity among the growers due to its better prices and short duration. It is grown as dubari/rabi crop after rice on residual moisture and 1-2 irrigation/crop. The most limiting factor is availability of hybrid seeds. Most of the seed is imported from abroad which failed to germinate on certain occasions. It is planned to coordinate with an international seed company for local hybrid seed production of sunflower.

**Vegetables**

The area, production and yield data of different vegetables grown in the project area during the year 2001 is presented in Table C.13.

**Table C.13 Area, Production and Yield of Vegetables Grown in Project Area in 2001**

| Crop | Area (ha) | Production (tonnes) | Yield (kg/ha) |
|---|---|---|---|
| Tomato | 1,427 | 5,642 | 3,954 |
| Turnip | 25 | 227 | 9,080 |
| Spinach | 164 | 616 | 3,756 |
| Cauliflower | 148 | 1,814 | 12,257 |
| Lady's finger | 91 | 216 | 2,374 |
| Tinda | 56 | 275 | 4,911 |
| Brinjal | 28 | 137 | 4,893 |
| Bitter gourd | 35 | 146 | 4,171 |
| Bottle gourd | 37 | 171 | 4,622 |
| Luffa | 28 | 79 | 2,821 |
| Green chilies | 149 | 275 | 1846 |
| Rabi chilies | 135 | 133 | 985 |
| Coriander | 183 | 76 | 415 |
| Onion | 402 | 4,450 | 11,070 |
| Potato | 12 | 83 | 6,917 |

Tomato is the most important cash crop of all the three districts of the region. The climatic conditions of Badin district are best suited for the earliest production in Pakistan, from where it is transported to other regions of the country. At present, the production of tomato is seriously affected by number of viruses and other diseases resulting in low yields. Chemical control of these diseases is not easy. Solution must be sought through development of resistant varieties. Fruit set in tomatoes is hampered by high temperature. By using heat tolerant varieties with shading and hormone spray, it may be possible to extend the tomato growing season into early kharif season. Since, the early season tomato has a good market; a research programme evolving such technology will be required.

At present, a research station on tomato is working in Badin; due to the poor soil its research programme is badly hampered. Objectives of a tomato improvement programme are: (a) to purchase new land for tomato research station, (b) introduce shading technology along with heat tolerant varieties, (c) tomato seed production, and (d) introduction of virus resistant varieties.

**Fruit and Other Tree Crops**

The area and production data for fruit and other tree crops currently being grown in the project area are presented in Tables C.14 and C.15 respectively. From these data it is apparent that banana cultivation followed by mango are the most important crops under cultivation.

**Table C.14 Area of Fruit and Other Tree Crops Grown in Project Area in 2002-03 (ha)**

| District | Banana | Mango | Guava | Papaya | Coconut | Oil Palm | Total Area |
|---|---|---|---|---|---|---|---|
| **Badin** | 1,216 | 1,330 | 34 | 24 | 0 | 0 | 2,604 |
| **Thatta** | 2,387 | 181 | 0 | 235 | 195 | 0 | 2,998 |
| **Karachi** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 3,603 | 1,511 | 34 | 259 | 195 | 0 | 5,602 |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

**Table C.15 Production of Fruit and Other Tree Crops Grown in Project Area in 2002-03 (Metric Tonnes)**

| District | Banana | Mango | Guava | Papaya | Coconut | Oil Palm | Total Area |
|---|---|---|---|---|---|---|---|
| **Badin** | 3,757 | 9,278 | 160 | 99 | 0 | 0 | 13,294 |
| **Thatta** | 5,064 | 1,180 | 0 | 1,003 | 335 | 0 | 7,582 |
| **Karachi** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 8,821 | 10,458 | 160 | 1,102 | 335 | 0 | 20,876 |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

It should be noted that the CDA with the assistance of the Oilseeds Development Directorate have been trying to introduce oil palm into the coastal regions since the early 1990's. However, development of this crop as a commercial cash crop has been hampered by a number of serious problems which affect the crop. The most important of

which being the fact that the coastal region of Sindh is ecological unsuited to the cultivation of the crop, furthermore, the project area has severe problems with the availability of water throughout the year, subsistence and smallholder farmers are precluded from growing the crop because a land area required must be >6 ha, and also there is currently no processing facilities to extract the palm oil located in the region. The information presented in Box 3 below provides an insight into the ecological conditions required for oil palm.

**Box 3: Ecological Requirement for Oil Palm**

The natural environment of oil palms is the lowland humid tropics. They thrive on a good moisture supply and open areas as they cannot compete with faster-growing tree species. The oil palm does not grow under continuous flooding but is tolerant of fluctuating water tables with periods of standing water. Hence, the natural habitats are considered to be swamps, riverbanks and other areas too wet for dicotyledonous trees of the tropical rain forest. Under cultivation, rainfall is often the main limiting factor on production. Major areas of oil-palm cultivation are in the equatorial belt where mean annual rainfall deficits do not exceed 600-650 mm annually. Highest yields are achieved where rainfall is well distributed throughout the year with an optimum of 150 mm monthly. Dry periods must not exceed 3 consecutive months. Little is known about temperature effects other than that oil palms grow less well at higher altitudes (above 500-600 m) and at higher latitudes (above 10°); Sindh is located 24°N. In regions where minimum temperatures regularly drop below 20°C for prolonged periods, productivity and growth are severely reduced. The oil palm is also affected by high temperatures. Photochemical efficiency seems to be reduced above 35°C.

Oil palms can grow on a wide variety of soils ranging from sandy soils to lateritic red and yellow podzols, young volcanic soils, alluvial clays and peat soils. A major criterion for relative suitability seems to be water-holding capacity. As oil palms are responsive to soil nutrients, nutrient-release characteristics are also important as they affect efficiency of fertilizer use.

**Agro-ecological implications for oil palm cultivation in coastal area of Sindh province:**

- Area located outside the natural environment for oil palm i.e., within latitude 10°N.
- Unsuitable temperature regime – too hot in summer and too cold in winter
- Water availability is severely hampered by lack of sufficient perennial irrigation water.
- High salinity of the alluvial soils on the Indus river delta.

## 3.3 Livestock

Livestock contributes roughly one third in the total share of agriculture in the GDP in Sindh province. The livestock population for Sindh province forms a sizeable proportion of the national livestock population and is distributed throughout the province with marked concentration in irrigated areas. It is a very valuable resource during drought and natural disasters. It should be noted that there is a sizeable herd of buffalo (>1.0 million animals) situated around Karachi in urban dairy units to provide much needed milk and meat for the cities population. The per capita availability of milk in Sindh has reportedly reduced to 14 ounce (oz) from 14 oz, available in 1943. Today most of the milk is used in its fluid form as it is not possible to make butter and *desi ghee* (cooking oil of animal origin) due to the overall shortage of milk.

Over the past five decades improvements in the performance of breeds and methods of exploitation of their genetic potential has been negligible. There has been no breakthrough in milk and meat production per animal and consequently no genetic improvement in productivity has occurred in the highly regarded Red Sindh and Tharparkar cattle or in the Kundhi buffalo or other class of livestock. There is a general shortage of purebred stock where its estimated there is only 10-15% pure bred stock, with this number continuously declining due to indiscriminate breeding. The shortage of

purebred bulls can be attributed to: (a) high cost of managing and feeding of sires and breeding bulls which is becoming unbearable for small farmers; (b) the non-availability of true to type breeding bulls; and (c) a weak artificial insemination programme.

Two types of poultry production exist in the project area: commercial and subsistence. Commercial poultry production can be found in the rural areas of Thatta in particular and is based on the rearing of commercial poultry strains (layers and broilers) of exotic origin, whereas, subsistence poultry farming is based on indigenous strains or breeds. Currently the poultry sub-sector is in decline for two reasons the current over-production of the commercial units and the low performance and management of the subsistence poultry activities.

A major problem which applies to not only poultry but all livestock is the high incidence of disease which prevails because of the lack of knowledge about the benefits of timely vaccination and other measures of disease control. Many infectious, contagious and parasitic diseases affect various classes of livestock, and the most commonly prevailing diseases among different species are as follows:

- Diseases of large ruminants: Haemorrhagic septicaemia, Rinderpest like disease, Bovine viral diarrhoea, Foot and mouth disease, Scours (white diarrhoea), Fascioliasis and Trypanosomiasis (*Surra*).
- Diseases of small ruminants: Enterotoxarmia, Contagious pleuro-pneumonia, Anthrax and Fascioliasis
- Diseases of poultry: Newcastle Disease

In coastal Sindh most farmers traditionally keep a few head of livestock, ranging from bullocks and buffalo for draft to cattle and buffalo for milk, and poultry for eggs and meat. There have been many traditional communities in the area exclusively dependent on livestock for their livelihood, however, the importance of livestock as a source of income has declined over the years. Livestock population estimated at 1.2 million in 1998 in Badin district declined to 860,000 after the 2003 floods due to disease and the sale of animals as a coping mechanism. Prior to the floods, between 57-60% of the livestock was held as large animals with balance being sheep and goats. Livestock number for the project districts are presented in Table C.16.

**Table C.16 Number of Livestock by District/Taluka in 2000 Census**

| District | Taluka | Cattle | Buffaloes | Sheep | Goats | Others | Poultry | Total |
|---|---|---|---|---|---|---|---|---|
| **Badin** | | **129,276** | **182,120** | **79,755** | **100,392** | **7,571** | **626,000** | **1,125,114** |
| | Badin | 62,544 | 90,890 | 35,847 | 57,871 | 3,794 | | 250,946 |
| | Golarchi | 66,732 | 91,230 | 43,908 | 42,521 | 3,777 | | 248,168 |
| **Thatta** | | **190,247** | **186,660** | **104,377** | **141,850** | **73,260** | **510,000** | **1,206,394** |
| | Mirpur Sakro | 40,550 | 41,090 | 21,790 | 25,910 | 13,580 | | 142,920 |
| | Keti Bunder | 23,030 | 20,043 | 15,233 | 18,580 | 11,380 | | 88,266 |
| | Gohra Bari | 23,150 | 25,452 | 12,825 | 20,520 | 11,570 | | 93,517 |
| | Jati | 53,607 | 54,705 | 26,170 | 37,470 | 13,260 | | 185,212 |
| | Shah Bunder | 28,070 | 32,970 | 16,885 | 25,340 | 11,770 | | 115,035 |
| | Kharo Chan | 21,840 | 12,400 | 11,474 | 14,030 | 11,700 | | 71,444 |
| **Total Project** | | **319,523** | **368,780** | **184,132** | **242,242** | **80,831** | **1,136,000** | **2,331,508** |

Source: Development Statistics of Sindh 2004; Bureau of Statistics, Planning & Development Dept, GOS.

There is a considerable degree of concentration in livestock ownership, and it is estimated that 68% of the coastal communities have no livestock. About 29% of households own between 1 to 10 large animals while 3% own >11 large animals. Poultry is reared in small commercial farms and also kept at home in small flocks. There are also large poultry rearing units which supply the Karachi market. These are however, owned by outside traders and entrepreneurs. The commercial production of poultry is estimated at a population of around 219,000 birds for Badin.

The livestock numbers have been particularly affected as a result of the decrease in the flow of the Indus. Livestock in the project area suffers in particular from a shortage of feed and fodder crops and fresh water. The government has veterinary hospitals, dispensaries and centres in the districts but the service has deteriorated over the last decade. Shortage of professional staff, vaccines, deep freezes and lack of feed mills are major constraints to livestock development.

### 3.4 Forestry

In the project area there are two types of productive forest: riverine forests and irrigated plantations, and the protected forests which are the mangrove rangelands. Most of the forests in Thatta district are located astride the banks of the river Indus, in addition the main forest area are Gharhko, Ban Purandas, Hilaya, Sonda, Monarki and Surjani. The total area under forest in Badin district is 12,000 ha, as compared to 422,000 ha for Thatta.

The forests consists of four main species of trees, namely *Acacia nilotica* or *babul*; *Proposis specigera* or *kandi*; *Populus euphratica* or *bahan*; and two species of tamarisk, *Tamarix gallica* and *jioica*, called *lai* and *jhao* respectively. Of these *babul* is the most useful. It yields and excellent timber used extensively for wheels, agricultural implements, building purposes, fuel wood and charcoal. Furthermore, it produces a gum which is only slightly inferior to true gum Arabic, and its astringent bark is used for dyeing and tanning, and the pods afford an excellent livestock feed. When young it grow in dense unmixed stands and is readily cultivated from seed. It grows to a maximum high of 18-24 metres.

*Kandi* is next in importance being a source of good fuel and the pods can be used as fodder for cattle, goats and camels. *Bahan* grows in the intermediate areas of the inundations and yields a good quality wood used for building and lacquer work. Tamarisk exists chiefly on the new lands thrown up by the Indus, giving good fuel and wood for agricultural implements and tanning purposes. Both *kandi* and tamarisk are susceptible to insect attach and it is hard to find sound trees.

Other tree species include: *Zizyphus jujube* or *ber* (yielding fodder for goats and camels); Azadirachta indica or neem (timber and traditional medicine); *Albizzia lehakor* or *siras*; *Ficus bengalensis* or *banyan/wad*; *Ficus religiosa* or *papal*; *Tamarindus indica* or *tamarind*; *Acacia farnesiana* or *vilayati babul*; *Cordia myza* or *lasora* and *C. rothii* or *liar*; *Parkinsonia aculeta* or *vilayati kikar*; *Casuarina equisetifolia*; *Capperis aphylla* or *kirir*; and *Salvadora persica* or *khabbar.*

The forests harbour a large number of medicinal plants such as *mithozehr* (*Aconitum napellus*), *bankhewro* (*Agave americana*), *gulkhero* (*Althaea-rosa*), *kanwargandal*

(*Aloevera)*, *phog* (*Calligonum polyonides*), sagghal (*Chenopodium album*) and *golarho* (*Coccinia cardifolia*).

The minor produce from the forests are: reeds from *sar* and *kanh* grasses (*Saccharum spontaneum* and *S. arundinaceum)*. Reeds are used for blinds, shades and walls for huts and duckboards and making baskets, chairs and ropes. Other grass species are used as fodder for animals and thatching. Non timber forest products (NTFP) make significant contributions to the livelihoods of the rural communities in the project area.

The fauna and flora of the project are have been adversely affected as a result of over-exploitation. In inventory conducted by the Sindh Forest Department in 1987 concluded that almost 50% of the riverine forests were so degraded that their productivity is no longer of economic value. The position is bound to deteriorate further if effective measures are not adopted to provide improvement of the water regime to augment the source in order to make the forestland productive. If this was not done the entire ecological setup is likely to degenerate.

In 1973 the Sindh Forest Department launched a modest social forestry programme, under which container plants, bedded nurseries, wind breaks and shelter belts were raised, Babul seeds were also provided to farmers and the general public at subsidised rates. The response to this was encouraging and expanded into a more extensive social forestry programme known as the Forestry Planning and Development Project. Another initiative under the same name was subsequently sponsored by ADB in 1999-2000. Almost 80-90% of all timber and fuel wood used in Badin and Thatta are extensively from privately owned lands. The balance of 10-20% is abstracted by the local communities from the protected mangrove forests.

The Forestry Sector Master Plan (FSMP) proposes certain interventions for the period 1995-2020, during which the target to be achieved is the afforestation of 25,000 ha at the rate of 1,000 ha annually for Sindh province as whole.

The stakeholders in the forestry sector include the Forest Department, farmers and communities, particularly women who are the wood users, as well as NGOs, politicians, and administrators. All need to be involved to bring a bout change and stop the decline in the forest are, particularly the protected mangrove areas. The department has to find ways of working with the local communities that are living in close proximity to these forests with their livestock, who need fuel, fodder and materials for building and domestic use. The forester will need to depend on these communities for the maintenance and protection of these resources.

Under the circumstances agro-forestry seems to be the only feasible option to increase forest wealth. According to the data from Sindh Forestry Department 50% of forestry lands are unproductive. These could be leased out on easy terms for a period of 10-15 years. The government will need to arrange loans for the development of land on easy terms. The installation of wood seasoning, preservation and processing units would also help in enhancing the quality of wood and will increase utilisation of locally produced timber. In addition, whenever government wastelands are distributed among landless *hari* (peasants), the condition of planting a reasonable number of trees on the land allotted to them must be imposed. In this context it is important to stress the role that women have as the users of most forest resources such as firewood, grass and leaf fodder, leaf litter, medicinal plants and bark. In social forestry the resources that are

created need careful protection which is only possible if women are involved in projects and are in fact educated.

For social forestry to be successful the government will need to introduce some farmer-friendly policies, namely: (a) no water rate/*ushr* be charged from land under closely spaced plantations called *hurries* (most *hurries* of *babul/kikar* are on private land); (b) *babul hurry* growers need to be provided interest-free loans by government banks on easy terms; (c) the government needs to reissue Circular No. 481, where up to four hectare of land is granted to farming families in order to raise tree crops; (d) education and motivation programmes may be launched by the government in coordination with NGOs to impart technical knowledge; and (e) NGOs with their local orientation and integrated approach to rural development can promote community based participatory forestry programmes that benefit economically or socially disadvantaged groups.

For any headway to be made in the forestry department, a radical and revolutionary change in the system needs to be introduced which recognise competence, motivation and hard work. Work is needed on a number of issues: to introduce salt tolerant tree and fodder species, fuel wood and agroforestry initiatives, work on gathering a greater understanding of NTFPs, and large scale mangroves replanting.

### 3.5 Fisheries

The Sindh coast is about 356 km in length and extends from Karachi to the Indian border. Characterised by a broad continental shelf and a coastline marked by a maze of creeks and mangrove covered tributaries of the Indus River Delta. The Sindh coast serves as breeding grounds for many fin and shellfish species. A large number of fishing communities are settled along the coastal creeks of the Indus Delta in many small and big villages. The fishing population in the province is reported to be living in no more than one dozen big and hundreds of small settlements and villages in Karachi, Thatta and Badin districts. Fishing is the key source of livelihoods for these coastal communities. While not all families own boats, the people get together in small groups of 5-10 and use the boat that belongs to one of them or a local *seth*. The fishing catch is divided between the owner of the boat and each crew member. The *seth* receives a share not only for the boat but also for the engine and the net. The captain receives one or two shares and each of the *khalasis* working on the boat receives one share each.

Overall, the fisheries sector provides employment to about 300,000 fisherman directly and another 400,000 people are employed in ancillary industries. During the years 2000-2002, the total fish production in Pakistan was recorded as 665,000 metric tons, out of which the share of marine fisheries was 480,000 metric tons while the contribution of inland fisheries was about 185,000 metric tons. Out of the annual marine fish exports of Pakistan worth US$100 million, about 10% originate from the Badin coast, while Thatta provides a major share (30%) of the catch. From the total fish production of 80,659 metric tons in Sindh in 2002, about 14,512 tons or 17.5% was supplied by Badin. There has been a significant decrease in fishing catch in recent years due to sea water intrusion in the area. The brackish water fishing resources are quite significant in Badin and Thatta districts. In the project area major inland catch of fish comes from the Indus River and its canals, followed by its lakes such as Manchar and Kinjhar Lakes.

Badin district has many other freshwater fishery development locations including the natural depressions and waterways such as the dhoro puran, surface drains, inland

lakes, tidal lakes and canals and distributaries etc. development of freshwater fisheries at selected locations from amongst these areas could yield significant gains in terms of fish production as well as income generation from the local communities. In Badin district there are 100 public water areas comprising of a network of 28 canals/distributaries, 39 drains and sub-drains, 24 *dhands* and *dhoras*, and 9 depressions. In addition 21 water areas with key potential for fish, prawns and lobster are under the possession of the Sindh Rangers. There are 370 recorded fish ponds with a total area of around 6,700 ha. Many fish farms reportedly established by influential land owners on government land, natural depressions and lakes are not reflected in these figures. One carp fish hatchery was established on 6 ha by the GOS in 1998, however, it has till date organised very limited training courses for fish farmers and has provided only 30,000 fish seedlings on subsidised rates.

The main freshwater fisheries resources of Thatta district include about 100 small and large lakes, the extensive system of canals and watercourses and rice fields. There is a very well equipped hatchery and research facility at Chilya near Thatta. Also, a hatchery has been established near Badin. The research and extension program of these centers is very limited.

### 3.6 Off-farm Income Generation

The economically active population in Badin district was estimated at 18% of the total population and 27% of the population aged 10 years and above. There is a wide variation in activity rates between males and females as it is 33% for males compared to just 1.8% for females resulting in an overall low participation rate. A high rate of un-employment at 14% has been recorded in the district, which varies between gender as well as for rural and urban areas. The un-employment rate for males is high at 15% compared to only 2% for women. The low participation and un-employment rates for women clearly indicate that they are generally missed from official statistics. In Thatta district, the economically active population is 25% of the total population and 37% of the ages 10 and above. A high un-employment rate of 18% was recorded for the district in 1998.

The percentage distribution of employed persons by employment status indicates that 64% of the labour force is self employed. The majority of male workers, i.e., 67% are employed in agriculture. About 30 percent of urban males are employed by the private sector compared to only 9% for rural males. Furthermore, 17% of working females are employed in the government sector in the urban areas compared to only 4% in rural areas. However, in the coastal areas, a majority of the people are involved in fishing with farming and wage labour as important secondary sources of income.

The data on income of survey households (WB Survey 2005) shows that 27% of the households were earning less than PRs 1,000 per month (US$0.45 per day) and can be classified as extremely poor. About 48% of households were earning between PRs 1,100 and PRs 4,000 per month (US$0.50 - $2.20 per day) and also fall below the poverty line (PRs 6,954). Only 18% of households earned between PRs 4,000-8,000 and only 6% earned more than PRs 8,000 per household in the two districts.

Many industrialists have taken advantage of the close proximity of the large market and port facilities in Karachi and located themselves in these two districts. From the industrial point of view Thatta district has made good progress, where about 30 industrial units

have been established. Apart from the sugar mills, all the larger industrial units are located in Dhabeji and Gharo adjacent to Karachi. Most of the labour in these units is generally non-local and commute to and from Karachi. Badin district has one sugar estate. Presently there are six large scale sugar mills which provide employment to over 6,000 persons. In addition there around 70 rice husking and milling units. Recent additions to the industrial units are the car manufacturing plant near Budho Talpur, belonging to the Deevan Group adjacent to the Deevan Sugar Mills in Thatta. The group also employs non-locals in large numbers.

Badin district produces more than 30,000 barrels of crude oil per day, which constitutes 45% of the total crude oil production in Pakistan. However, the district government does not benefit from this natural resource, they do not collect royalties. It is also reported that the local communities do not substantially benefit from the employment generated from this industry as only about 5% of the permanent and tenure employees come from local communities. Other natural resources exploited from the districts include stone from Makli hills and Kohistan which is supplied to the Pakistan Steel Mill and the Thatta Cement Factory. There are also large coal deposits in the Thatta Taluka.

Overall, local people in the project area in Thatta and Badin are not benefiting (at least directly) from industrial development and only really indirectly through roads/transport. Most farmers generally work on other farmers and not industrial units.

## 4. LIVELIHOOD SUPPORT SERVICES

### 4.1 Input Supply

The inadequate supply of essential inputs to farmers is cause for grave concern and is an area which will need to be addressed by the project. The following section highlights these and other issues.

**Seeds of Improved Varieties**

A number of crop varieties have been developed by agricultural research institutes and released by the Provincial Seed Council from time to time. It is impressive to see new crop varieties being released, however it is a matter of concern that most of these varieties do not get the acceptance of the farming community. In practice there is only a couple of varieties of each crop that bare common with the growers. In the case of wheat crops, TJ-83, Sarsabz, Kiran-95 and Inqlab (Punjab-based variety) are in demand. For rice IRRI-6 is the most common variety. A significant recent development is the introduction of Basmati rice as a result of water scarcity. In the case of sugarcane, some of the commonly grown varieties such as BL-4 and PR-1000 and a recently developed variety Thatta-10 have not yet been officially approved.

Currently there is no satisfactory system for the multiplication and distribution of quality seed to farmers. The Sindh Seed Corporation (SSC) was established by the government in 1983 to produce, multiply, procure, process and distribute genetically pure and certified seed to the growers to enhance crop production. The SCC covers an area of 5,945 ha comprising six basic seed farms. The area is sufficient for production of basic seeds of various crops required in the province. So far the basic seed production from these farms has not been able to meet the needs of the problems. Major problems faced by these farms include lack of cooperation by tenants with SSC staff to carry out various

technical procedures, scarcity of irrigation water, large portion of salt-affected soils and general management constraints. A seed processing complex was also established at Sakrand in 1980-81, consisting of facilities to process cereals and cotton. However, the plant even if fully functional was not able to meet a fraction of the demand for wheat and cotton seed. Thus there is tremendous scope for the development of a seed industry in Sindh through private sector involvement.

It is important to note that the SSC was closed in 2002, however, due to pressure from all stakeholders (government and private sector) the corporation has been reopened in mid 2005. In addition, in October 2001 the government established the Foundation Seed Cell (FSC), under the Director General Agriculture Research Sindh, for basic seed production.

Not only are there problems with supply but also of concern are the problems of seed adulteration where seed of low quality varieties are mixed with that of improved cultivars. The commercial sector generally handles the supply and distribution of vegetable and other seeds, however this too is affected by malpractice. This was especially the case for sunflower in recent years. The situation of seed supply is a major cause for concern and it is considered imperative that the project in some way tries to ameliorate the situation through support to multiplication and the distribution of quality seed through carefully monitored agriculture input supply outlets.

**Fertilisers**

Fertiliser data for Sindh as a whole shows that nitrogen use increased by 59% from 0.323 to 0.515 million tonnes, and phosphate by 92% from 0.077 to 0.148 million tonnes during the period 1990-91 to 2000-2001. During the same period the use of potash declined from nine to four thousand tonnes. The average use of fertiliser in 2000-01 was 161 kg/ha, which included 124 kg/ha N, 36 kg/ha P and 1 kg/ha K. In comparison fertiliser use in the project area in Badin and Thatta is much lower, especially in areas with non-perennial water supply and for low value crops like sorghum and millet. Although no hard data exists it is considered that in the perennial areas the levels of fertiliser use are comparable to those quoted for Sindh as a whole. The reasons for low application of fertiliser are the poverty status of communities hence lack of sufficient funds to purchase inputs, the disproportionately large (60%) proportion of the profits from cropping that the landowners take from the *hari* farmers which acts as a disincentive, the low levels of crop management, and the very high level of indebtedness of the farmers.

Micro-nutrient studies in Sindh have established that zinc is the most deficient micro-nutrient, and zinc application is recommended for rice and banana. Similarly cotton has shown a response to the application of boron. Most of the micro-nutrient research is limited to field crops and no work has been done on fruit trees. Further work is necessary to clearly establish the nature and extent of micronutrient deficiency problems, crops affected by these deficiencies and the cost-benefit analysis of micronutrient fertilisation.

According to official statistics, higher doses of chemical fertiliser (188+113+125 kg NPK/ha) was applied to crops having higher economic returns i.e., sugarcane, particular vegetables and orchards, while does applied to other crops were low. Cotton, wheat and rice applied 80 kg N/ha and 55 kg P/ha. About 25 kg K/ha was applied to other

vegetables. The use of chemical fertiliser has declined since 1996, due to low prices of sugarcane and rice in recent years. Consequently the yields of crops have declined. It is possible with the lower use of chemical fertilisers that greater use could be made of organic fertiliser and environmental management technologies for a more sustainable agriculture system.

The Directorate of Plant Protection, Agriculture Extension, Sindh, is responsible for quality control measures under the Sindh fertiliser Control Act. Authorised officers of the district agriculture extension have the mandate to regularly sample the fertilisers from markets and have their quality ascertained from the officially recognised laboratory of the Agriculture Chemist (Soil Fertility) at Tandojam. Only a small number of cases of adulteration are ever followed up, and hence there is growing public concern about the marketing of substandard and adulterated fertiliser.

**Pesticides**

On average 2-3 sprays of insecticides are applied on cotton and sugarcane crops. Vegetables crops such as chillies, okra and tomatoes can be heavily infested by insects and can receive up to 5-10 sprays/crop. Weed problems in wheat is sometimes combated by the use of herbicides. Rice, maize, and millet/sorghum are generally grown with not pesticide application. Mango may get one spray of pesticide for fruit fly. Seed dressing is not common.

Plant pests are managed primarily by using pesticides, where a major part of the pesticides is used for controlling pests on cotton, fruits, vegetables and rice. The private sector has played a major role in promoting the use of pesticides with aggressive media campaigns on television and radio that helped to convince farmers to use these chemicals. However, despite the sharp increase in pesticide use, the problems have not been solved. On the contrary, the excessive and indiscriminate use of broad-spectrum chemicals has led to many pest outbreaks and has damaged human health and the environment. It has also disturbed the agro-ecosystem and killed non-target bio-control agents. Such disturbance in the agro-ecosystem has induced pest resurgence and increased the resistance in naturally occurring pest populations. For example, the populations of natural enemies in cotton growing areas have declined as much as 90% in the last three decades.

Monitoring of the quality of pesticides is the responsibility of Sindh Agriculture Extension. Under the provisions of the Agricultural Pesticide Ordinance, 1971, inspectors are authorised to draw samples of pesticides and send them to the government analyst for testing. In a similar situation to fertiliser, but to a greater extent, very few cases of adulteration are decided against the perpetrator, with serious repercussions of the agriculture sector as whole. It should be noted that this problem is also found for the sale and quality of veterinary drugs and vaccines used for animal health control measures.

**Farm Machinery and Tractors**

In the project area land cultivation is undertaken by a mix of either mechanical or animal drawn operations. Generally large land owners use the former while tenant farmers use the latter as well as manual cultivation practices. The cost of M&O is becoming increasing expensive for tractor operations, and with declining yields farmers are tending to move away from this form of land cultivation to animal traction.

## 4.2 Credit

The provision of micro-finance and the status of the current system for credit in the project area are being covered by the Enterprise Development Specialists in their report. It is useful however to point out that due to the level of poverty and indebtedness of the target population, that conventional ways of providing credit through micro-finance institutions are not feasible.

Credit facilities for farmers are lacking. There are a number of branches of Zara Tarqiata Bank Limited (ZTBL) in the project area. The lending operation of this bank are quite limited as Badin for example is one of the black-listed districts of Sindh, where the proportion of defaulters is quite substantial due to a high incidence of natural disasters and liquidity problems faced by the communities.

## 4.3 Extension Services

At district level the office of EDO Agriculture manages the development services for almost all the green sectors including agricultural extension, livestock and poultry development, forestry and inland fisheries. The office carries out various activities in accordance with the directions of the relevant departments of GOS. District specific programmes and projects are yet to be developed and implemented. Research components are reportedly weak. No adaptive research farms and stations are located in the districts, and links between research and extension are for the most part non-existent.

**Agriculture Extension Systems**
The Agriculture Department, GOS, looks after the requirements of the agriculture sector in the province. The three wings of the Agriculture Department are Agriculture Research, Agriculture Extension and Agriculture Engineering and Water Management. Each wing is headed by a Director General. The extension section of the Provincial Agriculture Department is responsible for the introduction and dissemination of improved crop production technologies and crop varieties, fertilisers, pesticides and farm machinery, and for the collection of crop statistics. It also aims to provide information to growers on issues such as the insect pest outbreaks and the adulteration of pesticides and fertilisers. Implementation of various act/laws such as the Cotton Control Act, Agriculture Pesticides Ordinance, Sindh Fertiliser Control Act, and Agriculture Produce Market act is also the responsibility of agriculture extension.

After the devolution of agriculture extension services to district government in 2001, the organisational setup has undergone some changes. Instead of ten there are now five directorates. These are: Coordination, Plant Protection, Training, Agriculture Information and Agriculture Marketing, and one Joint Director Agriculture Statistics.

The Director Coordination is responsible for coordination with all the components of agriculture extension including technical planning and implementation, supervision of data collection, preparation of agriculture statistics and looking after various demonstration farms (seed farms and adaptive research farms). The Joint Director, Agriculture Statistics, works in close collaboration with the Coordination Directorate, where he is responsible for the collection and preparation of crop yield and production estimates for the province through sampling techniques. The Directorate of Plant Protection is responsible for the registration and licensing of fertiliser and pesticide

dealers, quality control of pesticides and fertilisers, suggesting suitable amendments in Agriculture pesticides and Fertiliser related act/rules, coordination with district governments regarding enforcement of different acts/rules related to pesticides and fertilisers and monitoring of pest problems.

Training activities for Sindh Agriculture Extension is provided by two Agricultural Training Institutes (ATI) located at Jacobabad and Sakrand. Since 1996, female Field Assistants have been enrolled at ATI Sakrand. The Directorate of Agricultural Marketing, under the provisions of Agricultural produce Market (APM) Act 1939 and other related provisions, help regulate the purchase and sale of agriculture produce (while protecting the interest of the growers) and the establishment of agriculture produce markets in the districts.

The budget for agriculture extension has increased by only 22% in 10 years from PRs 235.4 million in 1992-93 to PRs 288.4 million in 2001-02, while the salary component has increased by 144% in the same period. This is reflected in the proportion of O&M budget which reduced from 53.5% in 1992-93 to only 6.9% in 2001-02. This sums up the problems that the extensions process faces, especially as regards the undertaking of actual operations in the field.

Private sector agencies dealing with seed, fertiliser, pesticides and agricultural machinery, along with some NGO's are sharing agriculture extension services with the public sector, particularly where their business interests can be served. Private sector companies carry out aggressive marketing campaigns including farmer meetings, village level meetings, demonstrations, field days and publicity through electronic and print media to ensure farmer support. The government needs to reassert its priorities and, at the very least, regulate such commercial campaigns that may not be in the best interests of the farming community.

The agriculture extension unit needs to be strengthened to provide quality expertise and support to growers. The staffing levels at the district are below strength.

**Livestock**

The system for livestock extension comes under the control of the Animal Husbandry Department which through its district offices is responsible for a range of services to the communities in the project area. These services include the Livestock and Poultry Departments situated in the district centres of the two project districts. The on-going programmes are: (a) the establishment of mobile veterinary dispensaries to cover farmers in the coastal area, which provides services such as vaccination and drenching; (b) the provision of breeding sires for Red Sindh cattle, Kundhi buffalo, Kamori goat and Kuka sheep to progressive farms on a community basis; (c) the establishment of sheep shearing demonstration units to improve wool quality and quantity; and (d) a number of women with basic education will be provided with training in livestock production, diary product processing, management and disease control.

The district staffs are further supported by the EU Strengthening of Livestock Services Project (SLSP), which provides training to farmers through NGOs in livestock management, production and marketing.

The constraints for livestock development especially as it concerns livestock are the large number of livestock units in the coastal area, where it is very difficult to provide decent health coverage. Also the is always a shortage of feed and fodder negatively

affecting growth and production, and due to budgetary constraints there is a severe shortage of medicines and vaccines. Lack of transport for technical and para-vet staff is also a severe constraint.

**Forestry**

The Forest Department of Sindh has the mandate for forest protection and development in the province. At the district level the District Office Forests has the immediate responsibility for raising container plant nurseries of tree seedlings, farm forest block plantations, hurries and shelter belt plantations. Programme activities include the provision of saplings from their nurseries, for planting on farm plots. Forestry office staff provides technical information to the farmers.

NGOs are active participants of the forestry plantation programmes in schools, colleges, hospital and basic health units, where the NGO personnel are trained by the Forestry Department staff in agroforestry technologies. Pakistan Armed Forces have received many plants form the forest nurseries for their cantonment areas.

Forest extension methodology includes a number of activities: (a) every year spring and monsoon plantation campaigns are launched, (b) seminars and workshops, and (c) publicity and information dissemination through radio and television.

Constraints and issues related to forestry are a lack of funds to establish forestry nurseries close to farmland to alleviate the problem of sapling distribution and get the communities more involved in these activities, and farmers are ready to provide their barren lands for the cultivation of forest trees and agriculture crops in order to reclaim the land. It was suggested that the following works need to be undertaken before plantations are established: jungle clearance, uprooting/eradication of stumps, burning of brushwood, rough levelling of land, layout of irrigation system, fine levelling and then planting. It is necessary to reclaim the land before planting, and where agriculture crops like jantar, berseem, losan and other salt tolerant fodder crops should be cultivated before planting trees. The initial stage of this programme is for 100 farmlands of 20 ha, and where after completion of the works the land would be the sole responsibility of the landowners. The target is for 2,000 ha of coastal land over a five year period, with 400 ha established each year. After the establishment of the plantations it is planned to construct water ponds in each 20 ha of farmland. These ponds would provide water for aquaculture, livestock and irrigation.

In addition to this initiative the district Forest Departments want to establish model village farms, with the active participation of farmers and community residents. Nurseries would again be raised near to their land and the plants distributed among the farming community. Drought, saline and waterlogging resistant species would be planted into the plots, including *Eucalyptus, Conocorpus, Acacia, Azadarica, Sukhain* and fruit trees like *Zizyphus, Jaman, Badam* and papaya.

## 4.4 Research

**Agriculture Research**

Agricultural research in Sindh is headed by the Agriculture Research Institute (ARI) in Tandojam. Five important research institutions and soil testing laboratories that now work under the Director General are:

- Agriculture Research Institute (ARI), Tandojam (district Hyderabad)

- Rice Research Institute (RRI), Dokri (district Larkana)
- Sindh Horticulture Research Institute (SHRI), Mirpurkhas
- Wheat Research Institute (WRI), Sakrand (district Nawabshah)
- Quid-e-Awam Agriculture Research Institute (QAARI), Naudero (district Larkana)

There are District Soil and Water Testing Laboratories in all districts of Sindh province including Thatta, Badin and Karachi. The central laboratory at Tandojam provides support to all district laboratories. These laboratories were established in 1983-84 to provide facilities of soil, water and fertiliser sample analysis and also for advisory services to the farmers regarding efficient use of fertilisers. In order to make this service more accessible to farmers, nine mobile soil and water testing laboratories were added in 1994.

The five research institutions have total of 477 research scientists of which none hold PhD's. Only 2% of research scientists in the public agriculture research system in Sindh during 2002-03 were women. The yearly non-development research budget has increased from PRs 62.15 million in 1992-93 to PRs 194.1 million in 2001-02. Forty-seven percent of this went to staff salaries. The operational budget constituted 13.9% of 1992-93 budget and now stands at 6.5% in 2001-02 (total PRs 13.73 million). This budget is clearly insufficient to meet current demands for research.

Analysis of the budget allocation for public agriculture research on a commodity basis indicated that PRs 364 million was allocated for rice research, PRs 250 mn wheat, and PRs 100 mn oilseeds for year 2002-03, whereas in the case of minor crops PRs 26 mn went to pulses and PRs 6 mn barley.

The Pakistan Agriculture Research Council (PARC), Islamabad, extends support to the provinces through nationally coordinated research programmes. There are a number of agriculture related federal research institutions in Sindh. These include the following:

- Nuclear Institute of Agriculture (NIA), Tandojam
- Cotton Research Institute, Sakrand (CRIS)
- Drainage Research Centre (DRC), Tandojam
- Sugarcane Research Institute (SRI), Thatta

In addition to these the Provincial Oilseed Directorate Sindh, Karachi is under the responsibility of the Pakistan Oilseed Development Board (PODB), and has the mandate to undertake research on oilseeds crops, where it has been particularly focusing on sunflower and oil palm. Furthermore, there is the Drainage Research Centre, Tandojam, which comes under the Pakistan Council of Research in Water Resources (PCRWR). It is working on land reclamation, alternative systems of irrigation including drip and sprinkler.

Private sector organisations such as fertiliser and pesticide companies, sugarcane industries, and the farming communities also make a contribution to the research and development efforts of the public sector, through programmes such as the development of programme of the newly established Sugarcane Institute at Dewan Sugar Mills, Thatta.

Sindh Agriculture University (SAU) Tandojam is the only institution providing agriculture related education in the province. It produces graduates and post-graduates in Agriculture Extension, Agriculture Research, Agriculture Engineering, Water Management and Livestock. The university has a current enrolment of around 4,000 students in all programmes. In recent years the annual enrolment has reduced to around 200 students per year against the capacity of 800 students per year. The university also has a highly qualified teaching faculty of 220 of which 25% possess PhD degrees. The Z.A. Bhutto Agriculture College at Dokri is a constituent college of SAI and offers bachelors degree in various disciplines of agriculture. The SAU undertakes a range of research in agriculture through its programmes with post-graduate students.

In the light of new developments in South Asia, curriculum appraisals are needed in order to incorporate a more historically informed critique of agriculture practices over the past decades. A better understanding of the effects of the Green Revolution in there area and its detrimental affects also needs to be incorporated in the future programmes of the research organisations. This is especially true for the project area where much of the present research output has little or no bearing on the current range of constraints to agriculture production.

Issues that need to be addressed as regards agriculture research are: (a) the need for better coordination and collaboration between and within research organisations on specific clearly defined topics, (b) better funding for priority research, (c) a greater focus on poverty and its alleviation, and (d) as regards the project area focus on the problems of concern – salinity, drought tolerance, waterlogging, improved cultivars of major crops, alternative cropping systems, and a better understanding of the prevailing farming/livelihood systems.

**Livestock Research**

The main government organisations involved in the livestock sector is the Animal Husbandry Department which has a network of veterinary clinics; hospitals etc and are mainly responsible for livestock health. The Poultry Research Institute (PRI), Karachi, is the only research institute on poultry in the public sector which was established by FAO. Its mandate is to carry out research work on disease, nutrition, management, production economics and other aspects of the poultry industry. The Sindh Poultry Vaccine Production Unit, Karachi, is the unit working on the production of vaccines against poultry diseases like Newcastle disease. Central Veterinary Diagnostic Laboratory, Tandojam, an institute established under the FAI/UNDP programme, and has a network of collection centres at various district headquarters from where samples, disease affected body parts, tissues, etc., are sent for investigation and diagnosis. This directorate is mandated to carry out serological surveys of commonly occurring disease of livestock. The Vaccine Production Unit, Tandojam, produces vaccine for large animals. Other institutions involved in livestock sector in Sindh are:

- Faculty of Animal Husbandry and Veterinary Science, Tandojam.
- Directorate of Animal Breeding, Hyderbad.
- Livestock Experimental Station, Korangi, Karachi.
- Livestock Experimental Station, Tando Mohammad Khan.
- Livestock Experimental Station, Nabisar Road.
- Livestock Experimental Station, Rohri.
- Kamon Goat Farm, Dadu
- Arid Zone Research Station, Umerkot.

There are several options to increase productivity per unit of livestock. Biotechnology has an immense potential to revolutionise animal production. The province of Sindh has excellent tropical breeds of livestock which are well recognised all over the world. Sindh's cattle, buffalo, goat, sheep and camel breeds are multipurpose breeds and have good genetic potential. In order to conserve and improve productive capabilities of such animals, and for the development of livestock health, there are several options for the future.

Improved performance requires a better understanding of the fundamental relationships within the farming system. Far too often livestock are considered as a single commodity and insufficient allowance are made for the multipurpose animals in the village setting.

With the exception of commercial poultry producers, research results generated at public institutes and agriculture universities should be transferred to the farmers through technology transfer and an effective extension system. Widely promoted technology packages in the past have neglected the enormous variability between farm resources and animal practices in Sindh. The technical packages imported from other countries lacked an understanding of the every day livestock techniques practiced by the local farmers and the basic rationale behind these practices.

Livestock is customarily maintained on conventional feeds coming from natural rangeland vegetation, fodder crops, cereals and milling by-products in the irrigated areas. There is considerable evidence that indicate that the availability of these feed resources is declining against the pressure of frequent drought, declining area of cultivable land due to shortage of water, salinisation and waterlogging, and increasing pressure on cultivable land for the production of crops for human consumption. There are untapped resources for feeding of livestock which have not been fully utilised. These include the by-products of the sugar industry (bagasse, can molasses and pith), silage from the banana plant, and crop residue like wheat, rice straw and cotton crop residue can be fed after their on-farm physical or chemical treatment.

It is recommended that livestock research should focus on the following: (a) surveys to identify the characteristics of different livestock systems and to understand the characteristics of different sub-systems of livestock production such as diary production, meat production and draught animals; (b) determine the economically attainable level of livestock production and identify the socio-economic constraints to attain higher levels of production; and (c) analysis of factors affecting decision-making when investing in livestock in different socio-economic conditions, as well as within the context of a total farming system.

**Forestry Research**

Currently all research in forestry is being carried out by the Silviculture Research Division at Miani and Mirpur Mathelo. Staffing levels are much too low to tackle all the outstanding issues for the sector, with only one DFO and one RFO. A research institute, complete with library, computer facilities and research fellows, along the lines of the Punjab Forest Research Institute, Gatwala, needs to be established in Miani.

Forestry research as far as the project is concerned should focus on a number of issues including: (a) identification of saline tolerant tree species which a multipurpose usage

including fodder for livestock, and (b) development of agroforestry systems which are appropriate to the current farming systems of the area.

### 4.5 Participatory Organisations and Cooperatives

NGOs are playing an increasing role in governance related issues. As intermediaries they have helped in the project area to build bridges and established channels of communication and cooperation between communities, government organisations, development institutions and funding agencies. Through the establishment of Citizen Community Boards (CCB), in the Local Government Ordinance 2001, the state has found a constitutional way of including NGOs in local governance and as partners in development. It will be important for the project to make good use of the capabilities and participatory development initiatives undertaken by the NGOs. This issue will be covered in more detail in the reports of the PPTA Community Development Specialist.

To illustrate the type of work these organisations undertake, three NGOs have been selected, the are:

- Orangi Pilot Project-Organi charity trust (OPP-OCT) established 1980, areas of operations Larkana, Hyderabad, Karachi, Thatta, Badin. Thematic area agriculture, business, credit system, poverty alleviation, research and rural development.
- Pattan 1993 Hyderabad Dadu advocacy, agriculture, credit system, culture, development, disaster management/mitigation, education, emergency relief, env/natural resources management, food security, governance, health, information dissemination, infrastructure building/strengthening, poverty alleviation, religion, research, rural development, women.
- Society for conservation and protection of environment (SCOPE) 1988 Thatta, Hyderabad, Mirpurkhas, Karachi. Advocacy, children, communications and media, env/natural resource management, human rights, information dissemination, institution. Building/strengthening, poverty alleviation, research, technology.

### 4.6 Projects and Programs

There are a number of projects and programmes that are currently being undertaken in the project area by a range of organisations including the ADB, World Bank and the European Union. It will be essential to ensure complementarity and avoid duplication of effort among these various development efforts. This topic will be covered in much greater detail by the PPTA Team Leader Institutions Specialists in their report.

### 4.7 Postharvest Operations and Marketing

In Thatta the important items traded are rice, leather and wool. Badin is a famous trading centre for sugar products, tomato, chillies, and fish. Tomato the main vegetable crop which is produced off-season, has good demand and fetches a high price from traders in Punjab. The coal produced from Devi (Mesquite) shrub is sold in various markets of Sindh and Punjab. Livestock markets are organized in various towns on all weekdays. The district is also an important trading centre for traditional and non-traditional oil seeds including sunflower. The main commercial trade centers in the district are Sujawal, Jati, Chuhar Jamali, Shah Bunder, Ghora Bari, Mirpur Sakro, Daro and Mirpur Bathoro. For the most part markets are poor and underdeveloped. Very little postharvest processing is undertaken by farmers in the project area.

# Appendix 4 - Aquaculture Background Paper

## Sindh Coastal and Inland Community Development Project
## Integrated Mariculture Pond System: Proposed Pilot Scheme at Three Sites
## November 28, 2005

**The Problem:**

There are no accurate data on the number of fishers and the annual fish catches (volume and species composition) in the Indus Delta which might indicate recent trends in the capture fisheries. However, anecdotal evidence and field observations suggest that the capture fisheries in this area are under increasing pressure from over-capacity (too many fishers; some are recent entrants from declining agricultural areas), illegal fishing (inappropriate gear), and a pervasive lack of enforcement of fisheries regulations (all classical signs of an open access, unregulated fishery).

Fishers living in the Delta continue to use small mesh nets and barrier nets, do not respect size limits, and do not recognize restricted seasons (for example, the fishing restrictions in June/July). Observations of catches in the tidal creeks and irrigation drains indicate prevailingly small specimens of a range of species (shrimp, crabs, pelagic fish, flatfish, etc.; see Figure 1). The species composition in observed catches reflects an increasing marine influence in the lower reaches of the creek and drain system, with euryhaline species very common. There is a corresponding concern regarding the decreasing area of freshwater influence in the Delta, and the reduction in freshwater fisheries (capture fisheries: for example, the *palla*, which migrates up the creeks and main branch of the Indus, has declined significantly in some reaches; and pond culture, mostly carp, is also apparently declining, but seems of less concern than *palla*). Fishers near coastal areas are forced to rely on catching more marine species which, in Pakistan, have lower value than freshwater species.

