

# ANDHRA PRADESH AGRICULTURAL UNIVERSITY

Printed in Silver with Red Ink



# YEARS OF PROGRESS

RAJENDRANAGAR, HYDERABAD 500 030

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B.A., M.Sc.(Ag.), Ph.D., F.I.S.G.

**ANDHRA PRADESH AGRICULTURAL UNIVERSITY  
- 25 YEARS OF PROGRESS**



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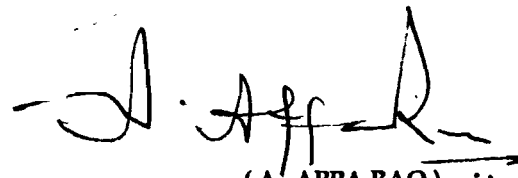
Andhra Pradesh Agricultural University  
Rajendranagar, Hyderabad - 500 030.

## FOREWORD

The Andhra Pradesh Agricultural University which was established in the year 1964, has completed 25 years of useful service to the farming community of the State by training the required manpower, generating technology and providing extension support. The University is celebrating the Silver Jubilee during this year, 1989 and to commemorate the occasion, the publication, "Andhra Pradesh Agricultural University - 25 years of progress", has been brought out. This publication envisages to bring together the contributions of the various institutions involved in Agricultural Education, Research and Extension. Besides, the role of other supporting institutions has also been documented.

The efforts of compiling the information and bringing out this volume in the present form by the Planning and Monitoring Cell of the University is commendable. It is hoped that this volume will serve as a compendium of information on the status and progress of the various constituent institutions of the University and as a source of reference in our future efforts to plan for the progress of the University.

A.P. Agricultural University  
Rajendranagar, Hyderabad-30



(A. APPA RAO) ..  
VICE-CHANCELLOR

## PREFACE

On the eve of the Silver Jubilee Celebrations of Andhra Pradesh Agricultural University, the Planning and Monitoring cell was entrusted with the responsibility of bringing out a document depicting the birds' eye view of the progress made by the university in vistas of education, research and extension. The data compiled in this volume finds its source in various institutions of the University related to agriculture, veterinary science and home science. This publication apart from permitting a journey down the memory lane will also serve as a reference for future strategy planning.

For this exercise in retrospection, I wish to express my sincere thanks to our Vice-Chancellor, Dr. A. Appa Rao, for his inspiration, constant guidance and encouragement without which this document would not have been in its present form.

The publication is a result of untiring efforts of the staff of Planning and Monitoring cell, for which I place on record my thanks to D. Jayaraj, J. Muralidhar Reddy, S. Jyoteshwara Reddy, Mrs. Anurag Chaturvedi, Shiv Karan Singh, A. Satyanarayana, G. Sanyasi Naidu, A. K. Acharya, J. Bhaskara Rao, C. Ganga Rao and B. Narasimha Rao.

I would be failing in my duty if I do not acknowledge the silent workers, whose contribution behind the scenes has been immense. For this I make a special mention of Dr. M.V. Shantaram, and Sri V. Ramakrishna Reddy, College of Agriculture, Rejendranagar. My thanks are also due to Dr. K. Pandarinatha Reddy, Officer-in-charge, Agriculture Information and Communication Centre, for arranging the printing of this document. My thanks are also due to R. Ankaiah & T. Ramesh Babu, Asst. Research Officers.



(D. V. MADHUSUDANA RAO)  
Coordinator  
Planning & Monitoring cell  
A.P. Agricultural University.

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## CHAPTER – 1

# HISTORICAL RESUME

Agriculture in India is an age old enterprise dating back to the Indus-valley civilisation (3000-5000 BC). A bird's eye view of the changing scenario of agriculture reflects a shift from a subsistence production to an enterprise with surplus production.

Agriculture is a source of livelihood for a majority of the population. It has been observed that the Indian economy fluctuates in sympathy with agricultural production in the country.

The importance of the development of science and technology in agriculture for providing a boost to agricultural production was realised by the successive Governments which appointed several commissions for suggesting steps to streamline agricultural development. The Royal Commission on agriculture was appointed in 1926 to examine specifically the role of agriculture in rural economy. This commission realised the need for a strong research base for agricultural development.

The University Education Commission, 1949, headed by Dr.S. Radhakrishnan, who later became the President of India, first extolled the Land-Grant Pattern of U.S.A., as an epoch-making contribution to agriculture and agricultural education in USA and recommended that agricultural education be recognised as a major national issue and that the new agriculture colleges, wherever established, be associated with new rural universities.

The first Joint Indo-American team's recommendations, submitted in 1955, laid the foundation for all the subsequent develop-

ments, in India, leading to the establishment of agricultural universities and enhancing the value of research work in agricultural sciences. However, for want of specific recommendations, the second Joint Indo-American team headed by Dr.M.S. Randhawa, the then Vice-President of the Indian Council for Agricultural Research (ICAR) was constituted, which submitted its recommendations in 1960. About agricultural universities, the team recommended that assistance to establish an agricultural university should not be granted unless there was an adherence to basic principles such as :

- i) Autonomous status
- ii) Location of Agricultural, Veterinary/ Animal Husbandry, Home Science, Technological and Science Colleges on the same campus
- iii) Integration of teaching by offering courses in the areas of these institutions to provide a composite course and the integration of education, research and extension.

As a sequel to the various commissions, the first agricultural university was established in Uttar Pradesh in 1960. The report of Education Commission (1964-66) headed by Dr.D.S. Kothari, who was also the Chairman of the University Grants Commission, recommended the establishment of at least one Agricultural University in each State.

Andhra Pradesh Agricultural University (APAU) was established on June 12, 1964. The proposal to set up an agricultural university in Andhra Pradesh was first taken up by the Government of Andhra Pradesh in 1957 and after going through necessary

stages, the relevant bill was finally passed into an act in December, 1963. The Act actually came into force on May 4, 1964. The first Statutes of the Andhra Pradesh Agricultural University under the act were made by the Government on June 11, 1964. Sri O. Pulla Reddy, ICS (Retd) was appointed as the Vice-Chancellor of this University and he assumed the charge on June 12, 1964, which was thus officially reckoned as the day of the establishment of the University.

As per the provisions of the Act, the College of Agricultural and the College of Veterinary Science and Animal Husbandry, Hyderabad established in 1946 and the College of Home Science, Hyderabad, established in 1961, affiliated to the Osmania University, the Agricultural College, Bapatla, established in 1945 affiliated to Andhra University, S.V. Agricultural College (1961), and Andhra Veterinary College (1955), Tirupati, affiliated to Sri Venkateswara University, were transferred to the University as constituent on July 10, 1964.

Prior to the constitution of first Board of Management, an Adhoc Committee of Management was constituted, with the approval of the Chancellor, which met eight times and took policy decisions regarding the functioning of the University. This arrangement existed till March 3, 1965, when the first Board of Management, duly constituted, met for the first time.

Under the provisions of the Act, the headquarters of the University were to be located at Rajendranagar, but due to non-availability of suitable buildings, the office was temporarily located in Government building, "Dilkusha", Hyderabad.

A course-credit system (Trimester system) modelled after the pattern of the U.S. Land-Grant colleges was introduced. In order to orient the staff to the new system, a seminar was organised in 1964 at Rajendranagar. Apart from university teachers, the

delegates from other agricultural universities like Uttar Pradesh, Punjab, US-AID officials from Delhi and Kansas State University staff stationed at Hyderabad, participated in this seminar.

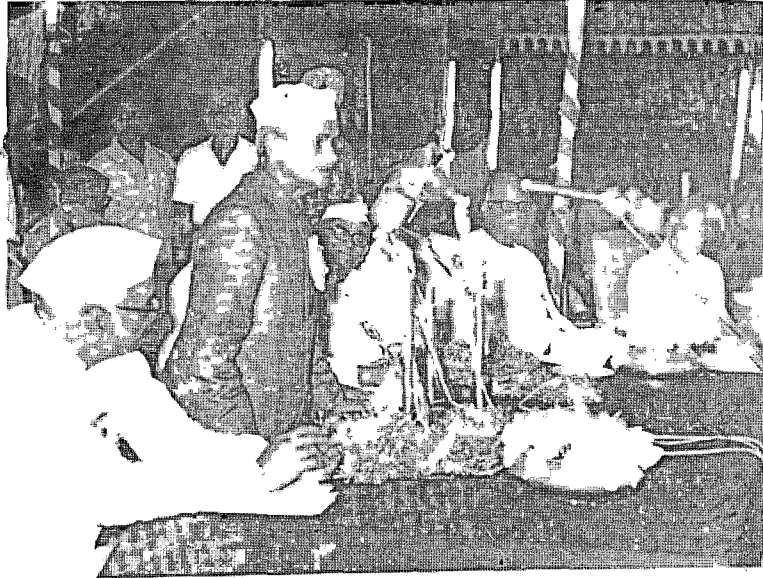
During 1964-65, another major step was taken in appointing a High Level Inspection Commission of Experts from outside the university under the Chairmanship of Dr.B.P. Pal, Director General of ICAR, to assess the possibilities of the instituting post-graduate courses (including Ph.D.) in all the six constituent Colleges of the University.

The University was formally inaugurated by the then Prime Minister of India, Sri Lal Bahadur Shastri, on March 20, 1965, at Rajendranagar campus, and the building programme by Smt. Indira Gandhi, Prime Minister of India, on June 23, 1966.

The University took over 43 research stations i.e., 41 in agriculture and 2 in animal husbandry with 108 research schemes on July 1, 1966. The research infrastructure was further strengthened with the implementation of NARP in 1979.

On the extension side, District Extension Education Programmes were introduced first at Hyderabad and later at Chittoor (1968) and Guntur (1970) districts. During the late sixties a number of teachers were deputed for higher studies to U.S.A. under the US-AID programme.

Post-graduate programmes, available initially at Rajendranagar, were extended to Bapatla and Tirupati campuses during 1970-71. Ph.D. programmes were started from 1976-77. Three Fisheries research schemes and stations were transferred to APAU in 1977. A new Home Science College was started at Bapatla in 1983. Three new degree programmes were started in 1983 i.e., B.Sc.(Hort.) at Rajendranagar, B.Tech. (Ag.Engg.) at Bapatla and B.Sc.(Dairy Tech.) at Tirupati. In addition, a pre-B.Sc.(Ag.)



Sri Lal Bahadur Shastri, Prime Minister of India inaugurating the University on  
20th March 1965



Smt. Indira Gandhi, Prime Minister of India inaugurating the Building Programme  
on 23rd June 1966



course for Village Development Officers was started during the year 1982-83. The University teaching activities at the time of inception included only 3 courses, one in each faculty. This was later diversified to 6 undergraduate programmes. Similarly new teaching departments were also started from time to time based on the training needs.

With the expansion of teaching, research and extension activities and the increase in linkages with National and International organisations, a need was felt for evolving a suitable mechanism for the planning and

evaluation of the programmes of the University. Consequently, the Planning and Monitoring Cell was established in 1987.

To meet the increasing demand for admissions to B.Sc.(Ag.) degree course, two new Agricultural Colleges were started during Silver Jubilee year of the university, 1989, one at Aswaraopet, Khammam district and another at Naira, Srikakulam district. An Agricultural Polytechnic was also started in 1989 at Palem, Mahboobnagar district, to train the middle level functionaries.

ORGANISATIONAL STRUCTURE OF ANDHRA PRADESH AGRICULTURAL UNIVERSITY

FINANCE COMMITTEE ---> BOARD OF MANAGEMENT ---> VICE-CHANCELLOR <--- ACADEMIC COUNCIL <--- BOARDS OF FACULTIES

COORDINATOR PLANNING & MONITORING CELL  
AR TO VC

T.Os, Eco, Stat., R.O.-Comp.

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Tech.PA>								
EES	DY. COMPT	JR	DY. REG	DY. REG		ADR HORS	ADR RARS	
R'NAGAR TIRUPATI						*DY.DIR(V) *Asst.DIRS *TO'S	ZREAC-- RARS	
DY EES	DY EES	ACS	ARS	ARS	AL	AGRI VET HSC	AAO & ASST.DIRS-- AC	ASST.DIRS-- AT HQ.
ANAKAPALLE ASWARAOPET NAIRA R'NAGAR (CIVIL & ELEC.)	TIRUPATI BAPATLA KADIRI	INTERNAL AUDIT ACCOUNTS BUDGET	ACADEMIC EXAMS OP LABOUR Sp. CELL	NTE TE	R'NAGAR BAPATLA TIRUPATI NAIRA	R'NAGAR TIRUPATI BAPATLA	RARS Res.Stuns LAM ANAKAPALLE(7) TIRUPATI(10) JAGTIAL(12) PALEM(5) NANDYAL(4) CHINTAPALLI(4)	EES KVS EII AICC NDS LAB TO LAND SC & OBC

ABBREVIATIONS USED:

- AAO-Adm-cum-Accounts Officer;
- AC-Asst. Comptroller; AL-Asst. Librarian; AR-Asst.Registrar
- NTE-Non Teaching Establishment; OP-Office procedures
- RARS-Regional Agricultural Research Stations
- REAC-Research and Extension Advisory Council; TE-Teaching Establishment
- UH-University Professor & Head;
- ZREAC-Zonal Research and Extension Advisory Council.

Figures in parenthesis indicate number of Research Stations in the Zone.

## CHAPTER - II

# ORGANISATIONAL SETUP

### A. Objectives and Functions of the University

The objective of the University as per the Act, among others, is to make provision for the education mainly of the rural people of the State of Andhra Pradesh in agriculture, to promote research, field and extension programmes in agriculture and increase agricultural production. Thus the main functions of the University are to provide technically trained manpower (Education), to generate the technology for increasing agricultural production (Research) and to disseminate the technology to the farmers (Extension).

### B. Organisational Setup

APAU is governed by a 16 member - Board of Management which is the apex body responsible for taking policy decisions. The Vice-Chancellor of the University is the Chairman of the Board of Management. The members of Parliament and the State Legislature, eminent persons with note-worthy contribution in the field of agricultural development, the representatives of progressive agriculturists of the State and officials form ICAR and official representatives of all the Faculties are the members of the Board of Management.

The academic administration of the University is vested with the Academic Council, consisting of the Vice - Chancellors of Osmania, Andhra and Sri Venkateswara

Universities, the Deans and Directors of the University, the Heads of the Departments of various faculties, the Professors of the University, the Principals of the University Colleges and eminent scientists nominated by the Vice - Chancellor. The Vice - Chancellor is the principal executive and is responsible for the academic administration of the University.

In carrying out its mandate, the University is functionally organised into three operational wings; Academic, Administration and Finance. The Vice - Chancellor is responsible for the entire administration. The administration is monitored by the Registrar of the University and the finance management is the responsibility of the Comptroller. The Deans of various faculties are responsible for the teaching programmes in the faculties concerned and Directors of Research and Extension for research and extension activities respectively. The academic heads of the Colleges are the Principals, while the Regional Research Stations are under the control of Associate Directors of Research. Individual research stations are managed by Heads of research stations.

### C. Officers of the University

#### Chancellor

The supreme head of the university is the Chancellor. The Governor of Andhra Pradesh officiates as the Chancellor and, by virtue of his/her office, presides over the University Convocation.

The successive Chancellors who have governed the University are :

Sri Pattom A. Thanu Pillai	12-6-1964	to	11-4-1968
Sri Khandubhai kasanjai Desai	11-4-1968	to	25-1-1975
Sri K. Obul Reddy	25-1-75	to	10-1-1976

Sri Mohanlal Sukhadia	10-1-1976	to	16-6-1976
Sri R. D. Bhandare	16-6-1976	to	16-2-1977
Sri B.J. Diwan (then Chief Justice of A.P.High Court)	17-2-1977	to	4-5-1977
Smt. Sharada Mukherjee	5-5-1977	to	14-8-1978
Sri K. C. Abraham	15-8-1978	to	14-8-1983
Sri Ramlal	14-8-1983	to	28-8-1984
Dr. Shankar Dayal Sharma	28-8-1984	to	26-11-1985
Smt. Kumudben Joshi	26-11-1985	-	continuing

### Vice - Chancellor

The Vice - Chancellor is the Academic Head and Principal Executive Officer of the University and is assisted by the various other designated executive functionaries responsible for administration, academic and

research activities and also the financial administration.

The persons who have served the University as Vice - Chancellor since its inception are :

Sri O. Pulla Reddy, ICS (Retd.)	12-6-1964	to	31-5-1972
Sri M. R. Pai, IAS	1-6-1972	to	31-8-1974
Dr. C. Krishna Rao	1-9-1974	to	6-11-1978
Sri J. Raghotham Reddy	7-11-1978	to	6-11-1981
Sri B. Pratap Reddy, IAS (Retd.)	30-1-1982	to	29-1-1985
Dr. A Appa Rao	14-3-1985	-	continuing

The other University Officers were initially appointed on a regular basis and were entitled to continue in the post till their retirement. In 1979, the University felt the need to make these posts tenurial for a term of 3 years. However, as per the recommen-

dations of the Review Committee Report of the University (1986) the term of 3 years which was considered as insufficient was increased to five years in 1989. The incumbents for the various posts of University officers since its inception are :

### Registrar

Sri M. Sreeramulu	10-7-64	to	20-2-67
Dr. G. Venkataratnam	20-2-67	to	25-10-72
Sri M. N. Bharati	26-10-72	to	14-5-73
Sri G. Prabhakara Reddy	15-5-73	to	13-10-74
Sri S. Vittal Rao	14-10-74	to	22-4-77
Sri T. Narayana Reddy, IAS	14-2-79	to	3-9-80
Sri E. S. Reddy, APAS	4-9-80	to	3-11-81
Sri Shaik Mowla, IAS (Retd.)	6-9-82	to	3-11-84
Sri T. Narayana Reddy, IAS	12-7-85	to	8-9-85
Sri J. M. Girglani	2-11-85	to	31-3-86
Dr. K. M. Azam	1-7-86	to	20-3-89
Dr. S. M. Siddiqui	22-7-89	-	continuing

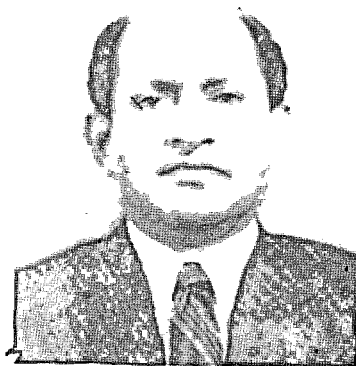
## VICE - CHANCELLORS



Sri O. Pulla Reddy, ICS (Retd.)  
(1964 - 72)



Sri M.R. Pai, IAS  
(1972 - 74)



Dr. C. Krishna Rao, Ph.D.  
(1974 - 78)



Sri J. Raghotham Reddy  
(1978 - 81)



Sri B. Pratap Reddy, IAS (Retd.)  
(1982 - 85)



Dr. A. Appa Rao, Ph.D.  
(1985 - continuing) 1990

**Comptroller**

Sri V. N. Subba Rao	22-7-65	to	8-8-68
Sri S. Venkataratnam	9-8-68	to	31-8-70
Sri Mir Sajjad Ali	1-9-70	to	1-9-73
Sri V. Gopalakrishna	1-9-73	-	continuing

**Dean of Agriculture**

Dr. T. R. Mehta	11-7-66	to	14-3-69
Dr. Hussain Ali Razvi	19-1-70	to	1-7-72
Dr. Ch. Krishna Murthy	27-10-72	to	27-4-73
Dr. Mir Hamid Ali	15-6-73	to	31-3-81
Dr. B. H. Krishna Murthy Rao	31-3-81	to	31-6-84
Dr. J. Subbaiah	22-5-85	to	30-6-87
Dr. M. Sugunakar Reddy	6-4-88	-	continuing

**Dean of Veterinary Science**

Dr. C. Krishna Rao	6-6-68	to	6-5-69
Honorary Dean			
Dr. Berte A. D. Souza	3-11-70	to	28-5-71
Honorary Dean			
Dr. R. D. Nanjaiah	26-6-71	to	25-10-72
Honorary Dean			
Dr. G. Venkataratnam	25-10-72	to	2-11-76
Dr. C. V. Reddy	2-11-76	to	30-6-88
Dr. D. Anjaneya Prasad	1-7-88	-	continuing

**Dean of Home Science**

Dr. (Miss) G. V. Subaima	18-11-65	to	17-5-66
Dr. (Smt) Rajammal P. Devadas			
Honorary Dean	24-11-66	to	28-10-68
Dr. (Miss) G. V. Subaima	28-12-68	to	28-6-69
	and 20-1-70	to	1-2-73
Dr. (Mrs.) Durga Deulkar	12-2-73	to	17-3-75
Honorary Dean			
Dr. (Mrs.) P. Pushpamma	23-7-77	to	11-1-88
Dr. (Mrs.) P. Geervani	1-7-88	-	continuing

**Dean of P. G. Studies**

Dr. K. V. Raman	25-7-79	to	19-3-84
Dr. A. Ramamohana Rao	15-5-85	-	continuing

**Director of Research**

Dr. Ch. Krishna Murthy	Aug. 1966	to	4-10-70
Dr. T. V. Reddy	5-10-70	to	13-5-72
Dr. A. Appa Rao	14-5-73	to	14-1-82

Dr. S. N. Rao	14-1-82	to	23-3-85
Dr. S. Mahboob Ali	10-5-85	to	30-4-87
Dr. I. V. Subba Rao	11-4-88	-	continuing

#### Director of Extension

Dr. D. Bap Reddy	7-4-66	to	31-12-66
Dr. B. Appala Naidu	10-3-67	to	11-10-72
Dr. A. Adivi Reddy	23-1-73	to	Oct. 1980
Dr. H. N. Byra Reddy	7-7-82	-	continuing

#### Dean of Student Affairs

Sri M. R. Satya Raj	27-6-66	to	2-7-67
Dr. K. Venka Reddy	19-7-67	to	23-1-73
Dr. Venkat Rao	5-6-73	to	16-2-89
Dr. K. Jayarama Reddy	24-6-89	-	continuing

#### University Librarian

Dr. D. B. Eswara Reddy	22-3-76	-	continuing
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#### Estate Officer

Sri R. S. Marthandam	June 1964	to	Oct. 1969
Sri G. Vittal Reddy (Maintenance)	Oct. 1989	to	31-3-74
Sri D. Lokanatham (Construction)	Oct. 1969	to	25-4-75
Sri D. Basappa	25-4-75	to	23-5-75
Sri P. V. Prabhakara Rao	23-5-75	to	6-12-75
Sri T. Bhaskar	6-12-75	to	24-10-77
Sri N. Vijayaraghavan	23-11-77	to	27-11-78
Sri Mohd. Karimullah Khan	3-7-79	to	31-10-83
Sri C. S. Varma	1-11-83	to	27-12-85
Sri V. Nagabhushanam	5-7-87	to	30-6-89
Sri P. Krishna Murthy	7-7-89	-	continuing

### D. Authorities of the University

The following are the Authorities of the University :

- i) The Board of Management
- ii) The Academic Council
- iii) The Board of Faculties
- iv) Such other bodies as may be prescribed

## BOARD OF MANAGEMENT

Till the formation of the first Board of Management, an Adhoc Committee of Management was constituted with the approval of the Chancellor. This functioned till March 3, 1965, when the first Board of Management met, with 19 members. The composition of the first two Boards was different from that of the Board subsequently constituted in 1976.

The first Board consisted of four ex-officio members, nine elected and seven nominated members. The term of office of the members of the Board other than the ex-officio members was five years. The Chairman of the first two Boards were non-officials, Sri K. Obul Reddy and Sri M. Bhoj Reddy respectively. With the amendment of the Act in 1976, the Vice-Chancellor of the University was made Chairman of the Board of Management. Since 1976, the term of office for the members of the Board, except the ex-officio members, has been three years. The Board of Management is the supreme decision making body of the University. The functions of the Board of Management are to determine and regulate the policies of the University, to approve the budget and govern the financial management and related matters.

The Board of Management, according to the amendment made in the Act in 1976, consisted of the following members :

### Ex-officio members

1. The Vice-Chancellor (Chairman, Board of Management)
2. The Secretary to Government, Panchayat Raj Department
3. Director of Agriculture
4. Director of Animal Husbandry

### Other Members (Nominated by the Chancellor)

5. One nominee from the members of the ICAR
6. One nominee who in the opinion of the Chancellor is a distinguished agricultural scientist
7. Three persons from the Academic Council
8. Four persons from among the members of the State Legislature and the members of Parliament elected from the State of Andhra Pradesh
9. Two persons from amongst the progressive agriculturists of whom one is a woman and
10. One person from the State Chamber of Panchayat Raj

The Registrar of the University is the ex-officio Secretary of the Board of Management.