There is very little added value, if any, in the fish catches in the Indus Delta (preparation and packaging of fish for human consumption). In fact, much of the intrinsic value of the fish catch is lost in poor handling (poor catch techniques, lack of proper storage, and eventual deterioration in quality – as a result, a lot of the catch goes into chicken feed, with a significant loss of protein conversion efficiency).

There is an additional concern with the decreasing mangrove habitat, which is critically important as a nursery area for a wide range of fish, molluscs, and crustaceans. Mangrove cover in the Delta has decreased by about 70% over the last thirty years (although recently stabilized), which must be reflected in the declining stocks of key coastal/marine species (which are also overfished, in any case, especially shrimp).

A wide transitional area adjacent to the coastal zone, in which there is a scarcity of freshwater (for human consumption), little vegetation, and poor infrastructure and services, results in most fishers having to live in areas further inland (where basic amenities *are* available), thus remote from their fishing locations. These result in time and money spent on transportation, or, alternatively, a requirement to live in very poor conditions in isolated locations adjacent to fishing sites for short periods during the fishing season (see Figure 2).

The situation is further complicated by inequities in the allocation of fishing rights (contracts by auction, and an earlier failed licensing system). As a consequence, some areas remain "unfishable" (local fishers are unable to enter, or are intimidated, especially in the Zero Point area) or the catch of fishers is sometimes appropriated by agents of the zamindars, or sea lords.

The pressures on the capture fisheries in the Indus Delta (not including those prosecuted in the Arabian Sea) and related problems can therefore be summarized as follows:

- increasing pressure from unregulated fishing effort (overfishing and ineffective management of resources);
- an inland/coastal area that is in transition from freshwater/estuarine to predominantly coastal/marine (change in catch composition and value);
- severe reduction in nursery habitat for key commercial coastal and marine species;
- a significant loss of catch value and potentially "easy" human access to protein;
- difficult living conditions in areas that are proximal to fishing sites; and,
- inequity in access to fishing areas.

Figure 1. A typical catch from the LBOD-Tidal Link near Zero Point, comprising primarily small fish (October, 2005; the cigarette butts provide scale).

Figure 2. There are fish, crabs, and shrimp in the drain, but this is no place for people to live (the Tidal Link, near Zero Point).

**The Strategy - Creating Alternatives that Take Advantage of Opportunities, and Learning From Previous Experience:**

The proposed strategy to address problems in the capture fisheries has three main principles:

- develop **sustainable alternatives** that reduce pressure on the capture fisheries;
- **do not compromise or preclude any other economic activities** in or adjacent to the coastal zone;
- create **economic activities** in tandem with **habitat rehabilitation** and **restoration of the natural resource base**.

A separate strategy to increase the value of the existing catch and promote increased consumption of fish in Pakistan is discussed elsewhere. It is also important to continue to address the root causes of problems in the capture fisheries by improving the structure and processes of the Sindh Department of Fisheries and the operations of the fishing communities themselves (the activities proposed in this paper are not expected to solve *all* problems in the capture fisheries).

The approach is intended to take advantage of what is perceived to be an *opportunity*:

- increased access to seawater (continuing intrusion of seawater into the upper reaches of the tidal creeks and the margins of the agricultural areas); and,

- vast expanses of salinized mudflats that are presently underutilized (currently with zero fisheries or agricultural production – see Figure 3: the coastal zone of the Indus Delta).

The most practical alternative that takes advantage of this opportunity (wide expanses of tidal mudflats and access to seawater) is development of extensive (low density, low technology) mariculture (culture of marine/brackish water species under controlled conditions), in tandem with mangrove replanting in strategic adjacent locations. This is referred to as *integrated mariculture pond systems* (aquaculture development integrated with coastal habitat rehabilitation).

It should be pointed out that aquaculture has long been recognized in Pakistan as a reasonable alternative to the capture fisheries; however, it has never been fully realized. Previous efforts at stimulating development of shrimp culture, for example, failed due to inappropriate site selection for a model operation, design problems with ponds, and inability to maintain the required supply of larvae of appropriate species which can thrive in euryhaline (and sometimes high salinity) conditions. The Sindh Department of Fisheries shrimp pond system at Gharo is currently being maintained with minimal shrimp production (*Penaeus indicus*) in only one pond. Plans to scale up commercial shrimp production on the basis of the Gharo facility have not been realized. The Department has also recently built a hatchery in Hawkes Bay. It is just becoming operational now, with production of penaeid postlarvae.

There are also small fish hatcheries in Thatta and Badin (operated by the Sindh Department of Fisheries) that are intended to support carp culture in the freshwater ponds in these districts. These produce some fry for carp ponds throughout Badin and Thatta, but at fairly low levels (there are also some private hatcheries which serve the same function; Jafri, 2004). Recent observations throughout Sindh *do* indicate that there is still significant farm production of carp in areas that have access to freshwater. The Sindh Department of Fisheries has also been experimenting recently with pen culture of barramundi, but apparently the fish in these pens have been stolen by local fishers. There have also been some experiments with pen culture of mud crabs, but these were unsuccessful, due to design problems, high water temperatures, and a high predation rate among crabs, due to lack of size classification and too high densities (ADB RETA 5974). An additional problem is the lack of extension on aquaculture, such that most communities living in the coastal areas of Thatta and Badin are not aware of aquaculture options.

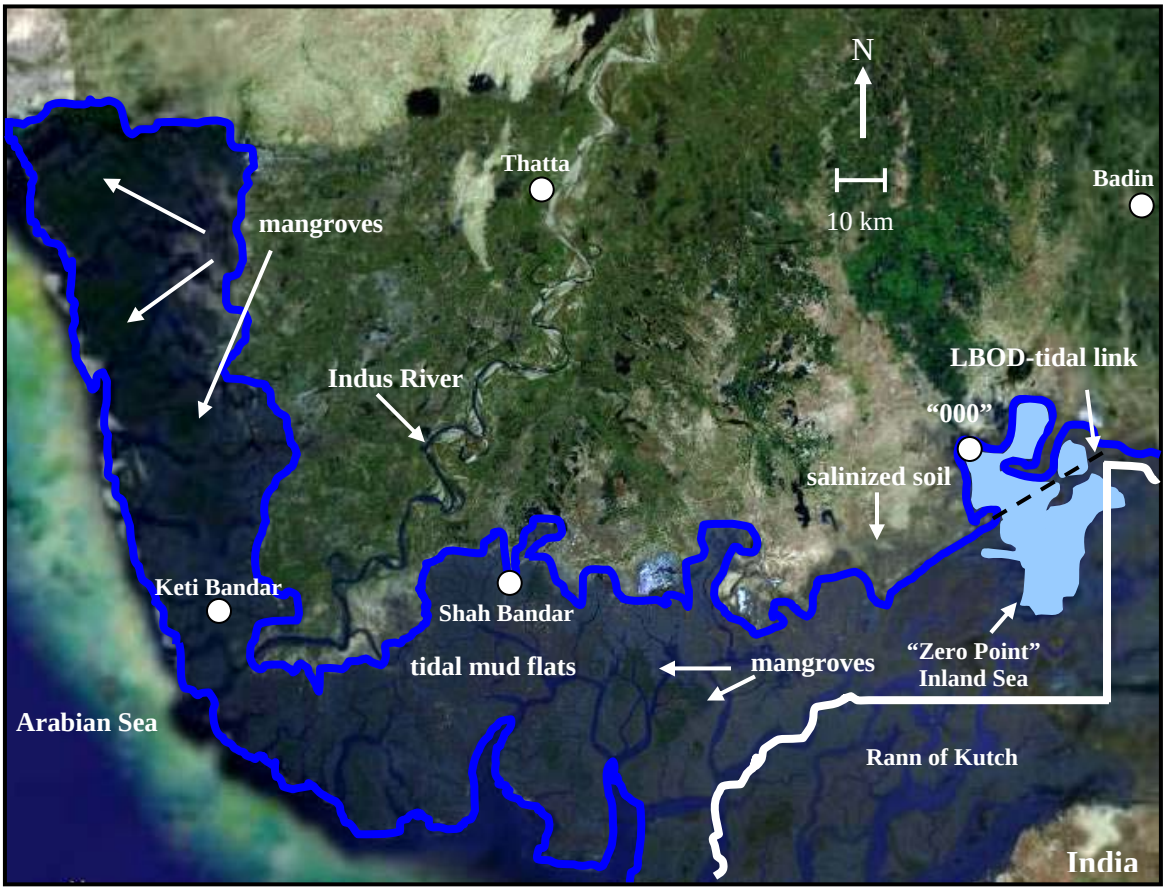
The proposed approach for the integrated mariculture pond system is intended to:

- build on previous experience;
- make best use of existing facilities;
- avoid previous pitfalls, by addressing all known constraints in the selected areas and weaknesses in institutional processes; and,
- start with pilot-scale interventions in three locations, to minimize risk to the loan funds, and to further test the practicality of the concept.

The site selection criteria and the basic design requirements for the integrated pond system are noted below. The selected sites are described, along with conceptual-level specifications for the integrated pond system. Cost estimates and an assessment of the viability of scaling up the integrated pond system throughout the coastal zone of the

Indus Delta are then provided. The development of the integrated pond system concept is consistent with the principles outlined in the draft "National Policy Framework and Strategy for Fisheries and Aquaculture Development in Pakistan" (November, 2005), in which development of aquaculture by communities living in coastal areas is encouraged.

Figure 3. Coastal Zone in Thatta and Badin (2005).



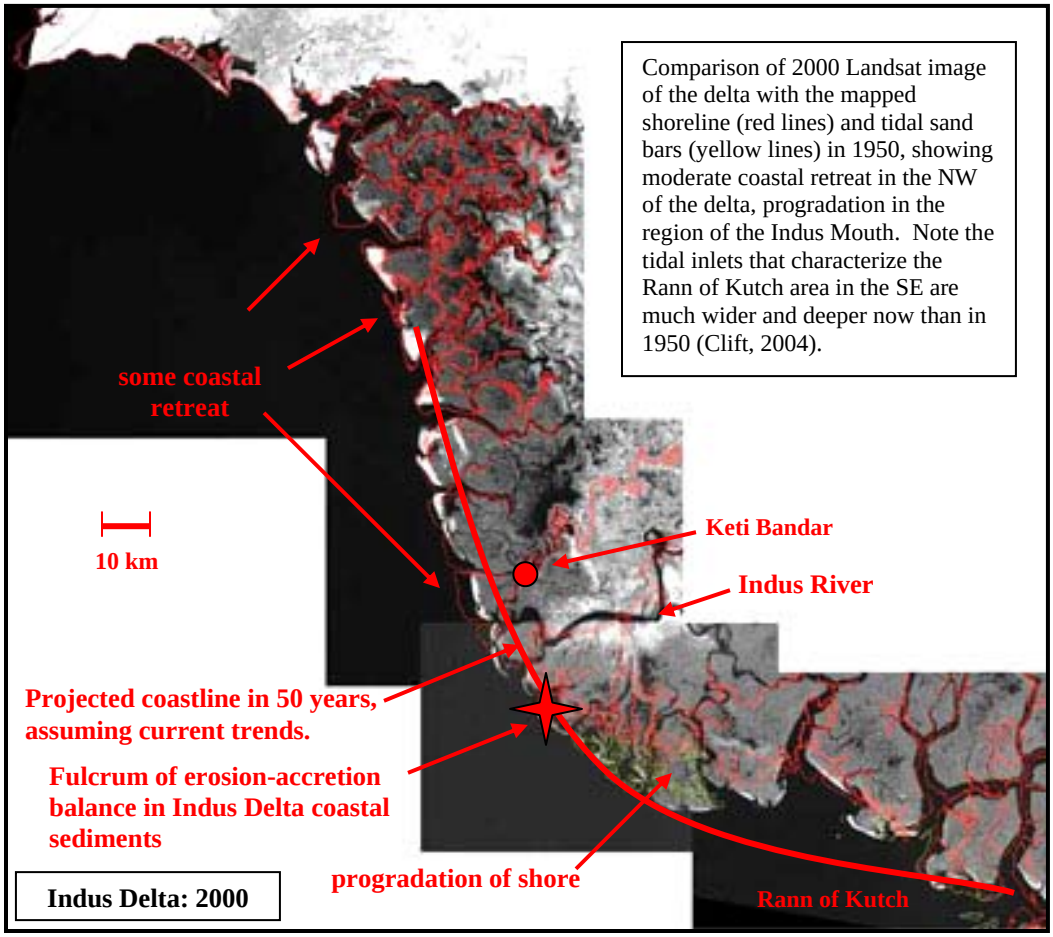

**Site Selection Criteria and Basic Design Requirements of the Interventions:**

In order to follow the principles of the strategy noted above and ensure the highest possible chance of the proposed integrated mariculture pond systems working effectively, the following site selection criteria and basic design requirements were defined:

- Proximity to **available labor**: settlements within 10-15 km, able to move on a daily or weekly basis along existing tracks or roads.
- Areas that will **no longer receive significant amounts of freshwater** from the Indus (however, still a possibility of some relatively fresh water from irrigation drains or just occasional rain).
- Areas that have **no potential for agriculture** in the future (no irrigation, and base soils are salinized).

- Areas that have **access to seawater** on a daily basis (under tidal influence **with good water exchange**).
- Areas that are **not within the projected 50-year coastal erosion zone** (see Figure 4).
- Areas in which infrastructure, ponds, culture and harvesting gear **can be protected from cyclones and tidal surges** (by strategic siting and planting of mangroves).
- Areas that currently have **zero land production value and no habitation** (just small-scale capture fisheries in the tidal creeks and drains).
- Areas that are **suitable for planting** of one or more of the following **mangrove species** (*Avicennia marina, Rhizophora mucronata, Ceriops tagal, Aegiceras corniculata*).
- Areas that have **some potential to support small permanent settlements**, assuming road/track access, local electricity supply (wind/solar), drinking water trucked in, public transportation to additional services in the towns (schools, markets, clinics).
- **Area can be leased** from Government or landowners (outright lease, or equitable sharecropping system, if necessary; documented in certificates and contracts).
- Areas which are **not currently designated as Wildlife Sanctuaries and/or Ramsar sites**, especially those of importance for migratory shorebirds.
- Interventions are **amenable to long-term economic incentive systems** (paid labor, profit from mariculture, annual habitat custodian payment system).
- Interventions are **low technology and within the capability and scope of interest of local communities, and suitable for small business management systems** (assuming that capacity building will occur).
- A **net social, economic, and environmental benefit** can be demonstrated over the long-term.
- Interventions can be **relatively easily replicated,** with appropriate extension from Government and NGOs.
- There is **wide geographical scope for extending the interventions** into other suitable coastal areas in Thatta and Badin (up to a certain **capacity limit**, suggested as **appropriate density of activity** in **one-third of available area zoned for the activity**, to **not foreclose future opportunities** for these areas and to **preclude negative environmental effects**); potential for future expansion into the Karachi area and coast of Balochistan.
- **Interventions can be implemented without creating jealousies** within the community; there is opportunity for **wide and equitable distribution of benefits within the community.**
- **There is an opportunity to reduce the degree of bonding of fishers to *arthis* and *baiparis*,** through cash injections (for labor) into the community (hopefully, middlemen can be discouraged from undermining the local resource management system that will develop with the project).

Figure 4. Coastal sediment dynamics in the Indus Delta.




**Candidate Sites:**

Three sites have been selected for development of integrated mariculture pond systems at a pilot scale, adhering to the site selection criteria noted above:

- Keti Bandar;
- Shah Bandar; and,
- Zero Point ("000") near Ahmad Rajo (northwestern corner of the Inland Sea, near Badin District).

These sites are shown in Figures 5 and 6.

Figure 5. Keti Bandar/Shah Bandar Proposed Intervention Sites.

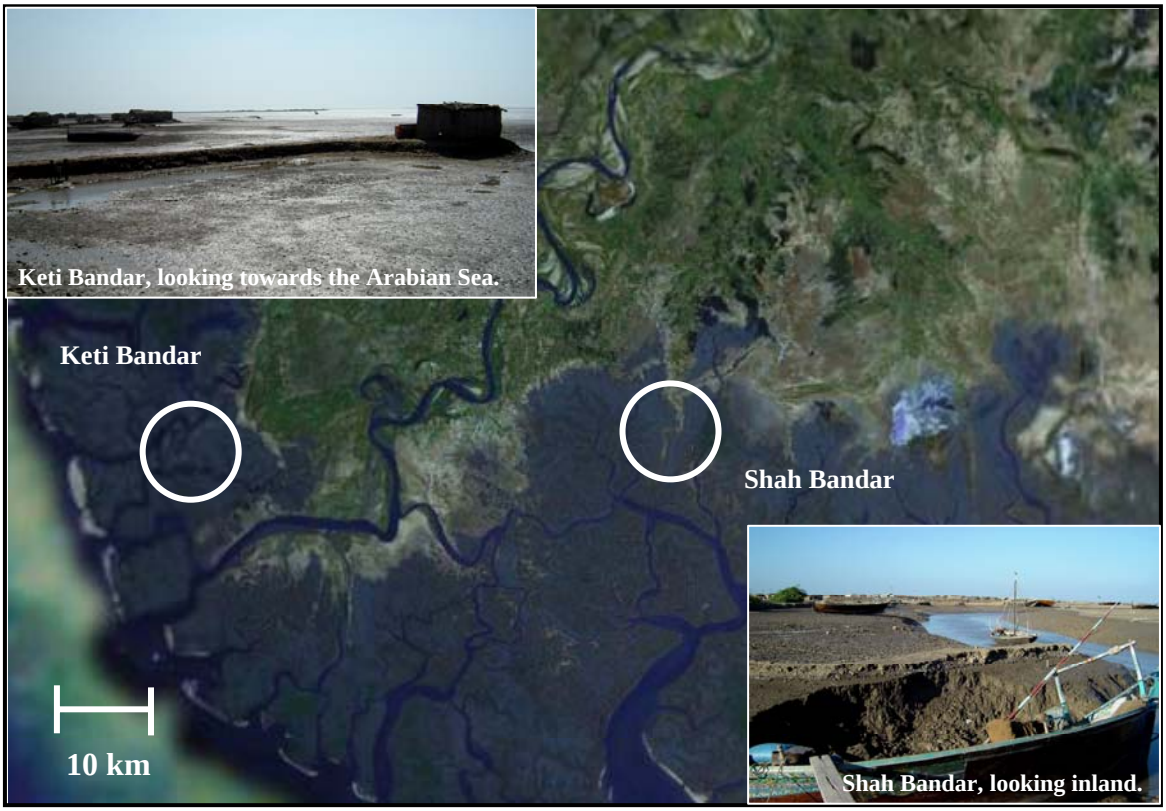
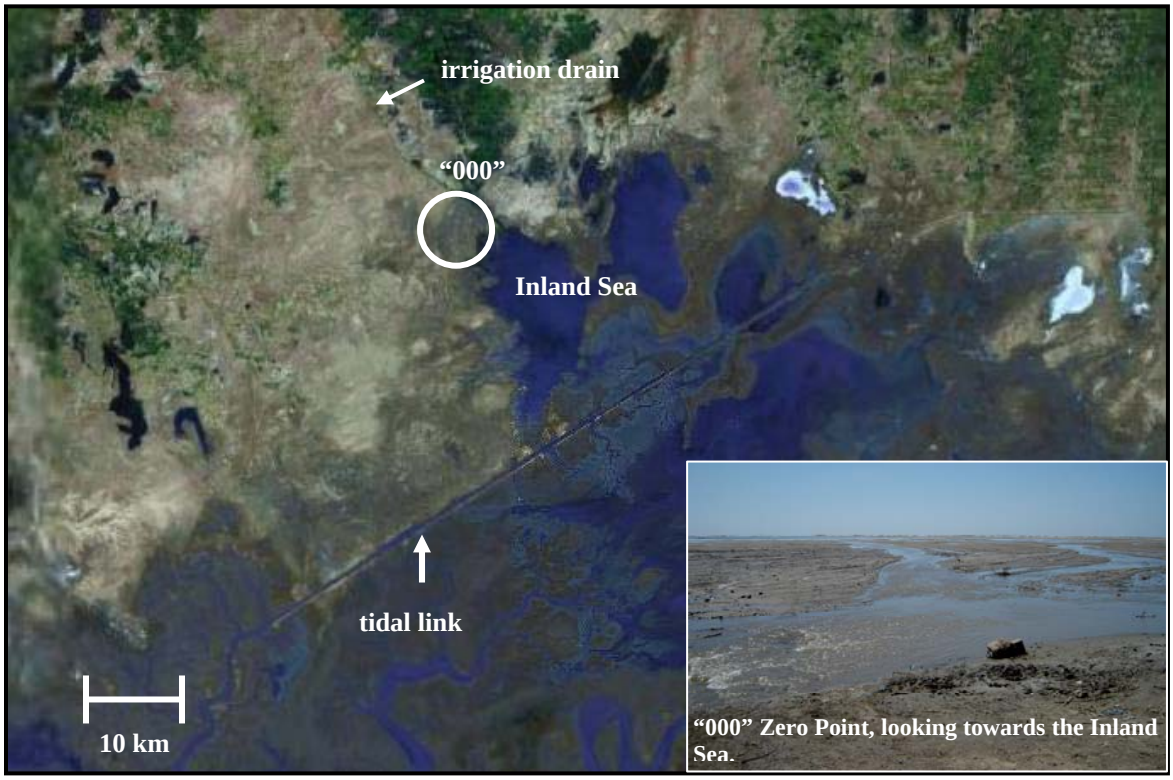



Figure 6. Zero Point Proposed Intervention Site.



*Keti Bandar*

Keti Bandar is located on an old branch of the Indus River (Hajamro Creek), which is no longer connected to the main channel (Figure 5). The town has apparently been subjected to various calamities over the last two hundred years, suffering from earthquakes (for example, "Rann of Kutch" earthquake in 1819), erosion, and "slipping into the sea" on various occasions (probably actually slipping into a branch of the Indus River during flood conditions in the Indus, rather than being lost to the sea), and moving location several times as a result (in the recent past, Keti Bandar residents lived on both sides of Hajamro Creek; most have now pulled back to the bunded area of Keti Bandar, but there are still at least six fishing villages along the creeks, within 5 km of Keti Bandar).

The north branch of the Indus River, on which Keti Bandar used to lie, has been silted up (probably a combination of natural adjustments in the lower branches of the Indus, caused by variations between flood and drought conditions and, more recently, reduced flow in the Indus) and over the last hundred years or so, was converted to agricultural land that ultimately evolved into mudflats. The current location of Keti Bandar is still connected to the sea, but is isolated in the coastal zone, connected to the agricultural area to the east (north of the Indus River main channel) by a recently constructed road (1995) that is rip-rapped (stone) for protection against erosion.

Keti Bandar still supports a significant population (about 3,000 people; IUCN, 2002; about 1,695 people in 275 households in the town and the rest in surrounding villages; WWF, 2005). Most people in this area are involved in the coastal fishery. Apparently many fishers move into temporary villages in the mangrove areas near the Arabian Sea and fish for shrimp and fish during the period October-May (however, catches are declining and many people in Keti Bandar are either in debt or have no cash leverage at all; field observations in November, 2005). As noted above, there are also permanent fishing villages located along the creeks near Keti Bandar. Keti Bandar has recently received community and technical support in the form of:

- establishment of a mangrove nursery (the nearest natural mangrove stands are about 10 km north of the town; most of the mangroves in this area, under the control of the Board of Revenue, were cut down or grazed long ago, during the British colonial administration and soon after);
- installation of water and toilet facilities (although most drinking water still has to be trucked or shipped in); and,
- some training of women (sewing, conservation techniques, mangrove nursery management).

The town is surrounded by a bund (an extension of the recent road) and then tidal flats beyond that. The town is exposed to prevailing winds from the southwest and northeast and has good potential for use of wind pumps for circulating seawater. Keti Bandar is about 10 km from the Arabian Sea. There is reference to fluctuating salinities in this area, depending on flood conditions in the Indus River and the extent of seawater intrusion (IUCN, 2002). There is, at times, an estuarine condition in the main creeks in this area, with low salinity water on the surface and highly saline water at the bottom of the creeks. IUCN has identified Keti Bandar as a High Priority Area, a target for coastal and marine resources management and poverty reduction (the ADB RETA 5974). Keti Bandar is located in the WWF G-200 EcoRegion.

*Shah Bandar*

Shah Bandar is a small settlement located on a ridge of slightly higher land surrounded by tidal mud flats and creeks (Figure 5). There is a large mangrove stand about 2 km east of the settlement. Like Keti Bandar, Shah Bandar used to be a relatively "bustling" port, but with flooding from the Indus River, most of the larger channels which connected Shah Bandar to the Arabian Sea filled with sediments. Larger vessels could no longer access the sea (the tidal creeks *are* still connected, and smaller fishing boats have access to the sea). Seawater intrusion in this area has reduced potential for agriculture (there is reference to seawater flooding of the area during monsoons; IUCN, 2002).

Apart from some water buffalo and camel grazing, the main economic activity in this area is coastal fishing (mostly small pelagic fish and shrimp; there were at least 20 fishing boats in the Shah Bandar area in October 2005 which seemed to have been in recent use; there may have been twice as many in the creeks and at sea at the time of the observations). The World Bank (2005) reports that about 27% of households in the Shah Bandar area earn less than 1,000 rupees per month. There is relatively good road access to settlements in the Shah Bandar area, but availability of drinking water is a problem (it is trucked in), and there is no electricity in most settlements.

This area comes under the jurisdiction of the Sindh Forest Department. Mangrove replanting has been undertaken in this area (the stand about 2 km east of the main settlement). However, most of the tidal creeks in the vicinity of Shah Bandar have no mangrove cover. IUCN has identified the Shah Bandar area as a High Priority Area (ADB RETA 5974). Shah Bandar is located in the WWF G-200 EcoRegion.

*"000" Zero Point*

The whole "Inland Sea" dhand system (an area of about 700 $km^2$; World Bank, 2004) has been in flux over the last ten years. Prior to construction of the tidal link (completed in 1995), the dhands were interlinked and connected with the Rann of Kutch, during wet years, the monsoon, and most high tides. The dhands also received irrigation drain water from the older Kotri drains (< 10 ppt) and later from the Kadhan Pateji Outfall Drain (KPOD, at the end of the Left Bank Outfall Drain). Salinity in the dhand system was reported to fluctuate between 15 and 45 ppt, depending on the amount of water coming from the drains and the influx of water from the Rann of Kutch. Maximum water levels in the Inland Sea (before the tidal link) were reported to be 2.6 to 3.8 meters above sea level (World Bank, 2004).

With completion of the tidal link in June, 1995, the Cholri Weir set the maximum water level in the dhand system to the northwest of the link at about 1.5 meters above sea level. The weir allowed the dhands to drain to the tidal link drain on an ebbing tide, when water elevations exceeded the weir level, and also allowed drain water to enter the dhand system when the drain was full (on a flooding tide). Thus, there was some limited water exchange between the tidal link drain and dhands, but overall, there was a much more restricted water exchange (blocked by the tidal link, and the KPOD water was directed to Shah Samando Creek at the end of the tidal link, rather than to Pateji Dhand). Over a few years this led to a reduced area of water in the dhand system and a *lowered* salinity.

Erosion of the tidal link embankments started immediately after the link started operating in 1995. In June, 1998, part of the Cholri weir collapsed. In May, 1999, during the cyclone, the rest of the weir was destroyed and 56 new breaches in the north and south embankments were created. It was not possible to repair the damage to the tidal link. Current recommendations (World Bank, 2004) are to leave the tidal link as it is. It is assumed that most of the water in the drain makes its way to Shah Samando Creek, at least on a falling tide, and over time the tidal link may evolve into a tidal creek, of sorts. At the moment, the breaches in the tidal link are increasing in size and there is a significant exchange of seawater between the Rann of Kutch and the original dhands north of the tidal link. This whole area (all the interconnected dhands on both sides of the tidal link) is designated as the "Inland Sea" for the purpose of this analysis (see Figure 3). Salinity in this area is now increasing, as the whole system reverts to the way it operated naturally before 1995. According to fishers who fish along the tidal link, the Inland Sea floods to a depth of at least 1-1.5 meters on normal tides. On ebb tides, much of the area is covered in shallow water, with the fringing mud flats exposed. This area apparently supports a significant population of bivalves (at least two species), fish, and shrimp (see details in other project reports).

The proposed site, "000" Zero Point, is at the northwestern corner of the "Inland Sea" (the dhand system made up of Sanhro, Mehro, Pateji, and Cholri Dhands; see Figure 6). The proposed project site is located at the end of one of the Kotri irrigation drains, where it empties into Sanhro Dhand. The area is characterized by unvegetated, salinized soil to the right of the drain, and some irrigated farm land to the left of the drain. Where the drain empties into the Inland Sea, there is a very shallow gradient of mud, with some vegetation in the brackish water area. Salinity in the drain (in October, 2005) was 3 parts per thousand (ppt). In the KPOD-Tidal Link area, the salinity in the drain is 3-7 ppt. The salinity in the Inland Sea (in October, 2005) was 20 ppt.

The premise for activities in this area is that the Inland Sea will continue to revert to its original dynamics, with no rehabilitation of the tidal link expected in the near-term (10-20 years). As the breaches continue to enlarge, and water exchange between the Inland Sea and the Rann of Kutch increases, the Inland Sea will become increasingly marine, and species composition will change accordingly. The area near the irrigation drain (Sanhro Dhand) provides an opportunity for manipulating salinities (blending the lower salinity water of the drain with the higher salinity water in the Inland Sea). Water quality monitoring in the irrigation drains in the Badin area in 2002 indicated *some* contamination with sewage, but no significant levels of pesticides (World Bank, 2004). This water can be scrubbed through a constructed wetland prior to use in the integrated pond system.

There is reference to 12,000-15,000 people living in 30 settlements (many of which are temporary) around the dhands near Zero Point (World Bank, 2004). Apparently average incomes are 600-800 rupees/month. Most communities are barely surviving, with difficult access to drinking water, and limited access to fisheries in the drains (the Thar Rangers still exercise control over the fisheries, despite recent government efforts to cut their control of the contracted fishing areas).

There are two designated RAMSAR sites near the Inland Sea. These are Narri and Jabho Lagoons, which are important to migrating birds. These lagoons are located near Mehro Dhand (not at the proposed site). These areas do not yet have the required management plans.

**Proposed Schemes:**

The concept for the integrated mariculture pond system includes the following:

- intake canals, for tidal exchange between the ponds and the tidal creeks (and Inland Sea), with wind pumps to augment water intake during low tides;
- a series of ten ponds (each about 15 x 50 meters) connected to the intake canal;
- outlet drains from each pond connected to a common discharge canal;
- the discharge canal connected to a scrubber pond, with seaweed (*Gracilaria*) and mussels (*Perna viridis*), to remove excess organic matter from the discharge water prior to its return to the tidal creeks or Inland Sea (the location of the discharge canals will minimize recirculation of water from the ponds);
- development of a small model village adjacent to each pond system (10 small wooden houses on stilts to provide housing for the pond operators); and,
- at the Zero Point location, an additional intake canal and constructed wetland (scrubber) for intake of relatively fresh water.

Figures 9-12 show the pond details and schematics of the integrated mariculture pond systems at each of the proposed sites. All pond systems would be located such that there is maximum protection from the erosive effects of tidal surges associated with cyclones or low pressure systems (generally on the northeast side of towns, structures, or protective land ridges). All canals, ponds, and discharge drains would be bunded and planted with mangroves to help stabilize the bunds and protect the pond systems (Figure 13). The larger area around the integrated pond systems would also be planted with mangroves, as part of the community-based mangrove planting concept (see separate paper).

Target species that may be suitable for culture in the pond systems (subject to more detailed analysis of site conditions, salinity variation, and natural availability of fry; all species listed below already occur in Sindh coastal waters – there are no exotics) include:

- barramundi (*Lates calcarifer*);
- mullet (*Liza* spp.and *Valmugil speighleri*);
- tilapia (*Tilapia* spp.) (where lower salinities can be maintained);
- mud crab (*Scylla serrrata*); and,
- shrimp (*Penaeus indicus*; possibly other species, if salinities can be maintained at low levels during the juvenile phases).

All species proposed for the pond systems can be targeted at domestic consumption (a concept to promote increased consumption of fish by Pakistanis is noted in a separate paper). As noted at the beginning of this paper, consumption of fish from mariculture can reduce the pressure on capture fisheries.

The proposed schemes will require provision of fry from a reliable hatchery system (the new hatchery at Hawkes Bay and the small hatcheries at Thatta and Badin will be upgraded and made operational to serve this purpose – see section below on development of the Sindh Hatchery System). There may be an opportunity to stimulate a wild fry collection operation (particularly mullet, juveniles of which are already in the tidal creeks), depending on the species and the viability of transport of fry to the pond systems.

The ponds will also require a reliable feed system. Seaweed and mussels from the scrubber ponds can be used as feed for carnivorous fish, crabs, and shrimp in the culture ponds. There may also be a ready supply of bivalves from the Inland Sea (to be confirmed with a proper resource survey of this area), which could be developed as a feed source (protein content) for the pond systems, as well as mudskippers and mangrove snails (*Telescopium telescopium*), which are ubiquitous throughout the tidal creek areas of the Indus Delta, and not presently used at all. Locally produced trash fish (that currently go to chicken feed) might also be re-directed as feed for the integrated pond systems. Ponds with mullet and tilapia can be fertilized with locally available chicken and water buffalo manure to stimulate algal production, to serve as the main food source for these fish.

The integrated pond systems can be built using locally available labor (hopefully the builders will also remain and become the pond operators). The building of the ponds and mangrove planting at each of the three proposed sites will create a cash injection into local communities that may help break the bond of local fishers to the *arthis* and the *baiparis*, and start to create a small amount of community capital that can invested in future small-scale operations.

There will be a component in the project to support community organization (facilitation by an appropriate NGO, which has experience working with coastal villagers). It will be very important for a “cohesive” group of villagers (a single village, for example, up to 10-20 huts) to develop and manage the ponds in a given area, adjacent to the village, or at least within the “control” area of the village, to ensure that operation is continuous, that the labor requirements are shared, and the benefits are distributed equally within the community. Book-keeping, monitoring, and records-keeping skills will need to be developed. There is also provision for development of technical skills within the community, related to siting, building, and operating the ponds (to be provided through the budget for Sindh Hatchery Development – see below). Figure 7 shows an example of a prospective site for pond development adjacent to Siddique Ronjho *Goth*.

Figure 7. A prospective site for pond development adjacent to Siddique Ronjho (near Keti Bandar).

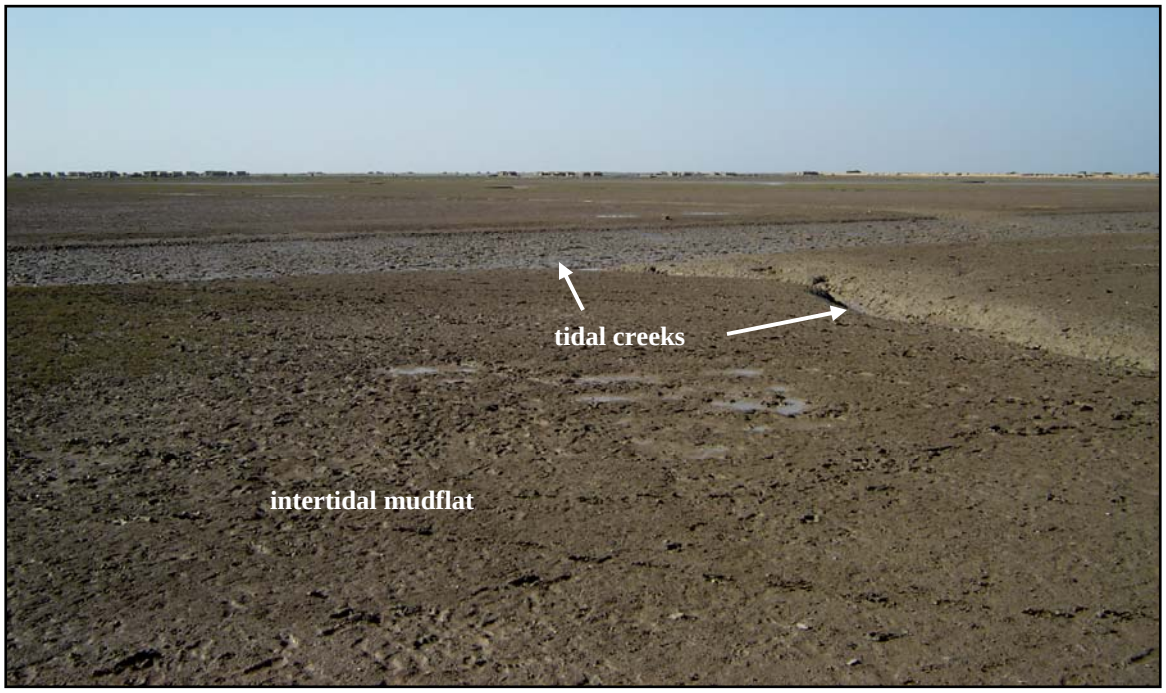
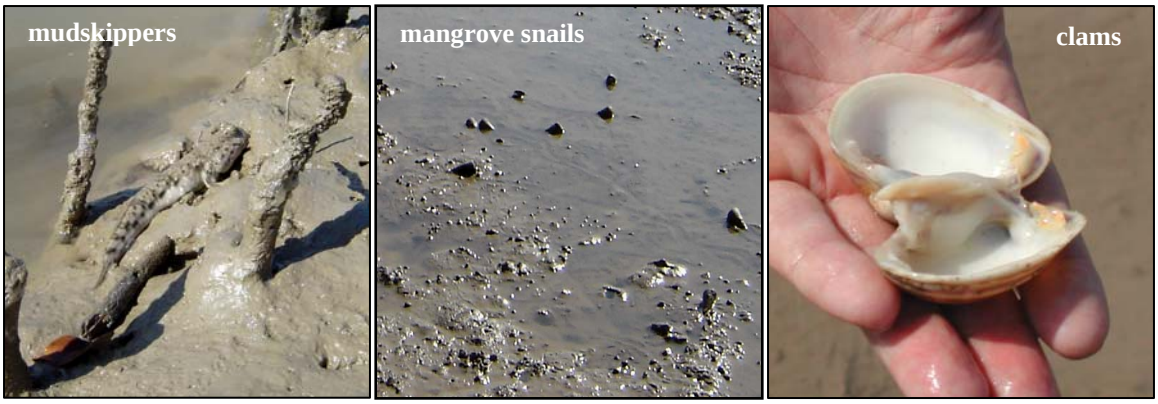



Figure 8. Unused protein sources in the Indus Delta; potential food for fish and shrimp in the pond system.




The proposed "model" villages will be very low-key. Ten wooden houses on stilts, which will be designed to withstand all tidal inundations, will be provided to the pond operators. These houses will provide a nucleus for other sustainable village concepts, such as rainwater catchment (although very limited in this area), grey water recycling, osmotic filtration treatment of water, composting toilets, composting of food waste, collection of manure, development of garden plots, solar and wind power generation, use of fuel-efficient stoves, etc. (see Figures 14 and 15).

The intention of the integrated mariculture pond systems is to demonstrate the viability of *extensive* pond culture systems (low stocking density, low input operations) that may be

amenable to community operation. They should have a low risk (given low capitalization), involve relatively unsophisticated technology, and therefore have the highest possible chance of replication at other suitable sites (with provision of appropriate extension from Department of Fisheries, and ongoing research by the universities and NGOs). The *integration* in the proposed system lies in the creation of local livelihoods in an environmentally-friendly manner (new economic activity combined with habitat rehabilitation), which makes best uses of local inputs (e.g., use of waste from the ponds to grow seaweed and mussels, which in turn are used as food for fish, shrimp, and crabs in the ponds; and use of other under-utilized local resources, such as the clams in the Inland Sea, and mudskippers and mangrove snails which occur everywhere throughout the Thatta and Badin mudflats, for pond feed, minimizing requirements for more expensive inputs from outside the region; Figure 8).

There will be a requirement to establish a monitoring program for basic oceanographic variables at each of the three sites, including salinity, water temperature, water elevation, dissolved oxygen, and turbidity. These data should be collected in continuous mode (recording instruments installed in creeks near the pond facilities). A facility could be established for real-time reporting (radio transmission of data), interrogation of instruments from the CDA office in Karachi, or local batch collection of data and e-mail reporting to the CDA office (data collection and transmission modes to be examined during the initial phase of the project, for practicality and sustainability). The CDA monitor in Karachi will be required to collate and interpret the data (with assistance from NIO), report on a regular basis to all agencies involved in the integrated pond system, and if a developing trend of concern to pond operators becomes evident (for example, a hypersaline event, or extremely high water temperatures), then a warning issued to operators (over the radio), to allow pond operators to shut their tidal gates, or harvest their ponds, depending on the situation. Over time, the trends in the oceanographic and environmental conditions in the tidal creeks of the Indus Delta and the Inland Sea will become evident, and future interventions can be designed accordingly.

The proposed scheme is to be established as a pilot at each of the three selected sites, in order to test the design and “implementability” of the scheme. The total cost of construction and five years of operation of the three sets of ponds is US$ 2.0 million (see Table 1). An additional US$ 6.15 million will be required to establish the hatchery system and to provide the required technical support for the hatchery system (see section below). The project construction and implementation will directly involve approximately 100 people at each of the three locations (with a family member multiplier of about 8-9, the total number of direct and indirect beneficiaries associated with the three pilot sites would be between 2,400 and 2,700).

Table 1. Proposed budget for construction and operation of pilot integrated mariculture pond system (total for three locations).

| Item | Unit Cost (US$) | Total Cost (US$) | Notes |
|---|---|---|---|
| **Pond Construction (over 1.5 years)** | | | |
| Labor to dig ponds and canals (75,000 $m^3$) | \$ 2/$m^3$ | 150,000 | Most of the effort to create the ponds will be manual labor, supported by a back-hoe in each location. |
| Backhoe (x3) | \$ 75,000 | 225,000 | For intake and discharge canals and creating the bunds. |
| Crane truck (x3) | \$ 50,000 | 150,000 | For lifting cement, fuel, other heavy items. |
| Pick-up truck (x3) | \$ 25,000 | 75,000 | For general personnel and small supplies transportation. |
| Transportation of workers to and from villages | \$25,000 per site | 75,000 | Bus service, as required. |
| Fuel for vehicles (maximum 100 km per day) | \$ 20 per vehicle per day | 150,000 | Estimated consumption, plus contingency for fuel price increases. |
| Design and installation of wind pumps | \$5,000 at each location | 15,000 | Required at the main intake canal and possibly at the gates to each pond. |
| Concrete gates | \$5,000 at each location | 15,000 | Required to prevent erosion at the pond intakes. |
| Site engineering design | \$20,000 at each location | 60,000 | Selecting the appropriate site, determining gradients, determining water elevations. |
| Local engineering supervision | \$20,000 at each location | 60,000 | Throughout the construction period. |
| Mangrove planting along bunds and canals | \$10,000 at each location | 30,000 | Cost of procurement and planting of propagules (about 5,000 seedlings at each location). |
| Shed | \$5,000 at each location | 15,000 | To house equipment and site plans, etc. |
| Communication; power | \$10,000 at each location | 30,000 | Generator, fuel, radio. |
| Contingency | | 150,000 | Approximately 15% |
| **Total Construction Costs for Ponds** | | **US$ 1,200,000** | |
| | | | |
| **Construction and Set-up of Model Villages (over one year)** | | | |
| House design | One architect on contract | 10,000 | Local architect, examining options from other locations and making suitable site specific designs. |
| Wooden stilt houses (10 at each location) | \$2,000 for wood for each house and | 60,000 | Local wood procurement and local labor construction. |

| Item | Unit Cost (US$) | Total Cost (US$) | Notes |
|---|---|---|---|
| | construction | | |
| Sustainable village technology review | Local consultant contract | 20,000 | Examination of the range of suitable technology options for rainwater catchment (although very limited in this area), grey water recycling, osmotic filtration treatment of water, composting toilets, composting of food waste, collection of manure, development of garden plots, solar and wind power generation, etc. |
| Procurement and installation of equipment and systems for the model villages | Tentative budget of $15,000 per location | 45,000 | Procurement from range of options above. |
| Technical support for first year | Local consultant contract (NGO) | 25,000 | Regular site visits. |
| Contingency | | 25,000 | Approximately 15% |
| **Total Costs for Model Village Set-up** | | **US$ 185,000** | |
| | | | |
| **Operation of Integrated Mariculture Pond Systems (over 3 years)** | | | |
| Fry, feed, fertilizer and related operational costs | $ 500 per pond per year | 45,000 | See Table 2 for an example of annual operating costs. |
| Fisheries Department extension on site: allowances and transportation expenses | One worker per location (assumed $10 per day) | 25,000 | 3 individuals, 800 days on site over three years. |
| NGO facilitation – fees | Local consultant contract (assume $50 per day) | 80,000 | 2 individuals, 800 days on site over three years. |
| Transportation and communication | Assumed $20 per vehicle per day use | 50,000 | Using project vehicles and radio/phone equipment from the construction period. |
| Project administration (within Fisheries Department) | Approximately 5% of intervention budget | 75,000 | Management of funds, activity monitoring, office overheads. |
| Installation of oceanographic and environmental variable monitoring system | Equipment at each of 3 sites installed @ $15,000 | 45,000 | Including instrument site set-up, probes installed, data transmission facility, all secure. |
| Technical support to installation and operation | 3 months per year @ | 216,000 | Support at each of the sites, as well as technical |

| Item | Unit Cost (US$) | Total Cost (US$) | Notes |
|---|---|---|---|
| of instruments; interpretation of data | $24,000/mo | | support to CDA, who will manage the system, with assistance from NIO. |
| Contingency | | 79,000 | Approximately 15% |
| **Total Costs for Pond Operation** | | **US$ 615,000** | |
| **Total Projected Cost of Intervention*** | | **US$ 2,000,000** | |

* technical support proposed for the Sindh Department of Fisheries (see below) will have a component specific to the design, construction, and operation of the integrated mariculture pond system.

Figure 9. Scheme for proposed integrated pond system at Keti Bandar.

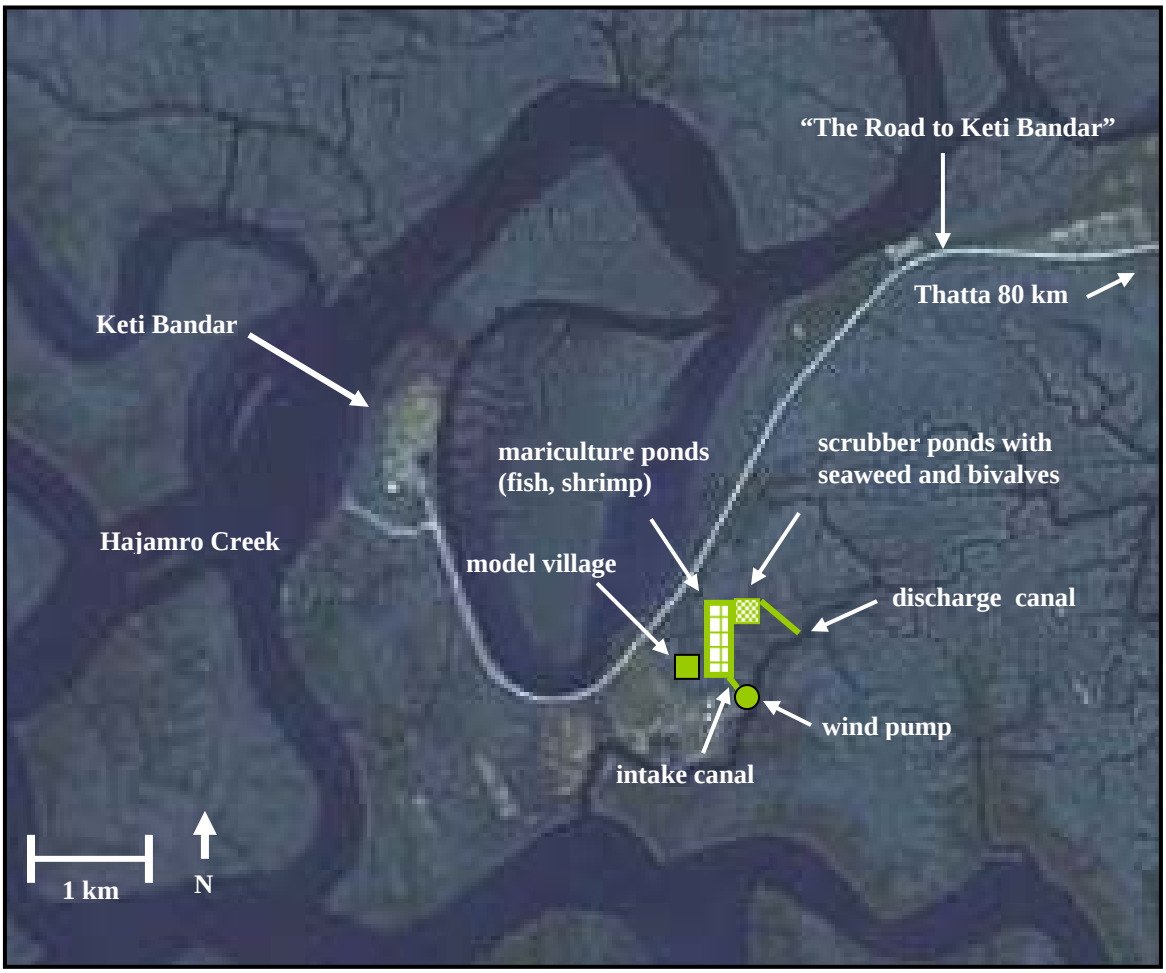


Figure 10. Scheme for proposed integrated pond system at Shah Bandar.

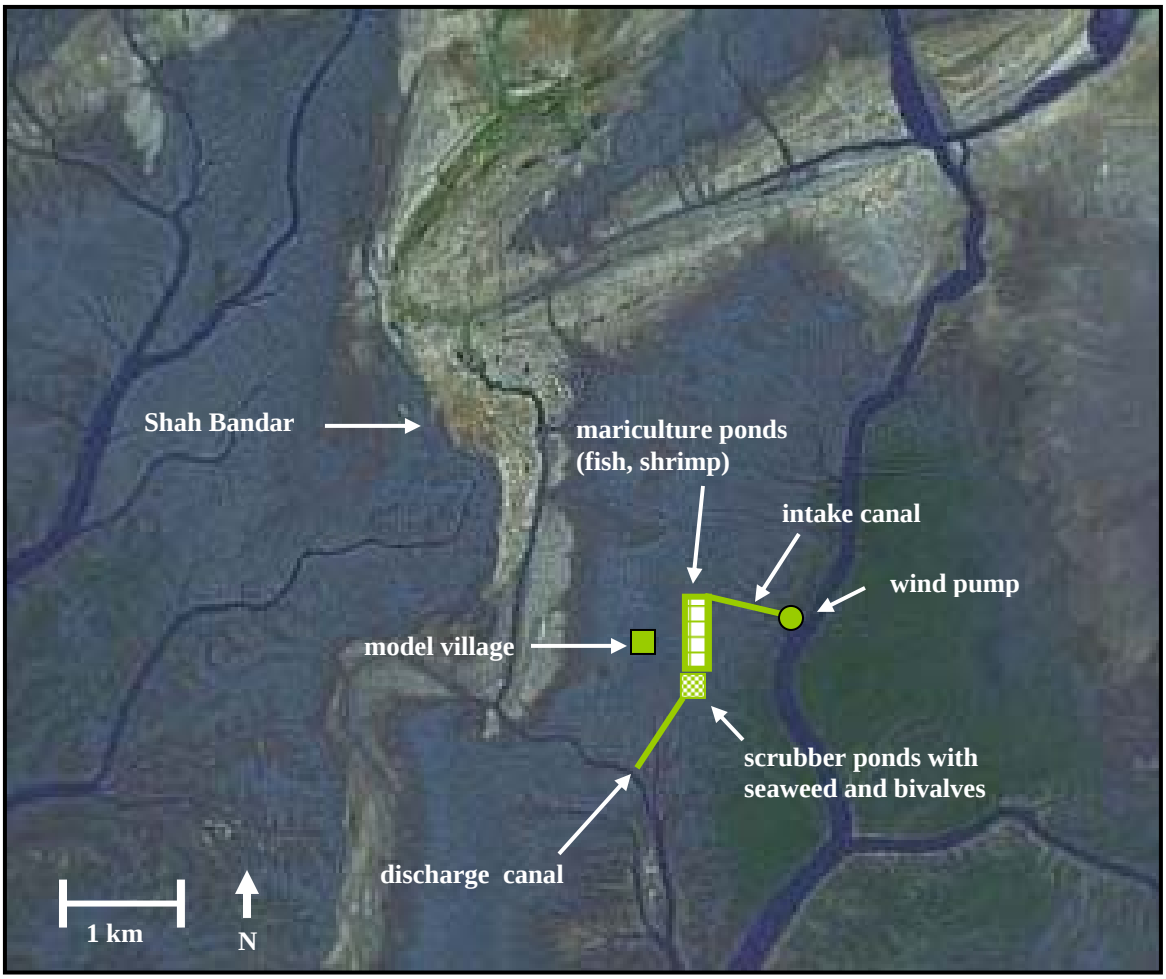
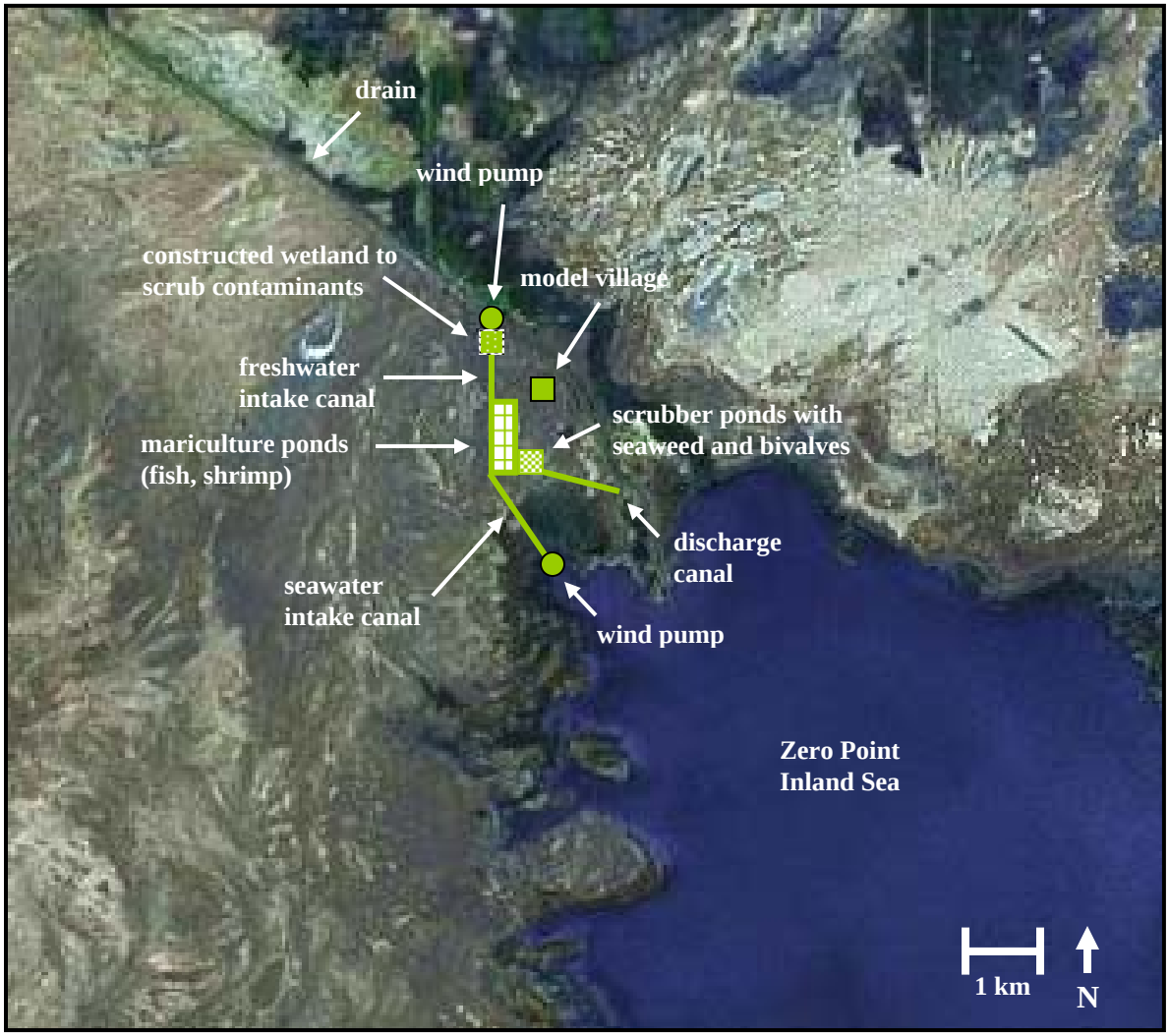


Figure 11. Scheme for proposed integrated pond system at Zero Point.



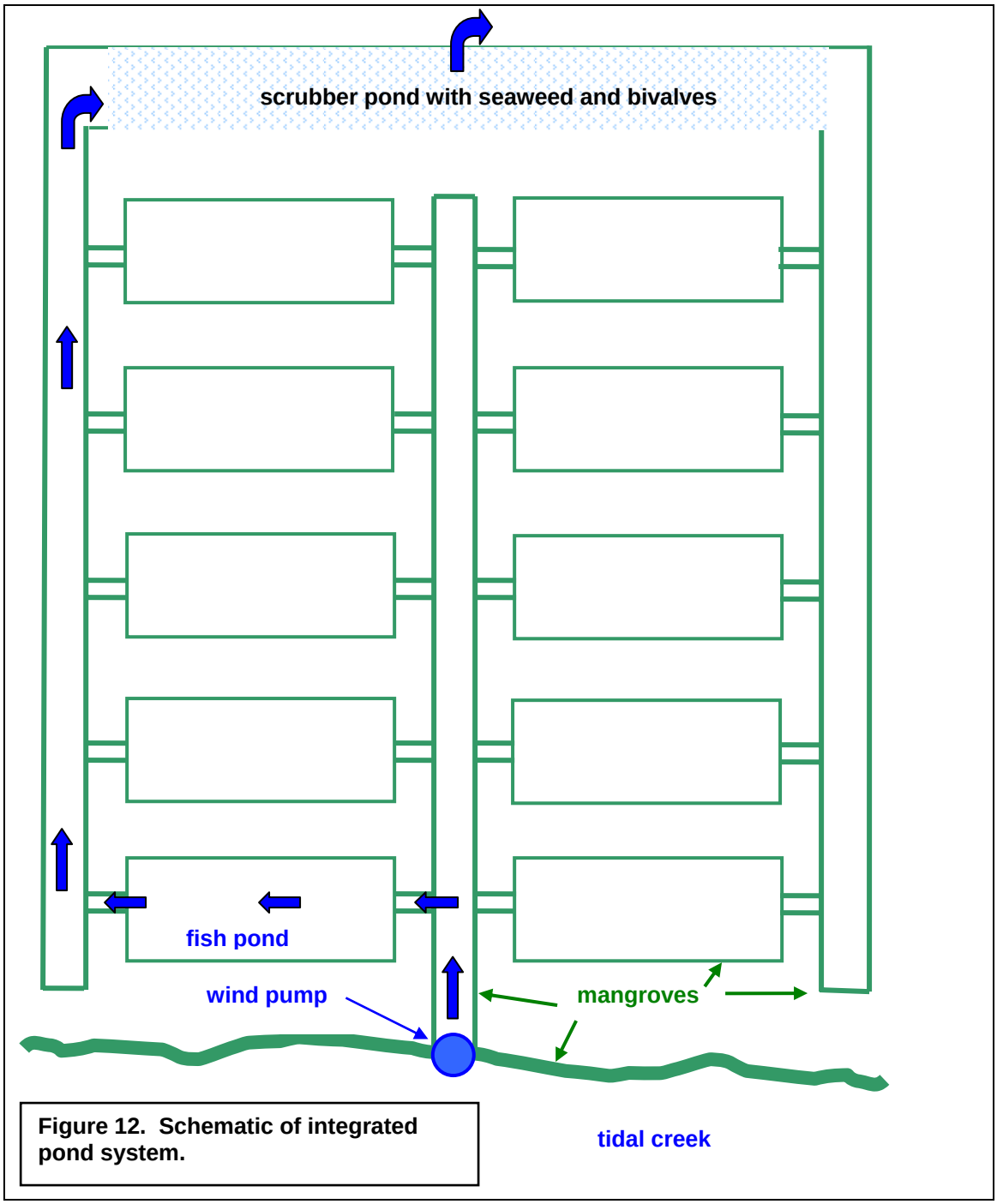



**Figure 12. Schematic of integrated pond system.**

Figure 13. Integrated pond system (Indonesia) with milkfish and shrimp (low density) and mangrove planting inside and outside the bunds (more mature mangroves along the main intake canal).

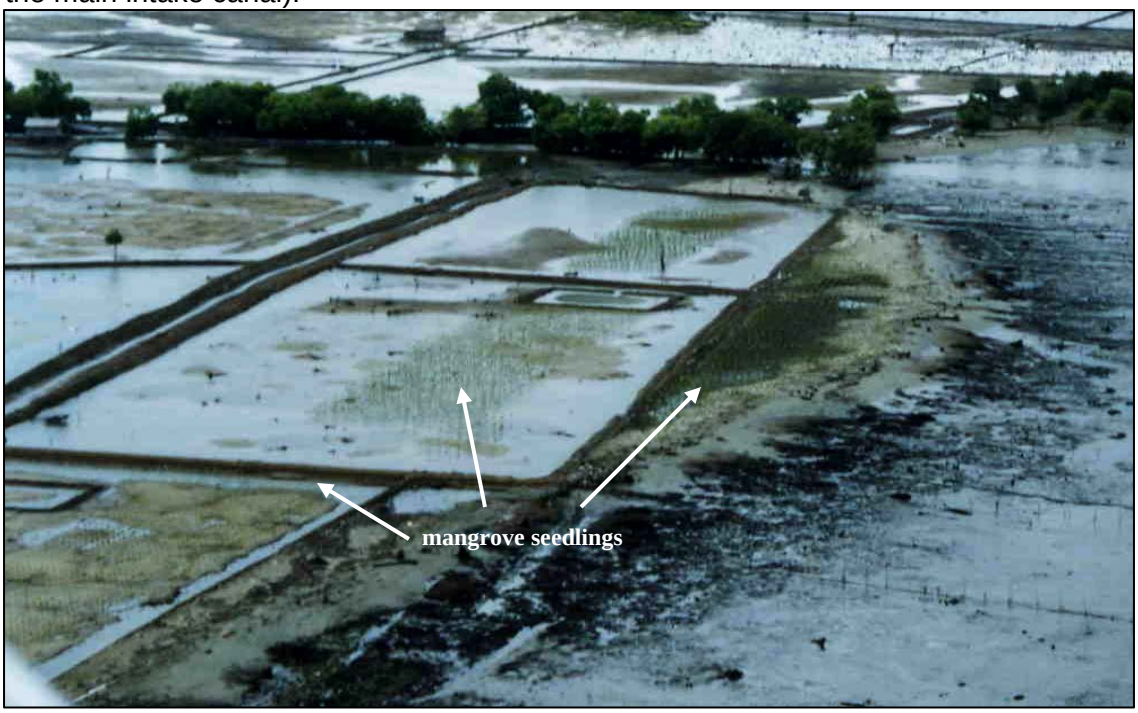



Figure 14. Small capacity wind pump (locally made; can be scaled up to handle higher pumping rates).

Figure 15. A house on stilts: suitable for mudflats in the intertidal zone.

**Economic Viability of Scaling Up:**

The concept for the integrated ponds was explained to fishers in the Keti Bandar area (an adjacent *goth*, Siddique Ronjho; consultations on November 19) and "tested" for practicality and viability within this community. There was apparent affinity of these coastal fishers with the concept of growing fish in ponds in the mudflat areas immediately adjacent to their huts. Furthermore, some of the members of this village apparently own land (or have had long-term use of land) on the right bank of Hajamro Creek, across from Keti Bandar, and believe that they could construct and operate ponds in this area (this area was examined and is suitable for development of small-scale ponds). This brief (and limited) groundtruthing of the concept indicates that two key criteria for development of the concept (interest of the local community, and access to land in intertidal areas) can probably be met, which will be key catalysts in scaling up the pilot level pond system.

If successful, there is scope to replicate the integrated mariculture pond system throughout the coastal zone of Thatta and Badin, up to the proposed limit of one-third of available tidal mudflats (those that currently do not have any mangrove cover). With these criteria, up to 500 $km^2$ of the coastal zone within 10 km of the upper tidal limit could be designated for integrated mariculture pond systems over the next 20 years. Within this area, up to 25,000 hectares could be in active pond production without overloading the surrounding environment with organic waste from the ponds (the other 25,000 ha left open for related infrastructure and settlements). An assumption has been made that land can be granted from Board of Revenue and Department of Forests to communities who are willing to stake a claim in the intertidal mudflat area and commit to the integrated mariculture pond system (therefore, no provision for land transfer costs; it is assumed that all lands below the highwater mark belong to the State and might be transferred under long-term lease as "pioneer" settlements).

Tables 2-4 show the results of economic modeling of extensive pond culture of barramundi, herbivorous fish (such as mullet), and shrimp (crab and tilapia have not been modeled, but may be targets of future mariculture pond systems). These models (using very conservative assumptions) provide an indication of the potential viability of expanding the pond systems throughout the available suitable areas in the Indus Delta.

Of the three examples examined, barramundi culture may have the highest internal rate of return and can show profitability at the operator level in the second year. However, it requires the most vigilance and management of pond conditions and fish sizing. Once the operation is stable, after three years, net profits from six small barramundi ponds may be about US$ 3,165 per year per operator. With mullet, profitability is evident in the third year, and net profits in the fourth year may be as much as US$ 1,650 per year (six ponds per operator; internal rate of return of 55%). Culture of mullet may be less technically risky than barramundi pond culture.

For shrimp, profitability is evident starting in the fourth year and net profitability may be about US$ 990 per year (six ponds per operator; internal rate of return of 23%). This type of pond culture may be technically challenging as well, depending on prevailing salinity and availability of fry, and with a relatively low rate of return, may be more marginal an operation than the other two that have been examined.

For the purpose of analyzing the scaling up of pond operations, it is assumed that each operator can handle six ponds (a total of 0.45 hectares). Assuming an equal mix of shrimp, barramundi, and mullet culture, average mariculture production per hectare in the Indus Delta may be 3,500 kg per year. Over 25,000 hectares, total annual pond production could be up to 87,500 tonnes (about 20-25% of the annual marine fisheries production in Pakistan). After subtracting investment costs and annual operating costs, the total potential net profit accruing to the operators and their families may be about US$ 107 million per year. Up to 50,000 people could be involved in mariculture ponds at this scale (this could be a significant percentage of people living in the coastal zone and in the adjacent fringe of marginal land).

Average start-up cost for an operator might be about US$ 1,800 - $2,300, to construct and operate two ponds over the first year, to the point of first cropping of fish or shrimp (these funds might be provided by the proposed small grant fund, or local micro-financing institutions). Thereafter, expansion should be capitalized by the operator, based on cash income from selling produce from the ponds. In each of Keti Bandar, Shah Bandar, and the Zero Point area, there is scope in available mudflat habitat, in a first tranche of expansion, to accommodate up to 500 hectares (equivalent to about 1,000 small-scale operators). Assuming an average start-up cost of about US$ 2,000 per operator, the initial credit requirement in each of the three proposed pilot sites (after successful demonstration of the pilot-scale ponds) will be about US$ 2 million.

What are the implications of producing up to 87,500 tonnes of fish (and possibly shrimp) per year? In the first instance, it is hoped that the pond culture will displace *some* capture fisheries effort (possibly one-quarter of current annual production from Pakistan's capture fisheries), which will reduce pressure on natural stocks of fish and shrimp, providing a benefit (ultimately) to the offshore fisheries. Secondly, trash fish currently going to the chicken feed industry could be directed to the ponds (this may have some negative implications for the chicken industry). However, it is hoped that local marine resources (in the Inland Sea) might be used for pond feed requirements, with no direct effect on inputs required for the chicken industry. Thirdly, the intention is to produce fish (and possibly shrimp) that will be consumed in the domestic market (probably Karachi), not export markets. There could also be increased local consumption of fish (in Thatta and Badin), in the communities directly associated with the pond operations.

Unless there is an increase in the per capita consumption of fish, fish and shrimp from ponds (average farmgate price of US$ 2/kg and 4.20/kg, respectively) will have to compete with chicken (in November, 2005, at 130-140 PRs per kg: about US$ 2.30/kg) and other sources of protein (beef and mutton at about US$ 3.60/kg). Currently, per capita consumption of fish in Pakistan is very low (about 2.5 kg/per capita/year; Jafri, 2004). If the per capita consumption of fish were to increase by just 0.5 kg per year (throughout Pakistan, assuming a population of 150 million rising to about 180 million over the 20-year period of analysis), the products from the scaled-up pond systems could be fairly easily absorbed by the country. If the main market is Karachi, then per capita fish consumption will have to approach at least 5 kg per year over the next 20 years to absorb the production from the proposed full-scale pond system in the Indus Delta.

By most standards, even fish consumption of 5 kg/person/year is low (for example, Egypt has per capita fish consumption of 14.2 kg/year; El-Gayar, 2003). It might be possible to encourage, through sustained public awareness programs, increased consumption of fish (which has a relatively competitive protein price) on the basis of increased health benefits, and decreased risk of contraction of diseases, such as avian flu (of concern at the moment). If Pakistani fish consumption increases and the integrated pond system can scale up to provide fish (and shrimp) to meet increasing local demand, then *all* the benefits of the investment will stay within the country, most of those within Sindh, and there will be minimal negative effects on other food industries in the country.

Table 2. Economic modeling of extensive barramundi culture in the coastal zone of Thatta and Badin.

| **One person scaling up to 6 ponds over 3 years: barramundi – 6 month production cycle.** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Investment costs: setting up ponds** | | | | | | | | | | | |
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| 2 ponds first year | US$ | 750 | | | | | | | | | |
| 2 ponds second year | US$ | | 750 | | | | | | | | |
| 2 ponds third year | US$ | | | 750 | | | | | | | |
| Wind pumps | US$ | 200 | 200 | 200 | | | | | | | |
| Intake/feeder canals | US$ | 375 | 375 | 375 | | | | | | | |
| Monks (gates) | US$ | 100 | 100 | 100 | | | | | | | |
| Mangrove planting | US$ | 50 | 50 | 50 | | | | | | | |
| **Annual investment** | US$ | **1,475** | **1,475** | **1,475** | | | | | | | |
| **Annual operating costs** | | | | | | | | | | | |
| Fertilizer (chicken manure) | US$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Seed stock (barramundi) | US$ | 120 | 240 | 360 | 360 | 360 | 360 | 360 | 360 | 360 | 360 |
| Feed | US$ | 500 | 1,000 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Sales costs | US$ | 100 | 200 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Maintenance | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Harvesting costs | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| **Total annual operating costs** | **US$** | **820** | **1,640** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** |
| Wages (internalized) | (operator) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash outflow** | | **2,295** | **3,115** | **3,935** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** | **2,460** |
| **Cash inflow** | | | | | | | | | | | |
| Total Fish Weight | Kg | 750 | 1,500 | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 | 2,250 |
| Value of fish (per kg) | US$ | 2.50 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| **Total cash inflow** | **US$** | **1,875** | **3,750** | **5,625** | **5,625** | **5,625** | **5,625** | **5,625** | **5,625** | **5,625** | **5,625** |
| **Net cash flow** | | **-420** | **635** | **1,690** | **3,165** | **3,165** | **3,165** | **3,165** | **3,165** | **3,165** | **3,165** |
| **IRR with NPV @ 10%** | **251%** | **US$12,989** | | | | | | | | | |

**Assumptions:** 60 PRps = $1 US; ponds are built by the owner/operator, with some hired labor; each pond is 15 x 50 m (0.075 ha); 6 ponds are built at 2 per year; volume of mud excavated for canals is 50% of pond volume; mangroves are collected locally (just a transportation cost); there is a belt of at least 2 meters of mangroves around all bunds and canals; no manure required (fish are carnivores); feed costs are $0.33/kg (for trash fish, or underutilized local species, such as clams and mudskippers); barramundi fry cost $0.02 per piece; stocking density is 2/$m^2$; 6 months to production of 0.5 kg fish; feed conversion rate at 2:1; survival rate of 50%.

Table 3. Economic modeling of extensive mullet culture in the coastal zone of Thatta and Badin.

| **One person scaling up to 6 ponds over 3 years: mullet – one year production cycle.** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Investment costs: setting up ponds** | | | | | | | | | | | |
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| 2 ponds first year | US$ | 750 | | | | | | | | | |
| 2 ponds second year | US$ | | 750 | | | | | | | | |
| 2 ponds third year | US$ | | | 750 | | | | | | | |
| Wind pumps | US$ | 200 | 200 | 200 | | | | | | | |
| Intake/feeder canals | US$ | 375 | 375 | 375 | | | | | | | |
| Monks (gates) | US$ | 100 | 100 | 100 | | | | | | | |
| Mangrove planting | US$ | 50 | 50 | 50 | | | | | | | |
| **Annual investment** | US$ | **1,475** | **1,475** | **1,475** | | | | | | | |
| **Annual operating costs** | | | | | | | | | | | |
| Fertilizer (chicken manure) | US$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Seed stock (e.g., mullet) | US$ | 60 | 120 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| Feed | US$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sales costs | US$ | 100 | 200 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Maintenance | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Harvesting costs | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| **Total annual operating costs** | **US$** | **360** | **620** | **880** | **880** | **880** | **880** | **880** | **880** | **880** | **880** |
| Wages (internalized) | (operator) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash outflow** | | **1,835** | **2,095** | **2,355** | **880** | **880** | **880** | **880** | **880** | **880** | **880** |
| **Cash inflow** | | | | | | | | | | | |
| Total Fish Weight | Kg | 563 | 1,125 | 1,688 | 1,688 | 1,688 | 1,699 | 1,688 | 1,688 | 1,688 | 1,688 |
| Value of fish (per kg) | US$ | 1.50 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Total cash inflow** | **US$** | **845** | **1,688** | **2,532** | **2,532** | **2,532** | **2,532** | **2,532** | **2,532** | **2,532** | **2,532** |
| **Net cash flow** | | **-990** | **-407** | **177** | **1,652** | **1,652** | **1,652** | **1,652** | **1,652** | **1,652** | **1,652** |
| **IRR with NPV @ 10%** | **55%** | **US$ 4,938** | | | | | | | | | |

**Assumptions:** 60 PRps = $1 US; ponds are built by the owner/operator, with some hired labor; each pond is 15 x 50 m (0.075 ha); 6 ponds are built at 2 per year; volume of mud excavated for canals is 50% of pond volume; mangroves are collected locally (just a transportation cost); there is a belt of at least 2 meters of mangroves around all bunds and canals; 2 trips per year required to collect manure; no feed costs – fish are herbivores; mullet fry cost $0.02 per piece; stocking density is 2/$m^2$; 1 year to production of 0.25 kg fish; survival rate of 75%.

Table 4. Economic modeling of extensive shrimp culture in the coastal zone of Thatta and Badin.

| **One person scaling up to 6 ponds over 3 years: shrimp – 6 month production cycle.** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Investment costs: setting up ponds** | | | | | | | | | | | |
| | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 |
| 2 ponds first year | US$ | 750 | | | | | | | | | |
| 2 ponds second year | US$ | | 750 | | | | | | | | |
| 2 ponds third year | US$ | | | 750 | | | | | | | |
| Wind pumps | US$ | 200 | 200 | 200 | | | | | | | |
| Intake/feeder canals | US$ | 375 | 375 | 375 | | | | | | | |
| Monks (gates) | US$ | 100 | 100 | 100 | | | | | | | |
| Mangrove planting | US$ | 50 | 50 | 50 | | | | | | | |
| **Annual investment** | US$ | **1,475** | **1,475** | **1,475** | | | | | | | |
| **Annual operating costs** | | | | | | | | | | | |
| Fertilizer (chicken manure) | US$ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Seed stock (shrimp) | US$ | 300 | 600 | 900 | 900 | 900 | 900 | 900 | 900 | 900 | 900 |
| Feed | US$ | 144 | 288 | 432 | 432 | 432 | 432 | 432 | 432 | 432 | 432 |
| Sales costs | US$ | 100 | 200 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Maintenance | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Harvesting costs | US$ | 50 | 100 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| **Total annual operating costs** | **US$** | **744** | **1,388** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** |
| Wages (internalized) | (operator) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cash outflow** | | **2,219** | **2,863** | **3,507** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** | **2,032** |
| **Cash inflow** | | | | | | | | | | | |
| Total Shrimp Weight | Kg | 240 | 480 | 720 | 720 | 720 | 720 | 720 | 720 | 720 | 720 |
| Value of shrimp (per kg) | US$ | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 | 4.20 |
| **Total cash inflow** | **US$** | **1,008** | **2,016** | **3,024** | **3,024** | **3,024** | **3,024** | **3,024** | **3,024** | **3,024** | **3,024** |
| **Net cash flow** | | **-1,211** | **-847** | **-483** | **992** | **992** | **992** | **992** | **992** | **992** | **992** |
| **IRR with NPV @ 10%** | **23%** | **US$1,465** | | | | | | | | | |

**Assumptions:** 60 PRps = $1 US; ponds are built by the owner/operator, with some hired labor; each pond is 15 x 50 m (0.075 ha); 6 ponds are built at 2 per year; volume of mud excavated for canals is 50% of pond volume; mangroves are collected locally (just a transportation cost); there is a belt of at least 2 meters of mangroves around all bunds and canals; 2 trips per year required to collect manure; feed costs are $0.33/kg (for trash fish, or underutilized local species, such as clams and mudskippers); shrimp postlarvae cost $0.02 per piece; stocking density is 5/$m^2$; 6 months to production of 20 g shrimp; feed conversion rate at 2:1; survival rate of 80%.

**Development of the Sindh Hatchery System:**

*Current Situation*

The Sindh Department of Fisheries operates three hatcheries in the coastal area:

- a main hatchery facility at Hawkes Bay (a relatively new building and associated equipment);
- a hatchery at Chilya, nearThatta; and,
- a hatchery at Badin.

These facilities all have the basic infrastructure in place and staff. The Thatta and Badin hatcheries have been operating over the last ten years or so (Figures 16 and 17), with accommodation, classrooms, laboratories, demonstration ponds (including buffalo manure/fish culture), a hatchery, adult stew ponds, fingerling grow-out ponds, and necessary piping and air supply). Both hatcheries produce carp fry (5 million annually at Badin) and have potential to increase supply of fry, as well as experiment with other species.

The purpose of the hatchery in Hawkes Bay (Figure 18) is to produce shrimp postlarvae to facilitate large-scale intensive farming of shrimp in the Indus Delta. This facility is just becoming operational, but is not fully scaled up, in part due to lack of demand for shrimp postlarvae (although there are various reports of commercial shrimp ponds in the Indus Delta, it appears that these are plans only). The other factor is lack of funding to experiment with shrimp larva production. The facility is ready to operate at higher levels of production, but needs a more specific purpose and some organizational development.

Figure 16. Ponds at the Badin Hatchery.

Figure 17. Ponds at the Thatta Hatchery.

Figure 18. Sindh Department of Fisheries hatchery set-up at Hawkes Bay.

*Opportunities and Rationale for Hatchery System Development*

As noted above, development of an integrated pond system is proposed at a pilot scale at three locations in the Thatta and Badin coastal areas. It is hoped that these pilot scale interventions will lead to expansion of the integrated pond system throughout the available coastal areas in the Indus Delta (at suitable sites and within the carrying capacity of the coastal zone). It is expected that there will be an increasing requirement for fish fry and possibly shrimp postlarvae (a common constraint in extensive development of mariculture is lack of availability of fish fry and shrimp postlarvae). The Sindh hatchery system therefore becomes a critical feature of the proposed mariculture development in the Thatta and Badin coastal areas.

A considerable investment has already been made in the Sindh hatchery system. The presence of the facilities, and staff who have experience in running the facilities, provide a very significant "jumpstart" in making the hatchery system more effective and providing the required fish fry and shrimp postlarvae.

Successful shrimp farming in Iran with *Penaeus indicus* (Indian white shrimp) suggests that it may be the most suitable shrimp species for culture in the Indus Delta (tolerant of high salinities and high temperatures). Current interest is therefore focused on this species. Some of the ponds at the Gharo facility on the Indus River are now stocked with *P. indicus*. The facility at Hawkes Bay could be ramped up to examine larval production with this species and eventually produce postlarvae for development of shrimp ponds in the Indus Delta. There is also potential for development of mud crab culture (*Scylla serrata*); trial culture of this species in Sindh has had limited success, and needs more experimental work.

Euryhaline fish species that may have potential for extensive mariculture throughout the Indus Delta include the following:

- barramundi (*Lates calcarifer*); and,
- mullet (*Liza* spp. and *Valmugil speighleri*).

The Hawkes Bay facility could also be configured to produce fry of these fish species.

The hatcheries at Thatta and Badin, being located in areas that only have access to freshwater, are more limited in their scope. However, these facilities can be upgraded to produce more carp fry and may also be set up for experimentation with tilapia (*Tilapia* spp.). The pond facility at Gharo can be used to experiment with the grow-out of the various species identified above, as well as seaweed (most likely *Gracilaria*) and bivalves, such as green mussels (*Perna viridis*), both of which are proposed for the scrubber ponds in the integrated pond system in the Indus Delta.

There is also an opportunity to pursue the culture of brine shrimp. Many parts of the coast of Thatta and Badin are potentially suitable for this activity, with extensive salt ponds, high temperatures, and high evaporative rates in the dry season.

What are the opportunities associated with culture of brine shrimp (*Artemia salina*)? There are several forms of brine shrimp products. *Artemia* are sold live or in cyst form, targeted at mostly the freshwater and marine tropical fish hobbyist. There is also sale of frozen brine shrimp. Freeze-dried brine shrimp and brine shrimp flakes are also sold as dietary supplements for tropical fish hobbyists. Perhaps the most commercially

important brine shrimp product is the cyst produced by brine shrimp under hypersaline conditions. The nauplii which hatch out of the cysts are one of the few "perfect" foods found to facilitate proper larval development in most crustacean culture systems (including shrimp, crabs, lobsters, etc.), brackish water and saltwater fish production systems. The most viable market for a developing brine shrimp industry in Sindh may be the production of cysts and/or adult brine shrimp for the hatchery system and for the proposed expansion of a mariculture pond system in the Indus Delta.

There are several options for development of a brine shrimp industry in Sindh. One that may be most suitable for development in Sindh is a two-stage pond system, in which increasing salinity levels can be managed to encourage *Artemia* cyst production. In a two-stage system, each of the two ponds is maintained at a relatively constant salinity, one (at 80-100 ppt) flowing into the other at a rate sufficient to maintain the salinity of the second pond at about 140-160 ppt. The difference in salinity is used to stimulate and accelerate cyst production (oviparous tendency, which is stimulated at about 80 ppt). There is also a requirement for support ponds: one for holding input water, and another for discharge of hypersaline water (crystalization ponds).

Experience in Eritrea with extensive brine shrimp pond systems that involve development of algal stocks in the ponds (*Synechococcus* and *Dunaliella*; food for the growing brine shrimp) suggest that a twenty-one day cycle can yield up to 17.6 kg (wet weight) of brine shrimp per 200 $m^2$ (Sato *et al*., 1998). This is equivalent to 10-15 tonnes per hectare per year, which may be a significant input to fish food in the proposed mariculture pond system in the Indus Delta.

*Proposed Activities and Budget*

There are five activity areas proposed for development of the Sindh Hatchery System. These include:

- development of the Hawkes Bay hatchery;
- upgrading of the Badin and Thatta hatcheries;
- development and operation of a pilot brine shrimp facility at Zero Point;
- upgrading and operation of the Gharo pond culture facility for trials with new species, such seaweed, bivalves, crab, etc.; and,
- technical assistance, institutional strengthening, and training (in support of all of the above).

There is also provision in the budget (see Table 5) for the consumables associated with operation of the hatcheries and the brine shrimp facility, which includes feed, algae, the initial procurement of fish fry and shrimp postlarvae, and miscellaneous equipment.

Upgrading of facilities will include incorporation of wind pumps, planting of mangroves, where feasible, for stabilization of intake canals and pond bunds (for example, at the Gharo facility and possibly the brine shrimp facility at Zero Point, depending on prevailing salinities), and use of solar energy panels.

Most of the budget is proposed for institutional strengthening. An aquaculture expert will be required over a four year period to manage the program and coordinate with the Sindh Department of Fisheries. Three technical advisors will also be required for the following areas:

- hatcheries;
- community aquaculture extension; and,
- a technical advisor to run the brine shrimp facility, until it is sustainable.

The terms of reference for these individuals are noted below.

Training will be provided through a series of attachments in each of the second, third, and fourth years. These attachments will involve Department of Fisheries staff and fish farmers in the Indus Delta visiting appropriate facilities within the South Asia/Southeast Asia/Middle East region (three attachments per year, up to about 2-3 weeks each, involving up to four people). There is also provision for specialist training advisors to come to Sindh for 2-3 months at a time to address training in specific areas, such as development of feed, fry and postlarvae handling, cleaning and fertilizing ponds, inoculation of ponds with algal stocks, and handling and marketing of pond produce, etc.

Table 5. Proposed budget for development of the Sindh Hatchery System.

| Component | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---|---|---|---|---|---|---|
| **Hatchery Development: Hawkes Bay** | | | **Costs (US$, 1000s)** | | | |
| vehicles: crane truck, fry transport truck & 4 x 4 pickups (3) | 195 | 5 | 5 | 5 | 5 | 215 |
| Generator, spares, building repair | 30 | 5 | 5 | 5 | 5 | 50 |
| water & piping system, air hoses & misc. | 20 | 1 | 1 | 1 | 1 | 24 |
| lab equipment | 25 | 2 | 2 | 2 | 2 | 33 |
| computers, printers, copiers, etc | 15 | 2 | 2 | 2 | 2 | 23 |
| camper van for extension | 40 | 5 | 5 | 5 | 5 | 60 |
| **Sub-Total** | **325** | **20** | **20** | **20** | **20** | **405** |
| **Rehabilitation of Thatta and Badin Hatcheries** | | | | | | |
| vehicles: 4 x 4 pickups (2) | 50 | 2 | 2 | 2 | 2 | 58 |
| motorbikes (4) | 10 | 1 | 1 | 1 | 1 | 14 |
| water & piping system, air hoses & misc. | 50 | 2 | 2 | 2 | 2 | 58 |
| lab equipment and field kits | 15 | 1 | 1 | 1 | 1 | 19 |
| computers, printers, copiers, etc. | 10 | 1 | 1 | 1 | 1 | 14 |
| large wind pumps | 20 | 2 | 2 | 2 | 2 | 28 |
| **Sub-Total** | **155** | **9** | **9** | **9** | **9** | **191** |
| **Pilot Brine Shrimp Facility: Zero Point** | | | | | | |
| Shed | 15 | | | | | 15 |
| wind pumps | 10 | 1 | 1 | 1 | 1 | 14 |
| Tanks | 10 | | | | | 10 |
| solar energy system | 10 | | | | | 10 |
| miscellaneous equipment | 5 | 1 | 1 | 1 | 1 | 9 |
| motorbikes (2) | 5 | 1 | 1 | 1 | 1 | 9 |
| pond construction | 25 | | | | | 25 |
| mangrove planting | 5 | 5 | 1 | 1 | 1 | 13 |
| **Sub-Total** | **85** | **8** | **4** | **4** | **4** | **105** |
| **Trial Culture: Gharo Facility (seaweed, crabs, bivalves, etc.)** | | | | | | |
| pond repairs (hard-banking intake canal) | 10 | | | | | 10 |
| wind pumps & water storage tanks | 40 | 4 | 4 | 4 | 4 | 56 |
| water & piping systems | 10 | 1 | 1 | 1 | 1 | 14 |
| mangrove planting | 5 | 5 | 1 | 1 | 1 | 13 |
| solar energy system | 10 | | 1 | | | 11 |
| motorbikes (2) | 5 | 1 | 1 | 1 | 1 | 9 |
| **Sub-Total** | **80** | **11** | **8** | **7** | **7** | **113** |
| **Consumables: feed, fry, algae, nets, misc.** | | | | | | |
| Hawkes Bay | 44 | 44 | 44 | 44 | 44 | 220 |
| Thatta and Badin | 22 | 22 | 22 | 22 | 22 | 110 |
| brine shrimp pilot at Zero Point | 11 | 11 | 11 | 11 | 11 | 55 |
| trial culture at Gharo Facility | 11 | 11 | 11 | 11 | 11 | 55 |
| **Sub-Total** | **88** | **88** | **88** | **88** | **88** | **440** |
| **Technical Assistance, Institutional Strengthening & Training** | | | | | | |
| aquaculture expert | 288 | 288 | 288 | 288 | | 1,152 |
| technical advisor (hatcheries) | 288 | 288 | 288 | | | 864 |
| technical advisor (community extension) | | 288 | 288 | 288 | | 864 |
| technical advisor (brine shrimp facility) | | 288 | 288 | | | 576 |
| field expenses | 20 | 20 | 20 | 20 | | 80 |
| attachments for staff & fish farmers | | 90 | 90 | 90 | | 270 |
| specialist training advisors | | 144 | 144 | 144 | | 432 |
| miscellaneous (media materials; posters, video) | 20 | 20 | 20 | 20 | 20 | 100 |
| **Sub-Total** | **616** | **1,426** | **1,426** | **850** | **20** | **4,338** |
| **Total** | **1,349** | **1,562** | **1,555** | **978** | **148** | **5,592** |
| **Contingency** | **135** | **156** | **156** | **98** | **15** | **560** |
| **Grand Total** | **1,484** | **1,718** | **1,711** | **1,076** | **163** | **6,152** |

**Terms of Reference for Hatchery System Technical Advisors:**

**Aquaculture Expert (& Team Leader Hatchery Development) (48 months)**

1. Identify the resources available to the Sindh Fisheries Department in the form of skills, equipment, and operating budget, including the three hatcheries at Hawkes Bay, Badin and Thatta.
2. Develop and implement a detailed plan to strengthen these institutions, within the parameters of the project objectives and budget.
3. Ensure coherence of the program; including decisions on methodology and approach, including defining the work plan, within the agreed terms of reference, budget and timeframe.
4. Oversee the activities of the Technical Advisors provided under the project
5. Assist with organization and conduct of meetings with other government agencies, stakeholder consultations, technical workshops and other consultative processes.
6. Ultimately responsible for planning, constructing and commissioning the pilot brackish water ponds in Badin and Thatta, working in close cooperation with the Sindh Fisheries Department (R & D) and the supervising Consultant Engineers (to be appointed).
7. Working with the Sindh Fisheries department (R & D) to ensure that land in proposed development areas is correctly allocated so as to permit the establishment of pilot mariculture ponds prior to their development.
8. Prepare outline designs for the 3 proposed Badin and Thatta pilot mariculture pond pilot interventions, including pumping/water exchange, inlet channels, drainage, and pond systems.
9. Provide an engineering work plan for the development of the pilot interventions in Badin and Thatta and evaluate local engineering resources.
10. Identify suitable means for implementing and supervising the development.
11. Identify a suitable construction company to act as consulting engineers for the construction of the pilot interventions, develop their TORs and provide guidance to them on necessary specifications for materials, equipment or construction standards.
12. Supervise, through the consulting engineers, the construction of the 3 pilot interventions.
13. In conjunction with the Sindh Fisheries Department (R & D), assess the best sustainable systems and species suitable for the Sindh region for culture in the pilot ponds in Badin and Thatta.
14. Identify potential risk factors and develop proposals to mitigate them over time, in particular salinity and temperature variations and increasing salinization.
15. Based on the success of the pilot schemes, provide feasibility analysis of further development of the integrated pond system (this should review the potential for nucleus farm/processing etc. with satellite smallholder type operations) as well as prospects for large farms in terms of sustainable production capacity and stakeholder benefits and losses.

16. Explore the possibilities of integration of other aqua- or agriculture-based activities so that resources may support a broader range of livelihood opportunities. This should include the use of other organisms which might also provide additional returns to the operation.
17. Measure, review and analyze parameters of production in the pilot ponds and promulgate the conclusions of successful trials.
18. Assist the Department of Fisheries (R&D) extension services in the production of extension materials, to assist in the establishment of private extensive mariculture in Sindh Province.
19. Take a major part in the in-service training of national staff.
20. Identify appropriate training institutions and assist in organizing overseas study tours/ training courses for project counterparts and local technical cadres, and the identification and recruitment of specialized experts to visit Sindh.

**Reporting:**

- Quarterly reports to Secretary of Livestock & Fisheries copied to CDA, ADB and Director of Fisheries (Research and Development Karachi).
- Annual report after 12 & 24 months.
- Final report at end of assignment.

**Profile of the Specialist:**

- At least ten years experience in aquaculture project management in tropical developing countries, preferably with some experience in South or Southeast Asia.
- Proven management skills, with good capacity for technical, on-the-job training.
- Excellent interpersonal skills and proven ability to manage teamwork in international development projects.
- Fluency in English and ability to write reports and project management plans in English.
- Familiarity with ADB processes and procedures.
- Demonstrated organizational and personnel management capabilities.
- Experience in the public sector at management level, with experience in the private and NGO sectors being an advantage.

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**Technical Advisor. Hatcheries (36 months)**

1. In conjunction with Sindh Fisheries Department (R & D), oversee all hatchery functions related to the project activities; in particular, spawning, hatching, brood stock and fry development.
2. Responsible for supervising and advising on routine feeding fish, cleaning tanks, harvesting fish, maintaining the facility and monitoring fish health.
3. Assist in the management of a small staff of technicians.
4. Apply modern aquaculture techniques to continuously improve operations.
5. Provide on the job training for Sindh Fisheries Department hatchery staff, both in Karachi and the Badin and Thatta hatcheries, on all aspects of hatchery management and the production of fish and other species.
6. Any other duties as requested by the Team Leader.

**Reporting:**

- Monthly reports to TA Aquaculture Expert, copied to Director (R&D) Sindh Fisheries Department.

**Profile:**

- Dynamic individual with practical hatchery experience with a variety of species.
- Experience with milkfish, barramundi or shrimp would be an advantage.
- Ability to work in a small team.
- Willing to travel widely in Sindh.
- Prior work experience in Southeast Asia or South Asia.
- Post-secondary education in aquaculture.

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**Technical Advisor. Community Development & Extension (36 months)**

1. Assist the Sindh Fisheries Department in the establishment of the pilot pond systems in Badin and Thatta.
2. Develop routine management systems for the ponds and pond systems, and ensure that appropriate staff and farmers receive relevant on the job training and skills enhancement.
3. Working closely with the Sindh Fisheries Department extension and training staff and with the Fisheries Departments of Badin and Thatta, provide ongoing management for the pilot mariculture pond systems set up in Badin and Thatta
4. Develop training modules and materials, and conduct training courses for extension workers/ farmers in the pilot areas in conjunction with the Sindh Fisheries Department extension services and the District Council Fisheries Departments of Badin and Thatta.
5. Determine the availability of natural indigenous stocks of postlarvae and juveniles to stock the extensive mariculture fish/shrimp ponds and the availability of natural food organisms growing inside the ponds as feed.
6. Determine the availability of wild underutilized resources for use as food sources for mariculture in Badin and Thatta and in the Indus Delta region.
7. Assist in the selection of farmers and staff for study tours and training.
8. Work with local community groups and NGOs to promote small scale extensive mariculture in the Inland Sea and Indus Delta region of Sindh.
9. Any other duties as requested by the team leader.

**Reporting:**

- Monthly reports to TA Aquaculture Expert, copied to Director (R&D) Sindh Fisheries Department.