The List of members other than the ex-officio members who have served on the Board of Management since the inception of the University are :

1. Sri K. Obul Reddy 1965-70
2. Sri M. Baga Reddy, MLA 1965-71
3. Sri V. Visweswara Rao, MLA 1965-66
4. Sri C. Kulasekhara Reddy, MLA 1965-67
5. Sri V. Venkata Krishna Raju, MLA 1965-71
6. Sri K. Ramachandra Reddy, MLC 1965-70
7. Sri P. Venkataswamy, MLC 1965-70
8. Sri J. Raghatham Reddy, MLC 1965-70
9. Sri Y. Venkateswara Rao 1965-70
10. Sri P. N. Appa Rao 1965-70
11. Smt. B. Rukmini devi, MLA 1965-70
12. Dr. B. Appala Naidu 1965-70
13. Dr. P. S. Rajulu 1965-70
14. Sri P. Ramana Reddy 1965-70
15. Dr. C. Krishna Rao 1967-68



16. Sri A. Eswara Reddy, MLA	1967-72	60. Dr. A. Appa Rao	1979
17. Sri B. Papi Reddy, MLA	1967-72	61. Dr. G. Rangaswamy	1979
18. Sri V. Ramaswamy Reddy, MLA	1967-70	62. Dr. A. Venkataraman	1980-83
19. Dr. C. V. Rao	1970-75	63. Dr. N. K. Ananta Rao	1980-83
20. Sri P. V. Appal Naidu, MLC	1970-75	64. Dr. K. V. Raman	1980-83
21. Sri M. Bhoj Reddy	1970-72	65. Dr. A. Appa Rao	1980-82
22. Sri Y. Ramamohana Rao	1970-72	66. Sri B. Kistaiah, MLA	1980-83
23. Smt. Prabhavathamma Mara Reddy	1975-78	67. Sri I. Ramakrishnam Raju, MLA	1980-83
24. Sri A. Bapineedu	1975-78	68. Sri Lakshmi Chand K. Shah, MLA	1980-83
25. Dr. P. Katam Lingaiah, MLA	1975-78	69. Sri K. B. Siddaiah, MLA	1980-83
26. Dr. Durga Deulkar	1973-75	70. Dr. D. Anjaneyaprasad	1980-83
27. Sri M. Ramdev Reddy, MLC	1975-80	71. Smt. D. Indira, MLA	1980-83
28. Sri G. V. Chandrasekhar Reddy	1970-78	72. Sri P. Govardhan Reddy, MLA	1980-83
29. Sri P. Ramachandra Reddy, MLA	1972-77	73. Dr. S. Venkateswara Rao	1980-83
30. Sri A. Veerappa, MLA	1972-77	74. Sri T. Amar Singh, MLA	1981-82
31. Sri Y. Venkata Rao, MLA	1975-77	75. Sri P. Koteswara Rao	1982-83
32. Sri Y. V. Krishna Rao, MLC	1975-80	76. Dr. S. N. Rao	1982-83
33. Dr. R. L. Narasimham	1972-75	77. Dr. T. C. Jain	1984-86
34. Sri Ch. Venkata Hare Rama Jogaiah, MLA	1972-77	78. Sri M. Padmanabha Rao	1984-87
35. Sri V. Jagapathi Rao, MLA	1972-77	79. Dr. M. Rama Rao	1984-87
36. Sri G. H. Sankara Reddy	1975-76	80. Dr. A. Ramamohana Rao	1984-87
37. Dr. J. S. Kanwar	1975	81. Dr. (Mrs.) P. Geervani	1984-87
38. Sri P. Kantam Lingaiah, MLA	1975-76	82. Smt. W. Rajasakkubai, MLA	1984-87
39. Dr. P. L. Narayana Rao	1975-76	83. Sri C. Vijaya Rama Raju, MLA	1984-85
40. Dr. (Miss) Rajammal P. Devadas	1975-76	84. Sri L. Kishan Reddy, MLA	1984-87
41. Sri N. Yathi Raja Rao, MLA	1975-76	85. Sri G. Muddukrishnama Naidu, MLA	1984-85
42. Dr. (Mrs.) P. Pushpamma	1975-76	86. Sri P. Indra Reddy	1984-85
43. Sri Ch. Satyanarayana Rao, MLA	1976-78	87. Smt. A. Bhanumathi, MLA	1984-87
44. Sri V. Munuswamappa, MLA	1976-78	88. Sri E. Jagannadha Rao	1984-86
45. Sri D. Peraiah, MLA	1976-78	89. Sri M. Subba Reddy, MP	1985-87
46. Smt. B. Sarojamma, MLA	1976-78	90. Sri M. Raghuma Reddy, MP	1985-87
47. Sri M. Subba Reddy, MLA	1976-78	91. Dr. U. Venkateswarlu, MLA	1985-87
48. Dr. S. Mahboob Ali	1976-79	92. Sri Vadde Sobhanadriswara Rao, MP	1985-87
49. Dr. D. P. Singh	1976-78	93. Dr. M. Aravindan	1986-89
50. Dr. Ch. Krishna Murthy	1976-78	94. Dr. M. Velayutham	1989 to-date
51. Dr. S. Venkateswara Rao	1976-78	95. Dr. M. Sugunakar Reddy	1987 to-date
52. Sri P. Appa Rao	1976-78	96. Dr. (Mrs.) K. Chittemma Rao	1987 to-date
53. Sri Y. V. Krishna Rao, MLC	1976-78	97. Dr. P. C. Choudhuri	1987 to-date
54. Sri A. Dasaratharami Reddy, MLA	1976-78	98. Sri K. Prabhakar Rao, MP	1987 to-date
55. Sri T. Musalayya, MLC	1978-79	99. Sri Ch. Ramachandra Rao, MLA	1987-89
56. Sri P. Venkata Reddy, MP	1978-79	100. Sri M. Jayadev Naidu, MLA	1987-89
57. Sri B. T. L. N. Chowdary, MLA	1978-79	101. Sri M. Krishna Reddy, MLA	1987-89
58. Sri Rajam, MLA	1978-79	102. Dr. D. Bap Reddy	1987 to-date
59. Dr. N. K. Ananta Rao	1978-79	103. Dr. Y. Shivaji, MP	1987 to-date
		104. Smt. T. Devaki Rani	1987 to-date

## Academic Council

The Academic Council supervises, directs, controls and maintains the academic standards of the university.

The following are the members of Academic Council :

1. The Vice-Chancellor (ex-officio Chairman)
2. The Vice-Chancellors of Andhra University, Sri Venkateswara University and Osmania University
3. Director of Agriculture
4. Director of Animal Husbandry
5. Director of Research
6. Director of Extension
7. Dean of Indian Veterinary Research Institute
8. Deans of various Faculties
9. Dean of Student Affairs
10. Heads of Departments of various faculties
11. Professors of the University
12. Principals of the University colleges
13. Two members of the Board of Management referred to in clauses (e) and of subsection 2 of section (19)
14. Four persons nominated by the Vice-Chancellor of whom two are from amongst the teachers for such period as is prescribed.

The Academic Council may co-opt as members not more than ten persons, for such period and in such manner as may be prescribed, so as to ensure adequate representation of the different aspects of agriculture.

Due to the creation of new departments and diversification of programmes at undergraduate and post-graduate levels, the membership of the Academic Council has been increasing over the years.

Table - I Membership status of the Academic Council

Year	Membership
1964	13
1965	15
1970	45
1975	52
1980	70
1985	80
1989	97

## Faculty Board

The Faculty Board is responsible for organisation and conduct of teaching, research and extension work of the departments in the Faculty. It also formulates rules and regulations for the Faculty and forwards them to the Academic Council. As per the act :

1. The University includes the Faculties of Agriculture, Veterinary and Home Science and such other Faculties as may be prescribed.
2. Each Faculty comprises of such Departments with such an assignment of subject of study as may be prescribed.

There is to be a Board for each Faculty and the Dean of the Faculty concerned is the Chairman and all the heads of the Departments in the Faculties concerned are the members.

In addition to the existing three faculties, Faculty of Post-Graduate Studies was constituted in 1988 to monitor the post-graduate programmes of the University. The Board of Faculty for P. G. studies consists of :

Dean of Post-graduate Faculty (Chairman-ex-officio)  
Deans of other Faculties  
Directors of Research and Extension  
Heads of Department where P.G. Programmes are offered  
All Professors and Senior Officers approved by the Vice-Chancellor  
Two eminent scientists from outside the University invited by the Dean and elected representatives from cadres of Associate and Assistant Professors connected with P. G. Programmes.

CHAPTER – III

**MANPOWER GROWTH**

At the time of establishment of the University in 1964, the 440 technical staff and 1243 non-technical staff have increased to about 1700 and 3300 respectively (Table 2 and 3). Initially there were only undergraduate programmes in its three campuses, with the P.G. Programme functioning only at Rajendranagar Campus.

**Table 2: Manpower Growth in the University - Technical**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
1. Teaching	217	318	393	499	563	573
2. Research	172 *	265	399	711	808	883
3. Extension	14 **	40	50	73	125	137
4. Library	27	27	28	28	50	50
5. Administration	10	11	15	26	27	35
<b>Total</b>	<b>440</b>	<b>661</b>	<b>885</b>	<b>1337</b>	<b>1573</b>	<b>1678</b>

\* Relates to 1966

\*\* Relates to 1967

**Table 3 : Manpower Growth in the University - Non-Technical**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
<b>a) Ministerial</b>						
1. Teaching	541	686	786	806	872	895
2. Research	358 *	550	732	1031	1014	1213
3. Extension	31 **	125	129	175	195	188
4. Library	19	19	21	21	38	38
5. Administration	120	180	225	300	300	300
<b>b) Agrl. Workmen</b>						
6. Teaching	2	12	20	73	287	291
7. Research	172 *	204	234	303	401	410
<b>Total</b>	<b>1243</b>	<b>1776</b>	<b>2147</b>	<b>2709</b>	<b>3107</b>	<b>3335</b>

\* Relates to 1966

\*\* Relates to 1967

However, in course of time, post-graduate programmes were introduced in the other campuses also. In 1983, three new degree programmes, namely B.Sc. (Hort.), B.Sc. (Diary Tech.), and B.Tech. (Ag.Engg.) were also started. In 1983, another College of Home Science was started at Bapatla. In addition to the existing departments, new departments like the Department of Forestry, Microbiology and Bioenergy were established. These diversification and expansion of academic activities gave a boost to the recruitment of technical manpower (Fig-1).

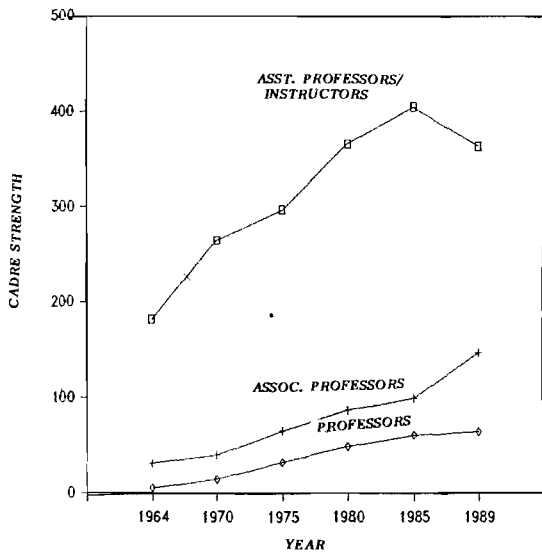


Fig.1: MANPOWER GROWTH IN TEACHING

The increase in research positions was mainly due to the implementation of All India Coordinated Research Projects from time to time and the National Agricultural Research Project (NARP) in 1979 and also the Plan and Non-Plan schemes. In addition to these projects, the increase in the number of research stations from 43 (1966) to 61 (1989) was due to the implementation of several ad-hoc research schemes financed by Government of India (GOI), and National agencies like Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research

(ICMR), National Institute of public Cooperation and Child Development (NIPCCD), Non-Conventional Energy Development Corporation of Andhra Pradesh (NEDCAP), etc., and International organisations like Food and Agricultural Organisation (FAO), United States Wheat Associates (USWA), International Development Research Centre (IDRC), International Foundation of Sciences (IFS), Ford Foundation etc., which have also contributed to the increase in manpower engaged in research (Fig.-2).

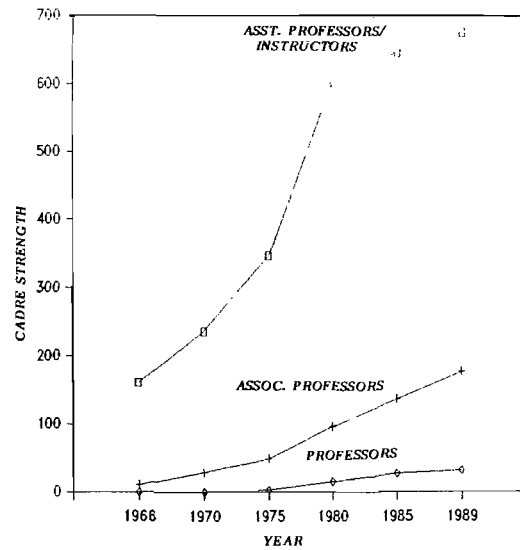


Fig.2: MANPOWER GROWTH IN RESEARCH

Due to the expansion of extension activities, there has been a steady growth in the manpower of Extension personnel in the University establishment of a printing press and Agricultural Information and Communication Centre (AI & CC), conversion of District Extension Programme into Extension Education Units at six Regional Agricultural Research Stations, establishment of three Krishi Vigyan Kendras and the implementation of SC & OBC Project at Palem. Master's and Doctoral programmes in Extension Education were also started. This increase in the extension activities led to an increase in

the extension personnel of the University (Fig.-3)

The expansion and diversification in Academic, Research and Extension Programmes of the University led to a considerable increase in the number of technical personnel. In support of this increased technical manpower, the number of non-technical posts also increased as seen from Table 3.

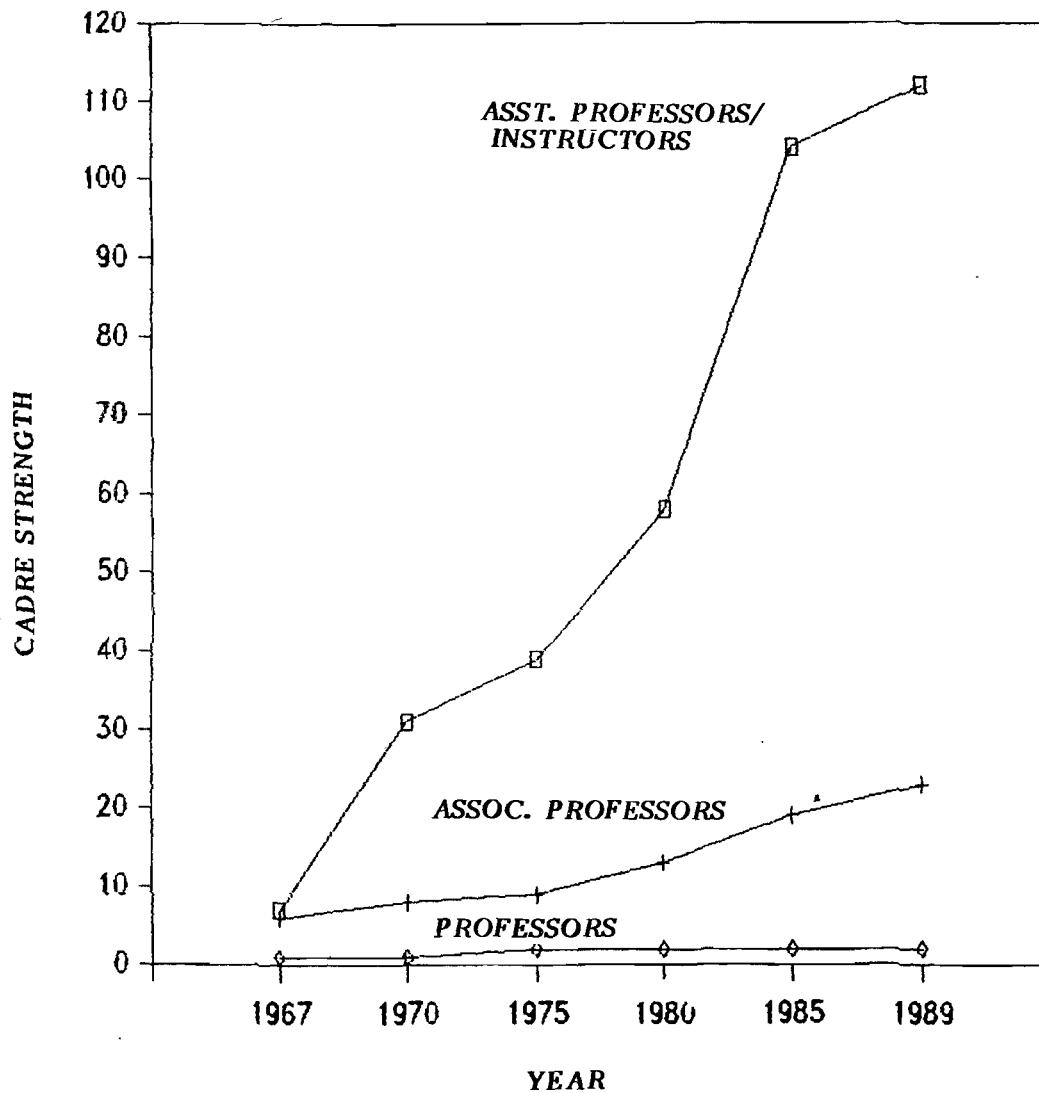


Fig.3: MANPOWER GROWTH IN EXTENSION

## FINANCIAL GROWTH

The University is a State supported institution with about 70 per cent of its finances being provided by the State exchequer.

The University under the auspices of the State Government receives funds for Non-Plan activities and also for the schemes sanctioned under the State Plan. The Non-plan funds are meant to meet the administrative costs of the University and the colleges, along with those of the Non-plan research schemes. The Non-plan grants are received through the 'Block Grants' which are quinquennially revised. The plan funds contribute to the developmental activities as well as specified schemes of the University including the State's share for the ICAR-funded Coordinate Projects.

Apart from the State Government, APAU also receives funds from ICAR, Govt. of India, and several other National and International agencies. In addition, the University receives substantial financial assistance from ICAR as developmental grants for educational institutions and also for implementing a number of Coordinated Projects and adhoc projects. The University also receives through ICAR, funds for the implementation of World Bank-aided National Agricultural Research Project. Consequently over the years, the University has been able to conduct research on crops, livestock and home science and also provide a sound infrastructure for colleges, hostels, libraries and high cost scientific equipment.

Some of the Extension activities of the University are financed by the Government of India. Finances are provided mainly for maintenance and the strengthening of the Extension Education Institute and its training programmes as also for some specified extension projects. The University periodically takes up **adhoc** research schemes financed by the State, National and International Agencies like the ICMR, NIPPCD, IFS, Ford Foundation, FAO, UNDP, IDRC, USWA etc. These grants are available for the schemes in operation only for a specified period. The University also undertakes paid up trials sponsored by certain industries manufacturing agricultural inputs like fertilisers, pesticides, fungicides, plant growth hormones etc.

A small percentage (7.9%) of the University's income comes through students's fees, rent from buildings and the sale of farm produce.

Apart from the expenditure towards the instructional, research, extension and developmental activities of the University, a considerable amount of the budget is spent on the large number of agricultural work force employed for the various University's programmes in operation all over the State.

Consequent to the diversifications and expansion in the teaching, research and the extension programmes of the University, the University, which at its inception in 1964-65 had a budget allocation of Rs.61.15 lakhs, increased it by almost 40 times to Rs.2607.91 lakhs in 1989-90 (Fig 4).

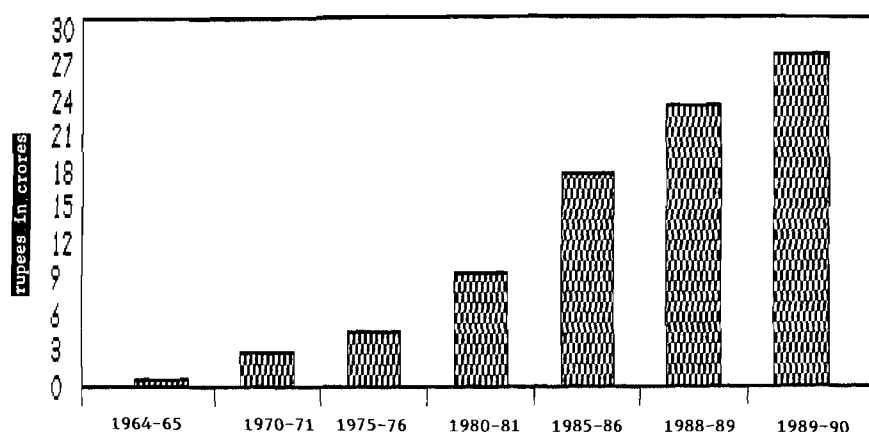


FIG. 4: YEARLY EXPENDITURE OF THE UNIVERSITY

Over the years, this increase in funds was mainly provided for by the increased allocations of the State Government and ICAR, and other agencies (Table 4).

Table 4: Source-wise Expenditure

Year	Rs.in lakhs				
	Non-Plan	State Plan	ICAR	Govt. of India	Other Agencies
1964-65	42.01	-	0.65	-	-
1970-71	131.52	48.46	52.22	1.00	0.33
1975-76	434.34	192.10	23.53	6.59	3.99
1980-81	536.60	74.30	254.10	12.60	10.30
1985-86	1001.47	151.35	391.03	22.97	17.01
1988-89	1617.47	207.00	247.47	22.67	39.00
1989-90*	1866.48	309.00	354.04	60.39	18.00

\* Budget Estimates only.

The State Government, which was contributing Rs. 42.00 lakhs in 1964-65 increased its financial support to about Rs.1825.00 lakhs in 1988-89. However, most of this increased allocation was used towards meeting the effects of inflation in the form of pay revisions, increased dearness allowances and labour wages. While the State Government fully meets the cost of expansion of staff, the construction costs are mainly borne

by ICAR.

The University incurs considerable expenditure in the discharge of its three main functions, viz: teaching, research and extension. However, over the years, keeping in view its main objective of increasing the agricultural production in the State through research, the allocations for research activities have tended to exceed those made for teaching and

extension (Fig 5). The share of expenditure on other items has also been increasing steadily due to higher pension payments, improved

staff welfare measures, increased number of deputations for higher studies and training etc.,

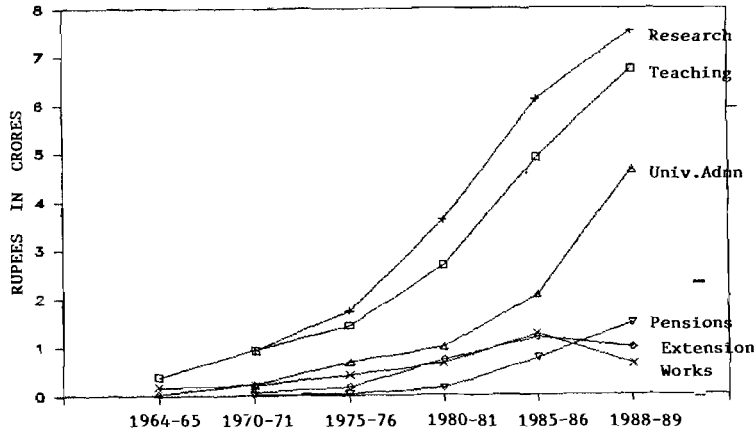
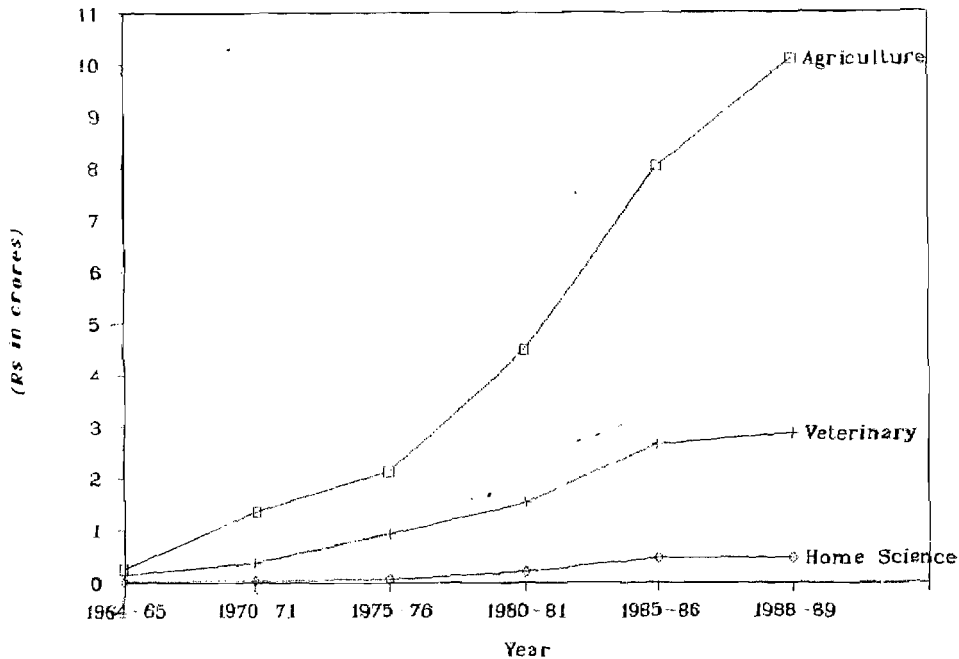


FIG. 5: FUNCTION-WISE EXPENDITURE OF THE UNIVERSITY

Over the years there has been an increase in the allocation of funds for all the three faculties, 40 times for Agriculture, 21 times for Veterinary, 49 times for the Home Science

Faculty (Fig 6). This increase is mainly due to the number of research schemes which have been taken up by each faculty.