**Qualifications:**

- Experience in extensive aquaculture systems located in developing countries (experience in South Asia or Southeast Asia is a necessity).
- General knowledge of a wide range of captive fish or crustacean culture, and knowledge of environmental requirements for the establishment of a sustainable industry.

- Excellent training skills and experience.
- Excellent communication skills in both verbal and written English. Knowledge of Urdu or Sindhi languages is an advantage.
- Willingness to participate in field activities and travel to remote areas within the country.
- Qualification in aquaculture would be an advantage.

(demonstrated successful practical experience of extensive fish farming systems management and extension is more important that formal qualifications).

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**Technical Advisor. Brine Shrimp Facility (24 months)**

1. In conjunction with the Fisheries Department of Sindh (R & D), establish a brine shrimp pilot pond system in Thatta district near the site of one of the pilot mariculture pond systems.
2. Identify sources of and obtain appropriate seed stocks of *Artemia.*
3. Develop to commercial status the pilot plot so as to demonstrate viability.
4. Determine the availability of other potential brine shrimp producing areas in Sindh, including the extensive salt ponds in Karachi and the Indus Delta.
5. Working with the Community Development Advisor (Aquaculture), seek to encourage small scale *Artemia* production in Sindh.
6. Any other duties requested by the team leader.

**Reporting:**

- Monthly reports to TA Aquaculture Expert, copied to Director (R&D) Sindh Fisheries Department.

**Qualifications:**

- Experience in brine shrimp production in developing countries.
- Knowledge of the environmental requirements for the establishment of a sustainable brine shrimp industry.
- Excellent training skills and experience.
- Willingness to participate in field activities and travel to remote areas within the country.
- Qualification in aquaculture would be an advantage.

(demonstrated successful practical experience of brine shrimp farming is more important that formal qualifications).

# Appendix 5 - Concept for Mangrove Planting

**Sindh Coastal and Inland Community Development Project**
**Concept for Mangrove Planting**
**November 28, 2005**

## The Problem:

There has been a significant reduction in the area of mangroves in the Indus Delta over the last 30 years, with only about 28% of the original mangrove coverage remaining (263,000 hectares in 1977; 73,890-158,500 in 1990/91; and 73,000 hectares in 2000 – see Figure 10; note, however, that there is a wide variation in estimates of recent mangrove cover, especially in the early 1990s, and the 2005 SPOT interpretation of "sparse mangroves" is questionable).

Reasons given for the decline in mangrove area include:

- over-harvesting of mangroves for fuel wood (about 60% of the estimated 135,000 people living near the mangrove stands harvest about 18,000 tonnes per year);
- grazing by camels (especially near the mouth of the Indus River; estimate of 16,000 camels per year, but probably declining);
- alteration of the freshwater/seawater dynamics of the Indus Delta, with an increasing rate of extraction of Indus River water north of the Kotri Barrage (especially in the last 45 years); overall, a significant decline in the freshwater discharge in the lower Indus River;
- reduced sediment load (and associated nutrients) in the lower reaches of the Indus River (from 400 million tonnes per annum in 1940 to 35 million tonnes after 1992);
- encroachment into mangrove areas (especially near Karachi); for example, industry and development of salt pans;
- industrial pollution load in the Karachi area;
- there is reference to loss of mangroves along eroding shorelines during cyclones; and,
- lack of enforcement of forest management regulations.

The exact contribution of each factor to the decline in mangrove cover is not known (and subject to much debate). In the near-term, it is unlikely that any more water will be released from Kotri Barrage (residual discharge from the barrage in the dry season is reported to be about one million acre-feet – MAF; much less than the 10 MAF specified in the 1991 water distribution agreement). Dry season conditions in the Indus River cannot get much worse than at present. With minimal discharge in the Indus River (a variable with little further influence), seawater intrusion up the Indus and the creeks will continue at current rates, under tidal influence, possibly soon reaching an equilibrium point somewhere on the main branch below Kotri and in the upper reaches of the tidal creeks. The *rate* of seawater intrusion is likely to increase only if seawater levels rise faster that at present (current trend is 1.1 mm per year over the last 30 years; IUCN, 2002), or there is an increasing frequency of cyclones and related tidal surges (creating channel development and ponding of seawater in inland areas).

Table 1 shows recent trends in the land and water area of the Indus delta. Dry land appears to have declined by about 7,000 hectares, or about 1% of the total area of the Indus Delta, over the period 1992 – 2000, and water area has increased by about 6,000

hectares. Mudflats have increased by about 2,000 hectares. This is, in fact, an *increase* in potential habitat for mangroves, assuming that these mudflats are sufficiently inundated by tides and mangrove propagules will become available over time, from adjacent mangrove stands (there is evidence from satellite images indicating mangrove development along the inland fringe of the coastal zone – see details below – and there is ample field evidence – November, 2005 – of self-propagation of *Avicennia marina* in tidal creeks adjacent to existing mangrove stands).

Table 1. Composition of the Indus Delta Satellite Image Area: 1992 and 2000 (Ashraf *et al.*, 2004).

| Feature | 1992 | | 2000 | |
|---|---|---|---|---|
| | Area (hectares) | % of Total Area Interpreted | Area (hectares) | % of Total Area Interpreted |
| **Dry Land** | 83,114 | 14.3 | 76,064 | 13.1 (-1.2) |
| **Tidal Mudflats** (no mangroves) | 210,609 | 36.3 | 212,950 | 36.7 (+0.4) |
| **Mangroves** (dense and sparse) | 73,890 | 12.7 | 73,001 | 12.6 (-0.1) |
| **Water** | 211,946 | 36.7 | 217,797 | 37.6 (+0.9) |
| **Total Area Interpreted** | 579,559 | 100.0 | 579,812 | 100.0 |

Harvesting of mangroves for fuel wood may continue to be a pressure on the resource (recent population trends in and near the coastal zone are unknown; whether people are moving in or out of the traditional fishing areas – there is reference to people moving away from the coastal areas in Thatta due to shortage of drinking water and disruption of livelihoods; World Bank, 2005). The mesquite (*Prosopis juliflora*) is used for fuel wood, as well as charcoal production, which takes some pressure off mangroves. There is a suggestion that, with the recent drought, and also with a declining mangrove resource, fewer camels are brought to the area, compared to before, and this should result in less grazing pressure in mangrove areas (see Figure 1 for evidence of this).

Figure 1. Old-growth mangroves (*Avicennia*) cropped by camels in the past, and new growth forming through self-propagation (in the absence of camel grazing). West of Hajamro Creek, November, 2005.

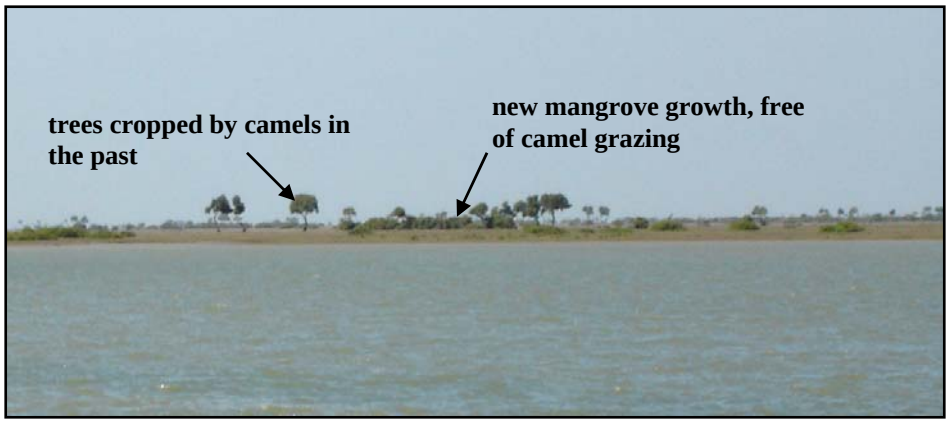
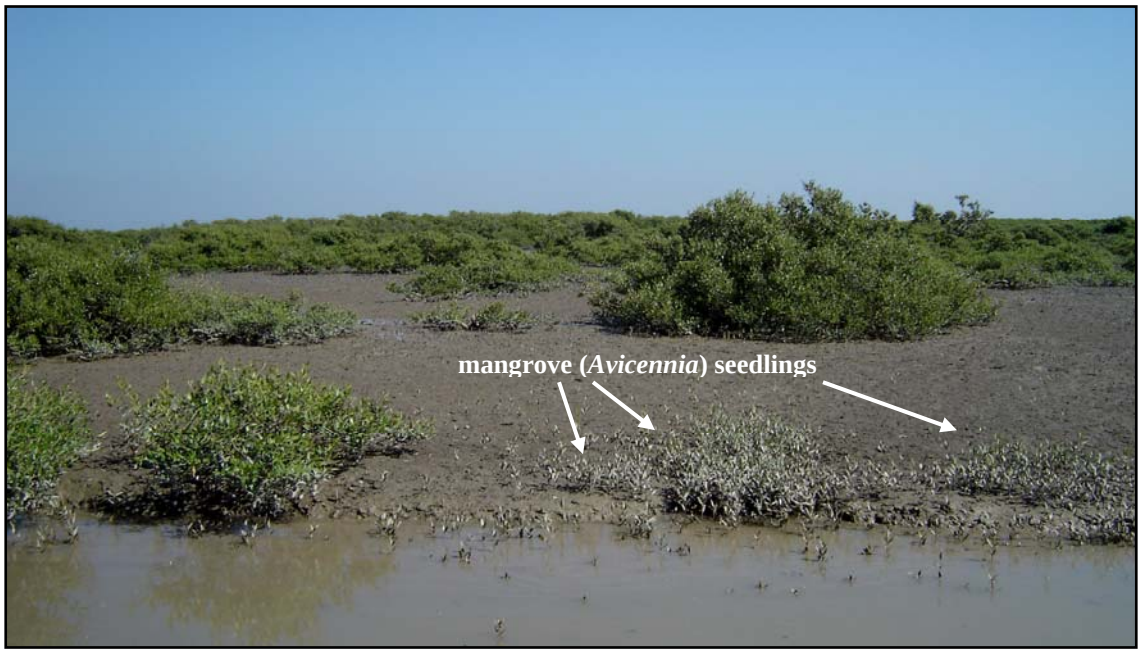


Figure 2. Natural mangrove areas near Hajamro Creek (west of Keti Bandar, November, 2005), previously cut for fuel wood and construction material, now regrowing (maximum height of 2 meters); there is a significant number of seedlings in the wetter parts of the tidal creeks.




The most accurate estimate of mangrove cover change was based on a comparison of mangrove coverage interpreted in satellite images from 1992 and 2000 (Ashraf *et al*., 2004). The overall change in mangrove cover over the whole of the Indus Delta was minimal, showing a reduction of only 889 hectares (about 1%) over the eight year period. However, there was a significant redistribution of the mangrove forest cover, with significant increasing cover in a large area from Korangi Creek to Hajamro Creek (immediately north of Keti Bandar) and a few pockets east of the mouth of the Indus River (notably Qalandri River and Shah Bandar, the latter an area that was replanted in the 1990s). There was an overall *decreasing* mangrove cover in most areas in the coastal zone east of the Indus River. Throughout the whole of the Indus delta, increasing mangrove cover in some areas compensated for decreasing mangrove cover in other areas; hence, the very small net change (about -1%) in mangrove cover.

What is more interesting is the fact that mangrove cover through the 1990s increased in *all* areas along the inland edge of the coastal zone, west and east of the Indus River (not around the mouth of the Indus). Mangrove cover *decreased* in most areas along a 10-15 km wide band at the seaward edge of the coastal zone (although less apparent in Korangi Creek). This pervasive shift in the overall distribution of mangrove cover (seaward to inland) *may* reflect the increasing penetration of seawater up the creeks (related to decreasing freshwater discharge in the Indus and reduced drainage from agricultural land) and self-propagation of *Avicennia* from existing stands, following the optimal band where seawater and freshwater mix to create salinities and tidal inundation most suitable for *Avicennia*.

The most dense stands of mangroves are confined to the area east of Karachi (Korangi Creek area and along the upper reaches of Dabbo and Chhan Creeks). There are few mangroves at the mouth of the Indus River. Mangrove density increases again southeast of the Indus River, in the area of Qalandri River, Gabhar Creek, and Khar Creek, and in a 40 x 50 km swath southeast of Shah Bandar. There are several areas where the mangrove stands are dense, but most of the mangroves in the Indus Delta are sparse (see Figure 10) and apparently they are fairly stunted in many areas as well, reflecting stress conditions.

Mangrove species diversity is limited in the Indus Delta. Most of the mangroves are *Avicennia marina* (known locally as *timer*), which is more tolerant of higher salinities and other stress conditions than other species (reportedly 95-99% of the mangroves in the Delta are *Avicennia*). Other species occurring in the delta area include *Rhizophora mucronata*, *Ceriops tagal*, and *Aegiceras corniculata*, but they are much more limited in distribution than *Avicennia*.

Mangrove habitat and environmental functions are critically important to the delta/coastal ecosystem, although now diminishing. They include:

- provision of nursery habitat for fish, shrimp, crabs, and molluscs, which are very important to coastal and marine fisheries;
- normally an area of higher biodiversity, compared to unvegetated coastal areas, including the indigenous animal populations, as well as migratory birds;
- if managed properly, sustainable source of fuel wood, construction wood, and fodder for cattle and camels;
- absorption of excessive amounts of nutrients and contaminants;
- protection against erosion (reduction of wave energy); and,
- opportunities for other economic activities, such as honey production, ecotourism, etc.

Figure 3. Communities in the Indus Delta have used mangrove trees as protection against the erosive effects of waves for a long time (near Keti Bandar, November, 2005).

**Previous Efforts to Solve the Problem:**

In 1958, two blocks of mangrove forest in the Indus Delta were designated as Protected Areas. These included the mangrove forest block from Korangi Creek to Chhan Creek (southeast of Karachi) and a block from Mal Creek to Sir Creek (under Sindh Forest Department control). Mangrove forest around the mouth of the Indus River was not protected (the area in and around Keti Bandar, under Board of Revenue jurisdiction). This area is quite devoid of mangroves (there have apparently been few mangroves in this area over the last 100 years, due to cutting of mangroves for fuel wood for the river fleet and grazing by camels).

Apart from discussions of the mangrove forest problems, and preparation of forest management plans (which do not appear to have been implemented), the only direct interventions to stabilize or increase the mangrove cover include several mangrove replanting programs (completed, underway, or planned), which are described below:

- World Bank program, implemented by IUCN and Sindh Forest Department (completed in 2000) that supported the planting of about 5,000 hectares of mangroves in the Indus Delta – target areas were narrowly focused on easily accessible areas, rather than being strategically located for maximum positive impact from mangroves; there is reference to mangrove planting north of Keti Bandar and near Shah Bandar, using *Avicennia marina* and *Rhizophora mucronata*.
- Rehri Creek (IUCN), where development of mangrove nurseries and mangrove replanting have been underway at various times (1985-87; 1993-98; 1997-2000 – the latter as part of an ADB RETA).
- IUCN, with funding from Norway, mangrove replanting in the Korangi-Phitti Creek area; apparently still underway, using mangrove nurseries.
- Reference to Bundal/Khipranwala/Muchaka Islands (immediately south of Karachi), where mangrove plantations have been established (this may be part of some initiatives noted above).
- Reference to Juna Bunder, 18 km south of Port Qasim Complex, where mangrove replanting has been attempted (this may also be part of some initiatives described above).
- WWF (and PFF) program underway with EU funding (to 2007), involving planting of mangroves, using a nursery technique, at four sites (for a total of 400 hectares), at Sandspit (near Karachi; see Figures 4 and 5); Keti Bandar (Keti Bandar has a very small nursery, and V-shaped trenches are used for out-planting; target of 100 hectares; Rasool and Saifullah, 2005; see Figures 6-8); and two locations in Balochistan; under the same program, attempting to develop sustainable mangrove management in 800 hectares in Chhan Creek, Hajamro Creek, and Turshian River, all west of Keti Bandar.
- 3-year WWF program funded by Shell; mangrove protection in the Korangi Creek and Paitiani Creek area (100 hectare target for replanting; 45 hectares completed with *Avicennia*; only 20-30% survival of seedlings ).
- Reference to a one-year UNDP Small Grants Program project at Kharo Chan and Keti Bandar; “Promotion of Tropical Forests”, being implemented by WWF; target of 100 hectares for mangrove replanting at Kharo Chan; still underway.
- Government of Sindh project to plant or regenerate about 8,000 hectares in the Indus Delta (subject to availability of funds, part of the Forever Indus WWF program) – no specific areas identified yet.

With current mangrove replanting schemes underway, there are still 450 hectares targeted for planting, 250 of which are located in the Indus Delta part of Thatta. There are no mangrove replanting programs underway or planned for Badin (there was some mangrove planting along the LBOD, but apparently this was unsuccessful).

Figure 4. Replanted mangrove fringe (*Avicennia marina*) adjacent to the mangrove forest at Hawkes Bay (near the WWF Wetland Center).

Figure 5. WWF mangrove nursery at Hawkes Bay, Sandspit, west of Karachi.

Figure 6. WWF mangrove nursery at Siddique Ronjho, near Keti Bandar.

Figure 7. Mangrove planting area at Keti Bandar (October, 2005).

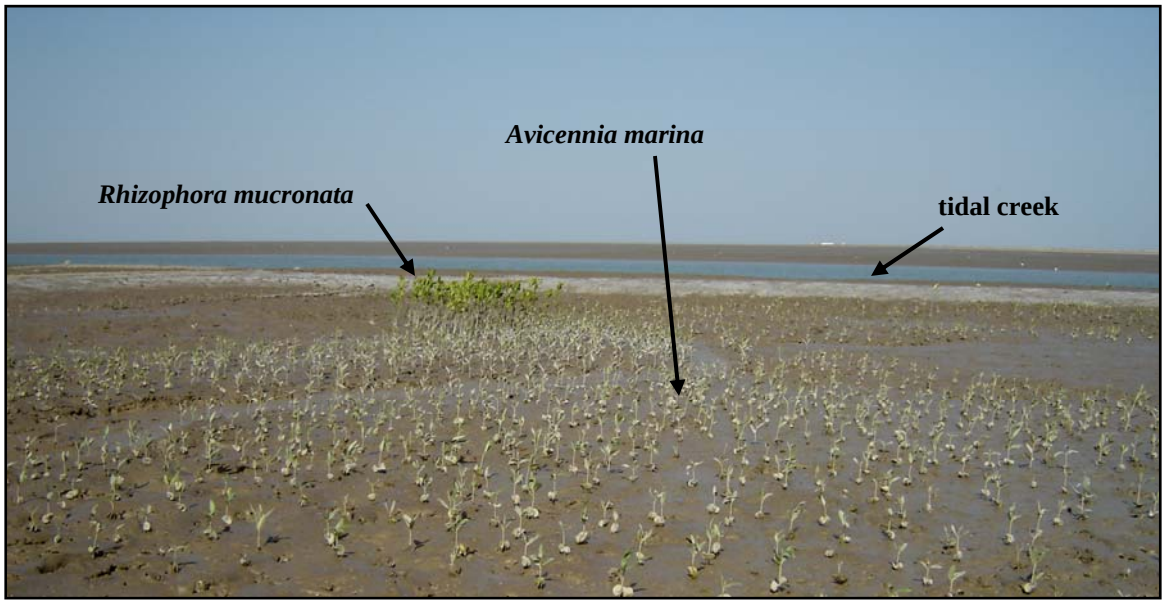


Figure 8. V-trench planting system for mangrove seedlings (WWF site at Hamza Dablo village near Hajamro Creek, November, 2005).


**Rationale for More Interventions and the Proposed Approach:**

There is no useful purpose in planting more mangroves in the Korangi Creek area, or in other locations between Karachi and Chhan Creek, where there is a relative abundance of mangroves. Most of the mangrove planting in the past has been focused on this area, even though anecdotal evidence points to ongoing natural development of mangroves in this area through self-propagation, without any human intervention (self-propagation with a high density of recent seedlings has also been observed in natural mangrove areas near Hajamro Creek, in November, 2005). The area between Karachi and Chhan Creek is also experiencing some natural mangrove progradation along the landward edge, due to the relatively large available mangrove stock. In any case, promotion of mangrove habitat sustainability and sustainable exploitation of mangrove-associated fisheries in areas near Korangi Creek may continue to be compromised by ongoing industrial expansion and discharge of untreated sewage and industrial waste (a proposal to address water quality problems in the Karachi area is discussed elsewhere).

There will certainly be more benefit from planting mangroves in areas that do not presently have adjacent mangrove stands, thereby creating new mangrove refuges that will eventually self-propagate (Figure 9). These areas can be selected on the basis of lack of pollution, presence of local communities and infrastructure in adjacent areas (providing some protection from erosion, as well as an opportunity for community-based mangrove management). These areas may also be suitable for other project interventions, such as the proposed integrated pond systems (for culture of fish, crabs, shrimp, and seaweed), which will benefit from adjacent mangrove planting schemes (see separate project paper).

Figure 9. Tidal mudflats: a candidate location for mangrove planting at Keti Bandar.

The mangrove planting program is therefore targeted at three areas in Thatta: around Keti Bandar, Shah Bandar, and the northwest corner of what is referred to as the Zero Point Inland Sea. The proposed program targets up to 225 hectares of mangrove planting, with seedlings planted in a 10-metre wide mangrove belt along tidal creeks in each of the identified areas and in the intertidal zone of the relict dhand system near Ahmad Rajo (see Figures 11-13). Given the configuration of the proposed mangrove belt, it is expected that up to 150 km of tidal creek banks in the Keti Bandar and Shah Bandar areas might be stabilized with mangroves, and 75 km of the landward fringe of the Inland Sea populated with mangroves.

The specific location and configuration of the planted areas will be important, such that stabilization of the banks of tidal creeks can be attempted, adjacent infrastructure can be protected, and the opportunity for self-propagation and advancement of mangroves stands (reflecting the changing location of optimal conditions) is high. The mangrove buffer zone along creeks, for example, can be configured to maximize the edge effect (mangrove propagules falling and germinating in intertidal mud immediately adjacent to existing stands; a mangrove strip, shaped as a buffer along a tidal creek that is 10 x 100 meters, has a significantly greater edge than a patch on a tidal flat that is 32 x 32 meters - roughly the same area, but with only 128 meters of edge, compared to 220 meters with the buffer strip).

Technical support will be required in each area to ensure that the most suitable locations are planted (proper vertical range and frequency of tidal inundation, silt/clay sediment type; use of trenches). It is likely that most of the mangroves planted will be *Avicennia marina*. However, where feasible within a given area, consideration should be given to the planting of more than one species of mangrove; e.g., *Avicennia marina* on the

seaward fringe and *Rhizophora mucronata* on higher ground, possibly raised levees, to increase the diversity of the habitat.

One aspect of the scheme is to create local community interest in and responsibility for the mangrove planting and subsequent management. Three steps in the process, which the community can manage with support from a local NGO, include:

- Collection of propagules from existing stands of mangroves (possibly in the Korangi Creek area, near Chhan Creek, and east of Shah Bandar), and planting in nurseries near the project sites;
- Planting in designated areas along the tidal creeks and the Inland Sea fringe (see Figures 11-13); and,
- Subsequent management of the mangrove planting areas, over a five year period, to ensure maximum survival rates of the seedlings.

Experience in other areas suggests that, without incentives, the communities may not be very interested in the mangrove planting scheme. In order to create interest in, and a sense of ownership of, the project as well as the planting sites, economic incentives are proposed, as follows:

- Payment for collection of propagules and establishment in local nurseries (10 Rp each propagule);
- Payment for planting seedlings in the designated areas (20 Rp each); and,
- Payment for the survival of each seedling (20 Rp per seedling per year, to a maximum of five years, by which time mangrove-planted areas may be stable and start to self-propagate).

Mangrove planting incentive schemes in other countries were examined for their potential application in Sindh. In Indonesia, for example, households are given small loans for poultry or duck farming, and loan interest is forgiven (principle *does* have to be paid back) if mangroves are planted and most of them survive after five years (Parish, 2005). This scheme is perhaps too cumbersome for Sindh, since it requires a loan administrative system, and extension on poultry and duck farming, as well as extension on mangrove planting techniques. It also requires household-level book-keeping and families having to pay back money, all of which may be beyond the capacity of the institutions and communities in the coastal areas of Thatta and Badin. Direct payment for mangrove planting and survival, with minimal recordkeeping by an NGO, was therefore assumed to be the simplest possible incentive scheme that can be applied in Sindh.

Total project liability over five years for each mangrove seedling would be about US$2.20. At a maximum planting density of 5,000 seedlings per hectare and a target of 225 hectares, total cost would be about US$ 2.5 million for planting and subsequent site management, plus costs associated with technical support, monitoring, and management of the community incentives (another US$ 0.5 million). Certainly not all the mangrove seedlings will survive; the project costs associated with mangrove planting would therefore likely be lower than noted above. An indicative budget of US$ 3 million for the overall mangrove planting program should be sufficient for all expected activities, with all the nursery development and planting to be completed in the first two years, and then ongoing NGO facilitation and payment of incentives through to the end of year five (see Table 2). Mangrove planting should be front-loaded as much as possible to achieve benefits in habitat rehabilitation sooner, rather than later (however, appropriate site selection and community organization are absolutely requisite before starting with the scheme).

Table 2. Budget commitments (maxima; US$) for mangrove planting over five years.

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Community planting | 937,500 | 375,000 | 375,000 | 375,000 | 375,000 |
| NGO facilitation | 100,000 | 100,000 | 100,000 | 100,000 | 100,000 |
| **Total** | **1,037,500** | **475,000** | **475,000** | **475,000** | **475,000** |

The role of the local NGO will be important. As the program will be voluntary (open to those who are interested in the incentives and have an ability to plant and manage specific sites), facilitation, technical support, and strict management of the incentive scheme will be critically important to the success of the program. Sites along tidal creeks will need to be demarcated and assigned to individuals or small groups within the community. Technical advice will need to be delivered, regarding the proper techniques for planting, the sequence of planting along the creeks, and appropriate methods to exclude animals (for example, use of mesquite brush, chicken wire, etc.). Individual seedlings will require tagging, reflecting ownership, survival, and payment of annual incentives (to avoid abuse of the incentive scheme; for example, a leaf hole-puncher marking payment, assuming the "tag" leaf on each seedling will survive for the duration of the incentive scheme). Specific details on planting sites and management of the incentive scheme will require further consideration during the implementation phase of the project.

**Potential Benefits of Mangrove Planting in the Project Area:**

There have been many studies of the economic value of mangrove forests. These are all based on monetizing the environmental functions of mangrove forests over 10-50 year periods, including:

- provision of nursery habitat for fish, shrimp, crabs, and molluscs (fisheries with high commercial value);
- intrinsic value of higher biodiversity;
- sustainable source of fuel wood, construction wood, and fodder for cattle and camels (for example, *Avicennia* branches can be trimmed for forage – copsing – and these branches will grow back);
- absorption of excessive amounts of nutrients and contaminants (reducing level of eutrophication and pollution in areas where this matters);
- protection of infrastructure against erosion (reduction of wave energy; note that mangroves do not prevent intrusion of water *per se*); and,
- opportunities for other economic activities, such as honey production, ecotourism, etc.

The actual value of mangrove forests in a given location depends on assumptions in the economic valuation and the specific environmental and socioeconomic features of the location. The most commonly cited range of values for a typical mangrove forest is about US$ 9,000 -12,000 per hectare per year, with some mangrove forests having values up to US$ 18,620 per hectare per year (Bann, 1999; McClung, 2002; Shester *et al*., 2005). Maximum project liability for the mangrove planting (assuming 100% survival) is US$ 11,000 per hectare, over five years (US$ 2,200 per year), which puts the project investment at the very low end of the range of mangrove valuations, giving the investment a high probability of good return in future mangrove environmental functions. Even using a low valuation for a mangrove forest (about US$ 5,000/ha/year), over

twenty years the mangrove buffers planted in this project may be worth an accumulated US$ 100,000 per hectare (in 2005 dollars), assuming at least *some* achievement of the environmental functions listed above.

In fact, the actual realized value of the mangrove planting, adjacent to the proposed integrated pond systems, will likely be much higher than US$ 100,000 per hectare over the medium- to long-term. Mangroves will contribute to the protection of the ponds, which might, after 20 years, expand in area to about 500 hectares at each of the three locations. These ponds will be protected by "outer lines of defense" (mangroves along the tidal creeks, which are threaded throughout at least two of the locations; the Inland Sea area is a different scenario), and "inner lines of defense" - mangroves planted along the intake canals for the ponds and along all the bunds; see Figures 11-13).

Annual production from the ponds in these areas (about 500 hectares in the immediate vicinity of towns and nearest settlements) may be worth US$ 3.5 million (see separate paper on the proposed integrated mariculture pond system; fish production worth about US$ 7,000 per hectare per year). Thus, an initial investment of US$ 11,000 per hectare, in addition to providing habitat and indirect fisheries benefits, as well as a potential sustainable fuel wood supply, may help protect pond production that may be worth a total of US$ 140,000 (gross income per hectare over 20 years, in 2005 dollars). Expressed another way, strategic planting of mangroves in 75 hectares at each of Keti Bandar and Shah Bandar (see Figures 11 and 12), at a cost of about US$ 1 million at each location, could help protect future pond production worth US$ 70 million at each location (after 20 years). Given the lack of tidal creeks in the proposed Zero Point project area, the mangrove planting may provide less strategic value to the ponds (there will, however, still be mangroves planted in the immediate vicinity of the ponds and the intake canals; see Figure 13).

How can the benefits of mangrove planting in the designated areas be distributed to the local communities? In the first instance, there is the incentive scheme described above, in which immediate cash injections to the community, acting as habitat custodians, are possible (most in the first year and then some in each of the subsequent years). Assuming that a family may take responsibility for a 10 x 100 meter mangrove buffer strip (1,000 $m^2$), this equates to planting and management of 500 mangrove propagules (eventually seedlings). A family would receive 5,000 rupees (US$ 83) initially for collecting and planting the propagules in a designated nursery (perhaps a corner of their buffer strip or some other location near their settlement), then another 10,000 rupees (US$ 167) for planting the seedlings in the buffer strip along the tidal creek. In each of the subsequent years, depending on survival rate of the seedlings, the family could receive up to 10,000 rupees. This income is about equal to the current average income in the coastal zone of the project area (about 600-800 rupees/month; World Bank, 2004). Therefore, for most households, mangrove planting and plot management will provide an opportunity to double family income. Assuming 10 households per hectare of mangrove planting, then up to 2,250 households (about 18,000-20,000 people) may benefit directly from involvement in the mangrove planting scheme at the three proposed locations.

The second benefit to local communities will come from the increasing environmental functions of the mangrove forest at each of the three locations, and the protection of the integrated pond systems, which the local communities will be involved with (described above).

Figure 10. Habitat distribution in the coastal zone of Thatta and Badin in 2005.

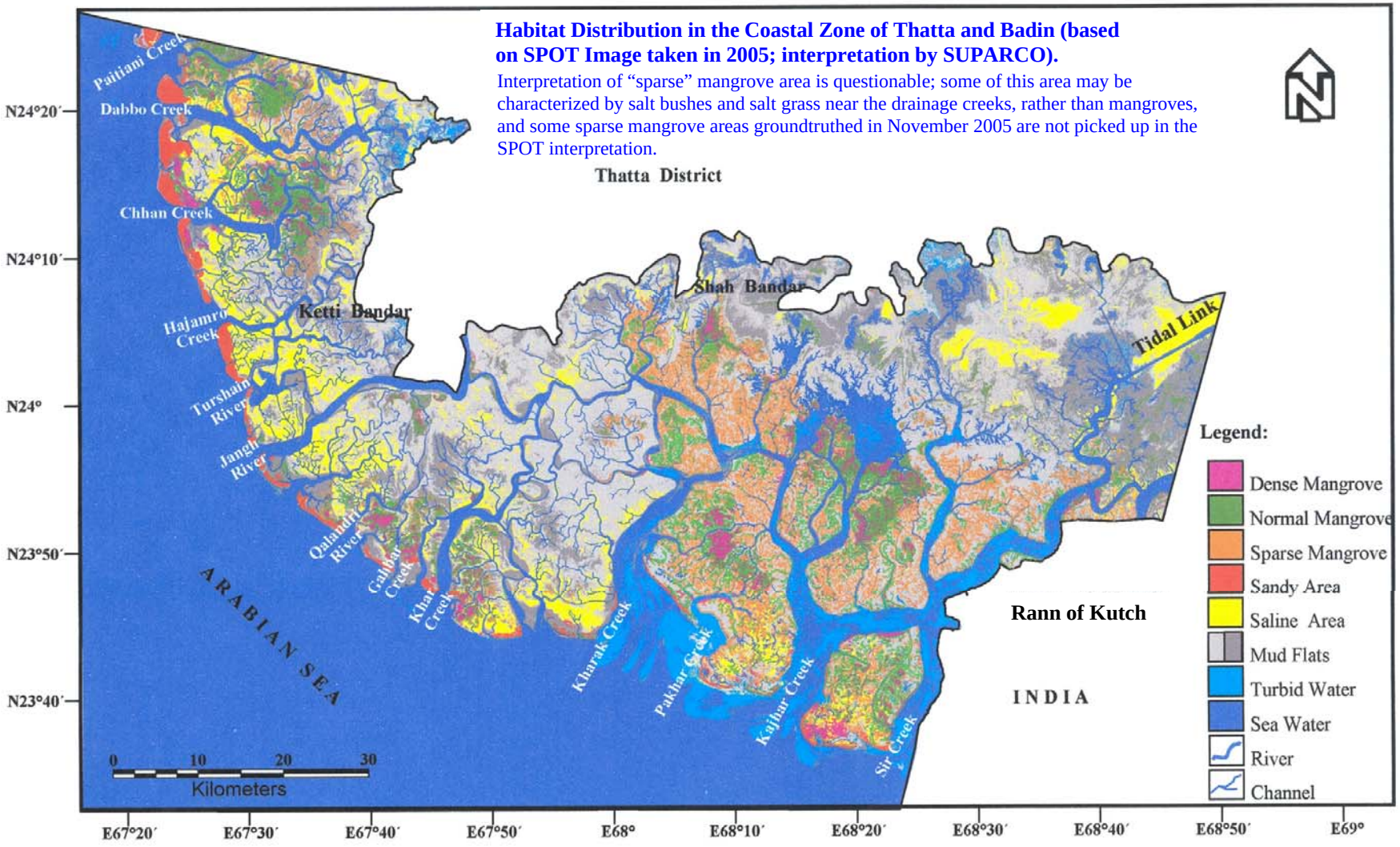


Figure 11. Potential locations of mangrove planting (and integrated pond system/model village) in the Keti Bandar area.

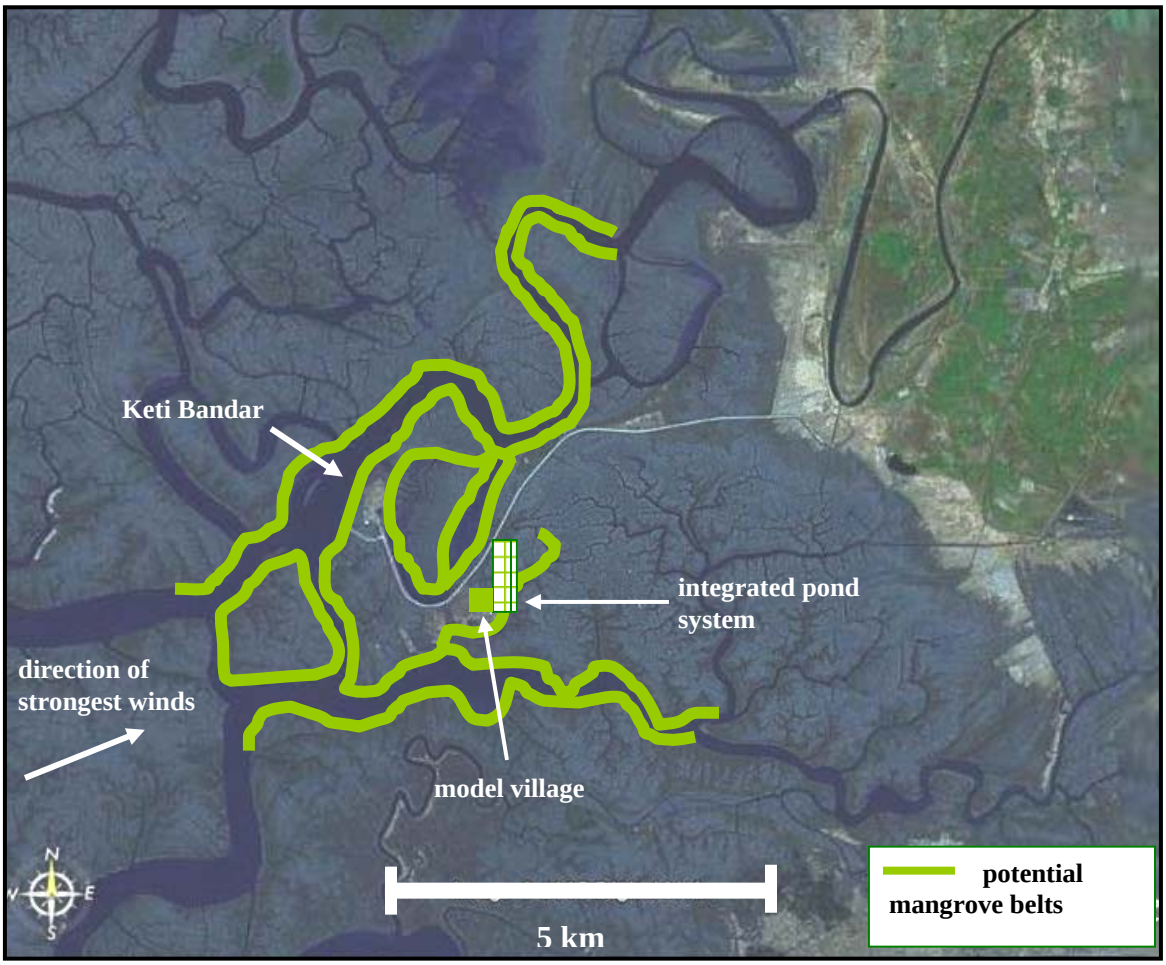


Figure 12. Potential locations of mangrove planting (and integrated pond system/model village) in the Shah Bandar area.

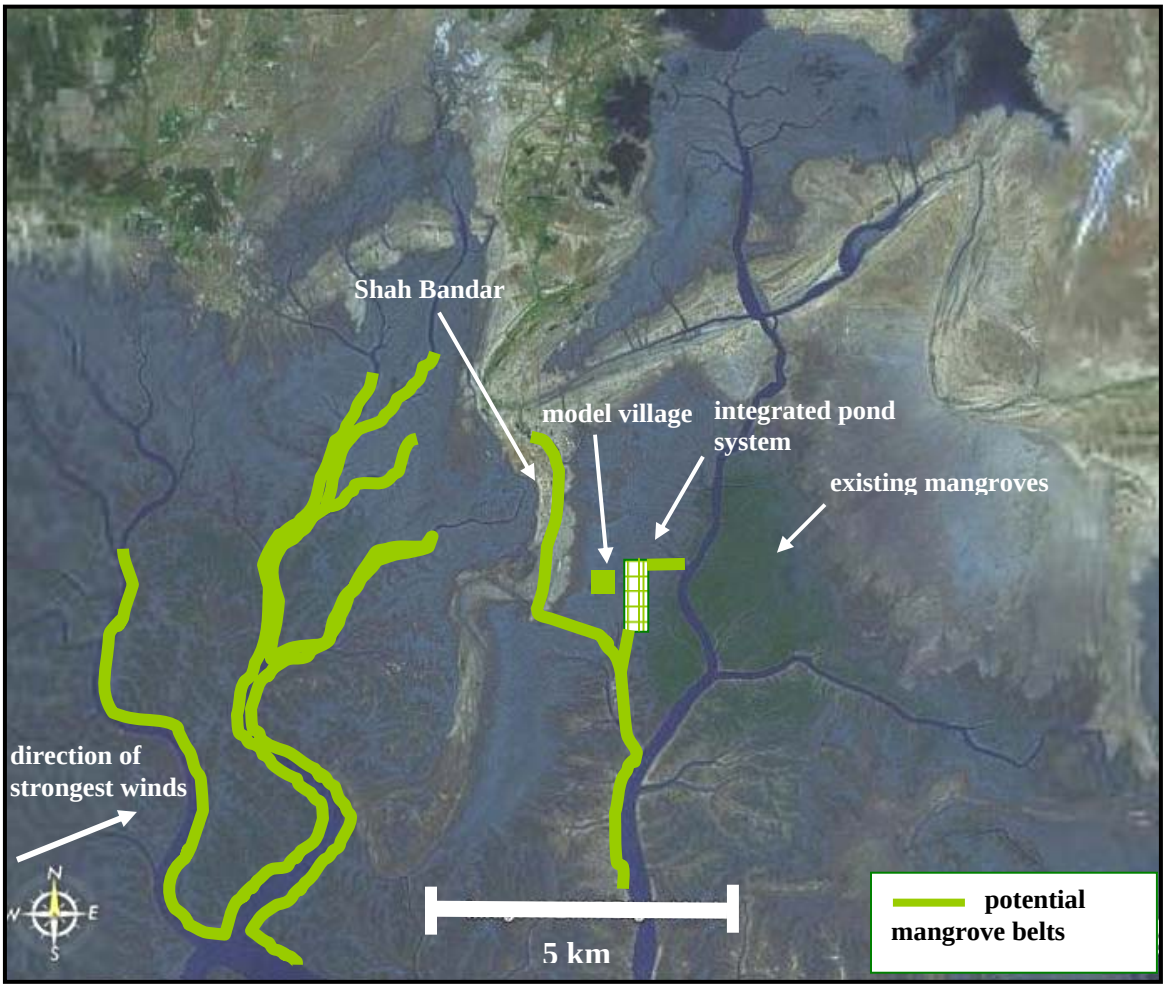
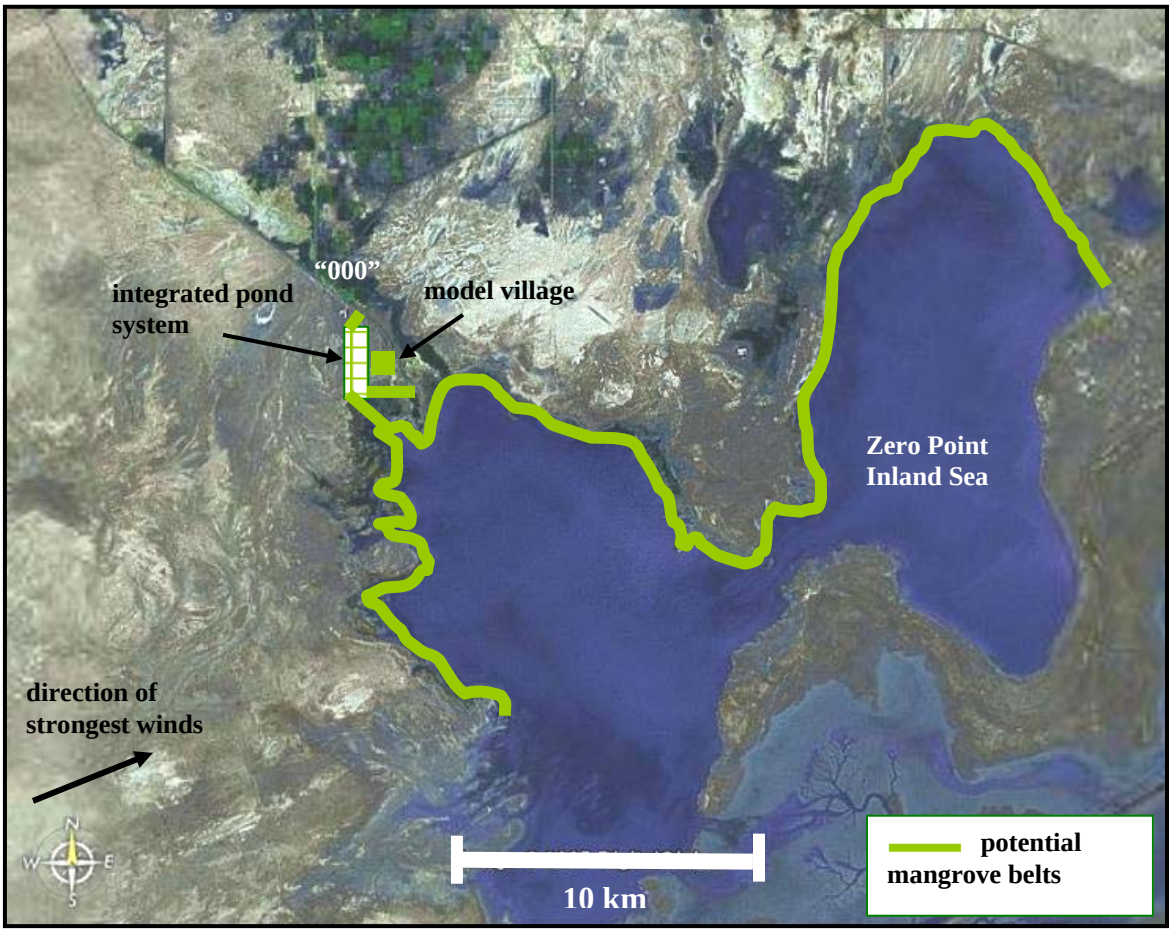


Figure 13. Potential locations of mangrove planting (and integrated pond system/model village) in the Zero Point area.



# Appendix 6 - Enterprise Development Background Paper

**Asian Development Bank**
**Project Preparatory Technical Assistance**
**No TA 4525 – PAK**

**Sindh Coastal and Inland Community Development Project (SCICDP)**
**Enterprise Development**

Report of the Enterprise Development Specialist (International)[68]
**Karachi, November 2005**

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[68] The Specialist also prepared a full draft of the *modus operandi* of the proposed Sindh Coastal Areas Small Grants Trust (SCASGT) and Small Grants Fund (SGF), which is annexed as an Appendix to this Report

**List of abbreviations**

| | |
|---|---|
| ADB | Asian Development Bank |
| CCB | Citizen Community Board |
| CDA | Coastal Development Authority |
| CO | community[-based] organization |
| CSO | civil society organization |
| DCO | District Coordinating Officer |
| Dept. | Department |
| DFR | Draft final report |
| ME | micro enterprise |
| MF | micro finance |
| NGO | non governmental organization |
| NRSP | National Rural Support Programme |
| P&D | Planning and Development |
| PA | Project Agreement |
| PAN | Project Appraisal Note |
| PMU | Project Management Unit |
| PP | project proposal |
| RSP | Rural Support Programme *(the network)* |
| SCASGT | Sindh Coastal Areas Small Grants Trust |
| SCICDP | Sindh Coastal and Inland Community Development Project |
| SGF | Small Grants Fund |
| SME | small or medium enterprise |
| STDC | Sindh Tourism Development Corporation |
| VTI | vocational training institute |

## 1. Background: appreciation of the enterprise development environment in the project area

The salient characteristics of the overall environment in the project area – decreased fresh water flow, sea intrusion, land loss and salination, over-fishing and declining fish yields to local boats, low agricultural yields, poverty and low skill levels of the agricultural and fishing populations and of both genders, lack of obviously-accessible alternative livelihood opportunities, etc. – form the known general background to the (SCICDP) project and to the entire Draft Final Report (DFR). There is no need of their further amplification here. All that need be stated is that the (Enterprise Development) Specialist and his domestic counterpart consultant have found nothing field investigations and discussions with stakeholders to contradict these characteristics, and have indeed further confirmed some of them.

The basic implication is that the project must serve a large, growing and increasingly impoverished agro/fisheries target group who may be helped to improve their material condition by fisheries regulatory measures and local infrastructural (road/track, water supply, mangrove, etc.) investments, but who need help to exploit every remunerative and sustainable income-opportunity they can get, whether in agricultural (including fisheries) or non-agricultural sectors, and whether in self-employment or being employed by others, in whatever locations make economic sense to them, whether inside or outside the project area. Moreover, the target group has little reserves or capital – on the contrary, most are encumbered by significant debt. On an individual basis, they cannot be benefited by 'opportunities' which either take a long time to mature, or require them to invest significant capital which they do not possess.

Some comments are in order about particular sub-sectors.

*Agriculture*: in the project area, (crop) agriculture does not offer many robust livelihood opportunities. See the DFR section on agriculture, where the reasons are discussed and various measures are proposed which may raise yields and incomes. No further enterprise development measures are indicated, other than micro finance - if feasible, which it probably is not (see below, in this Section). Whatever opportunities emerge in the sector will likely develop from institutional strengthening work within the Department of Agriculture. People can foresee opportunities but the policy and institutional environment limits their will to invest.

Livestock: small-scale livestock farming is an opportunity for various sub-target-groups (including not but necessarily limited to women, the landless, fisherfolk particularly those near Karachi, etc.). See the DFR section on agriculture. The range of *potential* animals includes buffalo, cattle, sheep and goats, and poultry. There may be possibilities of linkages with large-scale agribusiness investments (see below, in Section 2, Proposed Interventions ).

*Fisheries*: the prognosis on direct enterprise development promotion of sea/estuarine fisheries is unrelievedly negative. The fishermen face many challenges which have led to declining yields and incomes, and in some cases to laying-up of boats. It is doubtful whether these challenges can be met, or whether on the contrary the capture sea/estuarine fishery will continue to be a sick and declining sector in which further enterprise Development should not be envisaged.

Moreover, there is a lack of credible enterprise development tools. 80% or more of fishermen (boat owners) are heavily indebted to their customers, the fish-traders or 'moles'. The typical debt is much too large to be replaced by micro finance, even if micro finance is feasible at all. And while the debts to the traders persist, the profitability of the fishery to the boat owners and their crews is drastically reduced, because the trader-creditors have right of purchase of the catch at prices set by themselves. The fishery is scarcely worth the effort, as laid up boats and the preference of many fishermen to be crew rather than owners, testify.

Indeed, so serious are the effects of the debt problem that it is very doubtful whether ice-plants and jetties to assist the fisheries should be major objects of project investment/promotion. There is evidence that lower costs of fish landing and transport will accrue benefits primarily to the trader-creditors, not to the fishermen. This judgment is also made in other sections of the DFR. Enterprise development efforts in the capture sea/estuarine fishery thus look like being limited to skills development in other trades (see below). The fishermen all say they would welcome such efforts for themselves, their wives and their children, almost all of whom presently lack skills which can bring alternative employment.

Captive fish or shrimp farming is another matter. It offers some positive opportunities, which are discussed in other sections of the DFR. But any promotion package(s) should take great care not to replicate the debt-bondage problem which so bedevils the capture sea/estuarine fishery.

*Non-agricultural lines of local business*: given the low levels of agricultural and fisheries incomes in the project area, few of these lines suggest themselves as positive opportunities since in rural areas they are generally driven by backward consumption linkages with the farmers' and fishermens' incomes. They are not independent 'substitute' income-generators.

*Skill development and non-agricultural employment*: this is a major need of the target group and opportunity for the project's enterprise development intervention, primarily because all of the above list of sectors combined, will not be able to provide satisfactory livelihoods for most of the poor in the project area. This is certainly the case for the fishermen, and seems very likely to be so in the non-perennial agricultural areas too.

The needs – i.e. that they need non-agricultural employment, and that they need presently-lacking skills to secure such employment - seems to be recognised and accepted by the target group. They certainly are by the poor fishermen, who say they are willing to pay for such training. It is also recognised that the existing formal (primary and secondary) education system is not meeting the need. It is grossly deficient even in the delivery of basic academic education in rural areas generally, let alone training in practical vocational skills to poor rural residents.

The questions therefore reside in the details of promoting skill development and non-agricultural employment. These are discussed below, in Section 2, Proposed Interventions.

*'Eco-tourism' with community involvement*: there are some real opportunities to promote this sector at a few sites in the project area. They are discussed below, in Section 2, Proposed Interventions.

*Micro finance:* although micro finance is recognised almost throughout the developing world as a powerful enterprise development tool helping poor people to increase their incomes through ownership and operation of agricultural and non-agricultural micro enterprises (MEs) it does not appear to be a feasible option in the project area during the life-span of the SCICDP project. The project area is economically marginal and undiversified, very low income, relatively sparsely populated, and remote from towns. These features make it very difficult for micro finance to be a paying proposition for micro finance institutions or programs, since they reduce potential (mark-up/interest) revenues and increase the costs of providing financial services. And it is a hallmark of the micro finance approach to income generation that it be a paying proposition, and thus sustainable over the long term. There is no point at all in burdening poor people with debt and requiring them to pay 'high' interest rates, if the supply of micro finance loan capital to them cannot be sustained in this way.

Sadly this is likely to be the situation in the project area during the life-span of the SCICDP project. So far, there is no convincing evidence that micro finance is being provided, or is likely to be provided, by any micro finance institutions or programs, in the project area. If such programs are started, they will probably focus on the larger towns and perennial irrigation areas of the target Districts, quite rationally because it is there that micro finance may well be a paying proposition and thus a real development tool for uplifting poor people and their incomes.

Thus, the enterprise development interventions of the project will not include a micro finance component.

## 2. Proposed interventions

### 2.1 Skills development for (non agricultural) employment and self employment

**Economic background and strategy**

The project's target group is significantly unemployed and experiences serious deficiencies in income because of limited work opportunities and skills. This is even more acutely so for women than for men, but it is a severe problem for both sexes. Whilst many interventions in the fisheries and agricultural sectors are proposed in the project, they will almost certainly not be sufficient on their own to solve even approximately the deep-seated unemployment and poverty problems of the target group. More is needed, in the field of promoting non-agricultural skills and opportunities.

In a very real sense, the populations in the target project area have already recognised this. Although statistics are not to hand the PPTA Team has heard many tales of people in the area migrating permanently to Karachi or lesser cities and towns, and likewise many of family members who migrate temporarily (whether seasonally or otherwise) in search of employment or self-employment outside the project area. Nearly everywhere, too, one is told that the women of the household sit around in the house with 'nothing productive to do', at least for long periods of time each year. Given (a) the parlous state of the basic primary sectors in the project area (b) the equally parlous educational status of the target group, whose members rarely advance beyond Grade 5 and are often

functionally illiterate, and (c) the social customs restricting womens' movements and activities, this is hardly surprising.

Even among the men, who can at least move around more easily, one finds that their limited skills severely curtail their actual opportunities. They may migrate in search of jobs, but not find them due to competition from higher-skilled or better-placed competitors, or else earn such low wages that the move becomes hardly worth the effort. As one man in a poor village about 15 km from Zero Point in Badin put it:

> I sometimes work as a laborer at the steel mill in Karachi, but I only earn Rs.120-150/- day and I can earn that here as an agricultural laborer so why bother to go all the way to Karachi?

Many other men, still more hopeless, say that they have no skills other than those handed down from their fathers, so there is 'no point' in looking for alternative or supplementary jobs at all. This attitude prevails particularly among fishermen. Unemployed farmers in the project area can and sometimes do seek agricultural laboring employment in the perennial irrigation and/or peri-urban areas. But this work is not continuous and generally pays low wages, too.

Remedies must be sought beyond agriculture and fisheries for these problems of unemployment and low incomes. One may categorize the non-agricultural skills-development income-enhancing opportunities as follows:

a. Linked to local markets in the project area
b. Linked to outside markets, but with the employment[69] located in the project area
c. Linked to outside markets and with the employment located outside the project area

These categories are important to a clear conception of the underlying economic strategy of the skills development sub-project, although they do not necessarily correspond to the divisions between the skills – in the sense of trades skills - to be imparted. For example, automotive engine repair skills may advance the economic well-being of a target group member through, variously:

a. Employment in a tractor maintenance enterprise in, or very near, the project area

b Employment in an enterprise similarly located to a), but serving mostly longer-haul lorries or buses

c. Employment in a distant urban garage, say in Karachi.

The first point to be noted is that in the project area opportunities of type a) are likely to be quite limited. It has been known for decades internationally that the richer and more productive is an agricultural or fisheries area in a developing country, 'paradoxically' the higher is the percentage of local GDP and employment that is non-agricultural. The reasons are simple. Farmers and sometimes fishermen drive the local rural economy. If they are prosperous, they buy as consumers many goods and services, including

[69] and/or self employment. It would make irritating reading to insert this phrase at every possible point. Usually, it will be pretty clear to readers from the context what is meant: employment, self-employment, or a mixture of both.

construction and transportation goods and services, and this generates much local economic activity in trade, transportation, construction, communications, services, and artisan manufacturing e.g. tailoring or woodworking. Such backward consumer linkages from agriculture or fisheries are generally the most powerful force producing non-agricultural income opportunities in rural areas. They are reinforced by backward production linkages to agricultural inputs and services suppliers – seed merchants, tractor maintenance enterprises, boat builders and repairers, ice-plants, etc. – whose markets grow as agriculture or fisheries become more prosperous. And in many circumstances, they are further reinforced by powerful forward production linkages to agro-processing and trading, transport, and storage of produce.

But if the leading sectors of agriculture and fisheries cannot be radically expanded to yield adequate incomes and prosperity to large numbers of farmers and fishermen, nor can the non-agricultural opportunities related to local markets. This, sadly, is likely to be case in the project area. The two other categories of opportunities, exemplified by b) and c) above, must therefore be exploited as well.

The case of opportunities linked to outside markets, but with the employment located in the project area is also likely to be of limited, although less determinate, size. The size is largely a reflection of marketing capabilities. Since the project area has very limited resources other than agricultural or fishery-related which are location-specific, any opportunities other than those created by local agro- or fish-processing, will mostly depend on products and services based on 'imported' materials and local skills to make them up into marketable products, coupled with effective marketing. Agro-processing and fish-processing opportunities themselves are unlikely on a large scale in the project area within the medium term future. Either the primary resources are too meager, or there appear to be no significant advantages to a commercial-scale processor in locating within the project area as opposed to locating (say) in or near Karachi or in the areas of perennial irrigation. Nor does there appear to be any significant tradition of e.g. local wood carving which could act as a base for a handicrafts sector employing any large number of people. On the other hand, in the case of 'imported' materials and local 'make-up', the opportunities would seem to be limited largely to textile, e.g. embroidered, products. There is quite a strong tradition of local embroidery by women in the project area, and these handicraft products are known in the Karachi markets and elsewhere in Pakistan. This is probably the most significant of all the non-agricultural opportunities linked to outside markets but with the employment located in the project area. However, before any significant initiative is made to attempt to expand production skills, local consultants in the project's implementation phase should examine the marketing channels for embroideries in detail and determine whether or not marketing capabilities of either the home producers or the trading middlemen are adequate for market expansion; and if not, recommend whether they may also be augmented, and how.

This brings us to the third and last category, viz. opportunities linked to outside markets and with the employment located outside the project area – put very crudely, migration to a range of 'skilled' trades in Karachi or other urban or industrial centres . The theoretical opportunities here are almost limitless, and this category is almost certainly the one with the most significant non-agricultural income-enhancing potential to the target group. However, the potential will not be easy to achieve.

**Trades**

As a first step, it will be appropriate to propose a candidate list of non-agricultural trades which may be included in the skills development sub project.

The Table below displays the candidate list, with additional columns suggesting the applicability of each trade to skill development training for men and women in the target group.

**Table (1) of Trades, by gender of those likely to practise them significantly**

| Trade | Male | Female |
|---|---|---|
| Vet services suppliers | X | ? |
| Pump/tubewell installation/maintenance | X | |
| Boat builder/repairer | X | |
| Boat engine mechanic | X | |
| Tractor repair | X | |
| Agricultural implement repair | X | |
| Bicycle repair | X | |
| Motor cycle/auto ricksha mechanic | X | |
| Car/bus/truck mechanic | X | |
| Upholsterers | X | |
| Car/bus driver | X | |
| Welding – various types | X | |
| Blacksmith | X | |
| Tinsmith | X | |
| Coppersmith | X | |
| Sheet metal worker | X | |
| Electrician | X | |
| Fan Repair | X | |
| A/C Repair | X | |
| Radio/TV repair | X | |
| Photocopier repair/maintenance | X | |
| Carpenter/Joiner | X | |
| Metal Joiner | X | |
| Bricklayer | X | |
| Plumber | X | |
| Painter | X | |
| Cement-block/tile making | X | |
| Tailoring/dressmaking | X | X |
| Industrial tailoring/garment manufacture | X | X |
| Dress/garment designing | X | X |
| Embroidery | | X |
| Fabric/screen printing | X | |
| Tie & dye | | X |
| Potter | X | |
| Glass painting | | X |
| Hand made paper making (art market) | | X |

| | | |
|---|---|---|
| Baker | X | |
| Restaurant cook | X | |
| Sherbet, jam/jelly, sweets etc. - making | X | X |
| Barber | X | |
| Photographer | X | |

The overall candidate list of trades in the left-hand column of the Table was drawn up based on the following considerations:

- The generally poor educational status of the target group
- The lack of capital possessed by the target group (in the case of some trades mostly for self-employment)
- The limitations on the mobility of women in the target group
- Inclusion of standard major trades such as carpenter, car mechanic, plumber, electrician, tailor, etc. Such skills are almost certainly in demand, whether or not they have been observed being plied in the project area or in locations nearer to or in Karachi
- Inclusion of trades observed as being locally plied in the project area or rural locations adjacent to it, e.g. boat builder/repairer, tractor mechanic, tailor, embroiderer
- Inclusion of trades known to be already the object of skill development programs for the rural poor by NGOs and similar institutions in the project area or in other rural parts of Pakistan
- Inclusion of trades directly known to be demand by large/medium firms in Karachi[70] (wherever such trades are not excluded by any other of the considerations, such as low educational status)

Some of these considerations, particularly the inclusive ones, march in parallel. They are not mutually exclusive. For example, tailoring could be included either as a 'standard major trade', or as a trade observed as being locally plied in the project area, or as a trade known to be already the object of skill development programs for the rural poor.

Examples of some trades *excluded* from the list are:

- Computer repair, machinist, civil engineering draftsman (low educational status)
- Jeweler (lack of capital)
- Beautician/cosmetics/hair-dressing, greetings card design (lack of mobility of women in the project area, to the urban areas where these trades are in demand)

Of course it might be argued that e.g. a tradesman can work for a jeweler rather than being one himself, but in making up a candidate list one has to draw a line somewhere, and the list of trades in the Table is indeed quite ample. It could also be expanded during project implementation, based on experience of revealed demand and/or changing economic conditions.

[70] Or other urban areas, both near and far. Karachi is just the biggest and - except for Thatta and Badin towns - the closest, to the project area.

Turning to the gender applicability displayed in the middle and right-hand columns, the marked preponderance of 'male' trades is from some points of view (particularly that of increasing the overall incomes of target group households) regrettable. However, it reflects deep-seated social mores about the permissible economic roles and locational mobility of women in rural Pakistan in general and in the project area in particular. The project will make interventions to expand viable female economic roles as far as possible, notably in the raising of livestock and through social mobilisation and gender empowerment measures. Despite such efforts, any significant non–agricultural employment or self-employment of women in the target group is likely to be only in the limited number of trades indicated in the right-hand column of the Table, because it is only these trades in which the women are (a) 'acceptable' and (b) they can practice without having to move their domiciles to urban areas[71].

We now depict, in the Table below the trades distinguished by the three categories noted above: in and for local markets; located in the project area, but for distant markets; and located outside the project area, and in and for distant markets.

**Table (2) of Trades, by probable major location of opportunities**

| Trade | Local markets | In project area, for distant mkts. | Outside project area, in/for distant markets |
|---|---|---|---|
| Vet services suppliers | X | | |
| Pump/tubewell installation/maintenance | X | | |
| Boat builder/repairer | X | | |
| Boat engine mechanic | X | | |
| Tractor repair | X | | |
| Agricultural implement repair | XX | | |
| Bicycle repair | XX | | |
| Motor cycle/auto ricksha mechanic | XX | | |
| Car/bus/truck mechanic | | | X |
| Upholsterers | | | X |
| Car/bus driver | | | X |
| Welding – various types | XX | | |
| Blacksmith | | | X |
| Tinsmith | | | X |
| Coppersmith | | | X |
| Sheet metal worker | XX | | |
| Electrician | XX | | |
| Fan Repair | | | X |
| A/C Repair | | | X |

[71] Again, it might be argued that if entire target group households were to re-locate their domiciles to urban areas there would be a point in including urban female trades in the skills development program. However, it has been assumed that the men would re-locate first. Therefore their wives' skill development needs for urban female trades would be catered for – if at all within the project itself – only in its later years of implementation, after success had been proved in developing male employment for target group members outside the project area.

| | | | |
|---|---|---|---|
| Radio/TV repair | | | X |
| Photocopier repair/maintenance | | | |
| | XX | | |
| Carpenter/Joiner | | | X |
| Metal Joiner | | | X |
| Bricklayer | | | X |
| Plumber | XX | | |
| Painter | XX | | |
| Cement-block/tile making | | | |
| | XX | | |
| Tailoring/dressmaking | | | X |
| Industrial tailoring/garment | | | X |
| manufacture | | X | |
| Dress/.garment designing | | X | |
| Embroidery | | X | |
| Fabric/screen printing | | | |
| Tie & dye | X | | |
| | | X | |
| Potter | | X | |
| Glass painting | | | |
| Hand made paper making (art | | | X |
| market) | | | X |
| | XX | | |
| Baker | | | |
| Restaurant cook | XX | | |
| Sherbet, jam/jelly, sweets etc. - | | | X |
| making | | | |
| | | | |
| Barber | | | |
| Photographer | | | |
| | | | |
| | | | |

There are several points to be made about this presentation:

- Since the term 'outside the project area, in or for distant markets' could be interpreted to mean 'the rest of the world, or at least the rest of Pakistan not in the project area', practically *any* of the trades in the entire candidate list could be practised there by members of the target group. One could even be a boat builder/repairer in Baluchistan, for example. And one could certainly be an ordinary tailor in Karachi, Thatta, Hyderabad, or any other city in Sindh. This is so obvious that the Table does not record it. Instead, in the right-hand column are recorded only those trades where it is believed that the *bulk* of opportunities for the target-group in that trade are located outside the project area. It should be noted that in some instances, particularly many of the fishing villages in Coastal Karachi, 'outside the project area' is not so very far from the project area itself. For example, the Korangi textile and garment factories are only 3-4 km away from the village of Rehri Goth.
- Similarly, in the right-centre column, are recorded only those trades where it is believed that the *bulk* of opportunities for the target-group in that trade are located in the project area, but for distant markets

- On the other hand, in the left-centre column are recorded those trades for which it is indeed believed that there are significant opportunities for target group members within or adjoining[72] the project area. But this does not preclude the possibility and indeed the probability that in many such trades, target group members will have significant attractive opportunities outside the project area as well. Such a probability is indicated by adding a second 'X' in the left-centre column against that trade
- For many of the trades, the 'X's recorded are necessarily a matter of *judgment*. There are no statistics breaking down non-agricultural employment and self-employment by trades in such detail by locations within Sindh or elsewhere in Pakistan. And even if there were, it would be a hard task indeed to make any accurate assessment of current or projected demand and supply for skills by trade and location in advance of implementation of the skills development sub-project, during which detailed local assessments could periodically be made, where necessary.
- Rather, the presentation in the Table is intended to provide implementers with a strategic starting-point in planning implementation. For each trade, it poses the questions: if we include it in the program, what and where are the likely achievable impacts? Where will target group members have to go (or, in some cases, most likely choose to go) to reap the opportunities provided? And what does that imply for who should be included because of appropriate motivation or qualifications or position in the target group household; and what, if anything, should be included within the course besides mere instruction in technical elements[73]?

**Modalities**

Under the modalities of the program, we may consider two primary aspects (a) institutions, and (b) locations and methods for running courses.

As a strategic background to these aspects, the whole focus of the program will be the transmission to target group members of skills which enable them to achieve remunerative employment or self-employment immediately thereafter. The focus will not the addition of vocational training to (say) the mainstream secondary education provided to younger children in the schools. Nor will it be the expansion of full-scale long-course vocational training to cover youth in the project area. The first of these 'alternatives' would have too long a 'payback' period, and the second would be needlessly expensive and probably impracticable in the project area in any case. And neither would provide any reasonable chance of success, given the institutional obstacles within the mainstream educational and vocational training systems, and the low average educational status of the target group.

[72] Meaning, in the immediately adjacent perennial irrigation areas, and particularly in the small towns in those areas, which are within reasonable daily commuting distance of the project area.

[73] Example: if it is believed that (say) 'local' sugar mills within daily commuting distance of target group members, present significant opportunities for blacksmiths, or electricians, or painters in addition to those opportunities to be found far outside the project area, should the component-implementers introduce any steps to assist the mills and the 'graduates' to come together, such as a week or two working in the mills under experienced employees?

Instead, what is needed is practical training which enables target group members of employable age – either already adult, or about to become so[74] - to find jobs or set up micro enterprises within a very few weeks of its completion. Pakistanis in urban or prosperous rural areas mostly acquire such training on the job and/or from their parents, but in the case of our target group, pre-job but practical and short-term training will be required to overcome their disadvantages of (a) distance from most non-agricultural opportunities and (b) highly sector-limited traditional skills.

The present public sector systems of academic and vocational training - the primary and secondary schools, and the vocational training institutes (VTIs) - will accordingly be marginal to the program. They either address the 'wrong' groups such as younger children, or expensively train urban youth. There are no VTIs in the project area outside Karachi District. Whilst there are certainly a number of high schools – in the coastal areas of Thatta District alone, there are 12 – they are not much attended even by the children of target group members, and they have no vocational instructors. Any direct contribution they make to the skills development program will likely be infrastructural, that of perhaps providing local venues for certain courses within their premises. It is, furthermore, known that Sindh has some of the worst indices for mainstream education, particularly in the small towns and the rural areas, e.g. the lowest provincial enrolment ratio for primary schooling, and the much the highest student-teacher ratio, in the country[75]. And there is n*o* explicit coverage at all in the entire Education chapter of the ICUN Report of vocational training, either in specialist institutions or in the general school system[76].

The only institutions encountered by the PPTA Team which are providing skill development services of the required type – short, practical, non-agricultural training courses to target group members of employable age – are NGOs. The case of the HANDS textile skills training center at Memem Goth in Karachi Rural, and its linkages with employment/self-employment systems, is particularly instructive and encouraging

This is a compact, well run, economical[77] training center providing short practical training courses to males and females, from the project area, of employable age and low mainstream educational status. The center operates courses which cater for (a) industrial employment in garment factories in Karachi (Korangi), and (b) rural self-employment as embroiderers. For both types of training, good links are maintained with the 'target markets'. The center is well-known to and visited by garment factory-owners, and its industrial training supervisor has good contacts with the labor-contractors through whom the factory-owners hire most of their operatives. The graduates (trainees) on this course are mostly men, but some women are also trainees. Both sexes readily find employment in the factories.

On the rural self-employment side, HANDS operates an effective system of transmission of the skills of the embroidery graduates, who are all female. Each of them returns to their local community in the project area and, equipped with a powered embroidery

[74] At least 16 years of age, and probably in most cases 18 years or more
[75] *Sindh: State of Environment and Development*, IUCN, Karachi (2004), p. 285
[76] ibid., pp. 282-295
[77] It trains 45 graduates per annum, with an initial investment cost of Rs. 350,000/- and Rs. 720,000/- operating costs per annum including rent of the building. Assuming the investment cost to be equivalent to Rs. 90,000/- per annum depreciation, this translates into a total direct training cost of Rs.18,000 per graduate. The courses are of 4 to 6 months duration for each graduate

machine, then acts as trainer to other women and girls in that community. Both she and they find local self employment as embroiderers for local markets. rural communities. Often they work together, at least to occupy and pay the costs of premises (a room or two) for production purposes, but this is not mandatory, rather it is chosen by the women themselves as a convenience. The equipment costs are not high. A powered sewing machine costs about Rs. 3,000-4000/- and a powered embroidery machine about Rs. 6,000 – 8,000 and can serve two or three sewing machines. Even without micro finance, the women can afford these investments if they form a savings section of a CO (separated from the mens' saving section, if one exists).

This achievement, albeit it is as yet still on a relatively small scale, is particularly impressive because HANDS' main focus is rural health and nutrition. It has only recently moved into promoting income generation, having recognised the need from its work in the health/nutrition fields. Already, it is directly combining the health and income generation sectors by training rural midwives. Because this is a specialist and critical qualification, the course for midwives – run at a cottage hospital operated by HANDS in Karachi Rural - is longer than the textile/garments courses: one whole year. The course includes training as community health workers. The graduates, on return to their communities, perform as health workers with little or no pay or fees, but they earn a good living as midwives.

Some other NGOs are active in non-agricultural skills development for the rural poor in Pakistan. Examples are the National Rural Support Programme (NRSP); Sungi; and Bunyad.

NRSP, which has rural support operations over all or most of the country, provides such training on a nation-wide basis in three 'centers': Islamabad/Rawalpindi, Baluchistan, and Hyderabad. Although Islamabad/Rawalpindi is the largest venue, all three are of significant size, and Hyderabad is evidently 'handy' for trainees from the project area. NRSP also conducts 'mobile' training courses, that is, on-location in or very near trainees' home communities.

The training at 'centers' is conducted at various specific venues. For example, at Islamabad/Rawalpindi, several public and private vocational training institutes (VTIs) are used as training contractors, providing the premises, equipment, and instructors although NRSP define the curricula. However, some courses are provided directly on NRSP's own Islamabad premises with instructors directly hired by NRSP. The choice is pragmatic in each case: is it better to do the job in-house, or contract it out?

The trainees come to the centers from their rural communities, and lodge near the training venue. Essentially, it is an 'immersion' experience, with very little spare time for the trainees. The courses are generally for 1 or 2 months, and sometimes include elements on setting up one's own small business, marketing, etc. Costs, including lodging and food, run at about Rs 15,000 per month per trainee, of which about 25-30% is training fees or direct training costs. Trainees pay 50% of the fees, that is about 15% of total costs, and they also pay their transport costs from and to their local communities.

The 'mobile' on-location training is conducted at rented or rent-free buildings within or very near the trainees' own communities. Costs are much lower, largely because the trainees live at home. The courses are generally short, less than one month in duration.

Sungi's non-agricultural skills development program is very similar in principle to NRSP's 'center' training, except that it is less varied, smaller, and presently geographically concentrated in Hazara Division. As with NRSP, the venues – mostly in Haripur and Abbotabad - are a mix of VTIs acting as contractors and Sungi's own premises. As with NRSP, Sungi does not limit itself to skills development. It operates in the rural communities it serves in several fields including community mobilisation, local infrastructure, health, civil rights, etc.

The main field of Bunyad, which operates mainly in rural Punjab, is literacy and non-formal (academic) education, but it also operates 'mobile' on-location non-agricultural skill development training for the rural poor in ways very similar to those used by NRSP. Interestingly, Bunyad's Chairman – a well-known and respected professor – has suggested to the Secretary of Education, Punjab that rooms in local rural schools should be used out of normal school hours for vocational training in common trades such as plumbing, electricians, carpentry, tailoring. The Secretary's answer was revealing. He said he would love to promote and allow this, but that 'Departmental boundaries' hinder or even prohibit it.

To summarize all this experience, including that of HANDS, it would seem that there are basically two models:

- Training at a center – more or less distant, and either run by the NGO directly, or with a public or other VTI as a contractor. Usually 1 – 2 months. NRSP, Sungi

- Training on location (mobile) at a local building, rented or rent-free, in home communities. Usually less than 1 month. NRSP, Bunyad.

- The HANDS model imaginatively links the two. It proceeds from training at a 'nearly-local' center to operation through the graduates of the center of on-location (mobile) training in home communities. Because (a) the center is 'nearly-local' and (b) because the center graduates then become trainers in their home communities, lodging and training costs are reduced, and it is probably because of this that HANDS' courses, both in its center and in the home communities are quite long: 4 - 6 months[78].

The project should not restrict itself to any one of these models, but rather accept – and encourage – NGOs and perhaps well-motivated *zamindars*[79] - make their own proposals. Probably, these will more or less approximate one or other of the models above. A possible variant might be short-course training in some trades at the premises of a suitable SME, whether 'local' or (say) in Thatta, Badin, or Karachi. There are precedents for this model in NWFP. And the poor fishermen of Mubarak village found the idea attractive, as applied, for example, to potential auto-mechanic training for them at suitable SME garages in Maripur, on the road to Karachi. They would be willing to contribute to the training costs and also to pay the daily bus fares involved.

[78] The year-long HANDS course for rural midwives is exceptional

[79] The PPTA Team met at least one *zamindar* in the project area who is proposing to introduce non-agricultural skills development in his local area. His intent is serious, but he has not yet worked out the details

On the other hand, the prospects of locating mobile on-location training in government schools 'out of hours' must be rated rather low. Not only is the reported reaction of the Secretary of Education, Punjab, relevant and discouraging. Meetings of PPTA Team members with senior educational officials in the project's own Districts suggested that officials are much more interested in extending the 'normal' curriculum in their high schools to include vocational components than in short courses for people of employable age but of low average educational status. Whilst this may be a laudable long-term goal, it is not going to serve the interests of the project's target group in the short and medium terms. And it is likely in any case to be fraught with long bureaucratic delays and frustrations occasioned by 'Departmental boundaries'.

The Table below indicates, based on the experiences of the NGOs, the trades in which useful training may be expected at (a) centers (b) on-location (mobile) in or very near home communities in the project area.

**Table (3) of Trades, by probable locations of training**

| Trade | In 'centers' | On-location |
|---|---|---|
| Vet services suppliers | X | |
| Pump/tubewell installation/maintenance | | X |
| | | X |
| Boat builder/repairer | X | X |
| Boat engine mechanic | X | |
| Tractor repair | | X |
| Agricultural implement repair | | X |
| Bicycle repair | X | X |
| Motor cycle/auto ricksha mechanic | X | |
| Car/bus/truck mechanic | X | |
| Upholsterers | X | |
| Car/bus driver | | |
| | X | |
| Welding – various types | X | |
| Blacksmith | | X |
| Tinsmith | X | |
| Coppersmith | X | |
| Sheet metal worker | | |
| | X | X |
| Electrician | | |
| | | X |
| Fan Repair | X | |
| A/C Repair | X | X |
| Radio/TV repair | X | |
| Photocopier repair/maintenance | | |
| | | X |
| Carpenter/Joiner | X | |
| Metal Joiner | | X |
| Bricklayer | X | X |
| Plumber | | X |
| Painter | | X |
| Cement-block/tile making | | |
| | X | X |
| Tailoring/dressmaking | X | |

| | | |
|---|---|---|
| Industrial tailoring/garment | X | X |
| manufacture | X | X |
| Dress/.garment designing | X | X |
| Embroidery | X | X |
| Fabric/screen printing | | |
| Tie & dye | X | |
| | | X |
| Potter | | X |
| Glass painting | | |
| Hand made paper making (art | X | |
| market) | X | |
| | | X |
| Baker | | |
| Restaurant cook | X | X |
| Sherbet, jam/jelly, sweets etc. - | X | X |
| making | | |
| | | |
| Barber | | |
| Photographer | | |

Comments on the presentation in this Table:

- There is nothing 'sacred' or 'cast in stone' about the suggestions made in it, which merely reflect experience and common sense
- Where relatively heavy or expensive/delicate equipment (or 'work in process' such as tractors or photocopiers) are likely to be needed in adequate training, it is more likely that the trade would be primarily be taught in 'centers', although these centers would not necessarily be training institutes, they might be well-equipped and experienced SMEs
- Where no such equipment or work-in-process is involved, it may be found more cost-effective to offer the training on-location (mobile)
- However, many trades might be taught at centers *and* on-location. Even more than those actually indicated in the Table, particularly given the HANDS model of training some people in centers, followed by those people acting as trainers back in their home communities. (Although that model may not be applicable to all trades, particularly not to those trades where the employment opportunities for the graduates lie mostly outside the project area, in distant markets)

In this as in other non-strategic (objective-linked) aspects of the program, the project is advised not to adopt any fixed stance in advance, but rather to respond pragmatically to reasonable schemes made by proposers, probably to the Small Grants Trust and its SGF.

There are two final aspects of the skills development sub-project.

- Contributions to the costs by the trainees themselves
- Overall scale of the Project

On the first point, best practice both internationally and in Pakistan is that beneficiaries (trainees) should make some contribution to the costs of training them non-agricultural skills. It has been found that only in this way do the beneficiaries really value the training and become committed to making the most of the opportunities it can provide. There is

no obstacle from the needy community members in the project area. All those interviewed, even very poor fishermen in remote and desolate communities, indicated that they would be willing to make some payments towards the direct and associated costs of the training. The scale of the contribution will vary according to the poverty of the trainees and the nature and total costs of the training in each specific proposal. However, experience both internationally and in Pakistan indicates that an average of 20-30% contribution by the beneficiaries to the total (direct; and associated, e.g. lodging and transport) costs of the training, may be anticipated.

On the second point, it would seem that the total population in the most deprived coastal areas of Thatta and Badin districts amounts to some 160,000 persons. If this is increased somewhat to include marginal areas and also the poorer fishing villages – *not* Ibrahim Hydri – in Karachi district, a figure of 250,000 persons may be estimated. Demographically speaking, this may include about 50,000 males and 25,000 females who are of employable age, not already advanced in years, and potentially willing to participate in the skills development sub-project with advantage.

It would indeed be a major achievement of the SCICDP project if the sub-project over 5 years could actually train 25% of this 'target group', i.e. approximately 19,000 persons. This would be a huge program, even if the majority of the beneficiaries could be trained on-location using the various model described above, or variants of the same. It would involve very large efforts to achieve this: from the project; from the Small Grants Trust and Fund which is envisaged as funding the great majority of the training proposals; and most of all from the NGOs/CSOs and well-motivated *zamindars* who would make most of the proposals and subsequently administer those which were approved.

Furthermore, if anything like this large number of needy community members could be trained through the efforts of the project, undoubtedly it would have a powerful further spontaneous positive 'knock-on' effect on the economy and employable skills within the project area. This would operate through at least two processes:

- through increased incomes and remittances from the graduates of the training programmes, which will stimulate local enterprise and employment through backward consumption linkages. And
- through example, emulation, and intra-family diffusion of the new skills, which will transmit them to further local community members and will make them, too, more readily employable outside the project area because, apart from the skills they actually acquire in this way (a) that area will have become 'known' to outside employers as a source of appropriately-skilled labour, and (b) relatives (the graduates of the training programs) will intermediate with their employers and even in some cases employ the further community members themselves.

Both these processes have already been in operation for many years in e.g. some formerly-deprived *barani* (rain fed) rural areas in northern Punjab

### 2.2 Development of 'eco-tourism' sites with community involvement

**Background: present situation**

The coastal areas include sites which have been in the past, or could become, tourist attractions. They center around selected beaches, creeks, and fresh water lakes adjacent to needy communities in the project area.

A few examples of this type include:

- Hawkes Bay and Sandpit beaches and mangrove swamp, west of Karachi
- Bhambore lake, archeological site, and creek, in Thatta district
- Haleji lake, in Thatta district
- Kinja lake, in Thatta district

The main envisaged market for these sites is domestic (resident Pakistani) tourists, particularly day-trippers or weekenders from Karachi. Any foreign tourists who may visit the sites would represent merely an extra 'topping on the cake'.

The sites cited all have genuine attractions, which however are currently poorly developed to attract and receive visitors. There follow brief descriptions of three of these sites.

***Hawkes Bay and Sandpit***
This site fronts onto what is essentially a single long sweeping attractive golden sand beach interrupted by one or two small spits. It is about 30-40 minutes drive from central Karachi on good roads, and there is a fishing village located on it, near Sandpit.

A few hundred metres behind the beach, at Sandpit, is a mangrove swamp. Both this swamp and the beach are used every year by many ocean-going leatherback turtles which were born there and return to lay their eggs. The turtles are the focus of a long-running conservation project of WWF Pakistan and the Sindh Wildlife Dept. The eggs, which are laid on, and buried in, the sands of the beach by their mothers, are vulnerable to being eaten by scavenging dogs. The project therefore transplants them on a large scale to its facility in the mangrove swamp, hatches them, and releases the hatchlings on the beach to give them a good chance of swimming safely out to sea and eventual maturity. Provided that this cycle can be preserved, the seasonal visits of the turtles and particular their hatching routine are themselves a very significant tourist attraction of the site.

The other attraction is the beach itself, which can become the focus of normal beach leisure activities including boat rides and the eating of refreshments, whilst the littoral immediately behind and overlooking it can be the site of holiday homes, guesthouses, restaurants, landscaping and small parks, and other amenities.

Presently, however, these potentials are very poorly exploited. There are many private holiday homes in varying states of completion or repair, which are almost invariably poorly landscaped. Complaints against these homes and their (usually rich and influential) private owners include (a) illegitimate occupancy of their sites (b) encroachment beyond areas legitimately owned (c) unsightly buildings (d) loud parties at night, which disturb the turtles in their egg-laying and also other local residents (e) bright lights which deter the turtles from visiting the beach or making their way back to the sea[80].

[80] *Dawn*: *the Review*, 20-26 October 2005, 'The Endangered Turtles', pp. 4-9

These homes constitute virtually the only man-made tourist development[81] so far of the entire site. Clearly, there is much potential for further, but more appropriate, development. The Karachi City District Council has reportedly since 2004 put out requests for proposals from developers, but nothing has so far come of these.

***Bhambore***

This is an attractive open site with several and diverse features. Much of it is presently under the jurisdiction and management of the Government of Pakistan, Dept. of Antiquities. It lies a few kilometers south of the eastern reaches of Korangi Creek. The site abuts onto a different saltwater creek of its own, from which sea-going fishing 'launches' operate.

If one is moving in a seaward (or creek-ward) direction, the site comprises:

- A small freshwater lake, presently approximately 2 ha. in area, which used to be larger but is being silted up. The lake has reed-beds and is the resort of wild birds, including seasonal migratory birds from the north
- Various structures of the Dept. of Antiquities, including an operational and interesting archeological museum and some buildings which might be developed as accomodation, which are separated by about 300 m of open and partly-landscaped ground from
- A large excavated and partly-reconstructed mound-site. This is well-maintained and contains major archeological remains stretching back two full millennia, and looks down on
- The saltwater creek about 400 meters distant from the creek-ward side of the mound. The creek curves attractively away from the mound towards the sea through bare salt mudflats. There are some mangroves at a few points lining this stretch of the creek

There are at least two villages within 2-3 km of the site. One, which is a village served by the HANDS NGO, has some workers in a salt factory about 500 meters from the site, but has very few fishermen. The other, upstream on the creek, is a fishing village, and is the focus of a proposed eco-tourism project by WWF Pakistan. It also owns camels. On a seasonal basis, these camels are turned loose in the creek/mudflat area where they swim around poorly-controlled, and eat the mangroves which are badly depleted as a result.

The mound-site and the museum of the Dept. of Antiquities are presently the only developed tourist 'attractions' on this site, where there is clearly room for further development which would be beneficial both for tourists and the local villages.

***Haleji***

This a large and deep roughly-rectangular perennial freshwater lake, lying between Thatta town and the smaller town of Jungshahi to the NW of it. It is about 1½ hours drive from central Karachi, almost all on metalled roads. It is the major source of Karachi's drinking water supply. The Water Board monitors the water level, and also its pumping stations and staff accomodation at the SW corner of the lake. Other than that, the entire lake and its littorals are managed by the Sindh Wildlife Dept.

[81] One small privately-owned guesthouse was also identified and visited by PPTA Team members There may be one or two others.

The site was formerly a favorite resort of day-trippers from Karachi, before the worsening of security conditions in and around the city in the 1990s. Those conditions have now improved. A resumption of day, and perhaps weekend, tourism appears possible.

The lake is beautiful, tree- and reed-fringed. It is also surrounded by a wide zone of reeds and rough grazing, outside a dyke, on top of which a road runs all the way round it, 90% clay, 10% (in the SW corner) metalled. Mature shade trees line this road for more than half its entire length. The aspect is particularly attractive on the northern side where there are many of these trees, plus reed-beds in the lake itself and reed-swamps outside the dyke. The local villagers on that side, who graze many cattle and goats there, say that even nowadays some people come from Karachi on weekends and holidays, and pick-nick there on food they have brought with them. There are also long attractive stretches on the southern side.

Siberian and Central Asian birds winter in the lake November-March. There are also local birds all the year round.

As noted, the lake is managed by the Sindh Wildlife Dept. They control uses of the lake other than Karachi water supply, e.g. shooting, boating, and fishing. According to the locals, the Wildlife Dept.'s management is highly restrictive, except when it comes to issuing seasonal shooting licenses to 'influentials'. On the southern side near the SW corner, the Dept. has an office and some staff accomodation, and also operates a captive breeding farm for lake bird species. Close by, there are two closed and semi-derelict 'tourist bungalows' owned, but not apparently actively operated, by the Sindh Tourism Development Corporation (STDC), a public-sector body.

Apart the road on the encircling dyke, this Wildlife/STDC complex of buildings and facilities constitutes the only man-made 'tourist developments' so far on the entire site, and they are very little utilized. Clearly, there is considerable potential for further development whilst preserving the values of the site, if arrangements can be worked out for cooperation between the project, the Wildlife Dept., the local villagers, and the commercial private sector.

**Illustrative interventions**

The following are illustrative interventions to develop 'eco-tourism' primarily for domestic tourists at the above three sites, with involvement of the local communities. The interventions are described in very brief 'concept' form only. These concepts are proposed as the starting point for full feasibility studies, followed by negotiations with all concerned stakeholders and then implementation, by the SCICDP project during its implementation phase.

***Hawkes Bay and Sandpit***

The following concept is suggested for further study and implementation during the implementation phase of the SCICDP project.

- Retention, and if necessary, strengthening of the WWF/Wildlife Dept. turtle conservation project
- Provisions against excessive night-time noise and/or lights disturbing the turtles (or local residents)
- Controls over the building of private holiday homes on the littoral above the beach, including demolitions and/or re-buildings if necessary

- On the littoral spaces not occupied by the (afterwards-remaining) holiday homes:
    - Shade landscaping to produce small parks and shady areas for restaurants
    - Controlled building of restaurants and guesthouses on selected sites
    - Ditto, with respect to booths for local vendors of food, drinks, and beach items
    - Other necessary infrastructure (water/sanitation and car parking)
    - Upgrading, if necessary, of the existing metalled access road to the site
- On the beach:
    - Cleaning operations as necessary, preferably by local villages as contractors
    - Turtle 'tour guiding', including training of local fishermen and other villagers
    - Facilities for local vendors to rent deckchairs and umbrellas, sell refreshments, etc
    - Boat trips provided by local fishermen

This concept offers benefits for the local village communities, and to the commercial private sector (investment opportunities in guesthouses, restaurants, and possibly boats), WWF, the public sector including the Karachi City District Council, and of course to tourist visitors to the site.

***Bhambore***

The following concept is suggested for further study and implementation during the implementation phase of the SCICDP project.

- Retention, with additional shade/'greening' landscaping, of the Dept. of Antiquities' existing facilities, particularly the museum and the mound-site
- 'Restoration', if feasible and economical, of the small freshwater lake, e.g. enlarging it by dredging, thus attracting more local and migratory birds
- Small pleasure boats on the lake, preferably operated by local villagers
- Construction of a small jetty suitable for small pleasure boats
- Construction of weekend bungalows (for rent) and restaurant(s), with appropriate landscaping
- Construction of booths for local vendors of food, drinks, and handicrafts at the lake and near the mound-site
- Production of handicrafts, e.g. embroidery, by local villagers
- Local villagers' operation of camel and/or horse rides from the lake to the creek, past the mound-site, plus local construction of a track suitable for this purpose
- Boat trips, including birding trips, on the creek provided by local fishermen, with appropriate training imparted to them
- Mangrove plantations along the creek sides, with improved control of camels grazing in the area

This concept offers benefits for the local village communities, and to the commercial private sector (investment opportunities in bungalows, restaurants, and possibly boats), to WWF and HANDS, to the Federal Dept. of Antiquities and possibly other public sector bodies, and of course to tourist visitors to the site.

***Haleji***

The following concept is suggested for further study and implementation during the implementation phase of the SCICDP project.

- Particularly, but not necessarily only, on the northern side of the lake:
    - Construction of a small jetty or jetties suitable for small pleasure boats for fishing, birding, and pick-nicking
    - Construction of small open-sided shelters for tourists' relaxation and meals at selected points on the dyke
    - Construction of booths for local vendors of food, drinks, and handicrafts at some of these selected points
    - Any other necessary infrastructure (sanitation facilities and car bays)
    - Boat hire or trips, preferably operated by local villagers
    - Birding 'tours' onshore and on the lake, conducted by local villagers with appropriate training imparted to them
    - Cleaning operations as necessary, preferably by local villages as contractors
- Production of handicrafts, e.g. embroidery, by local villagers
- Construction of a restaurant or restaurants, probably near the SW corner of the lake
- Construction or renovation of tourist bungalows, again near the SW corner of the lake

This concept offers benefits for the local village communities, and to the commercial private sector (investment opportunities in bungalows, restaurants, and possibly boats) to any participating NGOs, to the Dept. of Wildlife and possibly other public sector bodies, and of course to tourist visitors to the site.

### 2.3 Possible build up of appropriate new commercial agribusinesses

It has been observed by PPTA Team members that agronomic conditions in the project area may be appropriate for development of large-scale agribusinesses, linked to small farmers, in (a) poultry-processing for export markets (b) dairy products processing.

The poultry-processing factory would produce export quality packaged chicken parts and might have its own feed mill. It would hatch chicks and sell them (and feed) to outgrowers (small poultry farmers), from whom it would buy all or most of the grown birds for processing. Such poultry sheds are numerous but underutilized in the project area, and their Karachi owners are willing to lease them to local residents of the project area for quite low rentals. The factory would seek export markets, e.g. in the Gulf. Similar investments have proved highly successful, in terms both of private profitability and local economic development, in rural Thailand north of Bangkok.

A large rural dairy products processing factory in or adjacent to the coastal areas, close to the sources of fodder, could make much more economic sense than the present practice of transporting vast quantities of fodder on a daily basis to feed *circa* 1 million dairy buffaloes kept in pens in and around Karachi city. It would also open out livestock-raising opportunities to needy community members in the project area. In India, this type of operation, linking large dairies to small livestock-raisers, has been operating successfully on a very large scale for decades.

# Appendix 7 - Poverty and Social Issues

***DRAFT***

## POVERTY AND SOCIAL ASPECTS OF THE PROJECT[82]

## SUMMARY

This paper provides the basis for the formal Poverty Reduction and Social Strategy (PRSS) to be completed for the Final Report.

## A. POVERTY IN PAKISTAN AND SINDH

1. Poverty in the Project Area (two districts of coastal Sindh) has been considered in the context of the overall pattern of poverty in Pakistan. Sindh is one of the poorest areas in the country (the district of Thatta was the poorest of a nation-wide village survey conducted in 2004-05 – District Badin is probably even poorer). About 60 percent of Pakistan's rural poor are landless; most of these (45 percent of the total rural poor) are non-agricultural households, with landless agricultural laborers making up the remaining 15 percent. The incidence of rural poverty is overwhelmingly high; country-wide a little less than 40 percent of rural people live below the poverty line. In the project area of Thatta and Badin districts of Sindh the figure is very considerably higher – perhaps as high as 70 percent. Apart from humanitarian considerations, this high incidence of poverty becomes a crucial social factor for the governance of civil society. The alleviation of poverty thus becomes the overarching target for almost all GoP policy initiatives and is the prime focus for the proposed loan in Sindh.

## B. THE PROJECT AREA

2. **Location**: Sindh is Pakistan's second largest province in land area but despite being the site of its largest city (Karachi) contains only 23 percent of its population. The Province has a coastline of approximately 350 kilometers, a major part of which comprises the delta of the Indus River. The PA encompasses the district towns of Thatta, Badin and the "*Talukas*" (sub-districts) of Thatta, Ghorabari, Keti Bandar, Jati, Shah Bandar and Khoro Chan, Mirpur Sakro, Badin and SF Rahu. It is located in the furthest south-eastern corner of the Province, east of Karachi, straddling the Indus River south to the coast from a line drawn roughly west-east from Karachi to the district towns of Thatta and Badin. This area, though large enough in absolute area, is a small part of the total cultivable land area of Sindh and it holds a similarly small proportion of the total provincial rural population. However, these people may be among the poorest and least advantaged in Pakistan.