FIG. 6: YEARLY FACULTY-WISE EXPENDITURE OF THE UNIVERSITY



While there has been an escalation in the cost of expansion of the staff positions,

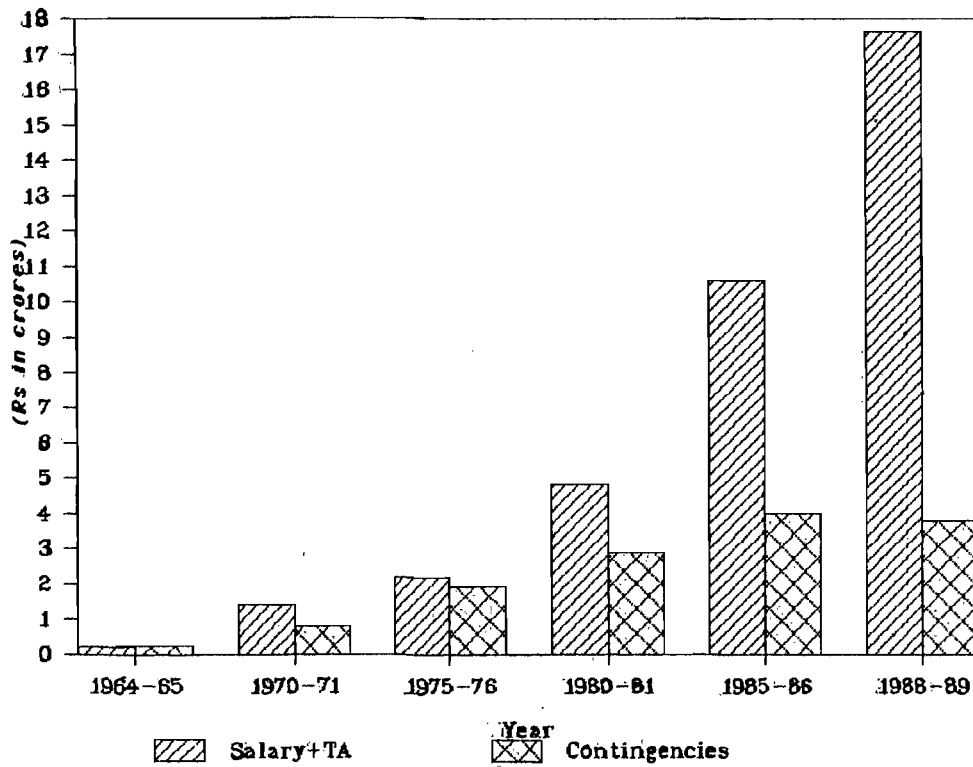
there has been no matching increase in the allocations for the contingent expenditure



(Fig 7). Increased allocation for the purchase of the latest equipment for laboratories and contingent recurring expenditure will facilitate optimal utilisation of technical manpower in the University.

tate optimal utilisation of technical manpower in the University.

**FIG. 7: ITEM-WISE EXPENDITURE OF THE UNIVERSITY**



## CHAPTER V

### BUILDING PROGRAMMES

The Andhra Pradesh Agricultural University had the privilege of having the foundation for its building programmes laid by the then Prime Minister of India, Smt. Indira Gandhi, on June 6, 1966.

The colleges at Bapatla and Tirupati had sufficient floor space in their various buildings at the time of their transfer to the University. Except for a small building for the College of Agriculture, there were no other buildings at the Rajendranagar campus. There after, buildings in the University came up in a phased manner. During the first 15 years of the University's development, emphasis was placed on the building programmes in teaching campuses. These buildings were constructed with assistance from the State Government, State Plan funds and ICAR. The College of Agriculture, Rajendranagar, had a prestigious new building complex together with hostels constructed during this period.

The Research stations, with meagre accommodation facilities at the time of their transfer to the university, received a fillip due to the implementation of the World Bank aided National Agricultural Research Project (NARP). Under NARP, office cum laboratory buildings, farmers' hostels, staff quarters and others were constructed at all the seven Regional Agricultural Research Stations. In addition, some research stations with improper accommodation facilities also

received financial assistance from NARP. Therefore, during the present decade the building growth could mainly be attributed to the implementation of NARP and also to the funds earmarked by ICAR and the State Government through State Plan funds.

The building accommodation for the new Home Science College at Bapatla (1983) and for the newly introduced undergraduate programmes namely, B.Tech. (Agrl.Engg.), B.Sc.(Dairy Tech.) and B.Sc.(Hort.) have also been completed.

During the later part of 80s, Government of India provided funds for the construction of buildings for three Krishi Vigyan Kendras and also for additional buildings for Extension Education Institute.

The cumulative plinth area of buildings is furnished from the inception of the university at interval of 5-year period in Table 5. The figures of 1964 and 1966 generally pertains to the buildings handed over by the Government. Sufficient accommodation for housing offices, class rooms, laboratories etc., is now available in the University. However, some research stations still require funds for expansion of their building infrastructure. Work on the building programmes of the newly started Agricultural Colleges at Aswaraopet and Naira (Srikakulam dist.) has been initiated.

**Table 5: Growth in Buildings**

**CUMULATIVE PLINTH AREA (1000 m<sup>2</sup>) OF THE UNIVERSITY BUILDINGS**

Particulars	Year						
	1964	1966	1970	1975	1980	1985	1989
1. Office buildings	0.96 (6)	3.75 (18)	5.25 (23)	6.58 (29)	7.31 (34)	8.52 (39)	8.85 (40)
2. Office cum Laboratories	—	0.85 (3)	1.70 (7)	3.10 (10)	3.44 (12)	6.64 (18)	8.30 (21)
3. Classrooms & Laboratories	7.54 (16)	7.68 (17)	32.38 (25)	40.48 (37)	48.51 (43)	50.33 (48)	53.58 (52)
4. Laboratories	1.02 (2)	5.80 (16)	9.64 (26)	12.90 (40)	13.77 (45)	15.65 (52)	16.33 (53)
5. Libraries	0.53 (1)	0.53 (1)	1.41 (2)	3.89 (4)	8.76 (5)	8.76 (5)	8.76 (5)
6. Hostel buildings	15.88 (20)	16.57 (23)	34.05 (36)	56.23 (46)	63.19 (54)	68.19 (63)	69.88 (67)
7. Quarters	4.18 (43)	25.13 (103)	27.29 (120)	30.03 (144)	32.98 (157)	43.51 (205)	44.93 (220)
8. Farm structures*	—	4.41 (8)	5.33 (15)	5.84 (20)	6.08 (22)	8.22 (31)	8.37 (34)
9. Farm sheds**	5.02 (18)	11.40 (41)	18.04 (69)	20.98 (114)	23.80 (125)	34.18 (136)	34.82 (142)
10. Stores	2.01 (12)	7.18 (33)	8.41 (36)	10.49 (45)	12.57 (54)	13.55 (64)	13.64 (66)
11. Workshops	0.41 (1)	2.28 (9)	2.28 (9)	2.28 (9)	3.84 (11)	3.94 (12)	3.94 (12)
<b>Total</b>	<b>37.55</b>	<b>85.88</b>	<b>145.78</b>	<b>192.8</b>	<b>224.06</b>	<b>261.49</b>	<b>271.4</b>

Figures in parenthesis indicate cumulative number of buildings

\* Farm structures includes threshing floors, green houses, glass houses, potculture houses weighing room etc.

\*\* Farm sheds include sheds for cattle, implements, tractors, drying, processing etc.

ORGANISATIONAL STRUCTURE OF TEACHING INSTITUTES IN ANDHRA PRADESH AGRICULTURAL UNIVERSITY

BOARD OF MANAGEMENT ---> VICE CHANCELLOR <--- ACADEMIC COUNCIL <--- FACULTY :-- Agriculture  
 REGISTRAR -----> :-- Veterinary  
 DEANS <-----> DIRECTOR OF EXTENSION :-- Home science  
 :-- P.G. Studies

Hostel --- :  
 Warden :  
 Physical Director : College  
 Director : Principals ----- DEANS OF STUDENT AFFAIRS ---> : <--- UNIVERSITY LIBRARIAN  
 RMOs of :  
 Health clinics :  
 -----

AGRICULTURE	VETERINARY SCIENCE	HOME SCIENCE	P.G. STUDIES
COLLEGE-----: COLLEGE-----: COLLEGE-----: COLLEGE-----:			
PRINCIPALS : PRINCIPALS : PRINCIPALS : PRINCIPALS :			
College Univ. Agri- College Univ. College Univ. College			
Heads Heads cultural Heads Heads Heads Heads			
of of Poly- of of of of			
Depts Depts technic Depts Depts Depts Depts			
Depts Depts			
Rajendranagar : : : : (15) : : : : Bapatla (15) : : : : (13) : : : : Tirupati (12) : : : : Aswarapet (15) : : : : Naira(Srikakulam) (15)	R'Nagar (6) Bapatla (6) Tirupati (16)	Hyderabad (6) Bapatla (6)	Agri- (9) culture (11) Veterinary (16) Science (16) Hyderabad (4) Tirupati (9)

Distances in kilometers indicated above within of Government

## TEACHING

### A. Teaching Programmes

Andhra Pradesh Agricultural University (APAU) was established with three teaching campuses at Rajendranagar, Bapatla and Tirupati and six constituent colleges under three faculties viz., Agriculture, Veterinary Sciences and Home Science. The constituent colleges situated in the different regions of Andhra Pradesh were established keeping in view the training needs of the geo-political regions concerned. These colleges initially were affiliated to the various traditional Universities in Andhra Pradesh and were later transferred to APAU. The second College of Home Science was started in 1983, at Bapatla bringing the total number of colleges to seven. With the increase in the demand for trained manpower and ever growing demand for admissions to professional courses, two more colleges of Agriculture were started from the academic year 1989, one at Aswaraopet in Khammam district and the other at Naira, Srikakulam district. In addition, an Agricultural Polytechnic has also been established at Palem, Mahboobnagar district for training middle level workers in agriculture and allied fields.

Prior to the transfer of these colleges to the University, the staff of the colleges of Agriculture and Veterinary Sciences, Hyderabad, were under the administrative control of Osmania University, whereas the agriculture colleges at Bapatla and Tirupati and Veterinary College at Tirupati were under the administrative control of the respective Departments of Government of Andhra Pradesh.

#### Organisational set up :

The University has three faculties, viz., Agriculture, Veterinary Science and Home

Science. Each faculty is headed by the respective Dean, to look after the academic programmes. In addition, there is a faculty of Post-graduate studies with a separate Dean to monitor the PG programming of all the three faculties. The Principals at college level are the administrative heads, assisted by the Heads of the Department. They collectively are responsible for the implementation of the teaching programmes.

Over the years, infrastructural facilities have been improved in the colleges so as to cater to their increasing needs. Apart from the regular teaching programmes in the colleges, the teachers of the colleges also act as advisors to the farmers. Consequently, diagnostic cells have been created with necessary infrastructure for suggesting suitable remedial measures for the disorders encountered by the farmers in the field crops in the vicinity of these colleges.

#### Degree Programmes :

Initially, the university offered three under graduate programmes, one in each faculty viz., B.Sc. (Ag.), B.V.Sc. & A.H. and B.Sc. (H.Sc.). Subsequently, in 1983, three more degree programmes, viz., B.Sc. (Hort.), B.Tech. (Ag.Engg.) and B.Sc. (Dairy Tech.) were added. Apart from the undergraduate programmes in the colleges, a number of post-graduate programmes were also started initially at Rajendranagar campus. The Post-graduate programmes in due course of time were extended to the other campuses and to several disciplines in the three faculties. In addition to teaching, the staff of the colleges were also involved with departmental research projects and ad-hoc schemes financed by several national and international agencies in operation in all the colleges. As a result, the concept of Departmental

research came into existence, and contributed to the development of new technologies in Agriculture, Animal Husbandry and Home Science. The number of undergraduate, post-graduate and doctoral teaching programmes offered in the three campuses are presented in Table 6.

Table 6 : Teaching Programmes of Andhra Pradesh Agricultural University

Year	No. of under-graduate programmes	Master's degree programmes				Ph.D. degree programmes		
		M.Sc. (Ag.)	M.Sc. (Hort.)	M.V.Sc.	M.Sc. (H.S.)	Agri-culture	Vety. Science	Home Science
1964	3	R (9)	-	-	-	-	-	-
1970	3	R (9) B (3) T (3)	-	R (6) T (7)	R (1)	-	-	-
1975	3	R (8) B (3) T (3)	-	R (6) T (8)	R (1)	R (1)	-	-
1980	3	R (9) B (5) T (4)	-	R (8) T (9)	R (3)	R (8)	R (2) T (3)	R (1)
1983	6	-	-	-	-	-	-	-
1985	6	R (9) B (9) T (9)	-	R (15) T (13)	R (4)	R (9)	R (6) T (7)	R (1)
1987	6	R (11) B (9) T (9)	R (1)	-	-	-	-	-
1988	6	R (11) B (9) T (9)	R (1)	R (15) T (14)	R (4)	R (9)	R (6) T (7)	R (1)

Note: Letter indicates the name of the campus i.e.: R: Rajendranagar, B: Bapatla, T : Tirupati. Figures in parenthesis indicate the number of disciplines offering the course.

### Educational system

A course credit system modelled after the pattern of US Land Grant Colleges was introduced replacing the traditional system of education. In this system, of which internal assessment was an integral part, teaching and evaluation were sequential operations undertaken by the same instructor. In this process it was ensured that (i) the objectives of the course were well defined, (ii) detailed course outlines giving the lectures and exercises to be done in each period were drawn, (iii) the course content was properly covered, (iv) different examinations such as quizzes, assignments, mid-term and final examinations were conducted according to schedule and (v) the corrected scripts were returned to the students and discussed to enable them to improve their performance subsequently.

The salient features of the system were (i) the academic year comprised of 3 trimesters of 12 weeks duration each, (ii) the subjects were restricted to specific units of study called courses which were completed in a trimester and (iii) the students were evaluated by assigning letter grades – A, B, C, D and F.

In the course of the implementation of the trimester system, several deficiencies and drawbacks were identified. The main drawbacks were the lack of sufficient time for the coverage of the syllabus and the inability of the students to cope with the number of examinations conducted in several courses during the trimester. Thus, the trimester system came in for a severe scrutiny mainly because of loss of several working days for examinations, trimester breaks, lack of complete coverage of course content by the teachers and poor comprehension of the subject by students. Hence the University switched over to semester system both at undergraduate (1970) and post-graduate levels (1972).

As the agricultural universities were concerned with the production oriented practical instructions under field conditions, there was

a need to provide opportunities for giving sufficient practical training to the students. This was achieved with ease in the traditional system wherein the students were sent for practical training for a full half a day for sufficient number of days per week giving them adequate field exposure. Similar efforts were also made to increase the practical component in the new system of education. In this direction, in addition to the Integrated Farm Practicals, selected crop production courses were also introduced in the final year for some years.

Subsequently, an innovative practical oriented programme called "The Rural Agricultural Work Experience Programme" to provide practical training to students about field conditions and problems, was introduced in 1979. This was a distinct academic innovation introduced by the University and came to be appreciated not only by ICAR but also by other agricultural universities. A workshop was also conducted on RAWEP programme at S.V. Agricultural College, Tirupati, in 1987 with participants from many agricultural universities in India. This unique programme provided opportunities for the under-graduates of agriculture, to live and work in villages during the final year of their study and to develop the right perspective about rural life and farming. A similar programme was also introduced in B.V.Sc. & A.H. in 1981, wherein the students undergo internship for a semester in a District Veterinary hospital.

Another landmark in the educational system of this university was the introduction of centralised question paper setting and evaluation for undergraduate courses for the semester final examinations. This overcame many of the deficiencies of the internal assessment system.

Further, the 4 point scale of grading was replaced by a 10-point scale, which eliminated the disadvantage of bunching in the letter grading and made the process of evaluation more objective and better defined.



Students participating in Rural Agricultural Work Experience Programme



### Under-graduate Programmes

In 1964, at the inception of the University, there was only one under-graduate programme per faculty viz., B.Sc.(Ag.), B.V.Sc. & A.H. and B.Sc. (H.Sc.). Over the years, several new programmes have been added.

The increasing population and growing awareness of people to the importance of fruits and vegetables in their diet led to a substantial increase in the area under horticultural crops. Consequently, to cater to this increased demand for trained persons, the Government of Andhra Pradesh established a separate Department of Horticulture. Keeping this in view, a special programme, B.Sc. (Hort.) was started at the College of Agriculture, Rajendranagar in 1983.

With increased mechanisation in the agricultural sector and the adoption of modern technology in water management, the need for agricultural engineers was felt. In order to meet these requirements, an under-graduate course, B.Tech. (Ag.Engg.) was started at the Agricultural College, Bapatla in 1983.

With the rapid expansion of the Dairy industry in the State and the country as a whole, there was a growing demand for B.Sc. (Dairy Tech.) graduates. Hence, a B.Sc. (Dairy Tech.) programme was started at College of Vety. Science, Tirupati in 1983.

The Government over the years has been

deputing inservice Village Development Officers for admission to B.Sc.(Ag.) course. Due to their insufficient educational background and a large time gap between the completion of studies and joining the B.Sc. (Ag.) course, they were unable to cope up with the academic standards of this University. Therefore, for the benefit of VDOs a pre- B.Sc.(Ag.) course programme of one year duration, was started during 1982, at the S.V. Agricultural College, Tirupati.

#### i) Admissions

Prior to taking over the colleges by the University the total intake of students of all the agricultural colleges was 320, Veterinary 140 and Home Science 60. In 1964-65 the intake capacity in agriculture faculty was increased to 440 and later to 550 in 1989. Admission capacity in Veterinary was raised to 160 in 1981-82. The intake capacity in Home Science was raised to 80 in 1979-80 and to 100 in 1982-83. With the establishment of a second college of Home Science at Bapatla, with an admission capacity of 30, the admission strength in the faculty increased to 140. Later, under-graduate degree programmes B.Sc.(Hort.), B.Tech. (Ag.Engg.) and B.Sc.(Dairy Tech.) were also added. The present admission strength in various under-graduate degree programmes are presented in Table 7.

**Table 7 : Admission to various Under-graduate Degree Programmes (1989)**

Programme	Admission Strength
B.Sc. (Ag.)	550
B.Sc. (Hort.)	32
B.Tech. (Ag.Engg.)	30
B.V.Sc. & A.H.	160
B.Sc. (Dairy Tech.)	21
B.Sc. (H.Sc.)	140

Before 1986-87, admission to under-graduate programmes was based on the marks obtained by the applicants in the qualifying examination i.e. Intermediate Examination. However from 1986-87, students were admitted to the under-graduate courses based on the rank obtained by them in the EAMCET (Engineering, Agriculture and Medical Common Entrance Test) conducted by the State Government. The admission to

the newly started Agricultural Polytechnic, with an admission strength of 50 is based on the marks obtained in 10th class.

ii) Out-turn

The number of students who successfully completed their degree programme since the inception of the university is furnished in Table 8.

**Table 8 : Student out-turn from Under-graduate Programmes**

	Number of students graduated (cumulative total)					
	1965-66*	1970	1975	1980	1985	1989
<b>a) Faculty of Agriculture</b>						
B.Sc. (Ag.)	407	1735	3124	4805	6543	7747
B.Sc. (Hort.)**	-	-	-	-	-	29
B.Tech. (Ag.Engg.)**	-	-	-	-	-	31
<b>b) Faculty of Vety. Science</b>						
B.V.Sc. & A.H.	147	731	1254	1857	2507	2903
B.Sc. (Dairy Tech.)**	-	-	-	-	-	21
<b>c) Faculty of Home Science</b>						
B.Sc. (H.Sc.)	26	155	307	560	866	1253

\* First Convocation; \*\* Started degree programmes only in 1983.

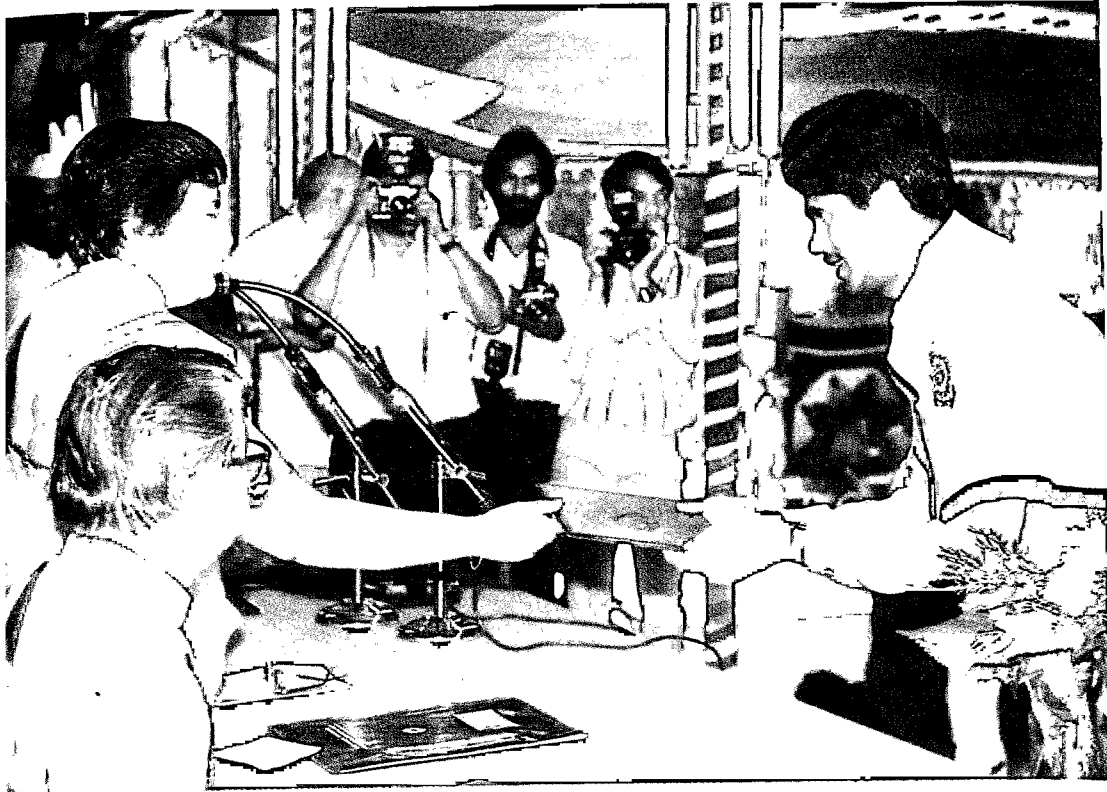
The students of these under-graduate programmes have been outstanding and many of them were able to secure seats for higher studies in prestigious National and International Institutions. Several students also entered the Indian Administrative Service, Indian Police Service, Indian Forest Service and other all India Services. Many others have also found placement in several International Organisations.

**Post-graduate Programmes**

At the time of transfer of the colleges to the University, Master's degree programme was available only in agriculture and confined to the College of Agriculture, Rajendranagar, with a limited number of 20

seats. Since the minimum qualification prescribed for the post of Asst. Professor was post-graduation in the subject concerned, the demand for admission to post-graduate programmes both from the staff and fresh students was on the increase. Hence, with the liberal assistance received from USAID, the laboratories were continually upgraded. Therefore, due to the increased pressure for admission to post-graduate programmes, and the availability of better laboratory facilities and competent staff, the intake into the PG programmes was increased and the programmes were diversified.

A significant event during the year 1964-65 was the appointment of an Inspection Commission of experts from outside the



Smt. Kumudben Joshi, Her Excellency the Governor of Andhra Pradesh & Chancellor APAU, at the Annual Convocation - 1989

university under the chairmanship of Late Dr.B.P. Pal, the then Director-General of ICAR to assess the possibilities of instituting Masters and Doctorate degree programmes in the six constituent colleges of the University. As a sequel to the Committee's recommendations, Ph.D. programmes in selected subjects were started in all the three faculties, from 1976, in the faculty of Agriculture and Veterinary Science and from 1978 in the faculty of Home Science. These programmes were later extended to other subjects in a

phased manner. Doctoral programmes are now available in nine departments in the faculty of Agriculture, in thirteendepartments in the faculty of Veterinary Science and in one department in the faculty of Home Science. In all, 38 seats are available for Ph.D. admissions under open category and another 34 are reserved for inservice candidates. The following table 9 gives the details of diversification and expansion of P.G. Programmes in the various faculties and campuses.

**Table 9 : Diversification and Expansion of Post-graduate Programmes**

Name of the discipline	Name of the Campus			
	Rajendranagar		Bapatla	Tirupati
	MSc.(Ag.)	Ph.D.	MSc.(Ag.)	M.Sc.(Ag.)
<b>a) Faculty of Agriculture</b>				
1. Agronomy	Prior to 1964	1978	1982	1970
2. Agrl. Botany*	"	1976	1968	1982
3. Soil Sc. & Agricultural Chemistry	"	1976	1970	1984
4. Agrl. Entomology	"	1976	1970	1982
5. Agrl. Economics	"	1982	1976	1984
6. Plant Physiology	"	1975	1982	1970
7. Plant Pathology	"	1976	1986	1968
8. Horticulture	"	1976	1984	1976
9. Extn. Education	1978	1978	1978	1986
10. Seed Technology	1987	-	-	-
11. Agrl. Statistics	1987	-	-	-
12. Soil and Water Management	-	-	1983	-
13. Plant protection	-	-	-	1984

Table 9 cont.,

Name of the discipline	Name of the Campus			
	Rajendranagar		Tirupati	
	M.V.Sc.	Ph.D.	M.V.Sc.	Ph.D.
<b>b) Faculty of Vety. Science</b>				
1. Anatomy	1968	1982	1986	-
2. Animal Science	1968	1977	1970	-
3. Animal Reproduction & Gynaecology	1984	-	1971	1977
4. Dairy Production	1966	-	1982	-
5. Dairy Technology	1978	-	-	-
6. Feed & Fodder Tech.	1984	1984	1985	-
7. Genetics & Animal Breeding	1978	1984	1985	-
8. Meat Science & Tech.	1984	-	1968	1983
9. Medicine	1982	-	1968	1984
10. Microbiology	1982	-	1967	1981
11. Parasitology	1984	-	1967	1977
12. Pathology	1984	-	1967	1976
13. Pharmacology	1968	-	-	-
14. Physiology	1969	1982	1977	-
15. Poultry	1967	1976	1982	-
16. Surgery	1983	-	1968	1982
	Hyderabad			
<b>c) Faculty of Home Science,</b>	M.Sc.(H.Sc.)	Ph.D.		
1. Child Development	1978	-		
2. Foods & Nutrition	1968	1978		
3. Home Management	1978	-		
4. Textiles & Clothing	1985	-		

\* Agricultural Botany was bifurcated into Genetics and Plant Breeding and Plant Physiology in 1978.

Note : Year indicates the year of starting of the programme.

i) Admissions

Upto 1978-79, admission to the Master's degree programmes was done on the basis of the marks obtained by students in the qualifying examination and a personal interview. Subsequently from 1979-80, an Entrance Test was introduced and admissions to Master's programme were made on the basis of the candidates performance in the Entrance Test and the qualifying examination.

Immediately after the University's taking over of the colleges, the admission strength to M.Sc.(Ag.) was

increased from 20 to 32 in 1964, 50 in 1965, 100 in 1967-68 and about 200 by 1982 in Agriculture. The Trimester system was followed till 1972-73 after which the semester system was adopted in all post-graduate programmes and 10 point scale of grading was adopted in place of 4 point scale. Post-graduate programmes were introduced in 1966 in Veterinary Science and Home Science during 1968 and were extended to more number of Departments in a phased manner. The following table (10) gives the admission capacity in the post-graduate programmes of the University.

Table 10: Admission Strength in Post-graduate Programmes

Degree	Year					
	1966	1970	1975	1980	1985	1989
M.Sc.(Ag.)	50	100	100	106	200	182 +20**
M.Sc.(Hort.)	-	-	-	-	-	7
M.V.Sc.	30	50	50	55	85 + 15*	85 + 10*
M.Sc.(H.Sc.)	-	8	10	16	22	24
Ph.D. (Agriculture)	-	-	2	20	22 + 22***	27 + 17***
Ph.D. (Vet. Science)	-	-	-	8	15 + 10***	9 + 16***
Ph.D. (Home Science)	-	-	-	4	1 + 2***	2 + 1***

\* For Inservice candidates nominated from the State Department of Animal Husbandry.

\*\* Seats of Inter-disciplinary courses, plant protection and soil and water management are reserved for inservice candidates of State Department of Agriculture.

\*\*\* Reserved for inservice candidates of the University.

ii) Out-turn

Since the inception of the University about 3400 post-graduate students have taken their masters degrees and 202 students the doctoral degrees (Table 11).

**Table 11: Out-turn of Post-graduate Students**

Degree	Cumulative total					
	1966	1970	1975	1980	1985	1989
M.Sc.(Ag.)	66	355	701	1238	1912	2429
M.V.Sc.	-	30	139	335	560	704
M.Sc.(H.Sc.)	-	-	22	70	204	272
Ph.D. (Agricultural)	-	-	-	-	68	132
Ph.D. (Vet. Science)	-	-	-	2	35	60
Ph.D. (Home Science)	-	-	-	-	5	10

**Agricultural Polytechnic**

To educate the rural youth in agriculture, specially those who are not in a position to afford collegiate education, a need to establish Agricultural Polytechnic, mostly for providing self employment was felt. In addition, there was a need to train manpower to serve as first level functionaries in various Government Departments and other agencies involved in agriculture and rural development. In view of this, it was decided to start the first Agricultural Polytechnic at RARS Palem, Mahboobnagar dist. offering a two year Diploma course in Agriculture. The Polytechnic with an intake capacity of 50 became functional in 1989-90.

**Teaching Campuses**

Andhra Pradesh Agricultural University has been conducting its academic programmes through seven constituent colleges, located in the five teaching campuses at Rajendranagar, Bapatla and Tirupati. The University now has five agricultural colleges, at Rajendranagar, Bapatla, Tirupati, Aswarapet and Naira, two colleges of Veterinary

Sciences at Rajendranagar and Tirupati and two colleges of Home Science at Hyderabad and Bapatla.

**i) AGRICULTURAL COLLEGES**

**a) College of Agriculture, Rajendranagar**

The College of Agriculture, Rajendranagar, established in 1945, was originally affiliated to Osmania University and on July 10, 1964, consequent upon the formation of Andhra Pradesh Agricultural University came under its purview. Its objectives were to impart education in the different branches of agriculture and allied avocations.

The college enjoyed the privilege of having eminent agricultural scientists as its Principals like Dr.Hussain Ali Razvi (1956-66), Prof. K. Bhaskaram (1966-71 and 1976-79), Dr. K.S.S. Suryanarayana (1971-75), Dr.B.H. Krishnamurthy Rao (1979-81), Sri I. Reddi Babu (1981-82), Dr.S. Mahboob Ali (1982-83), Dr.K.M. Azam (1983-85), Dr.M. Sugunakar Reddy (1985-88) and Dr.P.B. Parthasarathy (1988-continuing).

Apart from B.Sc.(Ag.) programme, B.Sc. (Hort.) was also introduced at this college in 1983. This was the only college which initially had post-graduate programmes in Agriculture.

## MANPOWER

The faculty strength of the college is presented in Table 12.

**Table 12 : Manpower growth, College of Agriculture, Rajendranagar**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
<b>College</b>						
Professor	1	4	6	14	15	15
Assoc.Professor	9	10	17	29	30	77
Asst. Professor/Instructor	50	54	59	86	89	38
Supporting Staff	70	80	86	93	93	93
<b>College Farm*</b>						
Asst. Professor/Instructor	3	3	4	4	4	4
Supporting Staff	7	8	12	12	12	12
Agril. Workmen	2	4	5	5	26	26

\* Including Botanical gardens.

## INFRASTRUCTURE

The College farms have been provided with necessary infrastructure facilities (Table 13) for imparting practical training to the under-graduate students and field facilities for the post-graduate research work.

**Table 13 : Infrastructure Facilities of the College Farm, College of Agriculture, Rajendranagar**

Particulars	Year					
	1964	1970	1975	1980	1985	1989
Total area (ha)	12.1	161.9	161.9	137.2	137.2	137.2
Cultivated area (ha)		112.4	112.4	61.8	61.8	61.8
Number of wells	1	13	14	14	13	13
Electrical motors	-	13	14	15	14	14
Office buildings	1	1	1	1	1	1
Store sheds/Motor sheds	1	1	3	4	4	4
Tractors	1	2	2	3	3	3
Bullock carts	1	2	2	3	3	3
Draft animals	18	38	40	59	26	21



## Out-turn

The details of the number of students who have taken their degrees under various degree programmes are furnished in Table 14.

Table 14: Out-turn of Students, College of Agriculture, Rajendranagar

Degree	Cumulative number of students passed					
	1966	1970	1975	1980	1985	1989
B.Sc.(Ag.)	178	582	1040	1802	2477	2905
B.Sc. (Hort.)*	-	-	-	-	-	29
M.Sc.(Ag.)	66	313	488	804	1197	1415
Ph.D.	-	-	-	-	68	132

\* Degree programme started in 1983 and the first batch students took degrees in 1988.

## RESEARCH ACHIEVEMENTS

In addition to teaching and departmental research, the staff members also involved in several research projects financed by National and International agencies. The following are the significant research achievements :

*Agronomy* : Weed Management practices were developed for different crops under PL 480 scheme.

*Genetics and Plant Breeding* : APSH-11 a Sunflower hybrid was released for cultivation in Andhra Pradesh during 1986. The hybrid was developed under the ICAR sponsored Ad-hoc research project. "Heterosis Breeding in Sunflower through the use of male sterile lines". Twenty seven new male sterile lines were developed by crossing 3 sources of male sterile lines viz., 1A, 20A, and 24A.

Facilities for undertaking research on Tissue culture were provided by establishing a Tissue culture Laboratory in 1985. Techniques for rose propagation relevant for commercial propagation of roses were standardized. Tissue culture techniques were also

standardized for regeneration of rice plants from calli of seeds and embryos of three rice cultivars. Nearly 60% of the regenerated plantlets survived when transferred to the field after hardening and had normal flowering and seed set. In chickpea, techniques for rescuing the hybrid embryos from inter-specific crosses were standardized.

*Soil Science and Agricultural Chemistry* : Technology for overcoming the effects of crust formation in soils was developed. The use of slag obtained from ferromagnesium industry in correcting soil acidity was also demonstrated.

The sulphur status of soils of groundnut growing areas of Andhra Pradesh has been studied. The transformation of major nutrients and their availability to crops under different farming systems have been investigated.

*Agricultural Economics* : The studies conducted through adaptive research project revealed profitability of different crops and crop sequences under existing conditions of farm product prices. Further, the studies also brought out the need for changes in the

cropping pattern based on economic feasibility and agronomic practicability.

The results obtained from the studies on increasing income and employment through optimal farm planning indicated the profitability of high yielding varieties and hybrids over other varieties.

*Horticulture* : Spraying 200 ppm ethrel and 1% KNO<sub>3</sub> in the off year induced flowering in mango and overcame alternate bearing. Ura-cil 50 ppm, sprayed 30-40 days after summer pruning, improved bud fertility in Anab-e-Shahi grapes.

Storage life of mango, banana and citrus was found to increase by treating with 6% emulsion either alone or in combination with 2, 4-D or 2, 4, 5-T. Ripening could be hastened in mango, banana and sapota fruits by treating with 1000-1500 ppm. ethrel.

Spraying 100 ppm NAA twice at fortnightly intervals from peanut size stage prevented fruit drop in mango. In Thompson seedless grapes use of Gibberellic Acid (GA) @ 50 ppm at fruit set stage was found to be beneficial in increasing the size of berries.

Nutritional requirement of vegetable crops like tomato, brinjal, chillies, *okra*, french beans, peas and potato was worked out. Pre-inoculation of mycorrhiza to the seedlings of chillies and seeds of *okra* and cluster beans was found to reduce the phosphorus requirements of these crops and increase the yield.

A brinjal variety Bhagyamathi and a *bhendi*, variety, Janardhan, were released.

*Biochemistry* : Shelf life of mango fruits was extended from 11 to 46 days by storing them under hypobaric conditions (6.6 k Pa pressure, 13°C temperature and one air exchange every two hours).

*Microbiology* : The bio-chemistry of host-

rhizobial interactions with reference to the kinetics of absorption and micro-nutrient requirements of nodulating and non-nodulating groundnut species was studied. The efficiency of different strains of rhizobia was evaluated with different cultivars of groundnut.

Efficient cultures of micro-organisms for the production of biogas from agricultural wastes like de-oiled cakes, cotton wastes etc., were developed.

#### b) Agricultural College, Bapatla

The college, which was initially affiliated to Andhra University became a constituent college of APAU in July, 1964. The objective of establishing the college was to meet the trained manpower requirements of Andhra region but after the establishment of S.V. Agricultural College, Tirupati it catered only to the needs of the Coastal Andhra Region. The successive principals of this college from the inception of the University are : Dr.B. Appala Naidu (1960-67), Sri P. Govinda Rao (1968-70), Dr.A.Adivi Reddy (1970-71), Dr.S.N. Rao (1971-75), Dr.R.L. Narasimham (1975-78), Dr. S. Mahboob Ali (1978), Dr.T.D.J. Nagabhushanam (1978-80), Dr.M.V. Reddi (1980-83), Dr.M. Sugunakar Reddy (1983-84), Dr.K.A. Balasubramanian (1984-86), Dr.A. Narayanan (1986-89) and Dr.G. Madhusudana Rao (1989 - continuing).

In addition to the existing B.Sc.(Ag.) programme at this college an under-graduate programme in B.Tech. (Ag.Engg.) was introduced in 1983. The post-graduate programmes in agriculture were started from 1970 in selected departments and were later extended to most other departments also.

#### MANPOWER

The manpower growth of the college and the college farm is presented in Table 15.

**Table 15: Manpower growth, Agricultural College, Bapatla**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
<b>College</b>						
Professor	1	1	4	5	10	10
Assoc.Professor	4	5	8	10	10	10
Asst. Professor/Instructor	12	75	75	78	78	78
Supporting Staff	86	121	138	141	162	164
Agril. Workmen	-	-	-	-	94	94
<b>College Farm*</b>						
Assoc.Professor	-	-	-	-	-	1
Asst. Professor/Instructor	1	1	6	6	4	6
Supporting Staff	3	3	15	13	13	13
Agril. Workmen	-	-	-	-	61	61

\* Including Botanical gardens.

## INFRASTRUCTURE

The increase in the infrastructural facilities of the College Farm are presented in Table 16.

**Table 16 : Infrastructure Facilities of the College Farm, Agricultural College, Bapatla**

Particulars	Year					
	1964	1970	1975	1980	1985	1989
Area (ha)	55.72	55.72	55.72	55.72	55.72	55.72
Cultivated area (ha)	55.72	55.72	45.16	52.98	62.98	52.98
Number of wells	1	1	8	10	10	11
Electrical motors	1	1	8	11	11	11
Office buildings	8	8	9	10	10	10
Store sheds	5	5	15	15	15	15
Tractors	-	-	3	2	1	1
Bullock carts	1	1	4	4	2	2
Draft animals	1	1	1	13	5	5

## Out-turn

The out-turn of students who have completed their degree requirement under the various degree programmes are furnished in Table 17.

Table 17: Out-turn of Students, Agricultural College, Bapatla

Degree	Year					
	1965	1970	1975	1980	1985	1989
B.Sc.(Ag.)	125	678	1290	1882	2569	3066
B.Tech.(Ag.Engg.)*	-	-	-	-	-	31
M.Sc.(Ag.)	-	30	97	209	353	516

\* Programme started in 1983.

## RESEARCH ACHIEVEMENTS

### *Genetics and Plant Breeding :*

Studies on heterosis in rice was undertaken to identify the best suitable male sterile and maintainer lines and six sets of A and B lines. The male sterile lines IR 48483A, IR 46830A, IR 46827A and U 41A and the corresponding B lines were found to be suitable for Bapatla region.

Among the cytoplasmic male sterile lines, IR 46830A was found to be the best combiner closely followed by U 41A. Among the restorer lines, IR 54 was the best combiner closely followed by IR 50.

The hybrid combination IR 46827 A x IR 54 gave maximum grain yield of 7 tonnes per hectare. The magnitude of heterosis recorded in the cross indicates the economic feasibility of hybrid rice cultivation, augmenting the high cost of hybrid seed production.

A super fine rice variety, BPT 5204 was evolved at Agricultural College, Bapatla. This variety has been released and has become popular even in the neighbouring states.

### *Soil Science and Agricultural Chemistry :*

A large number of soil samples received from farmers were analysed for Fe, Mn, Zn and Cu and suitable remedial measures were suggested for deficiencies noted. Studies on the persistence of aldicarb indicated that the pesticide applied to soil continued to be absorbed by tomato for 14 days following its application. It was found to be present in leaves upto 44 days, in fruits upto 34 days and in the soil it could not be traced after 74th day after application.

The sulphate sulphur content of soils of Telugu Ganga Project area of Chittoor district was below the critical limit (10 ppm). Groundnut or any other leguminous crop was found to respond to sulphur application in these soils.

### *Plant Physiology :*

Hybrid seed production practices of cotton were verified and new production practices were worked out. These new techniques of hybrid seed production in cotton were adopted by the Seed Certification Agencies and Seed producers.

c) S.V. Agricultural College, Tirupati

Sri Venkateswara Agricultural College, Tirupati, was established in 1961 under Sri Venkateswara University and was transferred to APAU in 1964. The major objective of the institution was to impart training in agriculture to the under-graduate students of the faculty of Agriculture. Subsequently post-graduate programmes were also introduced.

The successive principals of the college

are Sri C. Krishna Murthy (1962-68), Prof.G.H. Sankara Reddi (1968-72, 1973-75 and 1978-79), Prof. K. Bhaskaram (1972-73), Dr.S.N. Rao (1975-78), Dr.J. Subbayya (1980-82), Prof. I. Reddi Babu (1982-83), Dr.M. Rama Rao (1983-86), Dr.K. Jayarama Reddy (1986-89) and Dr.C. Raja Reddy (1989 - continuing).

**MANPOWER**

The manpower growth of the college is presented in Table 18.

**Table 18: Manpower growth, S.V. Agricultural College, Tirupati**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
<b>College</b>						
Professor	1	2	4	4	7	7
Assoc.Professor	-	-	6	8	11	11
Asst. Professor/Instructor	40	45	51	52	61	61
Supporting Staff	15	80	107	108	119	121
Agril. Workmen	-	-	-	18	18	22
<b>College Farm*</b>						
Asst. Professor/Instructor	5	5	5	5	5	5
Supporting Staff	8	8	8	8	7	6
Agril. Workmen	-	8	15	17	18	18

\* Including Botanical Gardens.

**INFRASTRUCTURE**

The expansion of the infrastructural facilities of College farm at Tirupati is presented in Table 19.

**Table 19 : Infrastructure Facilities of the College Farm, S.V.Agricultural College, Tirupati**

Particulars	Year					
	1964	1970	1975	1980	1985	1989
Cultivated area (ha.)	34.7	46.9	49.7	61.9	61.9	61.9
Irrigated area (ha.)	5.0	8.0	8.0	9.2	9.2	9.2
Number of wells	6	7	7	7	7	7
Electrical motors	1	5	5	2	3	3
Office buildings	2	2	2	2	2	2
Store sheds	6	-	1	2	2	2
Tractors	1	2	1	3	3	3
Bullock carts	1	2	4	-	-	-
Draft animals	2	2	2	4	3	3

## Out-turn

The number of students who have obtained their degrees in under-graduate and post-graduate programmes are furnished in Table 20.

**Table 20 : Out-Turn of Students, S. V. Agricultural College, Tirupati**

Degree	Year					
	1965	1970	1975	1980	1985	1989
B. Sc. (Ag.)	104	475	794	1121	1497	1778
M. Sc. (Ag.)	-	12	116	225	362	498

### ii) Veterinary Colleges :

#### a) College of Veterinary Science, Rajendranagar:

The College of Veterinary Science established in 1946, was affiliated to Osmania University till 1963. Consequent to the establishment of the A.P. Agricultural University in 1964, the college was transferred to the University. Its objectives were to impart veterinary education and award under-graduate and post-graduate degrees in Veterinary and Animal Husbandry Sciences, and also to initiate research and extension activities on problems relevant to the farmers in the re-

gion. Masters degree programme in some departments was introduced in 1968 and from 1976 Doctoral degree programmes have been introduced.

The distinguished scientists who serve as Principals of this college since 1964 are: Dr. V.N. Pargoankar (1964-75), Dr. C.V. Reddy (1975-76), Dr. D. Venkayya (1978-82), Dr. R.R. Reddy (1982-84), Dr. U.B. Singh (1984-86), Dr. G.V. Raghavan (1986-88) and Dr. V. Jayaramakrishna (1988-continuing).

#### MANPOWER

The Staff strength is presented in Table 21.

**Table : 21 Manpower growth, College of Veterinary Science, Rajendranagar**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
Professor	-	3	8	9	9	9
Assoc. Professor	9	9	16	20	20	20
Asst. Professor/Instructor	34	48	58	58	69	69
Supporting staff	227	227	227	232	239	249
Agril. Workmen	-	-	-	33	33	33

## Out-turn

Table 22 Provides the data on the out-turn of students at the College.

Table 22: Out-turn of Students, College of Veterinary Science, Rajendranagar

Degree	Year					
	1965	1970	1975	1980	1985	1989
B.V. Sc & A.H	57	278	491	783	1098	1255
M.V. Sc.	-	14	78	197	336	422
Ph. D	-	-	-	2	12	31

## Research Achievements

### *Dairy Production*

Norms of economic traits of buffaloes, production and reproductive traits of all cattle and buffaloes including cross-bred cattle of Andhra Pradesh have been analysed.

Utility value of deoiled sal seed, subabul leaf feeding in buffaloes and cross breeds, poultry litter waste in the concentrate mixture of milch animals was established.

In a study of systems of dairy farming, it was found that mixed farming system yielded 25 per cent additional income over and above that from arable and specialised farming systems.

### *Dairy Technology*

New product technology on cheese, *chenna* and *gulab jamun* were successfully established.

### *Animal Nutrition*

The findings from a study entitled "Economics of buffaloes beef production", indicated that the average daily gains increased with the increase in proportion of the concentrates in the ration from 0 to 25 per cent and also in the level of intake from 85 to

115% NRC levels. Less feed was consumed per kilogram gain in animals receiving highest concentrate level (25% concentrate) at different levels, better efficiency was seen among animals fed 85 to 100% NRC level. Thus buffaloes could be raised more economically for meat production (slaughtered at 300 kg body weight) on a ration consisting of 25% concentrates + 75% roughages as per NRC standards.

From a study entitled "Nutritional requirements of indigenous breeds of sheep in Andhra Pradesh", it was concluded that 14% crude protein and 58% TDN in the ration was the optimum requirement for both Nellore and Deccani breeds of sheep between body weights of 15 and 25 kg. ICAR considered these findings while formulating the nutritional requirements of sheep.

### *Feed and Fodder Technology*

A non-cereal based low cost complete diet for ruminants using different crop residues like cotton straw, sunflower straw, mixed grass hay, sorghum straw, maize cobs, groundnut hulls, cotton seed hulls etc., as roughage source was developed. Agricultural by-products and industrial waste materials like castor bean meal, poultry droppings, molasses sludge etc., were incorporated into poultry rations.