3. **Population and Gender**: There were approximately 1,135,000 persons living in the selected *talukas* of the PA in 1998 (date of the last full census). There is no data to indicate the current trend of the population. There were significantly more males than females in 1998. The preponderance of males may have significant implications for a range of social and political relationships, not all beneficial. Most people (69 percent) in the PA dwell inland. Most of these live in rural areas and can be considered to depend on agriculture rather than fisheries. However, the coastal population of 152,000 persons

[82] Paper prepared by the PPTA Economist, Geoffrey Bastin, November 2005 on behalf of the PPTA's social science team members. The paper includes and references work done by other team members, especially Shaheen Khan, Mubashra Atif and Dr. Jamshed Tirmizi.

(16 percent of the total population) is not insignificant and may be increasing as agricultural land is lost to sea incursion.

4. **Productive Physical Resources**: Both Badin and Thatta are prone to major hazard events. The districts are in an uninterrupted cycle of disasters. Cyclone, heavy rains, and floods follow each other with short intervals. Rainfall is usually low and there have been periodic droughts. Water supply for both human, animal and crop consumption is the critical issue for the PA. Lack of water impacts on the productive use of human time (women can spend all day fetching and carrying water), on health (dirty water means that a high proportion of the population, especially children, suffers from water-born disease), the distribution of the population (often along irrigation canals and drainage ditches) and the choice and productivity of crops. The failure of the water supply is the single most important constraint to any development in the PA. Almost all "sweet" (non-saline) water in the PA comes from the irrigation system. This means that irrigation and drainage canals determine (to a large extent) the distribution of the population and their access to potable water. The operation of the Indus Basin Irrigation System (IBIS) provides a major factor in the social dynamics of the PA. A reduced flow (associated with the high losses from the system as a whole) has meant that the sea has encroached and that water in the Project Area has become the principle concern of people's lives, both from the point of view of basic supplies of drinking water and as it relates to economic activity. Difficulties with management of the water in the context of reduced flows from up-river and increased seawater intrusion has reportedly dramatically reduced agricultural land. This loss of productive land equates directly with a loss or drastic change of livelihoods. It implies an enormous amount of disruption and probably involuntary resettlement (out-migration or relocation of settlements away from the sea). As the sea continues to intrude more land will be lost to irrigated agriculture and poverty will increase in proportion as people are forced from the good land and sources of sweet water.

## C. SOCIAL AMENITIES

5. **Housing**: While there are more or less permanent houses and shop structures in the District towns and in Keti Banda, the overwhelming impression in the PA is of a population that lives in wattle and daub shacks known as "*katchi abadis*". Villages represent collections of these huts, sometimes augmented with clay walls or plastic sheet roofs. These houses have no amenities. There are no sanitation facilities. 90 percent of the residents of the PA may live in these structures.

6. **Health**: The general health of the population in the PA is very poor. Perhaps the fundamental cause of ill-health is lack of clean drinking water. The human body subject to a degree of dehydration under-performs at every task and can suffer a range of chronic diseases including high blood pressure, kidney failure and joint disability. Dirty water also brings with it a variety of water-borne disease. Saline water damages the human body and may affect the brain's ability to process information. Prolonged consumption of saline water is likely to be a major underlying factor in a variety of health and associated problems including the inability to plan daily activities to the greatest effect. There are almost no health services available to mitigate this situation. It is almost certain that no qualified medical staff reside in the PA. In these circumstances the overall physical condition of the human capital of the PA ma be considered very poor and probably incapable of greater efforts at survival than are currently being made.

7. **Education:** The average literacy ratio is around 20 percent of the total population. The male literacy ratio is about three times higher compared to females. The ratio in urban areas is much higher than the rural areas. Further there is a wider gap between enrolment ratios of male and female and urban and rural areas. There is also a very low percentage of educated people at graduate and post graduate level in the areas.

8. **Access**: Many of the findings about water, roads, power, health and education add up to a lack of access to a range of essential services needed to conduct life beyond survival. In many cases even "subsistence" may be too optimistic a word to use about persons dwelling in the PA. The margin of existence, absent almost all the requirements of life seems small. One recent observer said that coastal Sindh requires emergency aid rather than development. What is being seen over much of the PA is the collapse of communities, a situation that requires mitigation before any serious development strategy can be implemented.

## D. COMMUNITY AND POVERTY ASPECTS

9. **Social Organization**: society in the Project Area, as elsewhere in Sindh, is characterized by a few powerful landlords and a large peasantry, the minority within which comprises tenant farmers (*hari*) and landless laborers. There is a highly skewed pattern of distribution of assets, notably land. The incidence of rural poverty is the highest among those who own no land and falls steadily as the ownership of land increases. Landlords meet the *haris'* needs for agricultural inputs, consumption, social events, emergencies through monetary advances, with the accounts of these transactions kept secret. The debt accumulates over the years. *Haris* cannot leave the landlord without clearing their debt, and so become bonded. The existing sharecropping tenancy system, concentrated in the canal-irrigated areas of the districts, is historically deep-rooted and perpetuates the entrenched poverty of tenants and agricultural labor through unbalanced revenue-sharing and cost-sharing arrangements and a complex system of dependencies.

10. **Caste and kinship:** These groups are a crucial element of poverty analysis in Pakistan and in the Project Area which has seen in-migration from different regions including India. Persons from different castes and kinship groups co-habit peacefully and in social and economic relationships that are (presumably) mutually supportive. However, the fact that villages often consist of a "nucleus" of households and then a few or single households scattered around the area may reflect conflicts between kinship groups. Alternatively the scattered nature of the village may reflect a search for natural resources, especially drinking water.

11. **Gender**: Villages in Sindh generally stand out in terms of the proportions of female workers reporting occupations other than household work. Most women reporting these activities belong to the Hindu Bheel and Kohli groups. Apart from fieldwork, sewing and embroidery are the predominant non-farm activities for females. Muslim women are usually kept in the house undertaking household tasks. Women are more likely to be illiterate and large families mean that women are often pregnant or have just given birth. Child mortality is high leading to additional stress. Finding basic necessities for the family (especially water) is a time consuming and onerous task.

12. **Employment**: Farms employ a large proportion of the economically active population but there are a substantial number of landless persons who own and manage livestock (both small and large animals) and who work in non-farm employment. The number of people with a "non-farm rural enterprise" may reflect the national figure of less than one-sixth of surveyed villages country-wide. However in the fishing communities, possibly two-fifths of households are involved in buying or selling fish. Most other workers were engaged in seafaring which may be counted as casual labor. Labor markets operate effectively enough so that even the poor are able to choose and move (at least to some extent) between different occupations. At least the possibility of choice does exist. In extremity, a worker may migrate to other places, although migration is not a preferred choice, partly because seafaring and fishing offered a viable livelihood even if under poor conditions.

## D. POVERTY ANALYSIS

13. **Poverty measurements and "well being"**: Almost all of the persons in the Project Area mentioned lack of clean drinking water as a major concern. However, there was almost no mention of lack of basic food items as an issue. An important consideration for the project design is that livestock ownership is regarded as a form of saving. In this respect, where the value is seen simply in the beast itself rather than in what it produces (e.g., by way of milk), the development of livestock based enterprises may not be easy. Nevertheless, measures that can reduce mortality (and so the risk of this form of saving) are clearly worthwhile. Ownership of a wide range of durable items is not common outside the market towns. People walk between their houses and workplaces or ride buses or pickup trucks. Because there is almost no access to electricity, electrical goods are not widely used. Most people might own the clothes they stand in and keepsakes. There are few books (most people are illiterate) and no access to an information network beyond casual discussion in a tea shop in a market town (though this may in fact provide a variety of information, good and bad, from diverse sources. Outside the towns almost all the housing is *katcha* and cannot be considered to have any marketable value. Nevertheless, for those who have invested time in building settlements near roads, with access to water and surrounded by protective thorn fences it would be wrong to assume they believed these houses to be sub-standard or worthless.

14. In the coastal communities perceptions of poverty are inseparably linked to the amount and type of fishing equipments owned by the family. It should be noted that many people do not own any fishing equipment at all. Fishermen who do not own fishing equipment work on the boats of those who do own boats, and take a smaller share of the catch. Island communities have least access to infrastructure facilities, health and education. Their remoteness and vulnerability is directly linked with little access and in some cases no communication with outside world. There has been considerable discontent among fisherfolk about the contract systems in place for the sale of fish and this has been reflected through the Pakistan Fisherfolks' Forum (PFF).

15. **Poverty profiles**: Formal poverty profiling has not been undertaken by the PPTA. However some secondary data is available. 54 percent of the population was found among the "poorest" category while another 79 percent were poor. Poverty was highly correlated with household economic characteristics such as land ownership and employment opportunities. Landowners are usually among the "non poor". The intrusion of the sea on agricultural land has badly affected the perception of wealth. There is a

strong positive effect of land ownership and the increasing loss of value in the soil as it becomes saline equates with a loss of wealth in those communities affected by it. The poverty of the communities in the PA is not static or decreasing, rather it is increasing as the sea destroys productive land. Government institutions and agencies in the PA have proved unequal to the task of ameliorating this situation.

16. The communities living in project areas are trapped in a complex of vulnerabilities at community, household and region level. Villages that are situated in close proximity of the4 Arabian Sea are the most frequent subject to the periodical disasters. The structure and placement of houses, non-availability of disaster resistant physical infrastructures and the remoteness comes into alliance to constitute the physical vulnerability of communities at large. The villages situated at the tail-end of the Kotri command areas are most vulnerable from the incursion of the sea (salinization of their productive land) and loss of sweet water. Land under cultivation has become saline and degraded due to successive floods and sea erosion. Furthermore, a huge irrigation and drainage infrastructure (the IBIS, and especially the LBOD) has added into the vulnerabilities of the area and communities living therein.

17. The absence of rights (e.g. over land), lack of access to other productive resource and non-availability of formal protection and social safety nets reduce the social resilience and coping capacity of communities against vulnerabilities in both districts. People resort to an inefficient loan system to pay for basic goods and services. In some cases they resort to begging as a survival strategy. Communities of the coastal area largely depend on a poor and fragile resource base with no control over and entitlements of natural resources like arable land, human rights and small-scale entrepreneurship. These non-structural dimensions of vulnerability make coastal and island folk the most vulnerable of the vulnerable.

## E. BENEFICIARY NEEDS ASSESSMENT

18. A formal questionnaire-based Beneficiary Needs Assessment was not undertaken by the PPTA. Beneficiary needs have been informally assessed based on rapid assessment surveys and interviews with individuals and ad hoc groups of persons met in the field (ranging from the individual farmer to groups of women). Workshops were held in District Commissioners' offices in both Thatta and Badin during late November 2005.

19. **Roads and infrastructure**: In Thatta, district officials expressed a strong priority need for roads. Other needed infrastructure mentioned by participants included cold storage for fish. Officials in Badin also expressed the need for roads and rural infrastructure. They supported the suggestion that the project build refuge or "disaster" mounds as refuges from storm surges.

20. **Water and irrigation**: In Thatta, protection from the sea was seen as important and district officials asked that the project build some kind of coastal protection measures. Badin workshop attendees made a strong request that the proposed project to intervene in issues related to the collapse of the Left Bank Outfall Drain (LBOD). Officials in both districts confirmed the need for development of the potable water supply.

21. **Education and health:** Lack of educational opportunities was seen as a major constraint and the perceived cause is a lack of teachers. Female education was mentioned as a particular problem.

22. **Rapid Rural Assessment:** Almost every group interviewed by the PPTA mentioned the lack of drinking water. A lack of physical security resulting from the activities of "Rangers" apparently working for a local landowner was experienced by dwellers near an irrigation drain at "000" Point in Badin District. Poor conditions for fisherfolk were mentioned. The quality of housing in the PA is visibly poor and there is a lack of access everywhere to basic social amenities. Some link roads were in poor condition, although the overall standard of the main roads was good. Electricity failed to reach most remote areas of the PA.

23. On the basis of the RRA, the following important needs were identified as being those with a priority for the PA:

1. Improvement of the drinking water supply
2. Improvement of health facilities including access to medicines and health care professionals
3. Building link roads between remote settlements
4. Providing the services of teachers
5. Improving the management of irrigation water and the mitigation of losses from the system
6. Livestock improvement

22. Regarding gender differences in stated beneficiary needs, it was noted that women respondents listed drinking water as their priority followed by health services, whereas male respondents mainly ranked link roads.

## F. POVERTY AND SOCIAL STRATEGY OF THE PROJECT

23. The project poverty and social strategy is summarized in the following table.

**SUMMARY OF POVERTY ISSUES AND PROPOSED COUNTERVAILING MEASURES**

| POVERTY ISSUES | DESIGN FEATURES/MEASURES |
|---|---|
| Government departments are unable to assist in poverty alleviation due to weak capacities. Current policies do not favor the poor. | Strengthening of the Departments of Fisheries and Agriculture in order to focus policy, regulation and enforcement on the needs of the poor. |
| Productive resources, especially agricultural land, are being lost to sea encroachment. As farm land is lost, people move to the coastal areas and become fisherfolk living at subsistence level with few social amenities | Coastal protection measures are proposed including the planting of mangroves. Alternative sustainable livelihoods projects are proposed including:<br>- the development of hatcheries and model shrimp farms in coastal mudflat areas<br>- innovative approaches to dry-land farming with saline soils. |
| Lack of drinking water and other basic human needs and social amenities | A small grants fund is proposed for micro-projects to be undertaken by communities on |

| | |
|---|---|
| | the basis of their perceived needs. These micro-projects can include drinking water supply, electrical power generation (from wind power), sanitation, the payment of teachers, reconstruction of small bridges and culverts etc. The small grants fund wil be operated on aparticipatory basis with communities identifyuing their own priority needs. |
| The quality of housing is very low | Associated with the development of shrimp ponds there will be a model housing project that will design and develop appropriate low-cost housing. |
| Poor education and low skills levels inhibit the development of productive industry and prevent the migration of coastal workers to more remunerative activities in other locations outside the area | A vocational and skills training program is proposed. |
| Rural infrastructure has become degraded from lack of maintenance. Settlements have moved to areas with no roads in search of water and good land. | Link roads will assist villagers to physically access other settlements and market towns. |
| The PA, especially the coastal zone, is subject to cyclones and storm surges | Rescue or “disaster” mounds will be constructed in strategic locations |
| The poor often depend on livestock as a source of wealth. There are few resources to enable them to ensure the survival and productivity of these animals | A livestock/fodder pilot program will be introduced. This will include the training of village-level veterinary assistants. |

# POVERTY AND SOCIAL ASPECTS OF THE PROJECT

## A. POVERTY IN RURAL PAKISTAN[83]

1. The approach to poverty in the Project Area (two districts of coastal Sindh) has been considered in the context of the overall pattern of poverty in Pakistan. Sindh is one of the poorest areas in the country (the district of Thatta was the poorest of a nation-wide village survey conducted in 2004-05 – District Badin is probably even poorer)[84]. About 60 percent Pakistan's rural poor are landless; most of these (45 percent of the total rural poor) are non-agricultural households, with landless agricultural laborers making up the remaining 15 percent of the rural poor. The incidence of rural poverty is overwhelmingly high; country-wide a little less than 40 percent of rural people live below the poverty line. In the project area of Thatta and Badin districts of Sindh the figure is very considerably higher – perhaps as high as 70 percent. Apart from humanitarian considerations, this high incidence of poverty becomes a crucial social factor for the governance of civil society. The alleviation of poverty thus becomes the overarching target for almost all GoP policy initiatives and is the prime focus for the proposed Loan.

### 1. THE PATTERN OF RURAL POVERTY

2. The pattern of poverty in Pakistan is complex, varying between the agricultural and non-farm sectors, between ethnic (tribal) groups and between provinces and within provinces (e.g., the coastal area of Sindh is significantly more impoverished than the rest of that province). Regarding the geographical incidence of poverty, those areas nearer to the borders of Pakistan in the north and the west (i.e., the Tribal Areas, Balochistan, Kashmir and parts of NWFP) and the south and east (i.e., coastal Sindh) are relatively poor compared with the richer heartland of the Punjab and, of course the major cities. It is worth adding here that one unique feature of coastal Sindh is that it is located immediately adjacent to a very rich city, Karachi. The juxtaposition of rich and poor in the Project Area is a puzzle that must be explained.

3. Factors affecting poverty include traditional practices and behavior (especially towards women), tribal rivalries and divisions, cross-border conflicts, language differences and the persistence of a feudal landholding system related in part to inheritance practices that progressively reduce the size of cultivable plots. Another important factor in predicting poverty is the proximity and availability of water. Access to drinking water is the main need expressed by people living in the Project Area. It is a statement of the obvious that there is no simple, all-encompassing solution for poverty given this spread and level of complexity. Nevertheless, some areas may be explored in the context of providing an insight into the degree to which the proposed Loan might impact on the overarching target of reducing poverty.

4. The agricultural sector is the largest employer in rural areas. However, an unfavorable labor-land ratio limits income earning opportunities as the population increases and land holdings become so small that they become uneconomic. In consequence, the proportion of persons employed in agriculture (countrywide – it will be

[83] This section relies on TA 4319-PAK: Determinants and Drivers of Poverty Reduction and ADB's contribution in Rural Pakistan
[84] The survey for TA 4319-Pak, op.cit., included Thatta District

seen that the ratio is different in the Project Area) has declined from 68 percent in the early 1980s to around 60 percent today. The rural non-farm sector is dominated by informal activities that must absorb a large majority of unskilled, uneducated or less educated and poor individuals who have sold their land. The very poorest households depend more on unskilled labor income, while self-generated or self-employed income is the most important source of income for the households in higher income groups. As a consequence, the labor pool available for employment by commercial enterprises off the farm is rather poor quality in terms of its composition and skills. Coastal Sindh, it will be seen, has an especially poor reputation for its skill base.

5. That said, non-farm activity is a very important source of livelihood for a large number of such persons. About 44 percent nationwide of rural households were found to be dependent on non-farm sources of income in 2001. Among them 40 percent belong to the lowest income group. Non-farm income forms a considerable share of total income (73 percent) for landless households. For the self employed, wholesale and retail trade appear as the most important economic activity, whereas wage employees are found concentrated in the construction sector. Construction and service activities account for two-thirds of rural non-farm employment. Similarly, looking across the spectrum of poverty the majority of poor wage employees are found in the in the construction sector, followed by the services sector. Again it will be seen that this pattern is not common to coastal Sindh where the majority of people work as wage laborers either in fishing or agriculture.

## 2. TRENDS OF RURAL EMPLOYMENT

6. The estimated population of Pakistan in 2003 was 148 million with a labor force of just over 30 million (20 percent). Most workers are male. Females' participation remains extremely low at around 11-13 percent in rural Pakistan, although there has been a slight increase in the female labor force since 1997-98. Household responsibilities and cultural and family norms keep most of the females away from taking part in the wage market, especially at a younger age. In 2001-02 the female unemployment rate exceeded male unemployment rate by 8 percentage points.

7. Unemployment alone fails to present the true picture of the rural labor market. A very large segment of the labor force is characterized by underemployment. This phenomenon is most common in the agricultural and informal sectors. In the Thatta and Badin, men work about 15 days in a month and rest at home for the remaining 15 days. While at home, they usually rest and do not contribute in household chores. They play music, chew *pan* and visit the bazaars, where they take tea and watch Indian music and movies on the television. Female underemployment has been persistently four times as high as that of male underemployment from 1997 to 2004. Most females work as unpaid family help. Out of the total of working women, only one percent belonged to professional category and one percent worked as administrative and managerial workers. The majority worked in agricultural (54%), craft related work (11%) or in elementary occupations (27%). Among farm households, one-third of households are livestock holders. However, 64 percent of the livestock holders are self employed or obliged to work in the non-farm unskilled labor market.

**TABLE 1:**
**SOURCES OF NON-FARM INCOME**
**% DISTRIBUTION OF REPORTING HOUSEHOLDS**

| Source of non-farm income | Farm households | Non-agriculture households | Livestock holders |
|---|---|---|---|
| Service | 11.9 | 22.7 | 8.0 |
| Business | 7.1 | 19.5 | 8.4 |
| Livestock | 3.0 | 0.3 | 9.4 |
| Remittances | 2.9 | 1.7 | 1.3 |
| Agriculture Labor | 21.6 | 4.9 | 14.9 |
| Non-agri. Labor | 18.5 | 42.5 | 46.8 |
| Rent | 1.6 | 0.7 | 0.9 |
| Poultry | 0.2 | 0.2 | 0.4 |
| Others | 6.6 | 7.5 | 9.9 |
| None | 26.5 | 0.0 | 0.0 |

Source: Agriculture Census of Pakistan (2000)

8. Table 1 shows that the distribution of economic activity for farm households is more even than for non-farm households. This result correlates with the incidence of poverty in non-farm households. More than 40 percent of persons from non-farm households are compelled to be laborers or low-skilled service workers. Less than 20 percent work in some form of business.

9. A high incidence of poverty is found among non-farm households as compared to farm households. The average annual income of farm households is 1.7 times higher than those of non-farm households. According to some survey data poverty is concentrated in those areas growing the major commodity crops (wheat, cotton, rice). The cotton and wheat growing areas of Sindh have the highest incidence of poverty (but also have the highest farm-based poverty indicator – suggesting that low commodity prices and the structure of agricultural marketing for the major crops have a serious impact on poverty).

**TABLE 2:**
**FARM AND NON-FARM POVERTY BY AGRO CLIMATIC ZONES**
**'000 PERSONS**

| | 1993-94 | | 1998-99 | | 2001-02 | |
|---|---|---|---|---|---|---|
| Agro climatic zones | Farm | Non-farm | Farm | Non-farm | Farm | Non-farm |
| Rice/Wheat Punjab | 21.6 | 39.9 | 22.3 | 33.1 | 24.9 | 40.4 |
| Mixed Punjab | 16.9 | 25.8 | 30.5 | 34.6 | 40.9 | 48.3 |
| Cotton/Wheat Punjab | 19.9 | 31.4 | 35.2 | 44.7 | 42.1 | 55.6 |
| Low Intensity Punjab | 15.3 | 28.3 | 40.2 | 63.4 | 48.9 | 54.6 |
| Barani Punjab | 15.7 | 12.5 | 3.9 | 10.1 | 24.2 | 25.2 |
| Cotton/Wheat Sindh | 33.4 | 34.2 | 20.4 | 32.2 | 59.3 | 57.7 |
| Rice/Other Sindh | 25.7 | 27.1 | 19.5 | 14.6 | 60.8 | 53.0 |
| NWFP | 23.0 | 32.3 | 31.7 | 31.1 | 45.7 | 47.6 |
| Balochistan | 33.0 | 21.1 | 31.3 | 26.7 | 40.4 | 39.4 |

**Source: Malik (2005)**

### 3. EFFORTS TO RELIEVE POVERTY

10. In order to enhance the access of the poorer households and communities to socio-economic services and hence their empowerment, the Government of Pakistan set up Pakistan Poverty Alleviation Fund (PPAF) in February 1997. PPAF funds for income generation activities and improved community physical infrastructure are disbursed through its three main units 1) Credit and Enterprise Development Unit; 2) Community Physical Infrastructure Unit; and 3) Human and Institutional Development Unit. PPAF aims to reach the poor and disadvantaged communities in both rural and urban areas through NGOs and the Community Based Organizations (CBOs).

11. According to the Annual Report of PPAF (2004), micro-credit loans of PPAF have increased from Rs. 35.6 million to Rs. 2,814 million between FY2000 and FY2003. The bulk of the micro credit is disbursed under the Credit and Enterprise Development Unit with disbursements in FY2003 of Rs 1,314 million, 47 percent of the total PPAF disbursement. This amount was equivalent to 4.8 percent of the total institutional loans disbursed during that year. In 2003, the 119,196 borrowers received an average loan of Rs. 8,816. Nearly 44 percent loans went to women. Most of the loans (38%) were disbursed for livestock, followed by agriculture (32%), and enterprise development and commerce and trade (30%). PPAF is currently working with thirteen smaller Partner Organizations via the National Rural Support Programme (NRSP). Under the Community Physical Infrastructure unit, schemes for supply of drinking water accounted for (39%) of all projects. Projects for irrigation, link roads, bridges/culverts, and causeways accounted for 30% of physical infrastructure interventions. The balance of the funds went towards communication (21%), while (8%) was taken up in flood protection and sanitation schemes, leaving (2%) for other projects.

## B. THE PROJECT AREA

### 1. LOCATION, HISTORY AND GENERAL DESCRIPTION

1. Sindh is Pakistan's second largest province in land area but despite being the site of its largest city, contains only 23 percent of its population. However, Sindh contributes considerably to Pakistan's economy and holds a major share of its industry, oil and gas fields, and livestock and fisheries resources.

2. The Province has a coastline of approximately 350 kilometers, a major part of which, east of Karachi, comprises the delta of the Indus River. The Indus is the only river that passes through this region. The delta of the Indus covers an area of about 8,000 sq kilometres and extends along the coast line for about 200 kilometres. The region is historically important with a rural and marine-based economy going dating back more than two millennia. For most of its history the region was highly productive and a large rural production base supported the growth of Karachi. In this respect, the city draws in surplus Labor (especially skilled persons) and provides an enormous and accessible market for rural products. If rural Sindh followed the example of many countries, the Project Area (PA) might be among the richest area of Pakistan rather than one of the poorest[85]. One of the puzzles that will provide a constant theme in the socio-economic

[85] For example, Bangkok is similarly positioned with regard to its hinterland and provides a similar Labor and food market for the Central Chao Praya river basin which is very well developed with a low incidence of poverty. Many other examples can be found.

analysis of the proposed project is why coastal Sindh, so close to a major consumption area, should be so impoverished.

3. The PA encompasses the district towns of Thatta, Badin and the "*Talukas*" (sub-districts) of Thatta, Ghorabari, Keti Bandar, Jati, Shah Bandar and Khoro Chan, Badin and SF Rahu. It is located in the furthest south-eastern corner of the Province, east of Karachi, straddling the Indus River below a line drawn roughly west-east from Karachi to the district towns of Thatta and Badin[86].

4. The north western area of both Thatta and Badin districts is a hilly tract known as Kohistan. Southwards towards the Project Area the land degenerates into sandy wastes, uncultivated and almost devoid of vegetation. It is broken up by short ranges of low, stony hills and intersected by "*nais*" or torrents beds, which carry the drainage of the Kohistan to the Indus. The western (Karachi) border of the PA is roughly north-east to south-west and follows the district boundary of Thatta District,

5. Thatta, the main city of the Indus Delta, was considered to be the central city of the region. The city was famous not only for its commercial activities, but also because it was the hub of educational activities. Thatta nurtured a civilization rich in resources and culture. A decline occurred during the Aurghon and Turkhoan periods. There had been an abundance of fresh water and the land was fertile due to the high quantity of silt. Livelihood resources were good. Communities engaged in agriculture and livestock rearing were settled in the towns and villages on the fertile tracts and receiving Indus water as a result of high Indus flows as well as inundation canals.

6. Keti Bandar and Shah Bandar in Thatta District were important port towns, the history of which provides some important lessons for the design of the project. Shah Bandar, for example was the major port for Sindh before the advent of the colonial state and the regulated port of Karachi. The incursion of the sea, however, has virtually wiped Shah Bandar from the map and surrounded Keti Bandar with a unique sea defence bund and a road that is the only connection with the main land. Both townships are now greatly diminished in terms of population and natural resources. Shah Bandar in particular consists of very few households, there are only three settlements -- two small villages of the Jath group and one of the Mallah.

7. Badin District in the east of the PA is the part of the lower Indus plain, formed by the alluvial deposits of the Indus river. Its land is very uniform in character and is not diversified by hills and rivers. The eastern (Indian) boundary is at an angle sharply south roughly parallel with the border with India and the Rann of Kutch. A prominent feature of the eastern edge of the project area is the Left Bank Outfall Drain (LBOD) and the "tidal link", which has a large discharge of effluent that it carries from irrigated upper Sindh. The sub drains serve as a harbor for small boats and the main LBOD provides a convenient passage to the inland sea for neighboring fishing communities that depend on the shallow inland sea for their livelihood. Contiguous to the tidal link in the south eastern end of the project area is a *dhand* system or large shallow saline water ponds under tidal influence, with considerable fishing resources extending almost 700 sq km., also termed as the Inland Sea, bordering the Rann of Kutch.

[86] The word "Thatta" is derived from the Persian term "Tah Tah", which means "layer over layer" and reflects repeated invasions and movements of people in Sindh over millennia.

8. There are two key points to make about the area: first, the PA, though large enough in absolute area, is a tiny fraction of the total cultivable land area of Sindh[87] and second, it holds a very small proportion of the total provincial rural population[88]. Generalisations about "the Sindh" do not apply to this small and quite unique area.

9. The following table provides a general overview of the two districts in which the proposed project will be implemented. It should be remembered that the PA only includes a sub-set of the total number of *talukas* (sub-districts) in the two districts in order to focus on the main coastal areas which also are the home to the poorest of the poor.

**TABLE 3: PROJECT AREA OVERVIEW**

| | | BADIN | THATTA |
|---|---|---|---|
| **AREA** | | | |
| | District (sq.km) | 6,726 | 17,355 |
| | Irrigated area (sq.km) | 2,435 | 1,911 |
| | As % Total Area | 36 | 11 |
| **POPULATION** | | | |
| | Households ('000) | 183 | 194 |
| | Persons ('000) | 950 | 988 |
| | Persons per HH | 5 | 5 |
| | Density (persons/sq.km) | 141 | 57 |
| **VILLAGES +50 HOUSEHOLDS** | | | |
| | Number | 705 | 1,004 |
| | Households ('000) | 63 | 93 |
| | Persons ('000) | 442 | 646 |
| | As % rural population | 47 | 65 |

Source: RRP PAK 32024, Sindh Rural Development Project, October 2002, Appendix 5 – Selection Criteria for Project Interventions
Note: This data is for the entire district, subsequent tables are for selected talukas in the Project Area.

10. There are some general points to be made about the two selected districts:

- Both districts are largely un-irrigated, but Thatta has a very low proportion of irrigated area; as will be seen, water for human consumption (which is taken from irrigation canals) and cropping is a recurring issue for consideration by the project.
- The population of both areas is quite sparse, but again Thatta stands out as being very sparsely populated.
- Between 47 percent (Badin) and 65 percent (Thatta) live in villages with more than 50 households.

[87] Cultivable land area of Sindh is about 7 million ha.; cultivable land area of the PA is just under 200,000 ha. - about 3 percent.
[88] Rural population of Sindh was 15.3 million in 1998 of which Thatta and Badin districts were1.9 million and probable PA population in 6 talukas was 936,000 - about 6 percent).

11. The sparse nature of the population suggests that mobilizing the work force for major interventions will be challenging. This and other issues are discussed in more detail below on the basis of the talukas in the coastal areas..

## 2. DEMOGRAPHICS

12. This section focuses on the detailed demographics of the proposed Project Area. The approach taken is broad brush and based mainly on existing GOS census data for 1998 (the last time a census was conducted).

**TABLE 4: POPULATION OF SELECTED TALUKAS IN THATTA AND BADIN DISTRICTS COMPRISING THE TOTAL TARGET POPULATION OF PROJECT AREA**

| DISTRICT | Taluka | Males Rural | Urban | TOTAL MALES '000 | Females Rural | Urban | TOTAL FEMALE | TOTAL POP |
|---|---|---|---|---|---|---|---|---|
| **THATTA** | | | | | | | | |
| | Ghorabari | 55 | 0.00 | 55 | 50 | 0 | 50.00 | **105** |
| | Keti Bunder | 12 | 2.00 | 14 | 11 | 1 | 12.00 | **26** |
| | Jati | 62 | 4.00 | 66 | 54 | 4 | 58.00 | **124** |
| | Shah Bunder | 46 | 7.00 | 53 | 41 | 6 | 47.00 | **100** |
| | Kharo Chan | 14 | 0.00 | 14 | 12 | 0 | 12.00 | **26** |
| | Mirpur Sakro | 93 | 12.00 | 105 | 82 | 12 | 94.00 | **199** |
| | **TOTAL** | **282** | **25.00** | **307** | **250** | **23** | **273.00** | **580** |
| **BADIN** | | | | | | | | |
| | Badin | 142 | 46.00 | 188 | 128 | 40 | 168.00 | **356** |
| | SF Rahu (Golarchi) | 96 | 10.00 | 106 | 84 | 9 | 93.00 | **199** |
| | **TOTAL** | **238** | **56.00** | **294** | **212** | **49** | **261.00** | **555** |
| **TOTAL TWO DISTRICTS** | | **520** | **81.00** | **601** | **462** | **72** | **534.00** | **1,135** |

Source: Census 1998, Development Statistics of Sindh 2003

13. The data in Table 4 indicate that there were approximately 1,135,000 persons living in the selected talukas of the PA in 1998. There were significantly more males than females – nearly 13 percent more males and this suggests a strangely skewed population base, possibly because of the in-migration of Laborers from other parts of the country. The population of urban males and females is more nearly balanced, so it is in the rural areas that males are in the significant majority. If the numbers are accurate, it also suggests an unstable population subject to rapid changes in the size of its Labor force as unmarried males move to pastures new. Finally, the preponderance of males may have significant implications for a range of social and political relationships, not all beneficial.

14. As shown in Table 5 most people (69 percent) in the PA dwell inland. Most of these inland dwellers (671,000 persons or 86 percent) live in rural areas and can be considered to depend on agriculture rather than fisheries. The urban inland population

can be considered as being relatively better off than the rural dwellers and may represent in some way the population of land owners – say 11,000 households in all.

15. Nevertheless, the coastal population of 152,000 persons (16 percent of the total population) is not insignificant. This is an overwhelmingly rural population with perhaps only 10 percent living in villages or small towns (e.g., Keti Bandar would be the largest of the coastal communities and appears to have no more than 4-5,000 persons inside the town).

**TABLE 5: DISTRIBUTION OF THE POPULATION IN SELECTED AREAS**

| AREAS | TOTAL | % Total | RURAL | % Total | URBAN | % Total |
|---|---|---|---|---|---|---|
| | | | *'000 Persons* | | | |
| Inland | 784 | 69.07 | 671 | 85.59 | 113 | 14.41 |
| Coastal | 351 | 30.93 | 311 | 88.60 | 40 | 11.40 |
| **TWO DISTRICTS** | **1,135** | **100.00** | **982** | **86.52** | **153** | **13.48** |

Source: Census 1998 and Table 2

Note: Inland talukas are Ghorabari, Jati, Mirpur Sakro, Badin, SFR Rahu; Coastal talukas are Keti Bandar, Shah Bandar and Khoro Chan

16. It might be a reasonable hypothesis to say that the population of the PA is declining. Such a theory would be based on poor incomes and income earning opportunities as well as a perception that overall livelihood opportunities were diminishing. Simple considerations such as poor health facilities, bad housing lack of educational facilities, even lack of drinking water might be an incentive to encourage at least the more enterprising and intelligent of the community to move on to better pastures. In fact, comparison of 1981 and 1998 Census data suggest that over that period the population of the PA grew by an astonishing 42 percent overall.

17. All the PA talukas show a growth of population over the period (See Table 6). However the coastal talukas of Shah Bandar and Karo Chan show the largest growth figures, perhaps reflecting a move towards fishing over the period as a result of the encroaching sea. That said, the statistics do not support the anecdotal history of Shah Bandar which apparently has declined from a quite considerable port town to a few shacks (present observation from PPTA team). By contrast Keti Bandar remains a reasonable-sized small town with at least some fixed buildings, a seas defence bund and (relatively) easy road access. But Keti Bandar shows the lowest rate of change in the size of the population of the selected areas. The male rural population grew considerably faster than the female population, perhaps accounted for by the preference for male off-spring and a growth in the population of single male Laborers. Female growth figures are apparently distorted by a very strange number for Rahu. This remains unexplained.

**TABLE 6: GROWTH IN THE POPULATION OF SELECTED TALUKAS 1998 AGAINST 1981**

| DISTRICT | Taluka | Males Rural | Urban | TOTAL MALES | Females Rural | Urban | TOTAL FEMALE | TOTAL POP |
|---|---|---|---|---|---|---|---|---|
| | | | | % Change over 1981 | | | | |
| **THATTA** | | | | | | | | |
| | Ghorabari | 48.65 | 0.00 | 48.65 | 35.14 | 0.00 | 35.14 | **42** |
| | Keti Bunder | 20.00 | NA | 40.00 | 0.00 | 0.00 | 9.09 | **24** |
| | Jati | 51.22 | 33.33 | 50.00 | 38.46 | 100.00 | 41.46 | **46** |
| | Shah Bunder | 53.33 | 75.00 | 55.88 | 46.43 | 50.00 | 46.88 | **52** |
| | Kharo Chan | 55.56 | 0.00 | 55.56 | 50.00 | 0.00 | 50.00 | **53** |
| | Mirpur Sakro | 47.62 | 0.00 | 52.17 | 41.38 | 0.00 | 46.88 | **50** |
| | **OVERALL** | **48.42** | **92.31** | **51.23** | **38.12** | **91.67** | **41.45** | **46** |
| **BADIN** | | | | | | | | |
| | Badin | 42.00 | 0.00 | 28.77 | 36.17 | 135.29 | 51.35 | **39** |
| | SF Rahu (Golarchi) | 37.14 | 0.00 | 32.50 | 31.25 | 800.00 | 43.08 | **37** |
| | **OVERALL** | **40.00** | **0.00** | **30.09** | **34.18** | **172.22** | **48.30** | **38** |
| **TWO DISTRICTS** | | **44.44** | **17.39** | **40.09** | **36.28** | **140.00** | **44.72** | **42** |

Source: Census 1981 and 1998

18. Whatever the concerns about individual statistics, the apparent rate of growth of the population in the PA requires some explanation. It runs counter-intuitively to the observed conditions in the PA that would encourage outward migration. Of course, it is seven years since the 1998 census and things may well have changed. But for the purposes of project design some assessment of the growth patterns of the PA must be agreed.

## 3. PRODUCTIVE PHYSICAL RESOURCES

19. The Project Area is described here as a region with various physical resources or assets that provide it with advantages and disadvantages for productive economic activity[89]. This perspective emphasizes aspects of the environment that are useful to *homo economicus* rather than from a more holistic view of an environment suited for general animal and plant life. In this sense, the areas of cultivable land "lost" to salinity are only lost because they provide poor soil for the kinds of plants and livestock that are needed by humans; they are not lost to the birds and other wildlife that might find them useful.

[89] There is a wealth of documentation about the environment of the Sindh. Notably worth mentioning is the IUCN's "Sindh: State of the Environment and Development", 2004. Also ADB's Regional technical Assistance for Coastal and Marine Resources Management and Poverty reduction – Pakistan Component" (ADB RETA 5974) IUCN, August 2002.

### 3.a Climate and Hazard Mapping

20. A thorough description of the climate and soils of the PA are provided in numerous documents and for the PPTA by the Farming Systems and Crop Development Specialists[90]. In general, the climate is either cool and dry (winter) or hot and dry (summer). There is a very low level of precipitation (2-300 mm/year) and the PA cannot rely on natural rainfall to provide water.

21. Both Badin and Thatta are prone to major hazard events. A chronology of events over the last five decades reveals that both districts are in an uninterrupted cycle of disasters. Cyclone, heavy rains, and floods follow each other with short intervals. Earthquakes are fortunately rare phenomenon proving to be less disastrous in comparison to other hazards experienced by the communities at risk. Table 7.provides the summary of the hazards, causes and community's immediate responses.

**TABLE 7: SUMMARY OF HAZARDS, CAUSES AND IMMEDIATE RESPONSES**

| S# | Hazard /disaster | Year | How communities rationalize? | Kinds of losses | Community coping response |
|---|---|---|---|---|---|
| 1 | Cyclone | 1964 | Swift wind, constant rain | Livestock ,paddy crops mud houses | Sold livestock, undertook wage Labor in the area which was fed by Sukkur barrage |
| 2 | Heavy rains | 1973 | monsoon | Livestock, paddy crop, mud houses life losses boats and fishing nets lost | Self help, built earthen embankments, boats as a sandy by arrangement for emergency |
| 3 | Floods | 1976 | High water flow in the indus, it were the worst floods with highest volume of water passing through the barrages and the also highest floods levels ever recorded. | Agriculture land in kacha area destroyed, livestock died, crop damaged, infrastructure also damaged. | Patrolling along weak parts of banks |
| 4 | Floods | 1988 | | Crops destroyed, agriculture land submerged in water | |
| 5 | Heavy rains | 1994 | Monsoon | Livestock, paddy crops | |
| 6 | Cyclone | 1999 | Less rainfall in the area and shortage of fresh water in the sea | Human Lives, livestock, paddy crop, | By selling livestock and surplus milk, doing Labor (wood cutting). Survivors took loans, transitory migration |
| 7 | Earthquake | 2001 | Will of God long dry spell | Cracks in Pakka houses collapsed trauma | |
| 8 | Floods | 2003 | Sudden breach in KPOD, LBOD blockade of canal water. High sea tide and sea water intrusion in LBOD, weak embankment, unexcavated beds of small surface drains | Life losses wooden houses collapsed, livestock dies, farmlands submerged by the sea water, crops of rice, chilli, bana, sugarcane destroyed, nets, boats and engine drowned | |

[90] Report of the PPTA's Farming Systems/Crop Development Specialist, Dr. Ian Hancock, October 2005

### 3.b Soils

22.. Deep alluvial deposits form the soils[91]. Agricultural soils in Badin and Thatta are mainly loamy saline estuarine floodplain soils that are suitable for the cultivation of a wide range of crops. However the drainage capability of the soils is very low. 70 percent of the main soil types show severe upper salinity problems. The groundwater table is more or less contiguous with the sea level and is highly saline. Intrusion by the seawater (see below) also adds to the degradation of the economic value of the soils. In general, where sweet water is available from irrigation, the soils of the area are suitable, even good, for agriculture. However, increasing degradation because of seawater intrusion suggests that good soil will be a decreasing resource for human livelihoods from agriculture in the future.

### 3.c Water Supply and Irrigation

23. Water supply for both human, animal and crop consumption is the critical issue for the PA. Every documented beneficiary needs assessment mentions water supply as a major issue and most place a supply of drinking water as the first requirement for any project to tackle[92]. Lack of water impacts on the productive use of human time (women can spend all day fetching and carrying water), on health (dirty water means that a high proportion of the population, especially children, suffers from water-born disease), the distribution of the population (often along irrigation canals and drainage ditches) and the choice and productivity of crops. It can be fairly said that the failure of the water supply is the single most important constraint to any development in the PA.

24. Almost all sweet water in the PA comes from the irrigation system. Rainfall is usually low and there have been periodic droughts. This means that irrigation and drainage canals determine (to a large extent) the distribution of the population and their access to potable water from irrigation channels and drainage ditches. To say that "sweet" is a misnomer would be failing to explain that a large part of the population has to drink water that has already been used for agriculture (and therefore is almost certainly contaminated with agro-chemicals) or has been contaminated by human or animal wastes.

25. The irrigation system in the PA is a part of the Indus Basin Irrigation System (IBIS). The important feature of the system that impacts the project area is that it is at the tail-end, below the last large dam, the Kotri Barrage which is near Hyderabad. This means that there may be a general (i.e., persistent) shortage of water depending on demand upstream and releases from the Kotri Barrage. Nevertheless, there is sweet water in the Project Area and access to it is an important, perhaps the key, determinant of social and economic development in the Indus Delta.

26. Another feature of the irrigation system is that whereas the command areas above Kotri (i.e., downstream of the Sukkur Barrage) supply in both seasons (i.e., they are perennial), the canals below Kotri are non-perennial; the Kotri command areas grow only rice during the Kharif season which is the only time they get regular water supplies.

[91] Hancock, op.cit.
[92] For example, most recently the excellent paper "Rapid Assessment of Coastal Fishing Communities in Coastal Badin, Sindh", Ruqia Laghari NRSP, July 2005

To make matters worse, the major portion of the water available to lower Sindh is lost during the conveyance process[93].

27. It is beyond the scope of this paper to develop a comprehensive picture of the below Kotri irrigation system. However, it cannot be stated too strongly that it is the operation of this system that provides a major factor in the social dynamics of the PA. It is quite clear that that in the pre-Kotri period of 1955-1961 there was not a single day with zero flow during both Rabi and Kharif seasons[94]. Post-Kotri the Rabi season flow was reduced significantly. Flows in both seasons were then reduced by the construction of the Tarbela Dam in 1976 (Tarbela was the last major construction within the IBIS). This reduced flow (associated with the high losses from the system as a whole) have meant that the sea has encroached and that water in the Project Area has become the principle concern of people's lives both from the point of view of basic supplies of drinking water and as it relates to economic activity. In broad terms, access to sweet water from the irrigation system means that a resident in the PA has water for his or her personal consumption and the means to cultivate the land. These people (all things being equal) are relatively well-off compared with their cousins or neighbours without water. These persons must either buy their water and transport it or perhaps move to areas where there is work that enables them to buy water, i.e., they may migrate to the coast and become casual Laborers on fishing boats or they may leave the area entirely for non-rural work in Karachi.

28. Even with the reduced flow it is important to understand that the Kotri command areas cover almost all of the PA. There are two primary diversion canals and these appear to fall in three major command areas, one on the west bank of the Indus and two on the east. Maps available to the PPTA team indicate that almost the entire area is supplied with at least the infrastructure for the supply of water. It should also be noted that because of seawater intrusion, that in many places outside the command areas (even within them) groundwater is not suitable for tube wells.

29. Despite this physical coverage by the irrigation system, difficulties with management of the water in the context of reduced up-river flows and increased seawater intrusion has reportedly dramatically reduced agricultural land. All the coastal talukas report severe damage to their agriculture. Table 8 indicates that overall 83 percent of the potentially productive land has been lost in the talukas that comprise the PA. This is an astonishingly high figure and may not be accurate (almost all the data in relation to this PPTA are suspect). Nevertheless, even if the figure is wrong by half, then it is still a large amount of land lost to production.

[93] "Freshwater Resources of the Indus Delta Eco-region", Abdul Khalique Ansari, Sindh Irrigation Development Authority, in Proceedings of consultative workshop on Indus Eco-region, December 2002, pub. WWF 2004

[94] "Freshwater resources of the Indus delta Eco-region", Farhan Anwar, WWF 2004, op.cit.

**TABLE 8: PRODUCTIVE LAND LOST TO SEAWATER INTRUSION**

| DISTRICT | Taluka | AREA (ha) Cropped 2004-05 | Lost to seawater | TOTAL | Lost as a % Total |
|---|---|---|---|---|---|
| **THATTA** | | | | | |
| | Ghorabari | 8,781 | 12,744 | 21,525 | 59.20 |
| | Keti Bunder | 1,431 | 46,095 | 47,526 | 96.99 |
| | Jati | 21,962 | 91,730 | 113,692 | 80.68 |
| | Shah Bunder | 17,672 | 23,877 | 41,549 | 57.47 |
| | Kharo Chan | 189 | 47,683 | 47,872 | 99.61 |
| | Mirpur Sakro | 114 | 24,354 | 24,468 | 99.53 |
| | **TOTAL** | **50,036** | **246,483** | **296,519** | **83.13** |
| **BADIN** | | | | | |
| | Badin | 69,616 | 19,903 | 89,519 | 22.23 |
| | SF Rahu (Golarchi) | 76,899 | 12,394 | 89,293 | 13.88 |
| | **TOTAL** | **146,515** | **32,297** | **178,812** | **18.06** |
| **TWO DISTRICTS** | | **196,551** | **246,483** | **296,519** | **83.13** |

Source : Development Statistics of Sindh and ANZDEC estimates

30. This loss of productive land equates directly with a loss or drastic change of livelihoods in the project area. It implies an enormous amount of disruption and probably involuntary resettlement. As the sea continues to intrude (and there is no indication that there will be a change in water allocation from the Indus – indeed the construction of the planned Kolabargh Dam in the upper reaches will further restrict the flow even if a reported 8.6 MAF is mandated for below Kotri[95]) more land will be lost to irrigated agriculture and poverty will increase in proportion as people are forced from the good land and sources of sweet water.

31. In summary, nature itself fails to provide adequate rainfall; human attempts have also been ineffectual for a variety of reasons. Perhaps that statement can be stronger: human choices about the use of water from the Indus have not only diminished the supply of water at the tail end of the irrigation system, but have been a prime reason for the incursion of sea water which has increased salinity and removed land from crop production. The Government of Sindh and perhaps the Federal Government have made choices about the allocation of water from the Indus. These choices have meant that the areas at the tail end of the water supply system have had less water than is required both to irrigate crops and to push fresh water into the sea[96]. The result has been and will continue to be abject poverty for a majority of the population in the PA.