### Genetics and Animal Breeding

A number of rabbits of Newzealand White, Grey Gaint, Chinchilla and Angora breeds were supplied as breeder stock to the rabbit farmers for starting the rabbit farms.

### Meat Science and Technology

Norms for testing the quality of meat and meat products were developed.

### Poultry Science

Experiments on determination of protein and energy requirements of White leghorn cage layers indicated that a dietary protein level of 16 per cent with an energy level of 2550 K cal Me/kg was optimum. These findings were subsequently adopted by ISI in their specifications for poultry rations.

In experiments conducted using three housing systems viz., deep litter cages and flat floor it was found that cage house was the best.

Studies on protein and energy requirements of *Khaki* campbell ducks indicated that the requirements of protein and energy (ME) for *khaki* Campbell ducks for starter ducklings ranged from 14 to 16% for protein and were not more than 2600 K cal ME/kg diet. In the case of layer ducks, it was found that the protein requirment for optimum egg production ranged from 2300 to 2600 K cal ME/kg.

Work on *ambadi* (*mestha*) cake showed

that the cake could safely replace the groundnut cake in all types of chicken rations.

### b) College of Veterinary Science, Tirupathi

The College of Veterinary Science, Tirupathi established in 1955 was affiliated to the Sri Venkateswara University. The college was transferred to the Andhra Pradesh Agricultural University in 1964 as a constituent College of the Univesity.

The College was started to train veterinarians to man the various jobs in the Department of Animal Husbandry, State Dairy Co-operative Federation, State Meat and Poultry Corporation and Public and Private Institutions dealing with livestock and their products. The second important aim of establishing the college was the training of Post-graduates in Veterinary Science to man the teaching and research posts. In addition to its regular B.V.Sc. & A.H. programme, this college also started an under-graduate programme in B.Sc. (Diary Tech.) in 1983.

The successive principals from the inception of the university are Dr. P.S. Rajulu (1960-73), Dr. Ganti A. Sastry (1973-75), Dr. V.N. Paragoankar (1975-78), Dr. Ganti A. Sásty (1978-79), Dr. K. Satyanarayana Rao (1979-81), Dr. A. Ramamohana Rao (1981-83), Dr. D. Anjaneya Prasad (1983-85), Dr. B. Venkateswara Rao (1985-88), and Dr. P. Varadarajulu (1988-continuing).

### MANPOWER

The manpower growth is indicated in Table. 23.

Table 23 : Manpower growth, College of Veterinary Science, Tirupati

Cadre	Year					
	1964	1970	1975	1980	1985	1989
Professor	1	2	8	12	13	16
Assoc. Professor	7	12	12	11	16	16
Asst. Professor/Instructor	24	19	20	44	68	68
Supporting staff	91	118	147	151	158	167
Agril. Workmen	-	-	-	-	37	37



The details of the livestock are furnished in Table. 24.

**Table 24: Livestock Farm, College of Veterinary Science, Tirupathi**

Particulars	Year					
	1964	1970	1975	1980	1985	1989
Working cattle	60	50	55	45	63	56
Buffaloes	62	62	60	-	-	8
Milch animals	80	50	41	25	21	32
Sheep & goats	-	-	-	95	50	46

#### Out-turn

The following Table (25) shows the out turn of students at College of Veterinary Science, Tirupathi.

**Table : 25 Out -turn of Students, College of Veterinary Science, Tirupathi**

Degree	Year					
	1964	1970	1975	1980	1985	1989
B.V.Sc. & A.H.	90	453	763	1074	1409	1648
B.Sc. (Diary Tech.)*	-	-	-	-	-	21
M.V.Sc.	-	16	61	128	224	282
Ph. D.	-	-	-	-	23	29

\* First batch of 12 students obtained their degrees in 1988.

#### RESEARCH ACHIEVEMENTS

##### *Veterinary Medicine*

##### *Animal Nutrition*

Several slow release urea products such as Salurea-50 and Salurea-70 were developed using S-100 model and Salurea-90 using S-40L cooker extruder using *salseed* meal and urea as an alternative to conventional vegetable protein supplements for ruminants.

It was found that the use of nivaquine in combination with supportive therapy using haematinics orally was found to be effective in controlling theicerciasis in crossbred and indigenous cattle.

##### *Microbiology*

Treatment of eggs in the a water bath at 55°C for 15 minutes was found useful to preserve the eggs.

##### *Feed and Fodder Technology*

Sugarcane top silages with 1.5% urea incorporated into concentrate mixtures in the ratio of 50 : 50 were found to be optimum for buffalo calves.

In a study on the protective antigens of *Bacillus antrasis* immunity trails indicated that toxins without Freund's antigen could delay death since they could not withstand

the second challenge after the lapse of 25 days. This toxin without the adjuvant could protect only for short period of 25 days.

#### *Parasitology*

Mapping of important helminthic infections of domestic animals in Andhra Pradesh was done.

#### *Pharmacology*

The artificial induction of lactation with synthetic estrogen, progesterone reserpine followed by dexamithosone resulted in satisfactory milk yield without any adverse effect on reproduction of heifers or cows.

The studies on comparative efficacy of some indigenous anthelmintics against *Ascardia galli* infections in chicken revealed that *Butea frondosa*, *Aristolochia bracteata* and *Caria papaya* seeds are effective against *Ascardia galli* by 71.25, 70.83 and 41.67% in comparison to piperazine hydrochloride. The cyproheptadine administered orally against *Ascardia galli* in chicken, at a dose of 4 mg/kg per day showed 100, 39.6, 51.47, 65.18 and 92.85% efficacy on 7, 12, 19, 25 and 39 days of post infection respectively.

#### *Physiology*

Prostaglandins treatment to the extended liquid or frozen semen enhanced the livability, mobility and fertility of murrh buffaloe sperm.

#### *Poultry Science*

In a study on utilisation of bajra (*Penisetum typhoides*) for growth in broilers, it was found that the weight gain and feed intake were significantly higher on bajra diet than on maize diets. Efficiency of feed utilisation remained unaffected with the source of grain.

#### *Surgery and Radiology*

An integrated circuit electroanaesthe-

siatic apparatus was designed and fabricated. The equipment was capable of producing sine, square and triangular wave forms with alternating current. The frequency was fixed at 700 Hertz with variable electromotive force (emf) and milliamperage. Sine wave group of animals consumed maximum current with minimum emf. Sine wave current produced desirable depth of anaesthesia to permit orthopaedic and thoracic surgery while moderate pain sensation was noticed during electro-anaesthesia produced by either square or triangular wave currents.

The effects of acupuncture anaesthesia on physiological, biochemical and haemodynamic parameters were studied on the experimental buffalo calves. A therapeutic acupuncture regimen was also developed.

In studies on embryo transfer in cows, surgical collection of embryos were done through mid-ventral laparotomy. Cannulation of oviduct with polyethylene tube was found to be easy. Flushing of the horn from fimbria towards uterus was observed to be easy. Surgical collection was found to be associated with certain draw backs, such as, adhesions between fimbria, fallopian tubes, ovaries and horns. Non-surgical embryo collection and transfer was accomplished with the help of Foley (balloon type) catheter for flushing and it was injected into recipient with the help of artificial insemination gun. The gun was passed into the uterine horn ipsilateral to the ovary containing corpus luteum. The embryos were deposited into middle of the horn. The cows became pregnant, out of which one cow aborted 90 days later. The other cow gave birth to a male calf at 296 days of gestation.

#### iii) HOME SCIENCE COLLEGES

##### a) College of Home Science, Hyderabad

This college was affiliated to Osmania University, and was under the control of the

Department of Technical Education till 1964. Subsequent to its transfer to APAU, the defined objectives of the college were to provide education to girls which impart skills for proper management and utilization of resources, to extend the research knowledge to rural homes and to conduct various research programmes in the areas of Home Science.

The college has been fortunate in having several eminent Home Scientists from the country as its principals. They are : Dr (Mrs) G.V. Subaima (1966-72), Mrs. T.C. Kamala (1972-73), Dr. (Mrs) P. Pushpamma (1974-82), Dr. (Mrs) P. Geervani (1982-84), Dr. (Mrs) K.

Chittemma Rao (1984-86), Dr. (Mrs) R. Vatsala (1986-89) and Dr. (Mrs) K. Chittemma Rao (1989-continuing)

Until the establishment of an additional college of Home Science at Bapatla in 1983, this college alone was carrying out the under graduate, post-graduate and doctoral programmes in Home Science. The Foods and Nutrition department of this college has been recognised as a centre of excellence for Foods and Nutrition in India. It also started a Nutrition and Diet Counselling and Resource Centre for therapeutic diet counselling, the only one of its kind in the entire State.

#### MANPOWER

The staff strength is presented in Table 26.

**Table 26: Manpower growth , College of Home Science, Hyderabad**

Cadre	Year					
	1964	1970	1975	1980	1985	1989
Professor	1	2	2	4	5	5
Assoc.Professor	2	4	6	8	8	8
Asst. Professor/Instructor	12	14	18	21	21	21
Supporting staff	34	41	46	48	52	52

#### Out turn

The out-turn of students from College of Home Science, Hyderabad from 1965 to 1989 is furnished in Table 27.

**Table 27: Out-turn of Students, College of Home Science, Hyderabad**

Degree	Year					
	1965	1970	1975	1980	1985	1989
B.Sc. (H.Sc.)	26	155	307	560	866	1186
M.Sc. (H.Sc.)	-	-	22	70	204	272
Ph.D.	-	-	-	-	5	10

## Research Achievements

Research carried out by the faculty of Home Science has been need based as most of the results have been found to be of use in planning and implementing several developmental programmes by the State Government Departments and other Institutions.

The major research achievements of the Home Science faculty are :

### *Foods and Nutrition*

Simple, practicable and effective methods developed for storing grains have been adopted widely by the farm families. Several varieties of cereals, millets, legumes, spices, fruits and vegetables developed in research stations situated in the seven agro-climatic zones of the State of Andhra Pradesh were analysed for their nutrient composition. Antinutritional factors and the nutritive value of some non-conventional foods was also studied.

A Dehuller to process sorghum and other millets and legumes at household level was introduced for the first time in the country. Experimental studies on its feasibility at several locations and the nutritional quality of the dehulled grain contributed valuable information. As a result, a great demand for this technology was generated which led to the production of a prototype by the Andhra Pradesh Agro-Industries Development Corporation.

Nutrition education material suitable for incorporation into the school curriculum and non-formal education was developed, tested and printed. This information is readily available in respective departments for use.

Low cost weaning mixes developed by the department of Foods and Nutrition have been adopted by the Department of Civil Supplies, Government of Andhra Pradesh, for distribution in rural areas.

### *Family Resource Management*

This department undertook research in various areas like housing, management of home, household economics and energy management. The salient findings are as follows :

An improved smokeless *Chula* was introduced in the villages and is being widely used.

Experiments on different *sigries* using charcoal, *sicco* and *badamcol* showed that there was a difference in the combustion behaviour of different fuels in different *sigries*. Of the kerosene stoves tested in the Department, Nutan stove had a high thermal efficiency of 63.49%.

A comparison between the two substrates viz: castor cake and neem cake with willow dust indicated that castor cake produced more bio-gas (156.0 litres/day) than neem cake combination (126.2 litres/day) but the thermal efficiency of a Mecker burner using neem cake was more (51.8%) as compared to castor cake (47.6%).

The field introduction of the three types of solar cookers viz: Suryakund, Flat box type and Sunbasket showed that home makers belonging to different income levels, family size, educational status and age groups were willing to use these cookers. A majority of rural home makers preferred flat box cooker to Suryakund whereas both cookers were preferred in the urban areas. Families spending more income on fuels showed interest in using the solar cookers. The cookers were useful in cooking steamed, boiled and baked foods.

A low cost earthenware domestic water filter was designed and developed. Clay and sand were the two locally available materials used for making the filter. The filter candles too were made with the same materials. The filtered water was free from

*Escherichia coli* and had the average filtration rate of 1000 ml/hour which was comparable to the commercial filter. The filter could be made for Rs. 15-20/- in the village and for Rs. 30/- in cities.

#### *Textiles and Clothing*

Vegetable dyes for *kalamkari* printing were developed and assessed for their colour fastness. Blue dye (*Indigofera*) had best colour fastness followed by orange (*Bin arellana*), garnet and lavender dyes (*Caesalpinia*).

Use of polynesian rayon yarns as a substituted for the silk yarns in weft direction of traditional Dharmavarm silk saree was economical and did not affect the aesthetic and serviceability characteristics of the fabric.

Study on the effect of using mercerised yarn in traditional Venkatagiri saree revealed that such sarees had better visual characteristics than unmercerised sarees when unlaundered and also at different levels of laundering.

A study on evolving and testing a suitable disposable diaper for Indian babies using an indigenous absorbent showed a favourable preference for the developed diapers to the commercial ones. The indigenous diaper compared well in performance to the commercial diaper at a lower cost.

#### *Human Development and Family Studies*

A positive association was found between socio-economic status, parents' education level and immunisation, but no association could be found between immunisation and socio economic status.

Studies on early childhood education showed that children from progressive

schools were better than their counterparts from less progressive schools, in productive thinking, reasoning, recall capacity and had a more positive attitude towards school.

#### **b) College of Home Science, Bapatla**

This was the first college in the university which was established after the university's formation. The college was established in 1983 with the objective of encouraging girls from rural areas of Coastal Andhra Pradesh to acquire knowledge in Home Science.

Dr (Mrs) Vijayakhader was its first Principal (1983-87) with a reappointment in 1989. Dr.(Mrs) K. Chittemma Rao worked as the Principal from 1987 to 1989.

#### **Manpower**

The manpower is presented in Table 28.

**Table 28: Manpower growth, College of Home Science, Bapatla**

Cadre	Year	
	1985	1989
Professor	1	2
Assoc.Professor	4	4
Asst. Professor/Instructor	5	13
Supporting staff	17	18

The college had a spacious newly constructed building for accommodating all the laboratories and class-rooms and office. Construction of hostel building is in progress.

#### **Out turn**

Table 29 gives the out-turn of students from the college of Home Science, Bapatla.



Hon'ble Chief Minister of Andhra Pradesh Sri N.T. Rama Rao  
at the foundation stone laying ceremony of the College of Home Science, Bapatla  
on 14.7.1989

**Table. 29: Out-turn of Students,  
College of Home Science, Bapatla**

Degree	Year
	1989
B.Sc.* (H.Sc)	67

\* First batch of 23 students took degrees in 1987

This college took a lead in organising training programmes for farm men and women in mushroom cultivation as a household economic activity.

## B. STUDENT WELFARE

The University lays considerable emphasis on the all-round development of students' personality and therefore to achieve this end, it has been actively promoting their participation in extra and co-curricular activities. In order to administer the student welfare activities, a full time Dean of Student Affairs was appointed in 1970. The students of this

University have always been encouraged to participate in inter-state, inter-collegiate and inter-faculty competitions in sports, literacy and cultural activities. Educational tours have also been organised every year.

### Earn-While-You Learn Scheme :

One of the unique features of this University since its inception was the introduction of "Earn-While-You Learn" Project in poultry and piggery breeding. This provided the students with an opportunities for practical training and for economically poor students a means to sustain themselves. This project was later extended to areas like swine production, ice-cream making and vegetable cultivation. Apart from the immediate benefits, projects of this kind helped the students to gain confidence and become better extension officers. This project at Tirupati made a handsome donation of three gold medals out of their profit to the institution.

National Cadet Corps (NCC) and the National Service Scheme (NSS) units of all the colleges have always elicited active interest as can be seen form Table. 30.

**Table 30 : Student Activities**

Activity	Cumulative total				
	1970	1975	1980	1985	1989
NCC camps attended	20	30	39	51	53
NSS camps conducted	-	32	42	73	176

### National Cadet Corps (NCC) :

The Remount and Veterinary cadets of the NCC of our University have repeatedly proved their prowess in equestrian events by winning the "Best Riders Trophy" as well as several gold, silver and bronze medals at the Republic Day celebrations at New Delhi, year

after year since 1974. NCC cadets of this University have participated in several other national equestrian competitions and won several medals.

### National Service Scheme (NSS) :

The service oriented National Service Scheme (NSS) activities have been a part of

the regular curriculum of the University. The NSS was introduced in the constituent colleges in 1974-75. Under this scheme, the University adopted nearby villages to promote their allround development. From 1975 onwards, the under graduate students have been regularly going to villages and contributing for their development in Agriculture, Animal Husbandry and Home Science. Special NSS camps are being conducted in rural areas every year in which the students actively participate in programmes like the mass inoculation of cattle, soil analysis, tree planting, weed control, pest and disease management, demonstration of water management techniques, compost preparation, purification of water, mass demonstration of sewing and stitching, food processing and preservation techniques, child care and other service oriented activities.

### Sports & Games

In order to provide the students with facilities in physical culture, four multi-gym units, at a cost of Rs. 1.40 lakhs, were installed in the three campuses in 1982. In the same year, the sports pavilion at Rajendranagar was constructed, duly equipped and commissioned for use. A similar pavilion was also completed at the college of Veterinary Science, Tirupati, thus providing three sports pavilions in the University, one at each campus. Inter-class competitions in sports and games has been the regular feature of every college. Annual games, sports and cultural meet of the University are organised in 3 phases in which students of three campuses participate in several events.

### Hostels and Messes

There are 12 hostels for boys and 4 hostels for girls at the three campuses. Efforts are being made from time to time to improve the hostel facilities in the University (Table 31).

Table: 31 Hostels and Messes

Number of	Year					
	1964	1970	1975	1980	1985	1989
Hostels	9	13	14	16	16	16
Rooms	400	1088	1088	1255	1370	1370
Students residing in the Hostels	1307	1745	1774	1868	2096	2369
Messes	11	11	14	14	15	15

### Health Centre

Well equipped health centres were established in all the three campuses for the benefit of both staff and students. In addition to the male doctors, three lady Medical

Officers, one each at Rajendranagar, Bapatla and Tirupati campus health centres, were also appointed in 1987 to cater to the needs of the girl students, and other campus residents (Table. 32).





NCC Cadets participating in Equestrian Sports





Students participating in National Service Scheme Camp

**Table 32: Health Care Facilities**

Number of	Cumulative Total					
	1964	1970	1975	1980	1985	1989
Honorary Doctors	3	3	3	-	1	1
Resident Doctors						
a) Male	-	1	1	4	4	3
b) Female	-	-	1	2	1	2
Patients treated	7200	10800	42147	98884	130320	169240

**Scholarships/Fellowships**

The State Government from the year 1975-76, exempted all under-graduate students, whose parents' income was less than Rs. 1000/- per month, from paying tuition fees and also provided a stipend of Rs.250/- per month to all Post-graduate students. The stipend for post-graduates was

revised from time to time. In 1988-89, this stipend was revised to be on par with that of the medical students. Several other scholarships and fellowships are also available for students in this University (Table 33). Above 85 to 90 per cent of the under graduate students also receive financial assistance from one source or the other (Table 33).

**Table 33: Number of Scholarships availed by the Students**

Name of the Scholarship	Year				
	1970	1975	1980	1985	1989
1. National Merit Scholarship	173	189	267	211	202
2. National Loan Scholarship	142	149	140	149	143
3. National Scholarship for the children of Primary and Secondary School Teachers	13	15	12	11	12
4. Govt. of India Merit-cum-means Scholarship	116	169	192	203	205
5. Govt. of India Scholarships to the students under GRD Programme	-	-	-	1	5
6. Govt. of India post-matric Scholarships to the SC students	388	408	507	521	528
7. Govt. of India matric Scholarships to Harijan Christians	27	27	40	45	43
8. Govt. of India post-matric Scholarships to ST	64	38	116	122	124
9. HRD Scholarship (ICAR)	-	-	-	14	19
10. General cultural Scholarships of Govt. of India	-	8	-	10	10
11. State Merit Scholarship	114	82	80	60	74
12. State Scholarship to denoted Tribes	25	26	21	26	29
13. State Scholarship to listed Backward Classes	740	573	652	602	637
14. State Scholarship to economically poor students	88	282	228	259	256
15. Stipends to Post-graduate students	-	-	377	718	682
16. Stipends to VDOs studying B.Sc. (Ag)	-	-	80	143	149
17. Stipends to Agricultural Officers studying M.Sc.(Ag) courses	-	-	-	39	42
18. A.P. State Educational Loans	176	150	191	183	187
19. Coromandel 'Grow more' scholarship	9	19	14	14	16

### Employment and Placement Bureau

With a view to guide students regularly for higher studies in foreign countries, course catalogues from Universities of Canada, U.K., Australia and U.S.A. are made available to the students through the Employment and Placement Bureau, functioning under the guidance of Dean of Student Affairs.

### C. LIBRARY AND DOCUMENTATION SERVICES

Right from the inception of the University in 1964 till 1979 the libraries continued to function as part of the respective constituent colleges under the administrative control of the Principals concerned. The day to day functions were performed by the college librarians under the supervision of the Officers in-charge who used to be either a professor or an associate professor in the college. In May, 1969 late Sri. K. Raghava Reddy, Retired Director of Public Libraries, Government of Andhra Pradesh, was appointed as a Special Officer to design the University library system.

#### Organisation and Administration

The reorganised set up consists of :

- Central Library, Rajendranagar
- Regional Library, Agricultural College, Bapatla
- Regional Library, Tirupati
- Branch Library, Veterinary College, Rajendranagar
- Branch Library, Livestock Research Institute, Rajendranagar
- Branch Library, Extension Education Institute, Rajendranagar

- Branch Library, Home Science College, Hyderabad

- Branch Library, Home Science College, Bapatla

The Library Advisory Committee was constituted in 1979 by the Vice-Chancellor and the committee consists of all the university officers (except the Estate Officer) and all the principals of the colleges and one library expert nominated by the Vice-Chancellor. The University Librarian is the ex-officio Secretary of the Library Committee. The Committee meets once in six months to review the working of the libraries and make suggestions for the improvement of its services.

The libraries function under the control and supervision of the University Librarian, who is one of the statutory officers of the University directly responsible to the Vice-Chancellor. The Regional Agricultural Research Stations have built up a sizeable collection of books with the funding provided under NARP scheme. There is a proposal to integrate these libraries also.

The Central Library and branch libraries in Rajendranagar are under the overall control and administration of the University Librarian. The Regional Library at Tirupati is looked after by an Assistant Librarian who works under the administrative control of the Principal, S.V. Agricultural College. The Library at Home Science College, Hyderabad, and the Regional Library at Bapatla are managed by the Assistant Librarians under the administrative control of the respective principals.

#### Physical Growth

##### Manpower growth

With the establishment of the University, Central Library and the two Regional Libraries, the strength of the libraries staff has increased considerably (Table. 34).

**Table : 34 Manpower growth in University Libraries**

Cadre	1964	1970	1975	1980	1985	1989
University Librarian	-	-	1	1	1	1
Assistant Librarian	7	7	7	7	7	7
Documentation Officer	-	-	-	-	1	1
Technical Assistant	-	-	-	-	2	2
Other Technical Staff	20	20	20	20	39	39
Office Staff	19	19	21	21	38	38
<b>Total</b>	<b>46</b>	<b>46</b>	<b>49</b>	<b>49</b>	<b>88</b>	<b>88</b>

### Buildings

The Central Library building with four floors was built with the assistance of the ICAR at a cost of Rs. 25 lakhs and has a carpet area of 4645 sq.m with a potential to accommodate over 200 thousand books. It has a seating capacity for about 200 readers. There is a provision for separate cubicles for research workers. The Regional Library building, Tirupati was funded by the ICAR to a tune of Rs. 15 lakhs. At Bapatla one more floor was added to the existing library building at a cost of Rs. 2.5 lakhs. This has provided an additional carpet area of 465 sq.m. The library of the Home Science College, Hyderabad functions in a separate building with two floors with a carpet area of 331 sq.m. The other libraries in the colleges are located in exclusive halls in the colleges.

### Finances

The ICAR and the State Government are the main sources of funding for the

libraries. The average expenditure on books for all the campuses is about Rs. 3 lakhs per annum, while about Rs. 5 lakhs has been earmarked for current periodicals. In addition, about Rs.2 lakhs for binding, furniture, equipment and other contingencies is incurred every year. The State Government has approved a scheme for the improvement of library facilities in the 7th plan and so far an amount of Rs. 19 lakhs has been provided in addition to the annual block grant of Rs. 8 lakhs. Realising the importance of current periodicals for advanced research in agriculture, the University has enhanced the outlay of current subscription for periodicals by 66% from Rs. 5 lakhs to Rs. 9 lakhs per annum from academic year 1989-90.