### 3.d Fodder and firewood

32. Because of water shortages and salinity, the PA is sparsely vegetated. There are few shade trees and much of the landscape outside cultivated areas consists of scrub and poor grassland. Nevertheless, the vegetation does provide grazing land for livestock and firewood for fuel. Both cattle and goats seem to do well enough and it is probably right to consider some of this rangeland as a positive resource.

[95] The construction of this dam is a major political issue in December 2005
[96] This issue is dealt with in more detail in the project paper by Geoffrey Bastin, ANZDEC 2005

33. Coastal Sindh is (or perhaps was) the location of the largest mangrove forest in the world. However, mangroves have been lost over large areas because of damage caused by camels that were brought into the area for grazing (herds of camels at one time were quite large) and because of increased salinity.

34. The management of camel herds in fact had considerable impact on both the vegetation and on society. The Jath, traditionally camel herders of Baloch descent who were not fisher folk half a century ago have settled down on the banks of these creeks. They did so primarily to graze their camels unhindered in the nearby mangroves (*timar*) as free grazing became restricted further inland and along the river belt of the Indus due to the advent of intensive irrigated agriculture.

### 3.e Roads

35. Despite being in a remote corner of Sindh (let alone Pakistan) the coastal south-east region benefits from relatively easy major road access to Karachi and other northern cities (e.g. Hydrabad) and from rural electrification in many areas. District towns such as Thatta and Badin are by no means cut of from Karachi where services and necessary inputs are readily available and where all surplus produce can be sold. Daily truck convoys bring animal feed from the PA to large buffalo herds in suburban Karachi which provide the city with milk. Journey time by road is approximately 5-7 hours by Toyota pick-up truck (i.e. the most usual form of small commercial road transport); 6-wheel trucks take slightly longer because of slower speeds. Equally, fishing vessels which have fished in Sindh coastal waters can easily off-load at wharves in Karachi. Voyage time by boat from e.g., Keti Bandar is approximately 8-10 hours. These vessels can also find workers from Karachi. The city's fresh markets abound in fruits, vegetables and livestock (especially chickens) much from around Thatta and Badin.

36. Although major access routes are fair to good quality, minor roads in the PA are less good, though by no means impassable. The oil companies that explore and pump for oil in the coastal zones have constructed a reasonable road network and continue to maintain it. Roads also run alongside the irrigation channels and drainage ditches that cover the Kotri command area. Most link roads are dirt track but because of low precipitation are passable most days. Even so, there are many poor communities that consider they are disadvantaged from the point of view of access. This is not primarily because of a lack of roads though the road system can certainly be improved) but because they cannot afford the means to travel. Thus one finds small groups living alongside drainage canals on the edge of a road and near to the fields they are employed to till who nevertheless cannot easily reach the nearest market.

### 3.f Power generation

37. Pakistan as a whole is among one of the world's lowest consumers of energy (16 percent of the world's average). Consumption of electricity in Sindh appears to have been static. Most energy is used for cooking and in rural areas almost all power/heat is generated from firewood. From observation, the power grid seems to be inadequate in the PA. Power lines are often badly maintained or broken entirely. It seems fair to assume that most of the rural population does not receive electricity, those along the main roads probably do.

38. Wind power appears to offer a solution both to high cost and poorly distributed electricity. There is a constant sea breeze that blows into the PA and at least Badin

figures in a list of the best wind power generation sites. Solar thermal power generation may be another alternative to be considered given the high values of solar radiation in Sindh. The key aspects are (a) to provide households with power for basic livelihood activities, and (b) to reduce their dependence on firewood in an area where the vegetation is limited at best and where every tree is needed.

### 3.g Productive infrastructure

39. There appears to be almost no productive infrastructure in the PA beyond a scattering of small-scale rice mills and chicken farms – these are discussed below in the section on the rural economy. There are small shops and informal market structures in the towns; in general observation of the primary markets suggests little if any attempt has been made to improve marketing or storage of fresh produce. There are some ice-making plants and it is said that ice can be found if required (e.g., for the transport of fish). There appear to be few animal houses; presumably small livestock spend there nights with the family, while it is not known how the large animals are managed.

40. There are sugar mills in the PA. At least one is owned by the government and is currently closed down. No information is found on the other factories. There appear to be one or two oil mills and some model farms, but their presence does not remove the impression that the PA is mainly an area of arable farms worked by peasant Labor living under extremely primitive conditions.

## 4. SOCIAL AMENITIES

### 4.a HOUSING

41. While there are more or less permanent houses and shop structures in the District towns and in Keti Banda, the overwhelming impression in the PA is of a population that lives in wattle and daub shacks known as "*katchi abadis*". Villages represent mere collections of these huts, sometime augmented with clay walls or sometimes with plastic sheet roofs. These houses have no amenities and often consist of one room with an earth bench on which people and animals seek refuge if there should be a flood (mainly in coastal areas where there might be a storm surge). In general there is no source of fresh drinking water available to the village and people consume water straight from the canal. There are no sanitation facilities. 90 percent of the residents of the PA may live in these structures, which are often less viable than structures found in refugee camps. The fact that some may have been in place for many years is a shocking and remarkable indictment of the inability of the Government of Sindh to cope with the scale of the human problem with which it is faced[97].

### 4.b HEALTH

42. The health of the population in the PA is reported as being very poor. Perhaps the fundamental cause of ill-health is lack of clean drinking water and indeed a lack of drinking water altogether. The human body subject to a degree of dehydration under-performs at every task and can suffer a range of chronic diseases including high blood pressure, kidney failure and joint disability. Dirty water also brings with it a variety of water-borne disease. Saline water damages the human body and may affect the brain's ability to process information. Prolonged consumption of saline water is likely to be a

[97] It should be said that katchis are found in Karachi and that GOS has had a Katchi Abadi Improvement and Regularization Programme in place since 1978. Since 1992 7,438 katchis were bulldozed in Karachi alone

major underlying factor in a variety of health and associated problems including the inability to plan daily activities to the greatest effect.

43. For project design purposes it is assumed that men are relatively healthier than women because many women are pregnant or in a post-natal condition. It is also assumed that old-age sets in early so that those over the age of 50 with few exceptions would contribute almost noting to the work force. Although no age cohort data is yet available to the PPTA based on assumptions about the age stratification of the population (a high proportion of person being aged less than 20) and about disease factor, it is found that only some 40 percent of persons (mainly men) are healthy enough to be considered effective economically active persons. poor health is a significant constraint on the supply of a prime factor of production in the PA – Labor.

44. There are almost no health services available to mitigate this situation. According to EDO (Health) Badin, the health facilities are quiet inadequate[98]. It includes only 1 district hospital, 4 Taluka hospital, 36 BHUs and 20 dispensaries. While medical staff is much lower than the population, calculated to be 5428 persons in 2001[99]. For a population of 1136.04 thousand, 5 hospitals were available in 1998, thus on the average one hospital bed was available for 3334 persons at the district level in 2000. All these facilities are insufficient to cater for the needs of the existing population. The few medical centres shown to the PPTA team appeared to be closed. It is almost certain that no qualified medical staff reside in the PA. Perhaps the nearest doctor mid-wife is in Thatta of Badin, but that is by no means certain. In these circumstances the overall physical condition of the human capital of the PA ma be considered very poor and probably incapable of greater efforts at survival than are currently being made. To expect such persons to adopt new technologies or new ways of thinking or organizing without tackling the fundamental problems of chronic ill-health is quite unrealistic.

### 4c. EDUCATION

45. Pakistan as a whole has one of the lowest literacy rates in the world. Rates in the rural areas are exceptionally low especially among females. In the PA it is probably correct to assume a 99 percent rate of illiteracy. In this case, an important question is begged about how new techniques 9e.g., of agriculture) can be disseminated. District Office can provide pamphlets on a variety of crops and how to grow them, but what is the point of written material if almost no one can read?

46. Equally, there is more to education than reading, writing and arithmetic (one wonders how many tenant farmers can really understand the concept of “percent”?). People need to be made aware of the world outside their immediate surroundings, of the possibilities that exist and the means by which these possibilities can be gained. Almost no infrastructure to deliver this level of understanding exists in the PA.

47. The literacy ratio is 19% of Thatta and 20.5% of Badin. The analysis of the reports reveals that the male literacy ratio is about three times higher as compared to females[100]. There is also a sharp difference in the literacy ratios by area (rural and urban). The ratio in urban areas is much higher than the rural areas. Further there is a wider gap between enrolment ratios of male and female and urban and rural areas.

[98] Meeting held at Thalasmia center Badin on 18/10/2005 along with NRSP Personnel
[99] Social development planning pp:256
[100] Provincial census report 1998

There is also very low percentage of educated people at graduate and post graduate level in the areas. Of the total educated persons, only 3.43% for graduates and 1.62% for post graduates in Thatta and 3.5% for gradates and 1.72% for post graduates in Badin.

### 4.e ACCESS

48. Many of the findings about water, roads, power, health and education add up to a total lack of access to a range of essential services needed to conduct life beyond survival. In many cases even "subsistence" may be too optimistic a word to use about persons dwelling in the PA. The margin of existence, absent almost all the requirements of life (even water!), seems extremely small. Suggesting that there are communities that can be developed in such circumstances avoids the point made by one recent observer that coastal Sindh requires emergency aid rather than development[101]. What is being seen over much of the PA is the collapse of communities, a situation that requires mitigation before any serious development strategy can be implemented.

## C. COMMUNITY AND POVERTY ASPECTS

### 1. GENERAL OVERVIEW OF SOCIETY IN THE PROJECT AREA

1. Society in the Project Area like elsewhere in Sindh is characterized by a few powerful landlords, and a large peasantry the minority within which comprises small land owners, and where the majority is made up of landless peasants (*hari*). The landowners are called *zamindar,* and large ones amongst them *wadera.* The term *wadera* is also used for the head of a clan or settlement, usually the eldest. Owning land means control over surrounding public space, and natural resources.

2. The northern boundary of the PA (running west to east along the Karachi-Thatta-Badin road) has a series of market town centers which service the *dehs* around them. These townships are primarily inhabited by shopkeepers, traders, millers and crafts people. Even though they may be moneyed, politically these town peoples are less significant than the *zamindars.* In the same vein those involved in fishing are also less significant politically than the latter.

3. The Project Area may also be divided into land within the command areas of the irrigation system below the Kotri Barrage and those areas outside it (see also discussion above in Section 3). Within the command areas a so-called "watercourse community" exists which comprises a group of landholders that divert the entire stream allocated to their block of land from the canal turn- wise have learnt to follow a distribution schedule for each individual holding upon which all shareholders can rely and do not have to negotiate or struggle to get the water from each other at each turn. This community also collectively organizes to de-silt the water channel. Besides organizing to bring reliability to their every day farming operations these individual water users on one channel unite to find ways to maintain a reliable supply of water through their outlet in the canal.

[101] Ruqia Laghari NRSP in "Rapid Assessment of Coastal Fishing Communities in Coastal Badin, Sindh, July 2005

4. The irrigation command areas also define the agrarian community. Where there is access to sweet water, people opt for agriculture which might include freshwater inland pond fishing. This community, landlords, tenants and landless Laborers, makes up the majority of the population residing in the PA (see Table above). The agricultural system is biased towards landowners. Most of the Labor force remains at subsistence. There is a highly skewed pattern of distribution of assets, notably land, is one of the important reasons behind the vulnerability of a large number of households. The incidence of rural poverty is the highest among those who own no land and falls steadily as the ownership of land increases.

5. Landlords (mainly Memon, Shah, Sheikh, Chandio, Lund and others) meets the *haris'* (Mallah, Kohlee, Bheel, and others) needs for agricultural inputs, consumption, social events, emergencies through monetary advances, with the accounts of these transactions kept secret. Even if these accounts were managed openly, the extremely low literacy rate would inhibit their control over the entries. The debt accumulates over the years. Haris cannot leave the landlord without clearing their debt, and so become bonded. The existing sharecropping tenancy system, concentrated in the canal-irrigated areas of the districts, is historically deep-rooted and perpetuates the deeply entrenched poverty of tenants and agricultural labor through unbalanced revenue-sharing and cost-sharing arrangements and a complex system of dependencies.

6. Changes over time, the influx of migrants, and the introduction of modern technologies have altered the relationship to the disadvantage of the hari[102].Agrarian communities mostly get drinking water from the canals, drains, hand pumps and ponds. Collecting water is mainly the responsibly of women and children. These communities comparatively have better access to nearby city resources, infrastructures and other livelihood options as compared to island communities.

7. Towards the coast and as the availability of sweet water decreases in the face of encroachment by the sea, there are communities of fisherfolk some of whom may be termed “coastal” and others who are termed “island” dwellers[103]. These communities are comprised of fisherfolk with little subsistence farming, especially animal husbandry (camels, cows and goats). They mainly live on coast and Indus delta, on small islands or creeks. Fishing is the only and major means of livelihood adopted by these communities mainly Malah, Jat, Mirbahar, and others. There are some small enterprises, but these all simply support the main economic activity of the town, which is fishing[104]. The men fish and sell the product, while women stay at home. Most of the fishermen communities do not sell fish, directly in the market but sell it to a “*saith*” near contract’s point in the village. Though, there is no legal binding on the fishermen to sell their catch to a particular contractor, but it has become very difficult for the fishermen to exercise their free will and chose the higher rates. The distribution of catch is based on the inputs in boating mission (equipments, boat and labor). The expenses of the mission are deducted at source and the catch is divided into equal shares, the laborer get ¼ of the total catch. A large boat has a team of 7 to 8 persons. When high tide recedes, the men immediately go for fishing in the creeks. All the boats go together for fishing. The fishermen are using Boola net. The net is illegal to use but it is being used widely.

[102] SINDH RURAL DEVELOPMENT PROJECT October 2002
[103] These categories are defined by Shaheen Khan
[104] Rapid Assessment of fishers communities in Thatta 2005

## 2. RELIGION AND MOTHER TONGUE

**TABLE 9: RELIGIOUS AFFILIATION**

| Religion | District Thatta | | | District Badin | | |
|---|---|---|---|---|---|---|
| | Both | Rural | Urban | Both | Rural | Urban |
| Muslims | 96.72 | 97.45 | 90.93 | 79.43 | 78.89 | 82.17 |
| Christian | 0.18 | 0.13 | 0.55 | 0.25 | 0.10 | 1.02 |
| Hindu | 2.70 | 2.07 | 7.69 | 18.85 | 19.59 | 15.11 |
| Ahmadi (Qadiani) | 0.04 | 0.04 | 0.07 | 0.24 | 0.19 | 0.47 |
| Schedule caste | 0.19 | 0.18 | 0.27 | 1.08 | 1.08 | 1.05 |
| Others | 0.17 | 0.13 | 0.50 | 0.15 | 0.14 | 0.19 |

Source: District census report 1998 GoP

8. The population of the districts is predominantly Muslims, which constitutes 96.7 % in Thatta and 79.43% in Badin, of the total population. In Thatta the Muslims' concentration are, with a higher share in rural areas 97.45 % as compared 90.93% in urban areas. the case is different in Badin, which shows more in urban 82.17% as compared 78.89% in the rural areas (see table 3). The most important in the minorities are Hindus 2.70% in Thatta and 18.85% in Badin. They are mostly concentrated in urban areas in Badin and rural areas in Thatta. Presence of other minorities in the districts as well as in rural and urban areas is quiet insignificant. Sindhi is the major mother tongue, which is spoken by more than 85% of the total population of both Districts. The next prominent group is Urdu speaking people in Thatta and Punjabi speaking in Badin, mostly concentrated in urban areas.

## 3. GENDER[105]

9. The participatory process of rapid assessment showed that a traditional, gender based division of labor exists in fishing communities of District Thatta and Badin and Karachi. While men are primarily responsible for the actual task of fishing, women are heavily involved in pre-fishing and post-fishing activities e.g. preparation of the food and repairing of the nets and fishing tools. During the time when men are in the deep sea for fishing women manage all the household and communal responsibilities. Post-fishing women are partly engaged with handling shrimp and marketing. These tasks are crucial but often not remunerated. Women work longer hours than men and are responsible for tasks both inside and outside the home. However, despite their significant contribution, women have weak bargaining positions in he household and little involvement in local resource management.

10. In the past as quoted by the communities themselves, women were used to have a direct role in fishing, from fish catch to mending the nets and even preparing new nets and some role in marketing as well. However, with the commercialization of the fishing livelihoods, modernization of the fishing boats and other equipment, the space for the women in livelihoods has drastically reduced leaving women dis-empowered. The surface level view of the coastal communities suggests that there are no gender issues in the coastal communities but slightly a careful assessment give rise to number of questions. Can any one believe that there are no gender issues among the coastal communities where the male have upper hand in the family and social affairs? The

[105] This section relies on the paper by Mubashra Atif entitled "Assessing Sectoral Gender Issues", ANZDEC 2005

decision-making powers rest with the men with little participation of women folk in decision-making process. Can we assume that once the major issues are resolved, gender equality would be a natural outcome? Or women would automatically benefit with the development inputs to household?

11. These questions have got to do a lot with the empowerment of women. As empowerment by definition; " presumes an unequal power relations between men and women. Power itself is not intrinsically associated with one specific gender. It is society, the culture and the community that associate power to a specific gender. Whereas society, culture and the communities are not fixed entities, they are ever changing and not to be used as an excuse for inaction or indifference to an oppressive or un-equal power relations among women and men.

12. The critical element is the development of methodology and approaches that take into account the existing inequality between women and men in the fishing communities. Organize women at the community level engage them in decision-making process at the community and household level. The single most important strategy could be locally fostered women's organizations to access benefits for the fisher women and create awareness among the policy makers about the distinct lives of fisher women.

## 4. CASTES AND CLASSES[106]

13. The major castes of communities in PA are Baloch, Jokhio, Soomra, Sammo, Syed, Memon, Khoha, Mirbahar, Machee, Mohana, Jat, mandhra, burgheri and others, which are further divided into 'urak' means sub-caste, while Mallah is considered as the most inferior caste among all, due to poverty and profession of 'fishing' as responded by communities during group discussion. All communities live in 'Paras' coved with boundary wall called as 'Lohra', which means community living inside the lohra belong to same tribe/cates/clan, who have blood relation (brothers/sisters/cousins) among each other. Oldest person (mostly man) behaves as head of the community.

14. We find settlements of Kohli and Bheels (Hindus/minorities) in the PA, working as Haris for Zamindars. They possess good agriculture skills and many of them are involved in agriculture as sharecropper/tenants. The general idea of people about Kholi - Bheels is that 'these communities are hardworking and provide more yield as compared to Muslim Hari'.

15. Large land holdings are mostly in the possession of clans of Baloch origin, a reflection of their historical dominance through conquest. They are addressed as Mir or Raees and carry names of their clans, Talpur, Jatoi, Jamali, Rind, Maghsi, Chandia, Kalamati, Chang, Alwani etc. However, the Syed, who claim descent from the Holy Prophet are accorded the highest status in society, which is often also reinforced by large land holdings, and great spiritual and political influence and usually connected to the shire of a spiritually illustrious ancestor. The third and largest element comprising

[106] This section is an excerpt from "Note on the Livelihoods and Societal Context of the Project: The Lower Indus Basin and Coastal Districts of Thatta and Badin in Sindh" Dr Jamshed Tirmizi. ANZDEC November 2005

society, are several groups referred to as the Sumaat, who claim origin from nowhere else but Sindh. Most *hari* are from the Sumaat , including the Mallah.

16. The Mallah, also called Mir Beher (masters of the sea), in an agro-centric society have traditionally had a marginal status within the Sumaat, by virtue of their work which does not relate to land. However, there is no taboo to their becoming a *hari*. It appears that for pariah groups seeking inclusion and upward mobility in the past an entry point may have been to term themselves as Mallah. Indeed there are small peripheral settlements along roads and stretches of water in the project area where a few households who claim to be Mallah squat with the explicit blessing of the *wadera* or large land owner of the area and demonstrate characteristics similar to the wandering (*pakhivas*) low caste hindu and other begging groups who typically set up camp outside urban settlements and agrarian market towns. The *pakhivas* see their life as wanders as given, and return annually in the monsoon for a few months to a point they call their root to where they also transport their dead when away from it. Unlike the *pakhivas* these local groups burry their dead in graveyards of nearby shrines, and have acquired quasi permanent residence in the peripheral patch they are squatting in, mostly public land. But similar to the *pakhivas,* women and children of these groups beg during the day in the market of the town. The men work on fishing boats in the open sea when the money runs out. The address of their settlement is the name of their clan, the name of the *wadera zamindar* with whose support they have settled themselves, the name of their own *wadera*, and reference to a land mark - town, shrine or bridge closest to them.

17. Quite opposite to these groups, that earn their livelihood primarily through begging is another group of low cast Hindus called Kolli and Bheel, particularly in the Badin district. They are known for their hard work and make popular share croppers and farm labor. Kolli and Bheel women, distinguishable by their dress and bracelets covering their entire arms, work side by side their men.

## 5. KINSHIP RELATIONS

18. Analysis of the communities in the PA usually focuses on households and villages. However, research suggests that a supra-household aggregation - kinship groups – is a crucial element in understanding identity, collective action and mobility[107]. These kinship groups are a crucial element of poverty analysis.

19. The primary loyalties in this society are towards the family and the clan. Marriage is mostly amongst ones own clan, often living in the same *goth* and also cousins. These primary communities are essentially inward looking and have little interaction towards the outside, except with the *zamindar* whose land they till and live on and have to make common cause with in his endeavors. The other communities living in the same *deh* or revenue estate have little significance, except either during elections when they have to vote for candidates contesting for the union council which represents a set of villages or if they happen to share the same canal watercourse.

20. All households belong to a kinship group and these groups are exclusive (no household belongs to two groups). Most if not all villages have households belonging to at least two kinship groups. In research done by ADB in Thatta (op.cit) there were three

[107] "Rural Economy and Livelihoods", Haris Gazdar, Draft Thematic paper for ADB TA 4319-PAK: Determinants and Drivers of Povevrty reduction and ADB's Contribution in Rural Pakistan

main kinship groups and several smaller groups found in one (coastal) village. This village can be thought of representative of the coastal community, but is not necessarily representative of any other, especially agrarian, community in the PA. This fact draws attention to the very diverse social structure of the PA. Homogeneity of social organization, caste class or kinship group is most certainly not a feature of the PA. In this respect, the proposed project must be highly sensitive to these social differences that will underlie every intervention or activity.

21. In this Thatta village, the most conspicuous group were the Sammat4 (sic) who dominated the main market and also included a number of prominent landlords. The Sammat kinship group is thought to be of the traditional Sindhi race and this is a main line of demarcation between this group and those of baloch origin.The second conspicuous group were Khaskelis who had been mostly share tenants of the Sammat4 but due to the drought had taken to marine fishing and other casual Labor. The third group were the Mallahs, the name for traditional sea-faring communities. One of the largest landlords was a Mallah, but other Mallahs were landless and poor.

22. For the Sammat4, the incidence of land ownership was 48 percent and they had significantly higher levels of education compared to the other kinship groups. In the Mallah group there was a sharp distinction between the chief Mallah who was a boat and landowner and the others in this group.

23. With the caveat that generalizations from this village-based research should not be drawn too widely, it is clear that persons from different kinship groups co-habit peacefully and in social and economic relationships that are (presumably) mutually supportive. That said, the fact that villages often consist of a “nucleus” of households and then a few or single households scattered around the area may reflect conflicts between kinship groups. Alternatively the scattered nature of the village may reflect a search for natural resources, especially drinking water. Little is known about these arrangements, but they are clearly an important feature of village life.

24. Especially when economic relations are governed primarily by groups based on social (rather than financial) standing or ethnic or family/ kinship background, markets becomes rigid and inflexible. The result is that resources are allocated inequitably and productivity is reduced. This is an overly simple understanding of how kinship groups may impact on the livelihoods of the population of the PA. In fact, there is some evidence in Sindh that both land and Labor markets are more efficient than the social structure described above suggests. In many villages, for example (even those with relatively low concentrations of land ownership), landless households may have access to share tenancy arrangements as well as opportunities for casual Labor. This provides a choice and some access to self-employment and so possible upward mobility if the share tenancy is successful (i.e., the tenant is able to gian access to water and produce a reasonable return on the Labor applied to his plot). Nevertheless, taking the Project Area as a whole, it is probably right to assume that domination by certain kinship groups leads to an overall inefficiency in the allocation of productive resources. In this respect, the proposed interventions must pay attention to how these relationships adversely affect market activities.

## 6. LAND TENURE

25. One of the prime causes of social and economic failure in Sindh has been long identified as the system of land tenure. The system is entrenched and has been the subject of academic and political study for years. The Sindh Tenancy Act dates from 1950 and has so far been an ineffective instrument in changing the fundamental fact that a few persons (perhaps only 10 percent of the population) control large tracts of Sindh and that the majority of the rural population is in debt to them.

26. It is beyond the scope of this paper or indeed the project design to delve deeply into the land tenure system found in Sindh and thus in the PA. But it must be acknowledged as a real constraint and a consideration that must be factored into the assessment of the project's impact on the communities by the design team. In this sense, the PPTA must thoroughly understand the land tenure system and its effects rather than attempt to change it or explain why and how it occurs.

27. Land ownership is organized within revenue estates called *deh* of different sizes. One such *deh* in Thatta, for example, has 3500 acres. 3000 acres belong to a Chandio clan and the remaining 500 in small holdings to other people. The Chandio are of Baloch descent. This particular clan (*urak*) of the Chandio is called Hussnani. The children today are the sixth generation of the Baloch called Sabo and his son Dital who originally moved to this location, and have now become 35 households living together in a settlement (*goth*) always referred to by the name of the eldest living male progeny of the eldest son of the original settler, currently a Mr. Yousaf Chandio. There are almost 50 other settlements or (*goth)* who share this *deh* with the Chandio. They are essentially separate compounds scattered all over the *deh* with the number of houses ranging anywhere between 2 to whatever, belonging to related families. Several of these are tenants of the Chandio, to whom the land on what these tenants claim as their *goth* is located, belongs. From amongst the Chandio a few work in government jobs.

28. In another *deh* with several *goth* and land owners, a Palejo clan also of Baloch origin own about 400 acres which are neatly tucked in a consolidated block bordering a road.
They live in one *goth* located in the middle of their block of land, surrounded by a thick and high thorny hedge (*lora*) beyond which outsiders cannot enter. This compound has four *para* or sections in which sub sections of the clan live. The agricultural land is individually inherited and owned. One cousin, if he does not have any siblings, will end up with a much larger holding than the other cousins who have siblings. In a large household, a few look after the agriculture and the livestock and the rest seek work elsewhere including on the fishing boats a little further south, if they can stomach the sea.

29. In one *deh* in Badin district two clans of different Sindhi population groups, the Bhatti and the Dall, unrelated to each other but tenants (*hari*) in the same *deh,* live together in a *goth* built on land categorized as public and for housing with the permission of the land owners. They knew each other for several years and got along well, before they started living in the same spot. Their settlement like most settlements in this society is surrounded by a thorny hedge boundary (*lora*). Though they live on different sides of the compound they have not separated themselves from each other by a hedge, and are a community. As Share croppers they get ¼ share from the total harvest of the land they till, do not pay for the tillage, the water, and the seed which are all borne by the owner but only pay ¼ of the fertilizer cost. They also get paid the labor for the harvest in kind. One or two grown up individuals from these *hari* households go away for a stretch

of time to the steel mill in Karachi, for daily wages, to supplement their income, where a labor contractor from their area operates.

30. At this stage of the PPTA little more has been done than attempt to estimate how the population of the PA is distributed between large-holders (one hesitates to use the word zamindar without knowing its exact meaning and use in local language). This exercise has been attempted in order to try to tease out the size of the beneficiary population and also to assess who the people might be that might respond best to interventions.

31. Table 10 provides an estimate of the distribution of cultivated land in hectares between holdings of different sizes. Total area is shown as 196,665 ha. of which 75 percent is in Badin District. SF Rahu taluka has the single largest area of land. Kharo Chan has a tiny cultivated land area as does Mirpur Sakro and may be considered insignificant from the perspective of agriculture. Keti Bandar's land area is also very small and reflecting the fact that the town itself is entirely surrounded by the encroaching sea except for a narrow causeway carrying the road. Shah Bandar is the only coastal taluka that has any significant area of cultivated land.

**TABLE 10: DISTRIBUTION OF CULTIVATED LAND AMONG SIZE OF HOLDINGS IN SELECTED TALUKAS, 2004-05 CROP AREA DATA**

| Size of Holdings | | **>20 ha** | **6.5-20 ha** | **2-6.5 ha** | **>2 ha** | **TOTAL** |
|---|---|---|---|---|---|---|
| Percent of total cultivated area | | 23 | 35 | 34 | 8 | **100** |
| **DISTRICT** | **Taluka** | | | *Hectares* | | |
| **THATTA** | | | | | | |
| | Ghorabari | 2,020 | 3,073 | 2,986 | 703 | **8,781** |
| | Keti Bunder | 329 | 501 | 486 | 114 | **1,431** |
| | Jati | 5,051 | 7,687 | 7,467 | 1,757 | **21,962** |
| | Shah Bunder | 4,065 | 6,185 | 6,009 | 1,414 | **17,672** |
| | Kharo Chan | 43 | 66 | 64 | 15 | **189** |
| | Mirpur Sakro | 26 | 40 | 39 | 9 | **114** |
| | **TOTAL** | **11,534** | **17,552** | **17,051** | **4,012** | **50,150** |
| **BADIN** | | | | | | |
| | Badin | 16,012 | 24,366 | 23,670 | 5,569 | **69,616** |
| | SF Rahu (Golarchi) | 17,687 | 26,915 | 26,146 | 6,152 | **76,899** |
| | **TOTAL** | **33,698** | **51,280** | **49,815** | **11,721** | **146,515** |
| **TWO DISTRICTS** | | **45,233** | **68,833** | **66,866** | **15,733** | **196,665** |

Source: District EDO Statistical Offices

32. 23 percent of the land area is in large holdings with the remainder in small-holding of up to 6.5 ha. Again, Badin has the greatest area of large-holdings. Most land (69 percent) is held in areas of between 2 and 6.5 ha. This suggests that this area, mainly rented by tenant farmers ("*hari*"), would be the target land for interventions in the

agricultural sector since the project would be directed to the relatively poor tenants rather than the richest landlords.

33. Table 11 translates the land area into population data. This indicates in broad outline the possible numbers of persons to be affected by the proposed project. The data include figures on those persons who are landless in order to give a comprehensive idea of how land holdings are distributed among the entire population.

**TABLE 11: DISTRIBUTION OF LANDHOLDING IN THE POPULATION OF SELECTED TALUKAS**

| | | >20 ha | 6.5-20 ha | 2-6.5 ha | <2 ha | Landless | TOTAL |
|---|---|---|---|---|---|---|---|
| Percent HH Heads holding | | 2 | 8 | 20 | 30 | 40 | **100** |
| **DISTRICT** | **Taluka** | *Heads of House Holds* | | | | | |
| **THATTA** | | | | | | | |
| | Ghorabari | 200 | 800 | 2,000 | 3,000 | 4,000 | **10,000** |
| | Keti Bunder | 50 | 198 | 495 | 743 | 990 | **2,476** |
| | Jati | 236 | 945 | 2,362 | 3,543 | 4,724 | **11,810** |
| | Shah Bunder | 190 | 762 | 1,905 | 2,857 | 3,810 | **9,524** |
| | Kharo Chan | 50 | 198 | 495 | 743 | 990 | **2,476** |
| | Mirpur Sakro | | | | | | |
| | **TOTAL** | **726** | **2,903** | **7,257** | **10,886** | **14,514** | **36,286** |
| **BADIN** | | | | | | | |
| | Badin | 678 | 2,712 | 6,781 | 10,171 | 13,562 | **33,905** |
| | SF Rahu (Golarchi) | 379 | 1,516 | 3,790 | 5,686 | 7,581 | **18,952** |
| | **TOTAL** | **1,057** | **4,229** | **10,571** | **15,857** | **21,143** | **52,857** |
| **TWO DISTRICTS** | | **1,783** | **7,131** | **17,829** | **26,743** | **35,657** | **89,143** |

Source: Census 1998

34. The data in Table 11 is presented in terms of Heads of Households in order to reflect the fact that these are persons owning land (i.e., the assumption, which requires verification, being that only heads of households own land). The intention is to indicate the number of persons that need to be directly affected if change is to occur – it being essential to persuade the owner or the legal tenant of the land rather than anyone else if new technologies are to be adopted.

35. The data provide clear evidence of the relatively few persons that might be considered “landowners” or “largeholders”, i.e., those with holdings above 6.5 ha. These few persons (1,783 in all) control a large area of land, 45,207 ha directly and probably own the land leased to another 51,703 persons in the “tenant” class. In any event, it is these two groups, say about 53,000 persons in all that are the target audience. Landowners have to be included with tenants since if they cannot be persuaded that change is in their interests it is unlikely that anything proposed by the project will be adopted.

36. Included in the table are numbers for the landless community. It is estimated these comprise 40 percent of the total population. They are the poorest of the poor and exist on marginal land and alongside irrigation channels and drainage ditches. They appear to have little if any control over their lives and exist to service the needs of the owners or tenants of land. This is a sizeable community of persons, say 36,000 households or 378,000 persons in total. A key question for the project is how these persons can be reached. As wage Laborers (at best) increase in yield on land owned by someone else may not trickle down to them as might be assumed. The project will have to demonstrate a clear mechanism how these persons can receive benefits.

37. A related point worth mentioning is that it might be right to include those tenant farmers with less than 2 ha in with the landless group. What seems to differentiate the two categories is that the small tenant farmers receive payment as a share of revenue, while the landless might receive casual wages. The tenant is tied to his patch of land, whereas the landless are free to come and go. Both categories are likely to be extremely poor and it might be difficult to say which is worse off. From this perspective, the poorest-of-the-poor category might be expanded to 64 or 65,000 households or 70 percent of the persons to be reached. If this is the case, the challenge to persuade these very poor people to change becomes that much larger. The assessment of the size of the very poor section of the community is critical because it will affect the adoption rate of new technology and practices.

## 7. LABOR MARKETS

38. It has been noted elsewhere in this paper (Section 1) that there is a relatively clear distinction between three sorts of Labor arrangement in the rural sector of the economy. Farms employ a large proportion of the economically active population but there is a substantial number of landless persons who own and manage livestock (both small and large animals) and who work in non-farm employment. National level data show a declining trend in the share of agriculture in rural employment. Nevertheless, the number of people with a “non-farm rural enterprise” was found to be less than one-sixth of surveyed villages country-wide[108]. This is probably also true of the agrarian communities in the PA, but not for the coastal communities. In these communities, possibly two-fifths of households are involved in buying or selling fish. Most other workers were engaged in seafaring which may be counted as casual Labor akin to agricultural Labor for landlords and tenants. In the Thatta village surveyed by ADB, 55 percent of the male Laborers were casual workers.

39. With respect to gender differences, villages in Sindh generally stand out in terms of the proportions of female workers reporting occupations other than household work. Most women reporting these activities belong to the Hindu Bheel and Kohli groups. Apart from fieldwork, sewing and embroidery are the predominant non-farm activities for females.

40. In the agrarian sector, various elements are present in determining the operations of the Labor markets. In most of Sindh and in the agricultural areas of the PA, there is a tendency towards share tenancy arrangements that tend to restrict movement of Labor. Where monopolistic land ownership is found the landlord’s costs of monitoring wage Labor can be high and so it is likely that a tenancy arrangement may cost less and

[108] ADB 4319-PAK, op.cit.

reduce risk. On the coast, however, landownership has been weakened by the reduced productivity of the land and the reluctance of workers to enter tenancy agreements when the crop output may be problematical. In these areas, families might work the land themselves while it has some value and then seek work fishing when the returns are no longer large enough to justify the effort.

41. Some farm operations are routinely contracted out. Harvesting is the most obvious, transplanting rice is another. With a large landless population, this approach to the use of Labor is common in the project area. Various groups (especially Hindu migrants) adopt a transient life-style where they live in temporary shelters and move from far to far with the work.. Remuneration is usually based on piece work which gives some measure of control over efficiency by the owner of the land.

42. What is clear from these data is that even the poor are able to choose and move (at least to some extent) between different occupations. At least the possibility of choice does exist. In extremity, a worker may migrate to other places, although in the Thatta village migration was not a preferred choice, partly because seafaring and fishing offered a viable livelihood even if under poor conditions.

## D. POVERTY ANALYSIS

1. In general, there are four variables that can be considered to determine the poverty (or sense of well-being) experienced in the Project Area. These include food consumption, ownership of livestock, ownership of durable items and housing conditions. The PPTA has not undertaken a formal poverty in the PA. Nevertheless, fieldwork has gathered a wealth of anecdotal data and there are some data points available from the ADB survey (op.cit.).

2. Whereas almost all of the persons consulted by the PPTA team mentioned lack of clean drinking water as a major concern, there was almost no mention of lack of basic food items as an issue. Agrarian communities have access to a variety of food items because within the irrigation areas agriculture is relatively prosperous (this is a different point from saying that the proceeds of agriculture are evenly distributed – clearly they are not). Food items are there to be bought or purloined or provided as part of a Labor contact (e.g., work in return for a meal). The large numbers of livestock in the PA mean that while clean drinking water is a problem, milk is not. Although the Sindhi villages in the ADB survey consumed slightly less milk than in other parts of the country, milk consumption was relatively high compared with e.g., pulses. Malnutrition in a strict sense does not appear to be associated with the PA.

3. An important consideration for the project design is that livestock ownership is regarded as a form of saving. In this respect, where the value is seen simply in the beast itself rather than in what it produces (e.g., by way of milk), the development of livestock based enterprises may not be easy. Nevertheless, measures that can reduce mortality (and so the risk of this form of saving) are clearly worthwhile.

4. Ownership of a wide range of durable items is not common outside the market towns. People walk between their houses and workplaces or ride buses or pickup trucks. Because there is almost no access to electricity, electrical goods are not widely used. Most people might own the clothes they stand in and keepsakes. There are few books (most people are illiterate) and no access to an information network beyond casual

discussion in a tea shop in a market town (though this may in fact provide a variety of information, good and bad, from diverse sources).

5. Housing conditions have been described elsewhere in this paper. Outside the towns almost all the housing is *katcha* and cannot be considered to have any marketable value. Nevertheless, for those who have invested time in building settlements near roads, with access to water and surrounded by protective thorn fences it would be wrong to assume they believed these houses to be sub-standard or worthless.

7. In the coastal communities perceptions of poverty are inseparably linked to the amount and type of fishing equipments owned by the family. It should be noted that many people do not own any fishing equipment at all. In Keti Bander, for example, about 70 percent of the households do not own fishing equipment of any kind. Of the 30 percent who do, only 40 percent have motors, and all of those are small. Fishermen who do not own fishing equipment work on the boats of those who do own boats, and take a smaller share of the catch[109].

**8. Island communities have least access to infrastructure facilities, health and education. More we go towards communities living on islands, more we find vulnerability and poverty among them. In Kharochan there are about 15-20 villages with scattered population living on islands of Indus delta, these villages have no facility of hospital, girls school, drinking water supply and road. Their remoteness and vulnerability is directly linked with little access and in some cases no communication with outside world. They use boats for travel to city for all types of businesses, from buying drinking water cans to see doctors and others, and pay fare for Rs 50/ person. In case of more items (bags, sack, food items), they are charged more.**

9. Formal poverty profiling has not been undertaken by the PPTA. However some data is available from the ADB survey (op.cit.) undertaken in Thatta. In that village, 54 percent of the population was found among the “poorest” category while another 79 percent were poor. Only 21 percent were classed as “non poor” in comparison with a reference figure of 60 percent.

10. Poverty in Thatta was highly correlated with household economic characteristics such as land ownership and employment opportunities. In general it can be said that landowners are among the “non poor”.

11. Nearly all the kinship groups are poor with the exception of the Sammat4 group who owned land and also owned shops. The Mallah1 group was worse off than most groups despite the fact that their chief and his immediate family were relatively wealthy and influential in the area. This reflected a strong class distinction within this kinship group.

12. It is clear from the analysis that the intrusion of the sea on agricultural land has badly affected the perception of wealth in Thatta (and probably Badin). There is a strong positive effect of land ownership and the increasing loss of value in the soil as it becomes salinated equates with a loss of wealth in those communities affected by it. In this respect, it is important to understand that the poverty of the communities in the PA is

[109] Rapid Assessment of fishers communities in Thatta 2005

not static or decreasing, rather it is increasing as the sea destroys productive land. Once the economic endowments are taken into account the Project Area is worse off than expected.

## 1. VULNERABILITIES

13. The communities living in project areas are trapped in a complex of vulnerabilities at community, household and region level. Before arriving at more specific classification of communities, there is need to look at two broader dimensions of vulnerability:

### 1.a Structural vulnerabilities

14. Villages that are situated in close proximity of Arabian Sea are the most frequent subject to the periodical disasters. The structure and placement of houses, non availability of disaster resistant physical infrastructures and the remoteness comes into alliance to constitute the physical vulnerability of communities at large.

15. The villages situated at the tail-end of the Kotri command areas are most vulnerable from the incursion of the sea (salinization of their productive land) and loss of sweet water. Land under cultivation have become saline and degraded due to successive floods and sea erosion. Further a huge irrigation and drainage infrastructures (LBOD and KBOD) have added into the vulnerabilities of the area and communities living therein. (e.g Floods occurred because of the sudden breach LBOD caused huge losses)

### 1.b Non structural vulnerabilities

16. Non-structural vulnerabilities relate to the way that how ownership of resources is distributed among communities and how the available resources are used to cope with any trend, shock and seasonality. The absence of rights (e.g. land), lack of access to other productive resource and non availability of formal protection and safety nets reduce the social resilience and coping capacity of communities against vulnerabilities in both districts of Thatta and Badin. It leaves them to opt for a repressive loaning system and in some cases restoring to begging as survival strategy. In this context communities of the area are largely depending upon poor and fragile resource base with no control over and entitlements of natural resources like arable land, human rights and small scale entrepreneurship. These non structural dimensions of vulnerability make them the most vulnerable of the vulnerable.

### 1.c Key vulnerabilities of communities[110]

**Agrarian communities**

- Overall, the evidence presented in the field indicates that access to institutional credit is severely restricted for poor people of area, and the bulk of cultivator households are simply access rationed out of the market. In the face of such credit constraints, landless tenants would be driven to opt for share tenancy contracts. Moreover, the increasing cash costs of production, due to rising input prices, have increased the credit needs of farmers. In the absence of a timely source of institutional credit most small farmers rely exclusively on informal lenders, who charge high interest rates and often tie loans to the marketing of crops, thus further reducing the net returns to

[110] This section is taken from the paper prepared by Shaheen Khan.

farming. All these factors combine to increase the vulnerability of poor and reduce the access on resources.

- The intensity of sea water intrusion has increased towards the fertile lands due to the shortage of fresh water and even irrigation water becomes stagnant due to the lack of proper drainage facility. Water logging and salinity has damaged soil fertility in the area, there are few crops are grown here[111]. Though water logging and salinity has increased in the area especially after the construction of the dams, reservoirs and barrages in the upstream of river Indus, but this year tail enders have received some water after five six years due to more water availability in Indus river and floods (e.g. Mirwah Minor).
- The key constraint to agricultural productivity, livestock breeding and human health is availability of adequate water for both irrigation and domestic use. Cultivation in the PA is overwhelmingly dependent on irrigation. Since any further increase in agriculture productivity requires increase water availability, an expansion in production depends on improving the efficiency of the existing irrigation system. Notably, given the limited scope for major increases in water supply in and outside the Indus basin, improvement of efficiency of currently available water use remains the only viable option for increasing productivity of irrigated agriculture in PA in a sustainable way

**Coastal and Island communities***:*

- The main hazard in these villages (e.g. Shahbandar, Keti Bandar) is monthly tidal wave when sea is on rise. It happens on 14, 15 and 16 of moon night when moon is full. The tidal water is about 4 to 5 meters of height and it comes inside the houses. The mud and water remain in and around the village for about 7 days. During these nights, the people can not sleep. They keep cleaning their huts for two to three hours. Though the water does not result in any major loss, it is considered as headache.
- Fishermen have been taking loans for livelihood, over the periods and such loans have prove to be quite burdensome. When going for deep sea fishing, fishermen also take advances for food stuff as well as some fishing tools and their income from fishing may largely be spent to clear the advances.
- There is monopoly of marketing of fish, and fishermen get very low rates. Monopoly mainly arises because fisher men rely on contractors and have no assets/equipments/transportation.
- Vulnerability of fishermen arises from lack of organization as well.
- The loss of capital over the years and small capacity to make any saving, have led to the situation worsened. The government failure to regulate the advances and loaning has turned them into an exploitative system.
- People are paying huge cost for drinking water. Absence of drinking water source in the area and its import, create many problems for communities.
- For few months' fisher men are not allowed for fishing, probably due to breeding season, which make them completely vulnerable without income.
- Although livestock is marginally important, but communities avoid having livestock as there is not enough water available even for human beings.
- There is no nearby facility for maternity or child care.

[111] socio economic impact of cyclone 02A

## 2. BENEFICIARY NEEDS ASSESSMENT

17. A formal questionnaire based Beneficiary Needs Assessment was not undertaken by the PPTA. Beneficiary needs have been informally assessed based on rapid assessment surveys and interviews with individuals and ad hoc groups of persons met in the filed (ranging from the individual farmer to groups of women). Workshops were held in District Commissioners' offices in both Thatta and Badin during late November 2005.

### 2.a Workshops

18. In Thatta, the Nazim said that there is a strong need for roads in the district. The other priority need is potable water. Other needed infrastructure included cold storage for fish. Protection from the sea is also important and the project should consider some kind of coastal protection measures. He said the sea is "not a blessing" and that the project must help in stopping intrusion by the sea. He mentioned that lack of educational opportunities is a major constraint and that the cause is a lack of teachers. Female education is a particular problem. Regarding implementation, the Nazim said that the NGOs require strengthening if they are to be the implementing agencies.

19. In Badin workshop attendees made a strong request that the proposed project to intervene in issues related to the collapse of the LBOD. It was explained that such issues were outside the scope of the PPTA and the proposed project. Some requests were heard for roads and drinking water.

### 2.b Rapid Rural Assessment

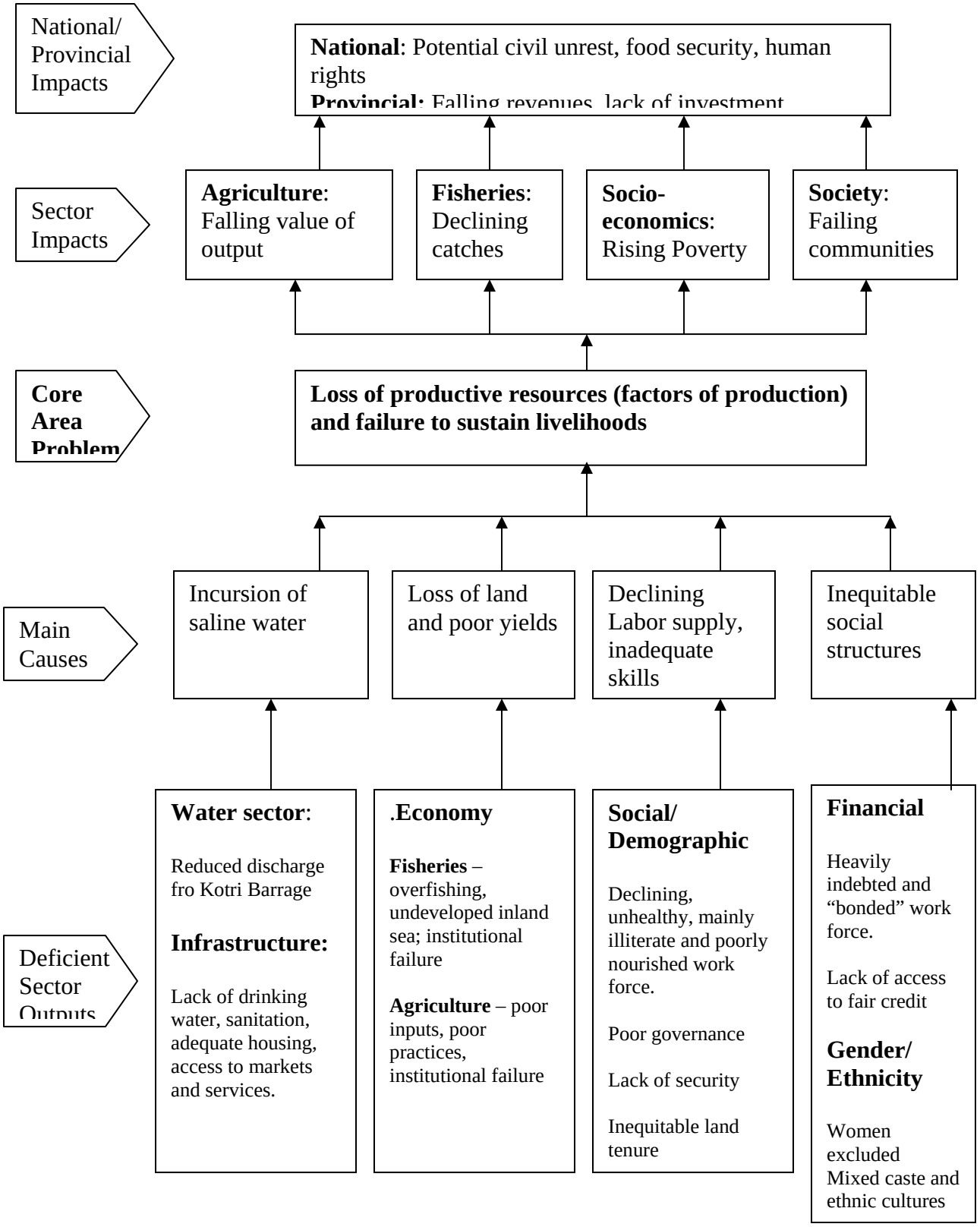
20. Almost every group mentioned the lack of drinking water. A lack of security from "Rangers" apparently working for a local landowner was experienced by dwellers near an irrigation drain at "000" Point in Badin District. The quality of housing in the PA is visibly poor and there is a lack of access everywhere to basic social amenities.