### Collection

The running length of stacks in the Central Library is about 1.7 km, with stacking capacity of about two lakh books and 520 periodicals. The Campus-wise holdings of books and current periodicals are shown in Table 35.

**Table 35: Collection of Books and Periodicals in the Libraries of APAU**

Campus	Books	Periodicals
Central Library, Rajendranagar	80,000	520
Regional Library, Tirupati	50,000	300
Regional Library, Bapatla	35,000	200
Home Science College, Hyderabad	11,000	120

The Central Library receives 125 copies of APAU Research Journal from the University to be sent on exchange basis to various national and international institutes. In turn, most of the CGIAR institutes and agricultural universities in the country send their periodicals and other publications. In 1978, the British Council had donated books worth of Rs 50,000 and the Government of Netherlands made a donation of books worth of Rs.2 lakhs in 1982. The ICSSR recognised the Central Library as a depository for all their publications. Several retired teachers and administrators also enriched the APAU Libraries by donating their personal collections. They include Sri J. Raghatham Reddy, Ex-Vice-Chancellor, APAU, late Sri. Ch. Krishna Murthy, Ex-Director of Research, APAU and Sri Bhujanga Rao, Retired Director of Horticulture, Government of Andhra Pradesh. During the initial stages of the development of the University, the libraries received books worth Rs.2 lakhs under TCM programme, from Kansas State University.

#### **APAU Library Service**

The Library initially worked one shift and was managed by the College librarians with minimum supporting staff. During the sixth and seventh plan period, 37 posts in different cadres were created for the libraries. Separate library service was constituted bringing all the library staff working in various campuses under one system. The University extended the U.G.C. pay scales to the University Librarian and Assistant Librarians, whereas the other cadres in library service were extended the State Government scales of pay. Further, the Assistant Librarians are being deputed for higher studies in library science with full pay for 2/3rds of their study period.

#### **Readership**

The libraries are mainly meant to cater to the requirements of students and teaching, research and extension personnel. The Central Library has a registered readers' strength of 1200 members. The research stations utilise

the collection in APAU Libraries on inter-library loan basis.

#### **Reprography**

Plain paper copiers have been acquired for all the three campuses to provide reprography services. The photo copying service is being rendered on self supporting basis by charging 40 paise per page. The income thus received is utilised for strengthening the reprography services.

#### **Functional growth**

##### **Library Rules**

Common library rules were adopted by the academic council by which the students could borrow books for 15 days and the teachers for 30 days.

##### **Working Hours**

The libraries work from 8 AM to 8 PM on all working days and for 6 hours on all holidays except on National Holidays and on important festival days.

##### **Cataloguing**

After the reorganisation of libraries, the technical processing work was taken up and the entire collection in all the libraries was classified by adopting the Dewey's Decimal Classification (19th edition). Anglo American Cataloguing rules were followed. Card catalogues were built up to facilitate easy approach to the reading material in the libraries by the users.

##### **Departmental Libraries**

With a view to help the teachers, departmental libraries were initiated. Under the scheme the Heads of Departments were allowed to borrow 30 to 40 books for common use by the entire department. To start with,

only the books available in multiple copies in the libraries were transferred. Efforts are afoot to make available the books for the departments exclusively. This facility is in addition to the normal lending to the individual teacher.

#### **Book Bank Scheme**

Under the scheme, multiple copies of text books were purchased and made available to the students on a nominal rent for one semester without any fine.

#### **Backward Class Students' Welfare Scheme**

Realising the importance of books in support of class room teaching and with a view to make the books accessible to economically backward class students, the State Government introduced special libraries by providing an amount of Rs 50,000/- per annum during the seventh plan period to each of the professional colleges in the State. All the three campus libraries were benefited by this scheme.

#### **Scheduled Castes (SC) and Scheduled Tribes (ST) Students Welfare Scheme**

In addition to the book allowance provided by the State Government for SC/ST students, a separate provision was made to build up the collection of books useful for competitive examinations taken up by the SC/ST students.

#### **Documentation work**

The Central Library brings out a monthly bulletin of "Recent Additions to the APAU Libraries". Also "Union Catalogue of periodicals in APAU Libraries" has been brought out. The catalogue of the dissertations submitted to the University so far has been brought out under the title "Agricultural Dissertations Index". The abstracts of Ph.D. theses has been published under the

title "Agricultural Dissertation Abstracts". With a view to help and guide the post graduate students, guidelines have been prepared under the title "APAU Guidelines for the presentation of Theses". An annual publication "Contributions of APAU Scientists from 1964" has been prepared.

#### **Course on the use of Library and Information Services**

A compulsory course on the use of library and information services has been accepted in principle by the Academic Council to be offered to under-graduate and post-graduate students. Orientation classes on the use of library are being conducted at the time of fresh admissions to under graduate courses in addition to informal lectures to post-graduate students on the use of information services.

#### **Extension Activities**

The professional staff in the library have enthusiastically participated in various seminars and conferences in the country. The APAU hosted an All India Seminar on "Agricultural Library and Information Services" in December, 1980 which was attended by about 150 delegates.

#### **Prospect**

Although during the past 25 years substantial funding has been provided and a sizeable collection of books and periodicals have been built up, there appears to be a need for some recent periodicals among the users of the libraries.

This is largely due to the vast expansion knowledge resulting in exponential growth of the variety of documents making it impossible for an individual library to be self sufficient. Fortunately, the emergence of national and international information services, such as SATCRIS of ICRISAT, AGRIS of

FAO, NICFOS of CFTRI, AGRICOLA of National Agricultural Library, USA, CAB abstracting services and several other facilities have come to the rescue of the researchers.

During the eighth plan period, it is proposed to computerise many of the library operations and also to build up a data base of all the documents acquired by the APAU libraries. Further, it is proposed to provide se-

lective dissemination of information to the scientists in the off campuses by utilising the International Data Bases available in CDROM form. Effective document delivery service also will be developed. With a view to have effective resource sharing facility, it is proposed to establish a network of all the agricultural libraries in Hyderabad with the support and cooperation of the heads of the institutes concerned.



ORGANISATIONAL STRUCTURE OF RESEARCH IN ANDHRA PRADESH AGRICULTURAL UNIVERSITY

VICE-CHANCELLOR

:  
:< Research & Extension Advisory Council

DEANS OF FACULTIES <-----> DIRECTOR OF RESEARCH <-----> DIRECTOR OF EXTENSION

:  
P.G. Research

:  
: --- At Admn. Office :  
: : ADR, Dy. DR (V),  
: : 2 Asst. Directors  
: : --- 5 Technical Officers

:  
VETERINARY RESEARCH

:  
AGRICULTURAL RESEARCH

:  
HOME SCIENCE RESEARCH

:  
ASSOC. DIRECTORS OF RESEARCH  
RARS

:  
Home Science College &  
P.G. Research Centre,  
Hyderabad

:  
: Heads of Livestock Research Stations  
Lam, Chintaldevi Palamaner, Garividi, Tirupati  
: S.S Poultry Project  
Other Co-ordinated Schemes, R'nagar  
: Heads of Fisheries Res.Stns.  
Kakinada, Kovvai Palair, Bapatla

:  
< Zonal Research and Extension Advisory Council  
(One Council for each Zone)

: Lam : : Anakapalle : : Tirupati : : Jagtial : : Palem : : Nandyal : : Chintapalli :

HRS/S of ** Lam * Bapatla * Chintalapudi * Adiguppula * J.M.Puram * Vuyyuru * Machilipatnam * Endakuduru * Garikapadu * Maruteru * Pulla * V.R.Gudem * Kovvur * Vijayarai * Ambajipet * Darsi S.S., Agronomy, Rice, Pulses Cotton, Agril. Engg., Watermanagement	HRS/S of ** Anakapalle * Yelamanchili * Amadalavalasa * Peddapuram * Vizianagaram * Ragolu S.S. for Sugar-cane	HRS/S of ** Tirupati * Perumallapalle * Anantarajupet * Kadiri * Utukur * Podalakur * Nellore * Kavali S.S for Goundnut Agronomy	HRS/S of ** Jagtial * Karimnagar * Rudrur * Bellampalle * Adilabad * Mudhole * Madhira * Warangal * Malyal * Wyra * Aswaraopet	HRS/S of ** Palem * ARI, R'Nagar, College of Agril., R'Nagar * Sangareddy * Amberpet S.S., for Horticulture, Agronomy, Millets, Oilseeds, Soil Physics	HRS/S of ** Nandyal * Adoni * Anantapur Chief (Dry Land) * Reddypalli	HRS/S of ** Chintapalli * Rastakuntabai * Seethampeta * Pandirimamidi
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SS : Senior Scientists under Zonal ADRS  
HRS/S: Heads of the Agricultural Research Stations/Schemes  
\*\* : Regional Agricultural Research Station (RARS)  
\* : Agricultural Research Station (ARS)

## CHAPTER - VII

# RESEARCH

One of the main objectives of the University is to generate new technologies to increase agricultural production. As per the Andhra Pradesh Agricultural University Act, the University took up the responsibility of agricultural research in 1966 by taking over 30 research stations with 108 research schemes from the purview of the Department of Agriculture, Government of Andhra Pradesh. In 1967, 12 livestock research schemes were transferred from the State Department of Animal Husbandry, while Home Science research was taken over in 1974, Fisheries and Farm forestry research in 1976.

There has been significant expansion and diversification of research programmes in the University over the years (Table 36).

Table 36 : Growth of Research Stations

Year	Number of research stations
1966	30
1970	35
1975	37
1980	46
1985	53
1989	61

In addition to a score of Non-Plan Schemes, the University has been implementing a number of Co-ordinated Research Projects of ICAR as well as projects sponsored by Government of India and other agencies. Similarly, new projects have also been proposed and implemented under plan schemes.

Apart from Coordinated Projects, further boost was given to the research programmes, with the implementation of World Bank aided National Agricultural Research Project

(NARP). Consequently, research work was initiated based on the concept of Agro-Climatic Zones under NARP. For this purpose, the entire State was divided into 7 agro-climatic zones based on rainfall, soil characteristics and other natural resources. The main emphasis under NARP was towards location specific, result oriented and need based research programmes. The research programmes once initiated were discussed at Zonal Research and Extension Advisory Council (ZREAC) which met twice a year, in which scientists of the University, extension personnel of the State Department and farmers participated.

### A. Organisational Set up

The Director of Research is responsible for the planning and implementation of research programmes by the University and is assisted by one Associate Director of Research and eight technical staff at the University head quarters. Each of the seven agro-climatic zones is headed by one Associate Director of Research with head quarters at the Regional Agricultural Research Station of the zone concerned. The work of research station/research unit/research scheme is supervised by the respective Heads of research stations/units/schemes. In addition, there are Senior Scientists to look after the research work of the major crops or group of crops in the entire State, across the agro-climatic zones. The organisational set up of research is presented in the flow diagram.

The programming of technical work and its implementation are effectively supervised by the Director of Research, Associate Directors of Research and Senior Scientists and the Heads of Research stations. All the scientific staff are in constant touch with the staff of extension personnel of State Departments of

Agriculture and Animal Husbandry and farmers directly. These linkages were further strengthened with the implementation of Training and Visit (T & V) system by the State Department of Agriculture wherein monthly T & V workshops were conducted in all the Regional Agricultural Research Stations and selected research centres. These linkages are being maintained effectively by the person-

nel attached to the Extension Education Units located at the Regional Agricultural Research Stations.

## B. Manpower growth

The technical manpower engaged in research in 1966 was only 172 and this has now risen to 883 in 1989 (Table 37).

**Table 37 : Manpower Growth (Cumulative Total)  
IN RESEARCH**

Particulars	Year					
	1966	1970	1975	1980	1985	1989
<b>a) Technical staff</b>						
1. Senior Scientists	-	-	3	15	27	32
2. Assoc. Professors	11	29	49	96	137	177
3. Asst. Professors/ARO's/ Research Assistants	161	236	347	600	644	674
<b>Total</b>	172	265	399	711	808	883
<b>b) Ministerial staff</b>	358	550	732	1031	1014	1213
<b>c) Agricultural Workmen</b>	172	204	234	303	401	410

## C. Schemes in Operation

Currently the schemes under operation at the University are 222 (Table 38).

**Table 38 : Schemes under operation (1989) at the APAU**

Funding source	Number of research schemes/projects			
	Agriculture	Veterinary	Home Science	Total
State Non-Plan	100	14	-	114
State Plan	17	9	-	26
I.C.A.R.	57	7	4	68
Govt. of India	3	1	1	5
Others	4	1	4	9
<b>Total</b>	181	32	9	222

With the sustained efforts of the scientists, APAU has released 147 high yielding varieties in various crops (Table 39).

**Table 39 : Improved crop varieties released by the APAU**

Year	Number of varieties released	Year	Number of varieties released
1968	4	1980	13
1969	2	1981	5
1971	12	1982	17
1972	3	1983	1
1974	4	1985	10
1975	1	1986	6
1976	17	1987	5
1977	3	1988	12
1978	12	1989	19
1979	1		

The crop-wise release of improved varieties (1966-1989) is presented in (Table 40) :

**Table 40 : Varieties released crop - wise (1966-1989)**

Crop	Number of varieties released	Crop	Number of varieties released
<b>A. Cereals &amp; Millets</b>		<b>D. Commercial crops</b>	
Rice	36	Cotton	14
Sorghum	4	Mesta	3
Bajra	6	Sugarcane	13
Ragi	5	Chillies	6
Maize	7	Coriander	2
Korra	4	<b>E. Fruits</b>	
Variga	3	Mango	2
<b>B. Pulses</b>		Guava	2
Greengram	2	Cashew	7
Blackgram	4	<b>F. Vegetables&amp; Other crops</b>	
Redgram	3	Brinjal	1
Horsegram	2	Bhendi	2
Bengalgram	3	Colocasia	1
<b>C. Oilseeds</b>		Sweet potato	1
Groundnut	5	Betelvine	1
Sesamum	3	Sunhemp	1
Safflower	2	Bougainvillia	1
Sunflower	1		

## D. ACHIEVEMENTS

The following are some of the major research achievements in Agriculture, Veterinary and Home Science.

### FIELD CROPS

#### RICE

Rice is the most important staple food crop of the State. It is grown under canal/tank systems in all the districts of Andhra Pradesh and also under well irrigation in some of the districts like Chittoor, Cuddapah, Ranga Reddy etc. Andhra Pradesh contributes about 13.5% to the Nation's rice production. It is called the "Granary" of the South.

In line with the importance of rice in the agricultural economy of the state, much attention has been paid to rice improvement research programmes. These programmes are carried out in ten Agricultural Research Stations. The major rice research stations being Maruteru, Rajendranagar, Warangal, Bapatla, Nellore, Ragolu, Pulla and Machilipatnam, However, at Rudrur and Utukur stations also rice research is being carried out on a limited scale.

#### Maruteru

The Agricultural Research Station, Maruteru, was established in 1925 with the objective of evolving improved rice varieties for the Krishna - Godavari delta. Sarvasri K. Radhakrishna Murthy (1966-68), G. Babu Rao (1968-70), K. R. Mohan Rao (1970-72), K. Lakshminarayana (1972-73), Dr. J. G. Krishna (1973-76), D. Koteswara Rao (1976-79), C. Bhaskar Rao (1979), Dr. G. Madhusudana Rao (1980-82), Dr. G. Venkateswara Reddy (1982-84), Dr. M. Nageswara Reddy (1984-86), Dr. N. Sreerama Reddy (1986-88) and Dr. V. Sreeramamurthy (1988-todate) have been the successive Heads of this Research Station.

Maruteru is the premier research station to evolve improved varieties for 6 lakh hectares of rice area in Godavari delta and 4 lakh hectares in Krishna delta. Out of several varieties released from Maruteru, Swarna, a 150-155 days duration, nitrogen thrifty, dormant, high yielding cultivar with good cooking and milling quality can be considered as the crowning glory of success from ARS, Maruteru. It presently occupies 4 lakh hectares and recently farmers have harvested 9 t/ha in their holdings. Until 1975-76, breeding programme was aimed only at improving the yield of local popular varieties. But from 1975-76 onwards, the objectives were reoriented, to develop high yielding varieties with multiple resistance and different duration groups for cultivation in the Krishna-Godavari delta. Hybrid rice programme was started from 1985 at this station. Thirty four rice varieties were released from the station since its establishment and 12 varieties since the inception of the University (Table 40).

The varieties, Gouthami, Vasista, Swarna (MTU 7029) and Vijaya Mahsuri were developed for low land irrigated situations for *kharif* season. Vajram (MTU 5249), Prathibha (MTU 5293) and Chaitanya (MTU 2067) were found suitable for medium and low land and Brown Planthopper (BPH) endemic areas for *kharif* season.

The concerted efforts of the station helped to advance *rabi* rice cultivation from January-April to November-March resulting in stabilization of rice yields at 7 t / ha in the zone. The optimum dates for planting were found to be 15th June in *kharif* and 15th December during *rabi* seasons. The recommended spacings were 20 x 15 cm during *kharif* and 15 x 15cm during *rabi* season. Similarly fertilizer schedules for different seasons and locations were worked out and recommended to the farmers.

Application of zinc sulphate at the rate of 50 kg/ha was recommended before transplanting during *rabi* season. Suitable plant protection schedules were worked out for important pests and diseases of the region.

### Rajendranagar

The Rice research section was established at the Agricultural Research Institute, Rajendranagar, the then Himayatsagar farm in 1950, to evolve improved strains in the earlier days and later short statured high yielding varieties along with package of practices, for rice cultivation. The section has been headed by Sri V. Rajagopala reddy (1965-79), Sri G. Babu Rao (1979-81 and 1982-85) Sri K. Ramaiah (1981-82), Dr. Aftab Ahmed (1985-88) and Dr. H.S.Nagaraj Rao (1988 - continuing).

After the formation of APAU, the following high yielding dwarf varieties of short and medium duration with cold tolerance were released from this station.

Variety	Year of release
Hamsa	1968
Tellahamsa	1971
Mahsuri	1972
Rajendra	1976
Saleema	1987
Satya	1987
Chandan	1989

Tellahamsa still continues to be very popular not only in the State but also in the neighbouring States, for its short duration, cold tolerance and fine grain. The variety Saleema is suitable both for *kharif* and *rabi* seasons. It is high yielding and resistant to blast and bacterial leaf blight.

Among the technologies recommended, seedling root dip with suitable insecticides, 12-14 hours before planting, to control early insect pests in transplanted paddy is becoming popular.

### Warangal

The Agricultural Research Station, Warangal was established in 1933, with the aim of evolving new varieties of different crops cultivated in Northern Telangana Region comprising of Warangal, Nalgonda, Karimnagar and Adilabad districts. Subsequently, work was initiated to evolve rice varieties resistant to gall midge, which became endemic in Telangana Region. This station is now recognised as the National Centre for gall midge research. It also serves as a research centre for pulses.

Dr. T. Venkataswamy (1965-69), Dr. Edwin Dharmaraj (1970), Dr. K. Ramasubbaiah (1970-71), Dr. Aftab Ahmed (1976-77), Sri K. Ramaiah (1977-78), Dr. P. Kameswara Rao (1981), Sri G. Babu Rao (1981-82), Dr. C. Subba Rao (1982-83), Dr. Narendra Kulkarni (1984), Dr. P. Sanjeeva Rao (1987-89) and Sri S. Tejkumar (1989 - continuing) headed this station.

The Research Station has released rice varieties like Kakatiya (1974), Surekha (1976), Pothana (1985) and Divya (1989).

Shallow planting using 2-3 seedlings, top dressing of N in 2-3 split doses, application of zinc sulphate at the rate of 50 kg/ha as basal and application of granular insecticides once in nursery and once in the main field to control gall midge are the recommendations made for rice.

### Bapatla

A Rice Research Unit was started in 1964 at Tenali on leased lands and was later shifted to Agricultural college farm, Bapatla in 1973. The objectives identified for the station were to evolve semi-dwarf and non-lodging varieties having Mahsuri grain type, coupled with seed dormancy at maturity and high yield potential. Subsequently, the centre was engaged in breeding varieties for

multiple resistance to pest complex with special emphasis on BPH, gall midge, stem-borer and leaf folder. The unit was intended to cater to the needs of farmers of Krishna-Western delta and Nagarjunasagar Project (NSP) right and left canal areas.

Sarvasri K. V. L. N. Dutt (1973-74), C. Bhaskar Rao (1974-78), A. Peraiah (1979-87) and P. S. N. Murthy (1987- continuing) have been the successive heads of this station.

Sona Mahsuri (1982), Dhanyalakshmi (1982) and Samba Mahsuri (1988) are the varieties which were released from this station. Nearly 90% of *rabi* area in Krishna - Godavari delta was under Dhanyalakshmi till 1986.

#### Nellore

The Agricultural Research Station, Nellore, was originally established as Government paddy farm in 1973 at Buchireddypalem, 15 km from Nellore on leased lands, to improve the local Molagolukulu paddy varieties which were then under cultivation. Later the station was redesignated as Rice Research Station and was shifted to Nellore in 1961. In 1985, the station was further strengthened with the implementation of NARP. Subsequently, other objectives like evolving short duration varieties (105-110 days) with higher yields, tolerance to insect pests and diseases like Brown Plant Hopper (BPH), blast, and blight were also added. The prime objective of the station, however, remains to evolve long duration varieties with Molagolukulu grain type and quality and resistant to blast that comes to harvest after cessation of North-East monsoon rains, a prime requisite for *kharif* season.

The successive heads of the Research Station have been Sarvasri K. Ramaiah (1965-67), K. Radhakrishnamurthy (1967-68), K. Rajagopalan (1968-69), J. Subramanyam (1969-73), D. V. S. Raghavendra Rao (1973-79), G. Venkata Rao (1979-83), K. Janardhan Reddy (1983-84), G. Venkateswara Reddy (1984-88) and Dr. P. Raghava Reddy (1988-continuing).

Prior to 1964, four improved tall varieties were released from this station. With the advent of semi-dwarf rice varieties in mid 60s, two long duration, semi-dwarf and high yielding varieties, NLR 9672 and NLR 9674, popularly known as Kotha Molagolukulu were released for cultivation in 1977. Pinakini (NLR 9672-96) and Tikkana (NLR 27999), high yielding and long duration varieties resistant to blast were released in 1987 and 1988 respectively for general cultivation. While transplanting of long duration Molagolukulu varieties by September gave highest yield, Tikkana could be planted even up to October without significant reduction in the yield. Application of nitrogen in the form of urea in 3 split doses 1/3 as basal, 1/2 at filling and 1/3 at panicle initiation stage increased the yield.

#### Ragolu

The Agricultural Research Station, Ragolu in Srikakulam district was established in 1956 to serve the rice and millet growing tracts of the North Coastal Andhra Region.

The main objectives were to develop photo-insensitive rice varieties of 150-160 days duration which could withstand late transplanting and overaged seedlings, and to

evolve gall midge and blast resistant varieties.

Sarvasri C. Hanumantha Rao (1965-70), V. Appa Rao (1970-76), K. S. Radhakrishna (1976-80), Dr. P. Raghava Reddy (1980-86) and M. A. Khader (1987 - continuing) have headed this Station.

Rice varieties, RGL 1, Nagavali (RGL 2), Pushkala, Vamshi and Mahendra were released from this research station for general cultivation.

#### **Pulla**

The Rice Research Station, Pulla was started in 1950. Fifteen per cent of the station area was in the heart of Kolleru lake, between the 3rd and the 4th contours. Kolleru is a natural fresh water lake located between the two major river systems, Godavari and Krishna. The total area of the lake is about 900km<sup>2</sup>. During heavy floods, 6000 ha of land gets submerged in the lake area, where only paddy can be grown. The objective of the station has been to evolve rice varieties suitable for deep water conditions with a total duration of 140 - 160 days so as to fit into the single crop and double crop wet lands of this tract. This station has been headed by Sarvasri Syed Ibrahim (1964-68), G. Venkata Rao (1969-72), K. Ramakrishna Raju (1973-78), G. Venkateswara Reddy (1979-80), B. Thammi Raju (1980-81), S. S. N. D. B. Prasad (1981-83), M. Subba Rao (1983-86) and A. Surya Rao (1986 - continuing).

PLA 1, (Dalwa Kichidi) in 1955, PLA 2 (Kolleti kusumulu), PLA 3 (Neeti kaluvalu) in 1959, PLA 4 (Burma Akkullu) in 1959 and

PLA 1100 (Badava Mahasuri) in 1982 were released from this Station. PLA 1100 was recommended for deep water conditions upto 40cm water depth and is now a popular variety. PLA CN 540, a variety in the pipeline of final testing, was found to be suitable even upto 75 cm of submergence.