21. On the basis of the RRA, the following important needs were identified as being those with a priority for the PA:

1. Improvement of the drinking water supply
2. Improvement of health facilities including access to medicines and health care professionals
3. Building link roads between remote settlements
4. Providing the services of teachers
5. Improving the management of irrigation water and the mitigation of losses from the system
6. Livestock improvement

22. Regarding gender differences in stated beneficiary needs, it was noted that women respondents listed drinking water as their priority followed by health services, whereas male respondents mainly ranked link roads.

## SINDH – PROBLEM ANALYSIS



# Appendix 8 - Quarz-e-hasna Scheme

## Part I - Quarz-e-hasna scheme

***A scheme intended to improve the well-being of the most poor.***

One of the less anticipated problems encountered was the inability of the more vulnerable communities to provide for or fund capital and development needs. In part this is due to the precarious “hand to mouth” existence that the more vulnerable communities endure. The absence of seed capital or surplus earnings within the communities means that they are excluded from various development opportunities such as the CCB program and micro finance. In essence there is a critical shortage of funding able to allow a community to take the first few steps towards helping itself. This means that those communities never reach a point of critical mass sufficient to then launch themselves on the road towards economic and social self-sufficiency.

And when there are funding programs they rarely reach much below the level of district governments or occasionally the taluka and union council level. Of these a large number appear to be thwarted by institutional ineptness or indifference or by accompanied by excessively complicated procedures. Furthermore most programs have an affinity for public sector involvement, which is not always the best way of ensuring effective or needs-based delivery.

In the target communities sweet water is invariably at the top of their wish list, followed generally by health support, small link roads, basic sanitation, support for crops or livestock and, especially in the Badin coastal area, some form of protection from periodic cyclones and massive inundations from floods or storm surges. Education for example is usually near the bottom of any wish list, not because the communities dismiss education but rather because the benefits of education in their current environment are difficult to comprehend.

These are fragile communities. In looking for an entry point or to engage with these communities it is evident that first and foremost the communities need to be energized by seeing something worthwhile and tangible. Such an inducement quickly shows that despair is not necessarily a default state. But larger organizations such as the Bank and the public sector are not very good at the subtle moves needed to orchestrate such small-scale initiatives. They can deal with large programs and policy issues but actual on-ground, micro sized interventions, are simply beyond them.

Somehow large sums need to be diffused into a series of smaller, targeted interventions. This is where the proposed quarz-e-hasna fund has a role to play. The logic for the scheme stemmed from the need to find some modality whereby a (large) loan-funded Project could meet the immediate (small) needs of vulnerable communities. It was desirable to remove some of the more onerous administrative procedures applied under large loans, from the process of funding far smaller, community based initiatives, and it was felt necessary to retain the integrity of loan funds by not disbursing capital for small programs but rather spending interest earnings derived from investing the loan funds. This way, in ten years time, the original loan amount would still be intact.

The scheme would invest $10 million of loan funds at approximately 5%. The annual interest would amount to $500,000 or Rs.30 million. This amount could fund at least 60 small programs a year if they were capped at say Rs.500,000 per project. Trustees

representing Government and stakeholders would consider proposals and allocate funds. Implementation arrangements would be flexible (public, private or civil) and a division within CDA would monitor implementation and performance of each and every initiative funded. There would be a Trust deed and independent auditors would audit the fund and report on a six monthly basis to Government. The CDA division would regularly report to Trustees on performance matters. A description of how the Trust Deed and the fund could work is contained in Part II of this Appendix.

Most projects would stem directly from needs identified by the community (demand driven) and approvals would be biased towards social programs that strengthened the fabric of communities (water, rescue mounds, health, education, housing, small jetties etc). It is unlikely that approvals would be granted for proposals that could otherwise be supported by micro credit providers.

## Part II - Quarz-e-hasna Fund
## Rationale and Objective of Activity

### *Objective*

To assist members of needy communities in the eight coastal talukas of Thatta and Badin overcome the disadvantages of extreme poverty through small local projects/interventions.

Rationale for the Quarz-e-hasna (QeH). The scheme will;

(a) respond to the needs of the local communities in a demand-led fashion, enabling the communities to prioritize their needs;

(b) permit a more direct and adept arrangement for enabling the flow of funds to assist small local poverty-alleviation projects;

(c) empower vulnerable communities by improving their social and livelihood environment.

### Scope and Details of Activity

### *The Sindh Coastal Areas Quarz-e-hasna Trust (QeHT) & its Board - structure & functions*

### *Legal Entity:*

The QeHT shall be set up and duly registered under the laws of the province of Sindh as non-profit-making private Foundation, with its own governing Board, and having Articles of Association with powers *inter alia* to receive and disburse moneys; acquire, lease, and dispose of assets; maintain bank accounts in its own name; enter into contracts for value; and to receive, administer, and disburse funds vested under its control.

Furthermore, the Articles of Association shall be framed so as to include/ensure Trust and QeH activities which are consistent with the Trust's objective, viz. to assist members of needy communities in the coastal areas to rise out of extreme income- and non-income poverty through support of small local projects, and to exclude those detrimental or potentially detrimental to them, e.g. the Trust is not itself to engage in production, sale or processing of agricultural, fishery, or other products or the provision of inputs thereto, and its activities shall be confined to non-profit promotion of poverty alleviation in the coastal areas.

As a legally-constituted Foundation, the Trust shall be subject to external financial audits at least annually under the laws and regulations of Sindh governing such Foundations. It will also be subject to separate external monitoring and audits to ensure its accountability for the use of SCICDP project funds, including quarterly external monitoring of the status of approvals of and disbursements to QeH project proposers/grantees.

**Board of the Trust:**

The Trust's Articles of Association shall also include provisions for a governing Board of Trustees, to be accountable to the stakeholders appointing them, for the direction and supervision of all the Trust's operations and activities.

In order to ensure that it is an active and dynamic body providing real direction and leadership, the Board will have a ***maximum*** of seven (7) voting Trustees, each of whom shall have a equal vote in reaching any Board decision. All Board decisions shall be made by a simple majority of votes cast, with the Chair having an additional casting vote in the event of no such majority being otherwise achieved. Because there are seven (7) voting Trustees, all of whom would be expected to attend Board meetings regularly[112], the provision for the Chair's additional casting vote should only rarely be necessary to achieve a Board decision.

The Trustees will be appointed by public and private stakeholders through a combination of nominative, *ex officio* and elective processes, as follows:

- One (1), a senior serving official of the CDA, to be nominated by the Director-General of the CDA;
- One (I), who shall be an appropriately-experienced and respected figure residing in any one of three target Districts and who shall not be a current holder of any public office which would conflict with his or her duties as a Trustee. To be nominated by the national Board of the Rural Support Program.
- One (1) shall be *ex-officio* the District Nazim of either Thatta or Badin (in rotation)
- Two (2) shall be elected by those NGOs and civil society organizations (CSOs) with substantive operations in the coastal areas, convened respectively in Thatta and Badin Districts[113], and
- Two (2) shall be elected by ballot[114] of local community-based organizations and groups in the coastal areas which make an initial, and afterwards maintain an annual, registration of their organization or group with the Trust

The Chair shall be either the nominee of the CDA, or the nominee of the Rural Support Program, the choice between these two to be decided by vote of all seven (7) Trustees at a meeting where this item is first on the agenda.

To provide continuity, the Trustees including the Chair, but excluding the District Nazims, shall serve terms of three (3) years each. The District Nazims of Thatta and Badin shall serve terms of eighteen (18) months in rotation, thus each of them filling half the term of the one (1) *ex officio* District Nazim Trustee. If the two District Nazims at the time of the appointment of the first Board cannot agree between themselves which of

[112] If and as necessary, by the devices (made regular and transparent by appropriate by-laws of the Trust) of nominees or alternate Trustees. The Articles of Association or by-laws shall also include appropriate provisions for a minimum voting quorum for valid Board decisions of any type. It is suggested that the quorum shall be (5) Trustees, of whom at least three (3) shall be not be government representatives

[113] Karachi-based NGOs and CSOs which do not have offices in these Districts, may opt at their discretion for inclusion in either the Badin or the Thatta forum, provided only that such organizations must have substantive coastal areas operations in the District which they opt for.

[114] With the proviso that both of these Trustees shall be primary residents of either Thatta or Badin, as opposed to Karachi, at least 2 of every 3 years; and that in every year, at least one of them shall be primary residents of either Thatta or Badin, as opposed to Karachi

them shall serve the first term of eighteen (18) months, this matter shall be decided by drawing lots.

Furthermore, again to ensure continuity, the terms of all seven (7) Trustees shall be staggered, so that each year the terms of at least two (2) of them shall end. It is suggested that this be accomplished by drawing lots as soon as the first seven (7) Trustees shall have been appointed by the above-noted processes.

**Registration and checking procedures for electors of the NGO/CSO and local community-based organisation/group Trustees**

For the NGOs and CSOs in the District fora:

- Legal registration with the appropriate authorities of the NGO/CSO, and if appropriate its local office
- Current membership of the Thatta or Badin District fora of NGO/CSOs
- Annual registration at the QeHT, with an annual registration fee of Rs. 2,000/-

For the local community-based organisations and groups

- For CCBs: legal registration with the appropriate authorities of the CCB
- For other 'legally registered' organisations and groups: legal registration with the appropriate authorities of the organisation or group
- For all types, including those *not* legally registered with the authorities:
    - Based in, and representing community-members resident in, the coastal areas
    - Annual registration at the QeHT, without registration fee
    - Field check by QeHT staff, between latest QeHT registration and the next election of Trustees[115], to establish genuine-ness of the organisation or group, e.g: at least 10 local active members; reasonable development activities and/or purpose; minimal records of its membership and activities; no dominance by a rich individual or other party which jeopardises its integrity; no 'artificial division' to secure more Trustee electoral votes.

**Voting rights for the election of Trustees**

Each NGO/CSO so registered, shall have an equal (single) vote in the appropriate District forum to elect one of the two (2) NGO/CSO Trustees at each election.

Each local community-based organisation and group so registered and checked, shall have an equal (single) vote in the ballot to elect the two (2) local community-based organisations and groups Trustees at each election.

**Voting rights at Annual and Extraordinary General Meetings of the Trust**

The following stakeholders' voting rights on all items at QeHT Annual and Extraordinary General Meetings, shall apply:

[115] For the *initial* registration and checking of these electors – i.e. before the Board of Trustees is formed - PMU staff or specially-hired PMU consultants would be used

Block vote of the Government of Sindh: 20% of all votes. To be exercised by the Planning and Development Board of the Government of Sindh, through a nominated representative who shall not be the CDA-nominated Trustee

Block vote of Civil Society: 20% of all votes. To be exercised by the national Board of the Rural Support Program, through a nominated representative who shall not be the RSP-nominated Trustee

Block vote of the District Governments: 20% of all votes. To be exercised by the DCO of whichever District (Thatta or Badin) does not have its District Nazim currently sitting as the District Nazim Trustee

Block vote of the NGOs/CSOs: 20% of all votes. To be exercised by a representative elected by all the member NGOs/CSOs in the two fora voting jointly (one organization, one vote), who shall not be either of the two NGO/CSO Trustees

Block vote of the local community-based organisations and groups: 20% of all votes. To be exercised by a representative elected by all the registered/checked local community-based organisations and groups in the coastal areas voting jointly (one organization/ group, one vote), who shall not be either of the two local community-based organisations and groups Trustees

**Quorum for exercising these rights**

At least 80% of all votes, i.e. four (4) or more voting representatives, in an open meeting attended by at least twenty (20) stakeholders of whatever type. That is, at least twenty (20) of any of the following types of individuals, who shall not be *either* voting representatives *or* Trustees:

- CDA officials, grade 17 or higher (no more than 2 individuals)
- RSP officials (no more than 2 individuals)
- District Government officials, Grade 17 or higher, from any of the three Sindh Coastal Districts (no more than 2 individuals)
- Professional or administrative staff members, or governing body members, of the SCASCT-registered NGOs/CSOs (no more than 10 individuals, with no more than 2 individuals from any single NGO/CSO)
- Members of the QeHT registered/checked local organizations and groups (no less than 8 individuals, no more than 2 individuals from any single organisation/group)

These twenty (20) or more Meeting attendees shall not possess any voting rights at the Meetings. Their attendance is required to ensure that the Trust's general proceedings remain transparent and public. However, although not possessing voting rights, the attendees shall otherwise have full rights severally and individually to participate in the Meetings, including the right to move and second motions for approval by the voting representatives and/or the Trustees.

Both quora - four (4) stakeholder voting representatives, and twenty (20) or Meeting attendees, as above-specified – shall be essential for the convening of any Annual or Extraordinary General Meeting of the Trust.

If the quorum of four (4) voting representatives should be equally divided on any item, the item must be referred to a subsequent decision of all five (5) representatives, which may be obtained by round robin.

The powers of the voting representatives are not intended to usurp those of the Trustees. The Trustees shall be the governing body of the Trust in all normal circumstances and purposes. The voting representatives' functions are limited to voting on matters which the Trustees feel obliged from time to time to refer to the stakeholders, and to exceptional circumstances such as a need to remove the Trustees.

**Trustees' responsibilities and checks on these**

Trustees will have significant responsibilities and workloads. Accordingly, they will all receive fees and emoluments, including those for attendance at Board meetings, to be decided upon by the voting representatives at Annual General Meetings. However, so long as the QEHT remains significantly involved in SCICDP project activities, in particular operating the QeH, the scales of such fees and emoluments shall be subject to approval by the Secretary, Planning and Development Department, Government of Sindh, and endorsement by ADB.

The Trustees may only be removed by the stakeholders' voting representatives in an Extraordinary General Meeting, or in exceptional cases by the Sindh governmental/judiciary authority responsible under law for regulating Foundations. However, if necessary the Governments of Pakistan or Sindh, or ADB, could bring extreme pressure on the stakeholders to remove a grossly-malfunctioning Board of Trustees that was acting at marked variance with the QEHT's Memorandum of Understanding with the SCICDP project. Put more bluntly, the revenue from the SCICDP endowment fund in favor of the QEHT or the QeH could be cut off in such circumstances.

**Scope of activities of the Trust**

As a legal entity – an ongoing Foundation with its own governing Board, and Articles of Association - the QEHT may over time develop various types of activities carried on for the benefit of its stakeholders, most particularly the needy communities in the coastal areas. However, from the point of view of the SCICDP project, the Trust's main activity will be to operate the QeH which will be set up within the project specifically to be so operated by the Trust. Its Articles of Association shall be framed so as to include/ensure QEHT activities which are necessary to help accomplish SCICDP project objectives, and to exclude activities detrimental or potentially detrimental to those objectives.

There therefore now follows a description of how the QeH will be operated by the Trust.

**Operation of the Quarz-e-hasna Fund by the Trust**

As noted above the objective of this SCICDP activity is to assist members of needy communities in the coastal areas to rise out of extreme income- and non-income poverty through small local projects/interventions in which the communities themselves are involved in prioritization, specification, part-funding, implementation, operation, and maintenance thereof.

Accordingly, the central activities of the QEHT will focus on encouraging the generation of such projects/interventions[116] within communities, reviewing applications for QEH funds and ensuring monitoring and evaluation of implementation.

Specific proposals for such services and/or investments will be made by community members and stakeholders representing the community's interests. Applications for funding shall be accepted or rejected by decisions of the Trustees.

Each proposal, and each service may provide for a co-financing content or contribution from an external source. The contributors to the co-funding plan may be the community members or other bodies which are making the proposal.

The list of **qualifying areas or fields** in which such proposals may be made, has been initially projected as follows:

- Community based water systems
- Community based sanitation programs
- Improved household cookers
- Supplementary teachers in village primary and middle schools
- Improvements in community health programs
- Skills development courses and programs
- Very small jetties/landing places and similar fisheries micro-infrastructure
- Improved livestock practices, including basic animal husbandry programs.
- Local forestry (including mangrove) improvements
- Community access and land-protection infrastructure (link roads/tracks, drainage channels, bunds and other flood control structures, etc.)

**Eligible types of bodies who may propose projects/interventions to the Trust**

The following is a list of the types of bodies which may, whether individually or in coalitions, propose projects/interventions in the coastal areas, and make applications to the Trust for support of such projects:

- NGOs/CSOs working with needy communities in the coastal areas, whether locally-based, or local[117] offices of national or international NGO/CSOs
- Citizen Community Boards (CCBs)
- Community Organizations (COs) at the village or similar local level
- Water associations at the village or similar local level
- Relevant governmental authorities or bodies, ***provided*** that they are proposing in substantive cooperation with one or more bodies of the types above
- Landowners *(zamindars*), ***provided*** that they are proposing in substantive cooperation wit one or more bodies of the (***non-governmental***) types above

[116] the term 'projects/interventions' is preferable because it may include a wider range of benefical activities than 'projects'. 'Projects' may tend to have a connotation of physical investment. 'Interventions' on the other hand can be also be non-material, e.g. provision of services. Usually, in this document, one or other of the two terms - 'projects' and 'interventions' – is used. The context generally makes pretty clear what is meant in each case

[117] 'Local and locally-based' mean in Karachi, and/or in Thatta or Badin Districts. In exceptional cases, these terms might extend to NGOs/CSOs or offices in Hyderabad. In such cases, the Hyderabad NGO/CSO or office must have proven and strong operational links with the coastal areas.

**Size limits on projects**

In most areas or fields, an overall size limit (measured in terms of QEH contribution) of Rs. 500,000/- per project would be applied by the Trust. The Trustees may revise the limits from time to time to reflect inflation and such increase would have to be approved by the stakeholders' voting representatives at an Annual or Extraordinary General Meeting.

**QEHT secretariat**

In order to assure well-formulated proposals and informed decision making by Trustees, all proposals will be referred to the Coastal Development Authority (CDA) for assessment against published criteria to gauge their suitability. Technical specialists within CDA will undertake any necessary technical evaluation of a proposal. CDA may request applicants to provide supplementary information before submitting the application to the Trustees.

CDA whilst facilitating the work of Trustees, will not decide policy nor preempt the decision of Trustees. The relationship between QeH and CDA will be defined in a MOU.

**Concluding remarks on the proposed mechanism**

As already noted, the Trust itself as a legal entity will be subject to external annual financial audit as provided by law. However, with respect to QEH operations and all SCICDP project funds used by the Trust in these or any other project activities, the Trust will be subject be additional third-party financial and technical audits to ensure that the funds committed are being used in accordance with the project design and the Memorandum of Understanding. However, the Trust will fully control the SCICDP project funds committed to it. The Trustees, assisted by CDA, will manage these funds and be accountable for their use of them to the Government of Sindh.

The design thus combines demand-led definition and approval of poverty-alleviating small projects/interventions by local community members and other eligible bodies via an essentially private and autonomous mechanism – the Trust and Trustees, with thorough provisions for assuring professional and effective programs and accountability for public (SCICDP project) funds used.

**QEH Project[118] Cycle:**

Having above described the main features of the operation of the QEH by the Trust, there follows a further description of how project proposals for QEH co-funding will be handled, both before and after they are approved. That is, the main stages in the QEH project cycle will now be summarised.

First, there is *project generation*. Considered project by project, this function is of course primarily the responsibility of the community members or other eligible bodies proposing the project. However, from the point of view of the Trust and its overall objective within SCICDP, the project generation process will include an initial *awareness program* covering all of the coastal areas to inform known and potential stakeholders and eligible

[118] In this exposition, the term 'project' will cover 'project or intervention'

proposing bodies, about the Trust and the QEH and their potential benefits to needy communities. The awareness program will advertise, promote and explain the QEH scheme and its purpose.

It is anticipated that the bulk of applications will be demand driven and result from social mobilization initiatives mounted by NGOs. Social mobilization, which will likely be a prerequisite for some communities, is best left to locally active NGOs/CSOs or (appropriately-motivated) *zamindars*. The CDA should help community members and eligible bodies formulate funding requests.

Next, there is *project proposal formulation and review*. This is the stage assuring that well-formulated and reasonable proposals are put to the Trustees for their decision. Note that the driving force remains the community members, or other eligible bodies associated with them, actually making the proposal. The project review process is to ensure that proposals are in line with what the QEH can fund, and that the proposal is clear with respect to activities, budget costs, and stands a reasonable chance of being implemented as proposed.

The responsibility for making such 'qualifying' project proposals for consideration by the Trustees rests solely with the proposers. CDA can assist by reviewing such proposals prior to their submission to Trustees.

However, it may be expected that in many cases, proposers will require technical assistance in the detailed formulation of their proposals. This will be true when either (a) the proposers are village-level COs or other groups of community members making proposals without the drafting assistance of an NGO or competent *zamindar*, or (b) the project, albeit small, involves engineering or other technical aspects beyond the complete grasp of the proposers.

One or two examples of such assistance in project proposal formulation will suffice to illustrate the principle:

- *Farmers' or other community groups, making a proposal for the construction or upgrading of a link road or track*: assistance in detailed formulation may be provided by the Public Works staff of the District, or by technical staff at CDA.

- *Fishermens' groups, making a proposal for local introduction of improved fishing and post harvest/transportation practices:* assistance in detailed formulation may be provided by the Department of Fisheries or other technically competent body.

The costs of proposal preparation and review will be borne by the proposer(s). Where a proposal requires permission from the government, for example a road or a jetty, evidence that all necessary approvals have been granted must accompany the application.

The next stage is *project approval*, which shall be secured by and at meetings of the Trustees. The provisions noted above for arriving at all Board decisions shall apply also to project approvals and rejections[119]. It is anticipated that the Trustees will meet to consider applications every month.

[119] Including the minimum voting quorum (five Trustees) for valid Board decisions of any type

Trustees may call on technical support when making their decisions. It is not enough for the QEH mechanism merely to generate appropriate and 'locally-owned' project proposals from or on behalf of needy community members in the coastal areas – the proposal must also be approved and executed (or rejected) quickly.

The final stage is *project implementation and monitoring*. Implementation is done primarily by the proposer(s) and CDA. CDA will have a separate division responsible for monitoring and evaluating implementation arrangements. Funds will be disbursed by Trustees in a manner and to a timetable recommended by CDA. The proposer(s) will enter into a MOU with the QeH fund and its Trustees undertaking responsibility for the application of funds in the manner described in their proposal. The MOU is a legal agreement between the Trust and the proposers about the nature, scope and modalities of the project, which will normally conform closely to the proposal document. Disbursement will be subject to normal prudential financial controls.

As with rapidity of project appraisal and approval, timely disbursement by the secretariat of QEH co-funding funds should be a major area of the Trustees' concern. Disbursement should commence not more than one (1) month after approval and CDA monitoring and evaluation process should permit the Trustees readily to see the status of earlier approvals.

Supplementary to such monitoring and reporting of individual projects, but still within the project cycle, will be periodic analysis and evaluation by CDA staff of earlier projects, and the preparation of an annual summary of past projects emphasizing lessons learned. The annual summaries and consolidations will be circulated to all QEHT registered stakeholders.

For prudential reasons, independent auditors may periodically require to audit projects, including sample spot checking of projects in the field.

**Reflection:**

The foregoing summaries of the operations of the QEH project cycle, and the provisions concerning the Trust and Board membership and procedures which preceded them, may be seen from two viewpoints:

- As a lot of bureaucratic nonsense standing square in the way of a crying need – the responsive support of demand-driven local projects/interventions to assist the needy communities of the Sindh coastal areas to lift themselves out of acute income- and non-income poverty, or
- As a set of sensible provisions and procedures absolutely necessary to ensure that services are effectively provided, and to prevent unwise use or even mis-use of public funds by narrowly self-interested parties

First, the procedures and provisions are primarily to assist the needy communities in the coastal areas to assure ***themselves*** that they will indeed be getting effective local projects/interventions. The procedures are not primarily there to prevent mis-use of public funds by irresponsible or ignorant private parties, but to ensure effective application.

Second, the right spirit of the comment about 'bureaucratic nonsense' should be incorporated at all points when specifying during project implementation the detailed procedures and provisions of the QeHT and the QeH, and operating them in practice. They are conceived to emphasize outcomes rather than process.

Hence one should always ask of the details of a QeHT or QeH procedure, not – is it a perfect mechanism for preventing any mistakes or conceivable mis-use of funds? – but instead - given the parties which it is desired to promote (the needy communities), will this version of the procedure on balance help them to get the projects they need effectively and on time, whilst still providing reasonable safeguards against grossly unjustified use or mis-use of public funds?

There are a host of points where QeH procedures can be more or less complicated to the point where it fails to function but the intent is absolutely clear. It is aimed squarely at delivering effective support to the most vulnerable communities in the project area, in a timely manner.

The Trustees are therefore strongly urged to make all the details of procedures as simple as possible consistent with reasonable prudential safeguards, and to rely primarily on transparency and effective monitoring, evaluation and audit mechanisms built into the project design, to deter and prevent any significant unwise use or mis-use of public funds.

### Trust & QeH operation – further aspects

In so doing, it is not with the intention of writing a Manual of Operations for the Trust and the QeH. That task would be far beyond the scope of this report; and besides, any attempt to produce a Manual at this stage be counter-productive. No new organization can work as a living and active organism, if every detail of how it is to operate is pre-defined in advance, and its Trustees merely operate procedures laid down in great detail from outside. For one thing, the details so pre-defined would at many points almost certainly be found not to fit local circumstances, needs, and constraints in practice. For another, the Trustees and indirectly also the stakeholders, must 'own' the way it works. They themselves must debate and draft the details, reflect on them, amend them, until they are confident that they will be workable and will produce the desired results.

The developing of working details should, however, proceed within guidelines suggested in the SCICDP project design. Such guidelines have been given at many points in the sections above.

### Scope or range of projects/interventions to be co-funded by QeH

### Payment for costs of the projects

The QeH program can be supplemented by or supplement other funding sources. The sources of payment for these costs will normally be two-fold:

- For most types of projects and proposers, a proportion of the total costs, varying with the nature of the project and perhaps also with its proposers, to be provided in cash or in kind by the proposers themselves, and
- The balance of the project's total costs to be provided in parallel, as a grant, from the QEH.

Howver, certain proposers, notably citizen community boards (CCBs) may access other co-financiers for their projects, for example funds accessible from the District government. Under the Local Government Ordnance, 20% of the District governments' annuall development budgets are to be spent on projects proposed and co-funded by CCBs.

Whilst the Trust should certainly not rule out such three-way funding – proposers, QEH, and others e.g. District government co-financiers – it should be cautious in approving projects so funded, for at least two reasons. The three-way funding (multi-co-financing) may:

- Reduce the proposers' contribution (even in kind) to the total project costs, below any significant levels, and
- make the process of project approval and subsequent implementation unduly complicated, time-consuming and risky. The more independent parties are involved in funding, the more difficult it is to agree on a project specification, secure approvals, and co-ordinate disbursements.

On the whole, therefore, the Trustees should at least be wary of approving projects proposing such 'multi-co-financing'. They should only do so if they are really convinced that neither of the above drawbacks will be present in any particular project they are being asked to approve.

**Project selection criteria and their use in the QeH project cycle:**

In practice, eligibility of a project implies compliance with a list of selection criteria. The following list of criteria is proposed as an SCICDP project guideline, to be further developed by the Trustees at the time the QeH scheme is established.

Any project/intervention proposed must meet the following criteria:

- Provide a good prospect of significant prospective alleviation of income or non-income poverty to needy community members from the coastal areas
- Focus on one or more of the eligible fields for projects/interventions in the list as under **qualifying areas or fields** above.
- Be *prima facie* technically sound. This does not imply a need for exhaustive technical analysis as soon as a proposal is initially mooted. It merely provides that (say) a proposal to build a permanent jetty at Keti Bandar would not be selected for further appraisal and/or assistance with preparation.
- Be not *prima facie* environmentally damaging. Again, this does not imply a need for immediate (or, in most cases, subsequent) exhaustive environmental analysis. It merely provides against selection of proposals that Trustees consider potentially dangerous,
- Not require recurrent funding from the QeH fund, and
- Be not *prima facie* above the applicable QEH project size limit

These selection criteria will be used for initial screening, i.e. primarily for screening-out.

Meeting them does not imply that a project proposal will eventually be approved by the Trustees. Meeting the selection criteria merely qualifies projects for further appraisal and possible approval, whilst at the same time preventing the waste of Trustee and

proposers' time and resources on lengthy consideration of proposals which it can be confidently predicted will not contribute to the overall objective of the SCICDP project.

Depending on the nature of the project proposed, it may be possible to apply the selection criteria with or without a 'site visit' or having a detailed proposal. In particular, a proposal might be screened-out without a site visit because on the basis of the initial proposal received it clearly did not meet one or more of the above five criteria.

However, it is clear that (a) if a proposed project were to be screened-in on a preliminary basis without such a visit, the most immediate next steps would be to conduct such a visit, and (b) that the visit might reveal that one or more of the selection criteria had not in fact been met, in which case the project would forthwith be de-selected (screened-out) and, with this decision appropriately documented and communicated to the proposers, given no further consideration unless and until the proposer made a radically-amended proposal.

To recapitulate:

The selection criteria are primarily for screening-out ineligible proposals, thus concentrating resources and further appraisal on eligible ones, which however may not be all eventually approved;

Some proposals may be screened-out without a site visit;

Some proposals may be screened-in, on a preliminary basis, before a site visit;

In the case of such proposals, the next step is a site visit, which may however result in the proposal being de-selected (screened-out);

If on the other hand the site visit confims that the selection criteria have been met, the preliminary screening-in is confiirmed, and the next step is for the proposer to produce a proposal if he or she has not already done so.

The alternative possibility is that, as part of their project generation activities, proposer and CDA technical staff have visited the site and discussed possibilities before an initial project proposal has been submitted. In that case, there will probably be enough information to screen-in the project as definitely eligible, and again, the next step is for the proposer to produce a proposal if one has not already been completed.

Thus, to summarise, the essential basis of selection (confirmed screening-in) is a simple 'yes-meeting'[120] of all the selection criteria, as confirmed by a site visit whether before or after a proposal has been received. By whichever route the selection has been achieved, the process and information involved in achieving it is on record, and is to be regarded as the first phase of project appraisal. If at that stage a proposal has not yet been submitted, the next step to assist further appraisal is for the proposer to produce and submit one.

[120] That is, has the criterion been met, yes or no? The answer must be yes for all the criteria.

**Appraisal Criteria:**

The details of the appraisal criteria for projects should be specified and further developed as initial experience is gained.

There will be many types of eligible projects. Moreover, both in theory and in practice, a project also includes its proposers as part of the criteria to be appraised. Thus there will be a multitude of project variants to be appraised; and detailed appraisal criteria attempting to cover all cases cannot and should not be laid down in advance within the SCICDP project design.

Notwithstanding these cautionary remarks, some general guidelines on appraisal criteria can be laid down. They are given immediately below.

First, the selection criteria which the project proposal has already met before proceeding to the appraisal stage, should continue to be met by the project as proposed in the full Project Proposal (PP) with more precise or definite and documented evidence in the PP, that these selection criteria have been met.

The key organizations involved in the project – its proposers, any other significant beneficiary parties such as needy community members, any other co-financiers, and the service providers – must be capable of playing their proposed parts in the project. That is, they must be judged to have sufficient experience, skills, organizational coherence, and resources given their priorities and other commitments, to provide their proposed contributions to the project, to provide the services specified, and to benefit as projected from the outputs to be delivered. Furthermore they must be identifiable and physically locatable[121], and the parts they are to play and the outputs for which they are responsible, must be adequately defined.

Should the Trustees decide to set proposers' co-funding proportion requirements (percentages), whether across-the-board or (more likely) varying with pre-defined differences of project type, one of the appraisal criteria will of course be that the project has met the appropriate co-funding requirement.

A proposed project will not meet the appraisal criteria if it is obviously 'high cost'. That is, given the project's anticipated benefits whether these are or can be economically quantified or not[122], there should not be an obviously lower-cost project-variant which is implementable by and for the proposers and which will plausibly achieve the same benefits. Since project-variants rarely produce exactly the same anticipated benefits, this criterion will evidently require judgement to apply. Nevertheless, a definite concern for 'cost-effiiciency' should feature in the appraisal criteria.

[121] In cases where tenders for services may be envisaged in the project design, the identity and location of the service provider will be 'replaced' by a specification of the tendering process.

[122] It is recommended that no attempt should be made by the Trust, whether through project appraisal criteria or by other means, to make economic cost-benefit analyses for the individual projects it appraises or approves. Reliable data is very rarely available for such analyses in small local projects in the fields to be co-funded by QEH. For many projects – both services-based, and infrastructural - although benefits may be probable and significant, they may only be quantified in economic terms by playing some 'numbers game' based on numerical assumptions which it is impossible to justify versus significantly, or even radically, different assumptions. Therefore the appraisal criteria should not encourage the playing of such numbers games, which moreover usually unduly delay the delivery of the project.

Finally, the appraisal criteria should include an assessment – and for approval of the project, a requirement – of the sustainability of the project's beneficial results. Sustainbility may take many different forms or aspects, depending on the nature of the project. For example, with mangrove planting projects, sustainability may focus on adequate organizational provisions made by the proposers to maintain the scheme and indeed to expand it in future years. On the other hand, in a project for non-agricultural skill development, sustainability may focus on whether the project will not just train a few community members but provide a mechanism for further diffusion of the skills throughout a large part of the whole local community. The Trust will therefore have to develop criteria suited to each type of project: but, however it is formulated, a 'sustainability' criterion is a must for all projects.

It is to be noted that, as with the selection criteria, the appraisal criteria are yes/no indicators, to assist the Trustees decide whether to approve the project or not. Have all the appraisal criteria been met? If yes, the Trustees should approve the project. If not, they should reject it. However, if only one or two criteria have not been met, the Trustees might request the secretariat to advise the proposers how they might appropriately amend the PP and re-submit it for approval.

Moreover, it is suggested that in all cases of rejection by the Trustees, the proposers should be sent (along with a letter advising them of the decision) a check-list of the appraisal criteria, indicating which criteria have been met and which have not. Should the proposers then wish to re-submit an amended proposal, they can approach the secretariat for advice on suitable amendments. However, neither the Trustees nor the secretariat should convey to the proposers any suggestion that approval of an amended proposal is any sense guaranteed.

The appraisal criteria are not for ranking projects one above the other. Several years after the QeH has been set up, when it has accumulated much experience of various types of projects, and (perhaps) is faced with a great surplus of approvable projects over its funding resources available for co-funding them, it may decide to develop ranking criteria, at least to rank projects within a certain type. But in the QeH's initial years, the development and use of ranking appraisal criteria will neither be necessary nor desirable.

These guidelines on appraisal criteria have obvious general implications for the format and content of the PP. However, like the appraisal criteria themselves, the details of the format and content of these documents should be worked out by the Trustees during the set-up phase of the QeH.

It need only be pointed out here that the PP submitted by the proposers should contain at least the nature and scale of the anticipated benefits of the project, including the number, type and general location of the beneficiaries; an adequate description of the measures (services and/or investments) proposed, with the rationale of how the measures will plausibly achieve the benefits; a plausible justification of the feasibility of implementing these measures; a project cost-breakdown and specified co-funding contribution from the proposers (which must itself be feasible); and, of course, plausible evidence that the selection criteria have in fact all been met.

**QeH Staff**

It may be necessary to employ a secretary to compile proposals in an acceptable format, maintain files on administrative issues and liaise with CDA and others to ensure sound record keeping of QEH affairs. It should be stressed that staff will only be hired as demand justifies it. Consultants or out-sourcing may provide and acceptable alternative.

**Monitoring and evaluation**

The framework for this function or group of functions (which also includes audit) has been described above under **project cycle**. It will be undertaken by CDA and comprise:

a. Monitoring of project activities and flows and uses of funds during project implementation;

b. Assessment of project outputs and impact during and after implementation;

c. Ongoing monitoring and evaluation of project portfolio progress – implementation and impact;

d. Periodic and final monitoring and evaluation of project portfolio progress – implementation and impact. And

This is a fairly standard sequence of activities in many development institutions. The details of its application will be worked out and refined by experience.

With respect to *implementation*, here are some of the issues to be examined by these several 'monitoring agents':

- What is the situation prevailing before implementation actually starts with respect to the main features which the project is designed to change, e.g. agricultural practices, yields, and products; sales prices and sales volumes in particular markets; costs of transport to specified market-relevant destinations; areas presently under mangroves; prevailing educational or skill levels; source, extent, and costs of drinking water supplies and health status of those using them, etc. This is the *pre-implementation base-line information* which will later be referred to when assessing impact. It must actually be gathered before implementation starts, or at least at the start of implementation or very soon after[123]. The Trustees should require regular reports from the secretariat which adequately demonstrate that this practice is being folllowed. Moreover, this base-line information ought to be gathered or checked by those who will probably stilll be around for ready and extensive consultation when impact assessments are made, i.e. by the secretariat staff themselves, not primarily by consultants assigned short term to the prioject.

[123] For example it might be gathered from farmer-beneficiaries/proposers at the outset, i.e. the first implementation meetings with them, of an extension or training project

- Did the project start, and was it implemented, roughly on schedule? If not, what were the reasons for the delays, and what lessons can/should be drawn from them?
- Did project expenditures, and the co-financing of them, evolve substantially as laid out in the approval? If not, what were the reasons for the significant deviations and what lessons can/should be drawn from them? Did the deviations happen in an 'uncontrolled' manner, or was there proper oversight by CDA and the proposer(s)?
- Did project activities evolve, and were deliverable outputs delivered, substantially as laid out in the proposal and subsequent approval? If not, why not?
- What is (was) the feeling of the main parties in the project – the proposers, the beneficiaries (where different from the proposers), and the service providers – about the planning and implementation of project activities? Are/were they satisfactory, in respect of (i) their appropriateness (ii) the efficiency and timeliness if their delivery? If not, what (a) remedies for this project (b) changes or lessons for future projects, do the parties suggest? Responses to these questions may be obtained by simple interviews, by focus group discussions, or by surveys. These aspects of implementation overlap with issues of project impact.

With respect to *impact*, these are the main issues which should be examined by the monitoring agents:

- Did the project outputs reach their intended beneficiaries? All of them? Less (or more) than in the approval?
- What do they (the beneficiaries) do differently now from their practices before the project was implemented? This question should be asked with reference to the objectives laid out in the approval, and the answers checked vis-à-vis the *pre-implementation base-line information* mentioned above;
- What has happened to the production, sales, incomes, employment, health, etc. of the beneficiaries where changes may reasonably attributed to the activities and/or deliverable outputs of the project?
- What is the sustainability of the changes in practices and indicators of business development and economic welfare immediately above-noted? As mentioned under **appraisal criteria** above, the main sustainability issues to be examined will take many different forms, depending on the nature of the project. A kind of sustainability, based on inherent enhanced capacity of the proposers and/or beneficiaries may justly be termed ***dynamic sustainability***.
- Was the project cost-effective? That is, granted its impacts and sustainability as covered in the preceding questions, could more or less the same effects have been achieved by lower-cost means? This will usually be a difficult question to answer convincingly, but it should always at least be posed. And
- Lessons learned, of whatever nature or type.

Finally, no details need be added here about financial audit. The principles of financial audit development organizations, and of uses of and accountability for external (in this case SCICDP project) funds committed to them are well-known and well-developed, and there are of course well-qualified independent accounting firms in Sindh capable of conducting such audits.

# Appendix 9 - List of Main Consultations, Meetings etc

**August 2005 onward.**

| Date | Name | Title | Relation to project | Issues |
|---|---|---|---|---|
| 1 August | Opel | DG, CDAGS | Director General | |
| 1 August | Hj. Abida Memon | Director | Director, environment and gender issues | |
| 1 August | Muhammad Ashraf Sahto | Asst Dir Admin | | |
| 1 August | Shaharyar Kazi | Asst Dir Eng | | |
| 1 August | Zamir Hussain Ujjan | Asst Dir Agric | | |
| 1 August | Ghulam Sarwar Khero | Additional Chief Secty. Development | Govt of Sindh | |
| 1 August | Hon. Syed Shoaib Ahmed Bukhari | Minister, Planning and Development Dept. | Govt of Sindh | |
| 1 August | Shamin Akhtar Qasmi | Chief manager | Allied Bank | |
| 2 August | Waheed Ahmed | Dir Fisheries | Head of fisheries department | |
| 3 August | Stella Jafri | Head, Organizational Development | IUCN | |
| 3 August | Abdul Latif Rao | Country representative | IUCN | |
| 3 August | Senyo Kufe | Security adviser | UN | |
| 4 August | Ghulam Rasool Kalwar | Government appointed consultant to CDA | CDA | |
| 6 August | Nazar Hussan | Secty Agriculture | Provincial Government of Sindh | Agriculture issues |
| 13 August | Ray Greer | Staff consultant ADB | Pakistan Country Assistance program | |
| 13 August | Syed Husaini Jagirdar | Development Economist | ADB's Country Assistance program | His view on country risks |
| 15 August | Steering Committee | | Refer attached schedule of names | |
| 15 August | Jamal Shoro | Advocate | FFF | Structure and constituents |

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| 15 August | Dr. Ejaz Ahmad | Deputy Director General | WWF | MOU and agreements |
| 15 August | Shamsul Haq Memon | Secretary to Government of Sindh | Environment and Alternative Energy Department | |
| 18 August | Waheed Ahmed | Dir Fisheries | Dir Fisheries | Possible projects and issues |
| 20 August | Ilyas Qureshi | Crop specialist | | Range of possible crop options |
| 22 August | Idris Rajpud 5869987 | Irrigation | Retd DG of Irrigation | Current state of irrigation in Sindh |
| 22 August | Sikander Brohi 03012177538 | Sociologist | | Key community issues |
| 23 August | Shamsul Haq Memon | Secretary to Govt Sindh | Environment and Alternative Energy | What's possible within the current system |
| 23 August | Mohammad Izhar Khan 021-5842169 | Chief Eng RBOD | Irrigation and Power Dept | LBOD and RBOD backgound |
| 23 August | Nazar Hussan | Secretary of Agriculture | | Institutional reform matters and seed plant privatization. |
| 24 August | Fazal Nizamani | Project director | ADB SRDP | Areas of respective interest |
| 24 August | Aqueel Karim Dhedhi | Chairman | AKD Securities Ltd | Oil palm investment |
| 24 August | Mohammad Yaseen Dhedhi | Advisor | AKD Farms | Oil palm investment |
| 25 August | Mohammad Ali Shah | Chairman | Fisher Folk Forum | Introductory meeting |
| 25 August | Khalid Mohtadullah | Senior advisor | Global water partnership | Institutional and policy issues as source of water problems |
| 25 August | Hafeez Tunio Jamal Shoro | Economists | FFF | Role of middlemen |
| 26 August | Dr. Keerio | DG | Agriculture Research | Suitable crops, salinity and seed problems |
| 27 August | Waheed Ahmed | DG | Department of Fisheries | Links with IUCN, WWF, FFF. Also pen culture |
| 29 August | Ali Jat | Rehri village | Fisher | Community involvement in mngt |
| 30 August | Akbar Kalhora | Land owner | Farmer | What is possible in and around Keti Bandar |

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| 5 Sept | Thatta DCO | Provincial govt | | Introductory meeting (40 people) |
| 6 Sept | Badin | | | Introductory meeting (30 people) |
| 6 Sept | Akbar Khalora | Jhangesar village | Land owner | 35 fishers |
| 10 Sept | M Muslim Abbasi | Chief Minister's Investment cell | Chairman | Impediments to investment in Thatta and Badin |
| 14 Sept | Anwarul Islam | Director Operations | Karachi Fisheries Harbor Authority | Middlemen, ice and post harvest issues. |
| 15 Sept | Hakim Din Junio | Additional Secretary Development | Department Planning and Development | Devolution issues |
| 16 Sept | Nadeem Hussain Bukhari | Program officer | UNDP | Implementation capacity and issues |
| 17 Sept | Mohammad Rashid | Additional Secretary | Provincial Government Transition cell | Devolution implementation |
| 17 Sept | Mohammad Moazzam Khan | Marine Fisheries Department | Govt of Pakistan | Institional and policy issues |
| 17 Sept | Alla Bus Khalora | Head of Agriculture | Planning and Development | Institutional capacity issues |
| 20 Sept | Anwar Ul Islam | Director | Karachi Fisheries Harbor Authority | Organization of fishing arrangements. |
| 22 Sept | Dr. Akash Ansari | President | Badin Rural Development Society | Agriculture and gender issues |
| 24th Sept | Najamuddin Vistro | Conservator of Forrests | Afforestation Circle | Suitable trees |
| 24 Sept | Nazar Hussain | Secty of Agriculture | GoS | Institutional arrangements |
| 24 Sept | Dr. Noor | Adviser to Secty Agriculture | GoS | Institutional arrangements |
| 24 Sept | Dr. Khalora | Chief Agriculture | Dept of P&D | Institutional arrangements |
| 29 Sept | | | Tripartite meeting | Review IR and future direction of Project |
| 30 Sept | Chief Secretary, ACS Agriculture, Secty Finance | | | Future direction of Project |
| 3rd Oct | Fatima Naqvi, Iftakhar Khalid | Analyst, Deputy country director | OXFAM | Nature of their interventions in Thatta and Badin |
| 3rd Oct | Tekola Dejene,<br><br>Ambreen Malik | Lead ops officer, Analyst | World Bank | Cooperation in Thatta and Badin |
| 4th Oct | Shandana Khan | CEO | RSPN | Cooperation and involvement |

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| 4th Oct | Dr, Rashid Bajwa | CEO | NRSP | Cooperation |
| 14 Oct | Nazir Mahar | Secty Agriculture | Govt Sindh | Quality of inputs, SGP, institutional strengthening |
| 15 Oct | Fisher Folk Forum | MAS, Jamal | | Their interests in development |
| 18 Oct | Memon Sahib | Secty Environment | Govt of Sindh | Mangrove interventions |
| 19 Oct | Tahir Quereshi | | IUCN | Possible ventures |
| 21 Oct | Dr Ejaz | | WWF | Possible cooperation |
| 24 Oct | Nizamani | PD | SRDP | Risks and implementation |
| 25 Oct | Ali Jat and others | Rehri community | | Livestock and and skills |
| 2 Nov | Fisher Folk Forum | Ibrahim Hadri | | Needs of members |
| 12 Nov | Nazar Manar | Secty Agriculture | Govt of Sindh | Seeds, IEC, reform |
| 16 Nov | Najam Viatro | Chief Forests | Govt of Sindh | Fodder crops |
| 22 Nov | Thatta | | | Community workshop (58) |
| 23 Nov | Badin | | | Community workshop (33) |
| 29 Nov | Karachi | | | Community workshop (73) |