#### **Machilipatnam**

The Agricultural Research Station, Machilipatnam was started in 1954 with the specific objective of evolving suitable rice varieties tolerant to salt affected lands (97,000 ha in Krishna delta) and for evolving technologies for growing rice in such areas.

The successive heads of this station have been Sarvasri K. Srinivasulu (1964-68), K. S. Radhakrishna (1968-76), N. Lakshman Rao (1976-77), K. Ramakrishna Raju (1977-78), I. Nageswara Rao (1978-79), D. V. S. Raghavendra Rao (1979-80), N. Vivekananda (1980-83) and S. S. N. D. B. Prasad (1984-1989).

Two salt tolerant varieties viz: MCM 1 and MCM 2 were released from this station. The station also has been serving as a production centre for paddy.

Sugarcane and Rice Research Station, Rudrur, was also actively involved in rice research and has been responsible for the releases of three varieties RDR 2, RDR 4 and RDR 7. Similarly Agricultural Research Station, Utukur, has been serving as a testing centre for the rice varieties already released. The following is a summary of the rice varieties released year-wise (Table 41).



Table 41 : Rice Varieties released (1966-1989) by the APAU

Year of Release	Popular Name/ culture No.	Duration (days)	Grain yield t / ha.	Remarks
(1)	(2)	(3)	(4)	(5)
<b>Maruteru</b>				
1969	GUTTI AKKULLU 3282	170	4.0	UNIFORM MATURITY
1976	GAUTAMI MTU 8002	165	5.0	PHOTOSENSITIVE
1976	VASISTA MTU 8089	165	4.5	PHOTOSENSITIVE
1976	PRABHAT MTU 3826	130	5.5	SEMI DWARF FOR UPLAND IRRIGATED AREAS
1982	VIJAYAMAHSURI MTU 4407	140	5.5	SEMI DWARF, GRAIN RESEMBLES MAHSURI
1982	LAKSHMI MTU 6024	135	5.5	RESISTANT TO BLB
1982	SWARNA MTU 7029	145	6.0	N -THRIFTY VARIETY
1982	SOWBHAGYA MTU 4569	155	5.0	FINE GRAIN QUALITY
1986	VAJRAM MTU 5249	150	6.0	BPH RESISTANT
1986	PRATIBHA MTU 5293	160	5.0	BPH RESISTANT
1988	CHAITANYA MTU 2067	150	5.0	BPH RESISTANT
1989	KRISHNAVENI MTU 2077	150	6.0	TOLERANT TO BPH AND RESISTANT TO GALL MIDGE
<b>Rajendranagar</b>				
1968	HAMSA	115	4.5	EARLY MATURING
1971	TELLAHAMSA RNR 10754	110	5.0	COLD TOLERANT
1972	MAHSURI	145	4.0	FINE GRAIN, EXCEL- LENT COOKING QUALITY
1976	RAJENDRA RNR 12329	105	3.5	FINE GRAIN
1987	SALEEM RNR 29692	130	5.5	FOR KHARIF AND RABI SEANONS, RES- STANT TO BLAST AND BACTERIAL LEAF BLIGHT
1987	SATYA RNR 1446	120	5.5	TOLERANT TO BLB & SHEATH BLIGHT
1989	CHANDAN RNR 74802	145	5.0	RESISTANT TO BPH AND BLAST AND TO- LERANT TO SHEATH BLIGHT, BLB AND GALL MIDGE.

(1)	(2)	(3)	(4)	(5)
Warangal				
1974	KAKATIYA WGL 13801	120	3.0	GALL MIDGE RESISTANT
1976	SUREKHA WGL 13400	130	4.0	- do -
1985	POTHANA WGL 22245	125	4.0	- do -
1989	DIVYA WGL 44645	125	5.0	- do -
Ragolu				
1982	NAGAVALI RGL 52	150	5.5	WITHSTANDS OVER- AGED SEEDLINGS
1986	VAMSI RGL 1746	130	5.0	TOLERANT TO BACT- ERIAL LEAF BLIGHT
1986	MAHENDRA RGL 1750	145	5.0	TOLERANT TO BLB AND GALL MIDGE
1986	PUSHKALA RGL 2624	100	5.0	DROUGHT TOLERANT
Bapatla				
1982	DHANYALAKSHMI BPT 1235	115	6.0	RESISTANT TO GALL MIDGE AND TOLE- RANT TO STEMBORER
1982	SONAMAHSURI BPT 3291	140	6.0	FINE GRAIN RESIS- TANT TO BLAST
1986	SAMBAMAHSURI BPT 5204	140	5.0	FINE GRAIN WITH GOOD COOKING QUALITY
Nellore				
1977	KOTHAMOLAGOLU KULU 72 NLR 9672	160	5.5	BLAST TOLERANT
1977	KOTHAMOLAGOLU KULU 74 NLR 9674	160	5.6	BLAST TOLERANT
1987	PINAKINI NLR 9672-96	160	6.0	BLAST TOLERANT
1988	TIKKANA NLR 27999	165	6.0	RESISTANT TO BLAST, GOOD COOKING QUALITY
Pulla				
1982	BADAVA MAHSURI PLA 1100	145	3.0	FOR SHALLOW SUBMERGIBLE AREA
Anakapalle				
1982	KOTHABAYAHUNDA AKP 70-73	160	3.0	WITHSTANDS OVER- AGED SEEDLINGS

## SORGHUM

Next to rice, sorghum occupies the place of importance in the State. It is mainly grown as a rainfed crop occupying an area of about 17 lakh hectares with a production of 11.46 lakh tonnes (1987-88). Research on sorghum is carried out at Palem, Nandyal, Podalakur and Madhira.

### Palem

The Agricultural Research Station, Palem was started by the A.P. Agricultural University in 1969. This station was subsequently upgraded as Regional Agricultural Research Station in 1980 with the objective of serving as a lead centre for research on sorghum, pearl millet, castor and horsegram for the entire State and as a verification and testing centre for finger millet, groundnut, green gram and black gram.

The successive heads of the research station have been Sri V. Virupaksha Goud (1969-80), Dr. P. Krishnamurthy (1980-82), Dr. M. Shivasanth Reddy (1982-85), Dr. T.V.S. Ramamohan Rao (1985), Dr. M.M.K. Durga Prasad (1985-86), Dr. M. Nageswara Reddy (1986-88) and Dr.K. Narayana (1988 - continuing).

High yielding sorghum cultivars (CSH 9, CSH 6, SPV 351, SPV 462, SPV 475 and CSH 5) have been identified as suitable for cultivation in this zone. SPV 86 (CVS 8R) was found to be high yielding sorghum variety and has been recommended as a replacement to the traditional tall growing M35-1. Date of sowing (before 30th June), optimum population (1,80,000 plants in *kharif* and 1,35,000 plants in *rabi* per hectare) and fertilizer schedule (80 N and 40 P<sub>2</sub>O<sub>5</sub> kg per hectare) for high yielding varieties and 30 N and 15 P<sub>2</sub>O<sub>5</sub> kg per hectare for local varieties have been worked out. Inter-cropping systems with sorghum, weed control measures and pest and disease management technology have been developed.

### Nandyal

The improvement of yellow and white *jowar* types have been the prime objective of sorghum improvement at Regional Agricultural Research Station, Nandyal. Consequently N 13, a yellow bold grain type was released in 1966 from this research station and is now accepted as the standard check in National and International trials on the root parasite strigā. NJ 2092 was released in 1988 with an yield potential of 33 q/ha. In 1989, two more sorghum varieties, N 14 and NTJ 2 were released with an yield potential of 3.0 and 3.6 t/ha respectively. The optimum sowing date was found to be middle of September for *maghi jowar*.

### Podalakur

The Agricultural Research Station, Podalakur was established in 1964. The station was further strengthened with the implementation of the NARP in 1985. Sarvasri G.P. Prasada Rao (1964-75), P. Venkata Rao (1975-81), U.C. Kumaraswamy (1981-82), J.N. Bavaji (1982-85), K. Lakshmaiah (1985-1989) and B. Ramaseshaiah (1989 - continuing) successive heads of this station.

The station has been conducting research to develop suitable dual purpose white sorghum variety/hybrid for Nellore and Prakasam districts.

### Madhira

There is a growing demand for dual purpose (grain cum fodder) type of *maghi jowar* varieties in Northern Telangana Zone. Therefore, to cater to this demand, the Agricultural Research Station, Madhira was established in 1945. This station was successively headed by Sarvasri P. Venkateswarlu (1972-75), V.V. Krishnaiah (1975-82), M. Rama Rao (1982-84), N. Ranganathacharyulu (1984-85), Dr. S. Venkateswarlu, (1985-1989) and P. Janardhana Rao (1989-continuing). Moti variety of *jowar* was released from this

station in 1978. The varieties of sorghum released year-wise are given in Table 42:

**Table 42: Sorghum varieties released**

Year of Release	Station	Popular name	Duration days	Grain yield t/ha	Remarks
1978	Madhira	MOTI	100	2.0	PEARLY WHITE GRAIN SUITABLE TO MAGHI TRACT
1988	Nandyal	NTJ 1	100	3.0	NON LODGING & DROUGHT TOLERANT; SUITABLE TO RABI AREAS
1989	Nandyal	N 14	110	3.0	YELLOW SORGHUM VARIETY SUITABLE TO MAHCHI AND RABI
1989	Nandyal	NTJ-2	100	3.6	EARLY AND DROUGHT TOLERANT WHITE GRAIN ; SUITABLE TO MAGHI AND RABI

## MAIZE

Maize is grown in Andhra Pradesh over an area of 3.08 lakh hectares, producing 4.54 lakh tonnes of grain. Nearly 81 per cent of area is confined to Telangana region comprising of Karimnagar, Nizamabad, Medak, Warangal and Adilabad districts. Maize is cultivated over limited area in coastal districts of Guntur, Visakhapatnam, East Godavari and Krishna. It is however gaining importance as an ingredient of cattle and poultry feeds, consuming about 30 per cent of the total maize produced in the State.

Research on maize is being conducted mainly at Amberpet, Hyderabad with Karimnagar serving as a verification centre.

The Maize Research Station, Amberpet, was established in 1957 with an All India Coordinated Maize Breeding Project to serve as the main zonal centre for peninsular India and the objectives of evolving high yielding hybrids and varieties and suitable technologies for higher production. Research was oriented towards heterosis breeding and development of populations.

The successive heads of this station have been Sarvasri S. Vittal Rao (1958-67), Dr. S. Mahboob Ali (1968-74), Dr. M. Mahendra Reddy (1975-78 & 1984), K. Kishan Narayan (1980-82 & 1985 - 87), C. Laxminarayana (1979-80), K. Srinivasulu (1984-85), R. Beneraj (1987-88), Dr. S. Raghuvardhan Reddy (1988- 1989) and Dr.M.Y. Sarma (1989-continuing).

Amber composite, the first maize composite, was released in 1965 and first popcorn synthetic variety at National level was released in 1971 as Amber popcorn. Varieties like DHM 101 (1975), DHM 103 (1982) and Rohini (1983), and Ashwini, Harsha and DHM 1 were released in 1988. Madhuri, a sweet corn variety with 30% sugars released from this station, is becoming popular with the urban population.

The optimum planting period for maize has been determined as the last week of May to the second week of June in *kharif* and the second week of October to the second week of November in *rabi* season.

The optimum plant density was found to be 60,000 to 65,000 plants per hectare. Sowing two seedlings per hill and thinning 10

days after emergence and retaining one plant per hill has been found to be good for maintaining optimum plant stand. For irrigated maize, a fertilizer dose of 120 kg N, 60 kg P<sub>2</sub>O<sub>5</sub> and 30 kg K<sub>2</sub>O per hectare and for rainfed maize 50-60 kg N, 30 kg P<sub>2</sub>O<sub>5</sub> and 15 kg K<sub>2</sub>O per hectare has been recommended. Irrigation schedule for the crop at less frequent intervals during the vegetative phase and at more frequent intervals in the reproductive phase have been worked out.

Plant protection schedules have also been developed and recommended to the farmers.

The following maize varieties have been released by this station since 1966 (Table 43).

**Table 43 :Maize Varieties/ Hybrids released**

Year of Release	Popular name	Duration days	Grain yield t/ha	Remarks
1971	AMBER POPCORN	90-100	3.0	GRAINS WITH POPPING EXPANSION
1975	DECCAN HYBRID 101	110-120	4.5	FULL SEASON HYBRID
1982	DECCAN HYBRID 103	105-110	7.0	TOLERANT TO FOLIAR DISEASES AND STALK BORER; RECOMMENDED ACROSS THE COUNTRY
1983	ROHINI	85-90	4.5	RAINFED FARMING
1988	DECCAN HYBRID MAKKA 1	85-90	5.5	RESISTANT TO DISEASES, MAINLY TO TURCICUM LEAF BLIGHT AND EARLY MATU - RING; RECOMMENDED FOR ACROSS THE COUNTRY
1988	ASHWINI	100-105	5.0	SUPERIOR TO LOCAL; TOLERANT TO STALK BORER
1988	HARSHA	95-100	5.5	HIGH YIELDING

### BAJRA (Pearl Millet)

The State produces 1.56 lakh tonnes of *bajra* (pearl millet) from 3.12 lakh hectares (1987-88). The *bajra* improvement programme has been taken up at Palem, Vizianagaram, Perumallapalle and Anantapur.

#### Palem

Palem is the lead centre for research on pearl millet. A synthetic *bajra* variety RBS2 (MUKTHA) was developed at Palem and released in 1985. This variety has an yield potential of 20 q/ha and possesses resistance to downy mildew. Another promising *bajra* synthetic, RBS 1 (Mallikarjuna) with high yield potential, was also released in 1988. Split application of 60 kg N/ha (1/2 as basal and another 1/2 at four weeks stage) was recommended.

#### Vizianagaram

Agricultural Research Station, Vizianagaram was established in the year 1954 with the objective of improving locally important millet crops i.e., *Ragi*, *Bajra* and *Jowar*. The station was upgraded in the year 1962. In the year 1969, the station was strengthened with

the initiation of a sub-centre of the ICAR for All India Millet Improvement Project. The station is also a verification centre for important rainfed crops of the zone viz., groundnut, greengram, blackgram, redgram, *jowar* and horsegram.

The successive heads of the station are Sarvasri K. Narasimha Murthy (1958-59), V. Rama Rao (1959-62, 1969-71 and 1977-87), S.H. Hussaini (1963-69), K.E. Prasada Rao (1971-72), M. Raghavendra Rao (1972-77) and T. Venkateswara Rao (1988-continuing).

Three *ragi* varieties VZM-1 and VZM-2 in 1958 and Simhadri in 1982 were released from this station. In *bajra* two varieties Vijay and Visakha were released in the year 1971 and 1976 respectively. In *jowar* also, one variety, VZM-1 was released in 1965. The optimum spacing and fertilizer schedules were also worked out.

#### Perumallapalle

Balaji (composite) with high yield potential was released from this station in 1976. The year wise release of *bajra* varieties (Table 44) is given below :

Table 44 : Bajra Varieties Released

Year of Release	Station	Popular Name	Duration days	Grain yield t / ha.	Remarks
1971	Vizianagaram	VIJAYA	75	16	SUITABLE TO ALL BAJRA GROWING AREAS OF A.P.
1976	-do-	VISAKHA	80	15-20	SUITABLE TO NORTH COASTAL ZONE
1976	Lam	NAGARJUNA	70	15-20	SUITABLE TO PRAKASAM, NALGONDA MAHABOBNAGAR & ANANTAPUR DISTRICTS
1976	Perumallapalle	BALAJI	75	15-20	SUITABLE TO SOUTHERN ZONE
1985	Palem	MUKTHA	80	17-22	SUITABLE TO SOUTHERN TELANGANA ZONE
1988	Palem	MALLIKARJUNA	80	15	ALL BAJRA GROWING AREAS OF THE STATE

### RAGI (Finger millet)

Research work on *ragi* (*Eleusine coracana*) improvement is in progress at Vizianagaram, Peddapuram, Perumallapalle and Palem.

Simhadri, a pure line selection, was released from Vizianagaram in 1981. Kalyani variety was released from Perumallapalle (1971). Sharada was released from Anakapalle (1972). Godavari (PR 202) and Ratnagiri varieties were released from Agricultural Research Station, Peddapuram in 1974 and 1985 respectively.

#### Peddapuram

The Research Station was established in 1954 with the objective of evolving high yielding varieties of millets and pulses suitable for cultivation in uplands of coastal districts particularly with specific reference to East and West Godavari districts under rain-

fed conditions. Seed production of Breeder and Foundation seed of *ragi* under rainfed condition were also taken up in the station. The station is now serving as a varietal testing centre for rainfed crops particularly pulses and millets.

The successive heads of the station from the inception of the university have been Sarvasri S. Ramanadham (1963-71), B. Krishnamurthy (1972), P. Venkata Rao (1973-75), M. Sivaramakrishnaiah (1976-78), T. Venkateswara Rao (1979-87) and V. David (1987-continuing)

Varieties PDM-1 of redgram (1971), PDP 71-1 of greengram (1971), PDP 71-1 of blackgram (1971), PDP-1 of horsegram (1971) and Godavari (1974) and Ratnagiri (1985) of *ragi* have been released from this station. The following Table (45) gives the number of varieties of *ragi* released year-wise.

Table 45 : *Ragi* Varieties Released

Year of Release	Station	Popular Name	Duration days	Grain yield q / ha.	Recommended to
1971	Perumallapalle	KALYANI	105	25-30	CHITTOOR, NELLORE ANANTAPUR & MAHBOBNAGAR DISTRICTS
1972	Anakapalle	SHARADA	105	30-35	NORTH COASTAL ZONE
1974	Peddapuram	GODAVARI	115	30-40	ALL RAGI GROWING AREAS OF THE STATE; DID WELL THROUGH OUT INDIA
1981	Vizianagaram	SIMHADRI	100	30-35	NORTH COASTAL ZONE
1985	Peddapuram	RATNAGIRI	110	30-40	ALL RAGI GROWING AREAS OF THE STATE

**KORRA (Foxtail millet)****Lam**

Varietal improvement work in *Korra* crop, (*Setaria italica*) is being carried out at Lam, Nandyal and Anantapur.

Arjuna *Korra* was released from Regional Agricultural Research Station, Lam, in 1969.

**NANDYAL**

Si A326 was released under the name

of Nallamala *Korra* through IDRC Project at Nandyal in 1985.

**Anantapur**

Chitravati (1982) and Lepakshi (1989) were released from Anantapur. *Korra* followed by sunflower has been found to be a suitable crop sequence.

Inter-cropping of *Korra* with redgram in 5:1 ratio was found to be economical.

**Table 46 : Korra Varieties Released**

Year of Release	Station	Popular Name	Duration days	Grain yield q / ha.	Recommended to
1969	Lam	ARJUNA	80	16-30	PRAKASAM, KURNOOL AND MAHBOOB - NAGAR DISTRICTS
1982	Anantapur	CHITRAVATI	80	12-15	ANANTAPUR DISTRICT
1985	Nandyal	PRASAD	78	20-35	ALL KORRA GROWING AREAS
1989	Anantapur	LEPAKSHI	80	15-16	SHALLOW SOILS OF LOW RAINFALL AREAS

**VARIGA (*Panicum miliaceum*)**

Research work on *Variga* is in progress at Lam.

Varieties like 'Varada' *variga* (1971), Nagarjuna (N 1387) and Sagar (L 5224) have been released from Lam in 1988 (Table 47)

**Table 47 : Variga Varieties Released**

Year of Release	Station	Popular Name	Duration days	Grain yield q / ha.	Remarks
1971	Lam	VARADA	80	15	SUITABLE TO ALL VARIGA GROWING AREAS OF THE STATE
1988	Lam	NAGARJUNA	65	25	- do -
1988	Lam	SAGAR	80	30	- do -



## PULSES

Pulses are grown as rainfed crops in an area of 15.09 lakh ha with an annual production of 6.57 lakh tonnes. Redgram (3.38 lakh ha), greengram (4.59 lakh ha) and blackgram (3.19 lakh ha) are the important pulses grown in the State.

With the implementation of All India Coordinated Project on Pulses, intensive efforts were made for pulses improvement in the last two decades. At the time of the transfer of agricultural research stations to the university research on pulses improvement was being carried out at Lam, Madhira, Peddapuram, Vizianagaram and Rajendranagar. As a result of the research work carried out at these stations a large number of varieties have been isolated. The varieties, PDP 71-1 of greengram and PDP 71-1 and PDP 71-2 of blackgram, PDM 1 of redgram, PDP 1 of horsegram were developed at Peddapuram. Madhira *mung* variety of greengram was developed from Madhira. L 35-5 of blackgram was released from Lam. VZM 1 of horsegram from Vizianagaram and ST 1 of redgram from Rajendranagar were also developed. But these varieties did not gain prominence due to lack of wider genetic base and susceptibility to diseases.

Multidisciplinary approach for developing stable technology for improving pulse production started with the initiation of the All India Coordinated Pulses Improvement Project during 1972, with the main centre at Rajendranagar and a sub-centre at Warangal. The All India Coordinated Pulses Improvement Project's main centre was later shifted to Lam in 1980. Research work on the improvement of pulses in rice fallows was also initiated at Lam from 1980. A research station on rice fallow pulses was proposed at Challapalli under second phase of NARP. The research work on pulses in the university is being carried out at four centres with four testing centres and seven voluntary centres. The main

centre, Lam and sub-centre, Warangal have multidisciplinary functions. Breeding work also is being carried out under State Non-Plan at Madhira on greengram and redgram and redgram and horsegram at Palem. The varietal testing centres are at Tirupati, Amadalavalasa, Adilabad and Anantapur. Voluntary centres for varietal testing/cropping systems are at Jagtial, Anakapalle, Nandyal, Podalakur, Peddapuram, Vizianagaram and Seethampet. Details of achievements for each centre in pulses improvement are furnished below.

### Lam

LGG 127 (Kondaveedu) of greengram in 1980 with an yield potential of 10-12 q/ha, in blackgram, LBG 17 (Krishnaiah) with an yield potential of 18-20 q/ha in 1985, LBG 402 (Prabhava) with an yield potential of 20-22 q/ha in 1988 and LBG 20 (Teja) with an yield potential of 12 q/ha suitable to all seasons, LRG 30 (Palanadu) with an yield potential of 20-25 q/ha and ICPL 332 (Abhaya) with an yield potential of 11-13 q/ha of red gram and Jyothi, Swetha (ICCV 2) with an yield potential of 8-10 q/ha and Kranthi (ICCC 37) with an yield potential of 10-12 q/ha of Bengalgram were released from Lam.

New plant types with sympodial and main stem bearing habits - a plant with two normal clusters per node in blackgram and resistant to pre-harvest sprouting and 'cereal mimic' bearing in green gram were identified. Resistance to powdery mildew and wilt disease in blackgram and to angular black spot in green gram were also identified.

Technologies for resource and pest and disease management in pulses were also developed. Sowing pulses early in season gave higher yields. A fertilizer dose of 20 N, 50 P<sub>2</sub>O<sub>5</sub> kg/ha for all pulses, inter cropping of redgram with short duration pulses like greengram or blackgram in 1:2 or 1:3 ratio were also suggested. One irrigation given at 35 to 40 days after sowing to blackgram in rice

fallows resulted in 3-5 q/ha of higher yield. Major pests and diseases of pulses were identified and plant protection schedules were worked out.

#### **Warangal**

Optimum time of sowing along with appropriate recommendations for crop management practices have been worked out. A variety of greengram developed from this station (WGG 2) with resistance to angular black leaf spot, charcoal rot, seedling blight, and web blight has performed well in multi-location trial conducted during *kharif* 1988, and is being proposed for minikits in *kharif* 1989. Sources of resistance to angular leaf spot, web blight, seedling blight, charcoal rot and powdery mildew in greengram have also been identified.

#### **Madhira**

The station was established in 1945 as Tobacco Experimental Station and was redesignated as Millet Research Station in 1960. Research work on *jowar* was initiated after research work on tobacco. The main objective

of the station was subsequently reoriented mainly to develop high yielding and disease resistant varieties of greengram, redgram and blackgram for the Northern Telangana Zone. The work on varietal evaluation and other technologies is in progress. The performance of the culture, MBG 162 blackgram, is promising.

#### **Palem**

Two cultures, PRG 88 and PRG 100 of redgram, evolved at this station are in advanced stage of testing. Medium duration redgram cultivars LRG 30, Hy 2, Hy 4, and Hy 5 and early maturing types such as Hy 6, Hy 8 and Hy 9 have been found suitable for Southern Telangana Zone. Fifty five thousand plants per hectare has been found to be optimum. The productivity of short duration cultivars of redgram was found to increase by increasing the population upto 2,40,000 per hectare (45 x 10cm). Horsegram cultures like PHG 62 and PHG 9 have been entered in the All India Coordinated Varietal Trails. Pulse Varieties released since 1966 is presented in Table 48.

**Table 48 : Prominent Pulse Varieties Released (1966-1989) By APAU**

Year of Release	Station	Culture No. Popular Name	Duration days	yield q/ha	Remarks
<b>Greengram</b>					
1971	Peddapuram	PDP 71-1	70-75	8-10	SUITABLE FOR UPLANDS AND FOR UNCERTAIN RAINFALL AREAS
1980	Lam	LGG 127 (KONDAVEEDU)	60-65	10-12	SUITABLE FOR BLACK SOILS IN THE STATE
<b>Blackgram</b>					
1971	Peddapuram	PDP 71-1	85-90	8-10	SUITABLE FOR RICE FALLOWS
1985	Lam	LBG 17 (KRISHNAIAH)	80-85	18-20	RESISTANT TO POWDERY MILDEW; BOLD GREENISH BLACK SHINING SEED. SUITABLE ONLY FOR RABI AND FOR RICE FALLOWS
1988	Lam	LBG 402 (PRABHAVA)	90-95	20-22	RESISTANT TO WILT AND TOLERANT TO SALINITY. SUITABLE FOR RABI AND RICE FALLOWS
1989	Lam	LBG 20 (TEJA)	70-75	11-12	PHOTOINSENSITIVE - SUITABLE TO ALL SEASONS IN A.P.
<b>Redgram</b>					
1971	Peddapuram	PDM 1	170-180	18-22	SUITABLE FOR HIGH RAINFALL AREAS
1980	Lam	LRG 30 (PALANADU)	170-180	20-25	HIGH YIELDER WITH WIDER ADAPTABILITY
1989	ICRISAT + APAU - Lam	ICPL 332 (ABHAYA)	170	11-13	MODERATELY RESISTANT TO <i>HELIOTHIS</i> POD BORER, SUITABLE TO BLACK SOILS
<b>Bengalgram</b>					
1976	Lam	JYOTHI	95-100	15-16	SHORT DURATION DESI TYPE WITH MEDIUM BOLD WRINKLED SEED
1989	ICRISAT + APAU - Lam	ICC V2 (SWETHA)	80	8-10	KABULI SEMISPREADING, EARLY MATURING THAN LOCAL
1989	ICRISAT + APAU - Lam	ICCC 37 (KRANTI)	80-100	10-12	TOLERANT TO <i>FUSARIUM</i> WILT AND DRY ROOT ROT
<b>Horsegram</b>					
1971	Peddapuram	PDP 1	90-95	14-16	BROWN SEEDED
1976	Vizianagaram	VZM 1	80-85	14-16	BLACK SEEDED

## GROUNDNUT

Andhra Pradesh is one of the leading groundnut growing State in the country, is Groundnuts cultivated mostly as a rainfed crop with less than 20 per cent of area under irrigation. The area under groundnut was 19.11 lakh hectares accounting for 15.7 per cent of the total cropped area during 1987-88 and a production of 19.06 lakh tonnes.

Research on groundnut was initiated at Regional Oilseeds Research Station, Kadiri, in 1954 with the implementation of All India Coordinated Research Project on Oilseeds in 1968. Groundnut improvement in the university is in progress at five centres viz., Tirupati, Kadiri, Jagtial, Palem and Yellamanchili. The APAU has so far released five groundnut varieties viz., K 71-1, K -2, K -3, TCG 704 and TCG 1706.

### Tirupati

The Regional Agricultural Research Station, Tirupati, was established in 1979 as part of the National Agricultural Research project for Southern Zone. It is the lead centre for research on groundnut in the entire State with the objectives of (i) Improvement in production and productivity of groundnut (ii) Evaluation of existing dryland farming practices under local conditions including the testing of agricultural implements (iii) Water harvesting and efficient use of limited stored water (iv) Development of contingency plan for adverse weather conditions and (v) Management of weeds through cultural practices.

Prof. G.H. Sankar Reddy (1980-82), Dr. C. Sreeramulu (1982-88) and Dr. M.V. Reddi (1988-continuing) have been the successive heads of the research station.

TCG 1704, a spanish bunch, early maturing variety with an yield potential of 2-3 t/ha during *kharif* and 4-5 t/ha during *rabi* and a shelling out turn of 79%, was released in 1989.

TCG 1706 a spanish bunch with an yield potential of 2.0 t/ha and oil content of 49% was released in 1989.

A spacing of 30 x 10 cm during *kharif* and 22.5 x 10 cm in *rabi* for TMV 2 groundnut has been recommended. For JL 24 variety, a spacing of 22.5 x 10 cm is recommended. Third

week of July has been found to be the optimum sowing time for rainfed *kharif* groundnut at Tirupati while at Kadiri the best sowing time was the second fortnight of July. At Jagtial, sowing during second week of June was found to give maximum yield.

A fertilizer dose of 20N, 40 P<sub>2</sub>O<sub>5</sub>, 50 K<sub>2</sub>O kg/ha for rainfed and 30 N, 40 P<sub>2</sub>O<sub>5</sub>, 50 K<sub>2</sub>O kg/ha for irrigated JL 24 variety with 500 kg/ha gypsum at first bloom has been recommended.

Placement of fertilizers to groundnut crop with "Enati Gorru" or "Tirupati" plough has been recommended. Intercropping of groundnut with redgram in 7:1 ratio has given better profits under rainfed conditions. Use of groundnut shell or other organic amendments at 5 t/ha has been recommended for red sandy loams to overcome soil hardening. Seven to eight irrigations have been found optimum for *rabi* groundnut. Weedicide 2,4-D-amine at 2 kg ai/ha and 0.48 kg/ha of fluchloralin was found effective in the control of nutgrass in groundnut.

For the control of groundnut root grub, soil application of carbofuran granules at 1.5 kg/ha at the time of sowing has been recommended. Dusting malathion (5%) or carbaryl (5%) or quinolphos @ 25 kg/ha have been effective in controlling leaf webber. Spraying of quinolphos or monocrotophos at 0.05% has been recommended for controlling leaf webber, red hairy caterpillar, jassids and thrips. Two sprays of Mancozeb and carben-dazim at 66 and 78 days after sowing controlled leaf spots and rusts. Shade drying of groundnut seeds of *rabi* crop is better for extending viability of seeds.

Power operated groundnut sheller devised by the station has been effective for shelling of groundnut pods. Tractor drawn blade harrow which ploughs 1.5 ha/hour and APAU Star weeder has been recommended for intercultivation and weeding.

An implement drawn by bullocks for making broad bed and furrow and three-in-one plough designed to apply seed and fertilizer at the same time have been recommended.

## Kadiri

The Agricultural Research Station, Kadiri, formerly known as Regional Oilseeds Research Station, originally started functioning at Anantapur in 1954. It was shifted to Kadiri in 1958 and is presently one of the centres for All India Coordinated Research Project on Oilseeds from 1968. In 1985, the Research Station under the aegis of NARP was upgraded with the creation of a post of Breeder, and research on groundnut was made multidisciplinary with the objectives of (i). evolving high yielding early maturing groundnut varieties resistant to drought and major diseases (ii). collection, testing and evaluation of germplasm lines and (iii). serving as sub-

centre for testing groundnut cultures under coordinated project.

The successive heads of the Research Station have been Sarvasri V.L.Narasimha Rao (1964-65), C.Sanyasi Rao (1965-66), J.Jayabhima Rao (1966), T.Narasimha Dass (1967), P.Subba Reddy (1968-73), Ch.V.S.Murthy (1974-77), J.Ramachandra Reddy (1977-79), N.Rajgopal (1979-80), A.Seshagiri Rao (1980-83), G.Lakshmikantha Reddy (1983-85), Dr.B.V.Krishnaiah Setty (1986) and Dr.P. Narasimha Reddy (1987-continuing).

The Research Station has so far released three varieties (Table 49).

Table 49: Groundnut Varieties Released (1966-89)

Year of Release	Station	Popular Name	Duration days	Grain yield q / ha.	Remarks
1971	Kadiri	KADIRI 71-1	130-135	14	SPREADING, PODS SHOW DISTINCT BEAK, TOLERANT TO LEAF SPOT DISEASE
1979	Kadiri	KADIRI 2	120-130	18	SEMI-SPREADING
1978	Kadiri	KADIRI 3	110 ( <i>Kharif</i> ) 125 ( <i>Rabi</i> )	21 30	SEMI-SPREADING WITH COMPACT-POD BEARING, TOLERANT TO BUD NECROSIS
1989	Tirupati	TCG 1704	120	30	<i>KHARIF &amp; RABI</i>
1989	Tirupati	TCG 1706	120	20	HIGH OIL CONTENT

The technologies developed at the station includes sowing of groundnut, during second fortnight of July for getting optimum yields spacing of 30 x 10 cm for bunch and 30 x 15 cm for runner varieties, a fertiliser dose of 20 N, 40 P<sub>2</sub>O<sub>5</sub> and 20 K<sub>2</sub>O kg/ha, application of commercial gypsum @ 500 kg/ha at flowering stage and soil application of phosphate granules @ 10 kg/ha to control root grub.

## Jagtial

Studies at Regional Agricultural Research Station. Jagtial, indicated that for *Kharif* season groundnut varieties JL 24,

Kadiri 3 and ICGS 44-1 were suitable for the tract. For *rabi*, groundnut varieties ICGS 11 and Kadiri 3 were recommended for cultivation. Intercropping of six rows of groundnut with two rows of redgram was recommended.

## Palem

Studies on groundnut at Regional Agricultural Research Station. Palem, indicated that TMV 2, JL 24, Kadiri 3, ICGS 47-1 and ICGS 44-1 were the suitable cultivars for the region. A population of 3,30,000 plants/ha in *kharif* and 4,40,000 plants/ha in *rabi* was found to be optimum.

A study made at Agricultural Research Station, Anantapur, on economic evaluation, including energy requirement of mechanical cultivation of groundnut with traditional method using groundnut + redgram, showed higher production with a favourable cost benefit ratio of 1:86 against 1:53 for traditional method.

## SESAMUM

Sesamum is cultivated both in *kharif* and *rabi* seasons in Andhra Pradesh. Vizianagaram, Visakhapatnam, East Godavari, Prakasam, Warangal and Adilabad are the important districts where the crop is cultivated and 1.67 lakh hectares is under sesamum cultivation in the State, with a production of 0.22 lakh tonnes.

There are two distinct areas under sesamum. In coastal districts, dark brown or black seeded varieties are grown whereas in Northern Telangana Zone, white seeded varieties are grown. Research work for coastal areas is conducted at Yellamanchili and for Northern Telangana Zone at Jagtial.

### Yellamanchili

The Agricultural Research Station Yellamanchili, was established in 1960. In 1968, the scheme for the improvement of oilseeds crop in Visakhapatnam district of Andhra

Pradesh was merged with the All India Coordinated Research Project on Oilseeds. With the implementation of NARP from 1981, this station has been elevated as a lead centre for sesamum and is acting as satellite station to the Regional Agricultural Research Station, Anakapalle. The objective is to evolve short duration and high yielding varieties of sesamum and groundnut having high oil content suitable for *kharif* in coastal districts of Andhra Pradesh along with evolving improved agronomic practices for general adoption. Sesamum varieties Gouri and Madhavi were released in 1974 and 1978 respectively. Promising entries like 79-1 for *kharif* and R 84-2-2 and B 84-360-3 for *rabi* are under advance stages of testing.

### Jagtial

Regional Agricultural Research Station Jagtial, released a sesamum variety 'Rajeshwari' in 1988. Two cultures, JCS 64, and JCS 96, developed from this station are now ready for release.

Based on the studies made at Tirupati, for summer sowings of sesamum crop, Madhavi is recommended with 30 x 10 cm spacing and fertilizer application of 40 kg N (20 + 20), 30 kg P<sub>2</sub>O<sub>5</sub> and 30 kg K<sub>2</sub>O per hectare.

The following (Table 50) are the sesamum varieties released by the University.

Table 50 : Sesamum varieties released (1966-89) by APAU

Year of Release	Station	Popular Name	Duration days	yield kg /ha.	Remarks
1974	Yellamanchili	GOWRI	90-95	685	DARK BROWN SEEDED, SUITABLE FOR COASTAL DISTRICTS FOR EARLY KHARIF AND SUMMER.
1978	Yellamanchili	MADHAVI	75-80	730	LIGHT BROWN SEEDED, SUITABLE FOR COASTAL DISTRICTS.
1988	Jagtial	RAJESWARI	85	700	WHITE SEEDED, RECOMMENDED FOR NORTHERN TELANGANA DISTRICTS

## CASTOR

Andhra Pradesh has the largest area of 3.11 lakh hectares under castor, producing 0.72 lakh tonnes of seed. Most of this area is in Nalgonda, Mahboobnagar, Rangareddy and Prakasam districts.

Castor improvement work at Agricultural Research Institute, Rajendranagar, and later at Palem in 1981, resulted in the identification of eight superior selections with an oil content varying between 49 and 51 per-cent. Among these, HC 6 and HC 8 were the most promising and widely grown. The Regional Agricultural Research Station, Palem, is the only research station now engaged in castor improvement programme. The following are the technologies developed and recommended.

- Aruna, Bhagya, Sowbhagya, SHB 18, VHB 63 and VHB 161 were found to be the most suitable cultivars for this zone
- Castor sown before 15th July has shown to result in higher yields compared to crop sown later.
- a population of 55,000 plants/ha was found to be optimum, 60 x 30 cm or 90 x 20 cm spacing was recommended for pure castor crop.

## SUNFLOWER

Sunflower is mainly grown in the districts of Kurnool, Rangareddy and Prakasam.

A scheme financed by ICAR for breeder seed production of sunflower was started in 1977 at Agricultural Research Institute, Rajendranagar, with a view to produce and multiply genetically pure breeder seed. A research programme was also initiated during 1987-88 to study the suitability of hybrids produced else where in the State. The successive heads of this scheme have been Sarvasri C. Venkateswara Rao (1977-78), T. Narasimha Das

(1978-79), K. V. L. N. Dutt (1979-85), M. Y. Sarma (1986), B. Sugunakar Rao (1986-89) and K. Ananthasayana (1989 - continuing).

The hybrid APSH 11 with a duration of 90-100 days with an yield potential of 2t/ha was released in 1987. It is a high yielding hybrid and tolerant to lodging and drought with an oil content of 40 - 42%. The recommended fertilizer application at 80 kg N /ha in three split doses i.e., half at sowing, 1/4th at 30-35 days after sowing and other 1/4th at 55-60 days after sowing gave significant increase in the yields. Increase in yield, protein and oil content were recorded with 30 kg/ha sulphur application as ammonium sulphate.

Since the inception of the scheme a total quantity of 3425 kg of Morden and 3500 kg of EC 68414 breeder seed was produced.

## SAFFLOWER

Safflower is a minor oilseed crop of the State and is mostly grown on black cotton soils of Telangana region and Kurnool district in Rayalaseema. Crop improvement work is being done at Agricultural Research Institute, Rajendranagar. Manjeera, a selection from C 438 with a duration of 115 to 130 days, was released during 1976 from this station. Rust resistant culture, APRR 3 was released as Sagar Mutyalu during 1985. Cultures, NP 3, JL 1436, 8-7-3A, TP 13-ANT and N 23 gave higher yields when grown in rice fallows. Intercropping of safflower with bengalgram in 2:1 ratio gave higher monetary returns. The scheme on safflower has been recently shifted to Tandur.

## SUGARCANE

Andhra Pradesh is one of the leading cane growing States in the country, ranking fifth in area (1.44 lakh ha) and fourth in productivity (70.4 t/ha) as seen from the mean 5 years data ending 1986-87. The cane cultivation in the state has been concentrated in the districts of Visakhapatnam, Chittoor, West Godavari, Nizamabad, Medak, East Godavari and Krishna.

Research on sugarcane is being carried out at Anakapalle, Rudrur, Vuyyur and Perumal-  
lapalli research stations.

### Anakapalle

The Sugarcane (formerly Agricultural) Research Station, Anakapalle, was established in 1913. Sugarcane research received a fillip due to the financial assistance extended by the then Imperial Council of Agricultural Research in 1933. In 1947, a comprehensive scheme for research on sugarcane was initiated with five separate sections (Agronomy, Chemistry, Physiology, Pathology and Entomology) which was partly financed by the Indian Central Sugarcane Committee and was later (1963-64) financed entirely by the state Government. From 1971, the station has been functioning as one of the main centres of the All India Coordinated Research Project financed by ICAR. This Station was upgraded to Regional Agricultural Research Station from October 1981 under the NARP, a World Bank sponsored project. It has completed 75 years of fruitful service in the cause of agricultural development and celebrated its Platinum Jubilee in April, 1989.

The Main objectives of the station are :

- to evolve improved varieties of sugarcane
- to generate suitable agro-technology for sugarcane
- to intensify work on scale insect on sugarcane

The station is also entrusted with the work of evolving suitable varieties and agro-technology in crops like sesamum, *ragi* and *bajra*.

Since the inception of the university, the successive heads of this research station have been Sarvasri M. Lakshmikantham (1964-72), G. Narasimha Rao (1972-76), K. K. Prasada Rao (1977-83 and 1985-89), P. R. Reddy (1983-85) and J. G. Krishna (1989-continuing). The

first cane variety of importance, Co 213, was released in 1926. In 1934, three more varieties Co 243, Co 281 and Co 313, were released. In 1936, the variety Co 419 was released and within a short span of time had occupied almost all the cane growing areas of the State. Variety Co 449 was released in 1943 as a drought resistant variety suitable for Bobbili area. In the same year Co 527 was also released. Co 997 released in 1959 was the richest cane released from Anakapalle. Co 975 was released in 1960 and it remains unrivalled as a variety resistant to water-logging. From 1963 onwards, true seed of sugarcane (fluff) derived by crossing parents were being obtained from Sugarcane Breeding Institute, Coimbatore. After adopting this method varieties viz., Co 62175, Co A 7602, Co A 7701 and Co 7508 were released for commercial cultivation. In 1989, two more varieties, Co 7706 and Co A 8401 were released from the Station.

Optimum time of planting was found to be February-March. Application of 112 N kg/ha in two splits at 45 and 90 days after planting by placement in soil at a depth of 7.5 cm was found optimum. Studies on drought tolerance showed that the varieties Co 997, Co A 7602, Co T 8201, Co 7219, Co 6907, Co R 8001 and Co 7803 were promising. After detrashing the cane and spraying the crop thrice at monthly intervals in July, August and September either with chloropyrifos or dimethoate or malathion or methyl demeton or endosulfan reduced the infestation of the scale insect. Hot water treatment of setts against sett borne infection of grassy shoot disease was recommended. Yellow spot disease on sugarcane could be controlled by copper oxychloride (4 g per litre of water) once or twice just at commencement of the appearance of spots on the foliage. Varietal resistance to various diseases was also worked out.

### Rudrur

The Regional Sugarcane Research Station, Rudrur, was established in 1932 with the main



objective of improving the agricultural practices in the Nizamsagar Project ayacut with particular reference to irrigated farming. Rice and sugarcane, which are the important crops of this tract, have received maximum attention at this station.

The successive heads of the station have been Sarvasri S. K. Sastry (1965-68), K. K. Prasada Rao (1968-73), B. Gopalam (1973-74), S. H. Hussaini (1974), P. Nageswar Rao (1975-78 and 1979-84), P. Hanumantha Rao (1984-85), B. Ramachandra Rao (1978 - 79) and 1985-89) and P. Hanumantha Rao (1989 - continuing).

During 1960s, Co 997 (early), Co 62175 (midlate) and during 1971, Co 740 (*adsali*) varieties were bred and popularised from this station. Co 6907 was released during 1979. Co R 8001 released in 1980 has been an outstanding variety for *adsali* conditions. Co 7219, released in 1981, is a mid season variety with potential for high yield and can tolerate delay in planting and harvesting. It is highly drought tolerant and a good ratooner. Spacing, fertilizer schedules and plant protection schedules have also been worked out for the cultivation of sugarcane in the area.

#### Vuyyur

The Sugarcane Research Station, Vuyyur, was established in 1978 on the agricultural land gifted by M/s. K.C.P. Ltd., Vuyyur, with a view to develop cane varieties and produce technology suitable to the area. Sri P. Hanumantha Rao (1978-89) and Dr. B. Ramachandra Rao (1989-continuing) have been the successive heads of the station.

The Sugarcane growing areas in Krishna - Godavari delta have been classified as low "quality" areas owing to the prevalence of adverse weather factors before and during maturity phase of sugarcane crop (Nov-Feb.), leading to poor sugar recovery. Hence, varieties capable of overcoming the impact of

unfavourable weather factors and record high sucrose juice values were needed. In this direction, some success was achieved during the past 10 years in spotting out promising canes/varieties like Co 8013, 81V 84 and 82V 12 having high quality and yield potential with built in resistance to important diseases. To derive the maximum genetic potential from these varieties, suitable agronomic and pest control schedules were evolved. The need for potassium fertilisation to sugarcane ratoon for realising higher cane and sugar yield was established for the first time in the State.

#### Perumallapalli

The Agricultural Research Station, Perumallapalli, was started in the year 1964 to meet the research needs of sugarcane crop for the entire Rayalaseema region. Subsequently, the millets scheme which was operated on leased lands at Chandragiri was shifted to A. R. S., Perumallapalli in 1967. Sarvasri A. Venkatachari (1965-67), D.V. Narasimha Rao (1967-71), V. Chandrasekhar Naidu (1971), V. Rama Rao (1972-77), J. Papa Rao (1977-78), M. Raghavendra Rao (1978-79), C. Raja Reddy (1979-80), D. V. Narasimha Rao (1980-83), P. Venkat Rao (1983-85), B. Ramaseshaiah (1985-89) and K. Sivanarayana Rao (1989 - continuing) have headed this Research Station.

The main objectives of the station have been to identify cane with the high yield potential and sugar content, early and late varieties of cane for sustaining supplies to factories, to evolve suitable management practices for established commercial varieties and to test the cultivated varieties for different stress situations like moisture stress, pests and diseases. Several varieties bred either at Coimbatore or at Anakapalle and Rudrur were tested at this centre and found suitable for the region.

The following are the varieties released by different research stations (Table - 51).

**Table 51 : Sugarcane varieties released (1966-89)**

Year of Release	Station	Popular Name	Duration in Months	yield in t /ha. cane	Remarks
1968	Anakapalle	Co 62175	12-14	142.5	GOOD FOR QUALITY JAGGERY
1971	Anakapalle	Co A 7601	9-10	103.2	HIGHLY SUSCEPTIBLE TO SCALE INSECT : WITHSTANDS LODGING
1976	Anakapalle	CoA 7601	9-10	105.2	FOR EARLY CRUSHING : EXTREMELY RICH IN JUICE QUALITY, SUSCEPTIBLE TO RUST, RESISTANT TO RED ROT
1976	Anakapalle	Co A 7602	11-13	94.8	FOR MID-SEASON CRUSHING: RECOMMENDED FOR ENDEMIC AREAS OF RED ROT, TOLERANT TO DROUGHT, SUSCEPTIBLE TO SCALE INSECTS
1977	Anakapalle	Co A 7701	9-10	94.1	WITHSTANDS DROUGHT
1979	Rudrur	Co 6907	10-12	115.2	FOR EKSALI CULTIVATION, THERMO INSENSITIVE
1980	Rudrur	Co R 8001	15-18	155.3	RECOMMENDED AS ADSALI CANE FOR EARLY CRUSHING IN TELANGANA REGION : RESISTANT TO DROUGHT
1982	Anakapalle	Co 7508	9-10	82.7	EARLY MATURING, HIGHLY RICH IN JUICE QUALITY :
1981	Rudrur	Co 7219	11-13	123.8	TOLERANT TO DROUGHT, GOOD RATOONER, MODERATELY RESISTANT TO SMUT
1982	Perumallapalli	CoT 8201	11-12	108.1	FOR EARLY CRUSHING IN RAYALASEEMA AND FOR MID SEASON IN THE REST OF THE STATE
1989	Anakapalle	Co 7706	12	115.0	RESISTANT TO RED ROT AND MODERATELY RESISTANT TO SMUT GIVES QUALITY JAGGERY SUITABLE TO IRRIGATED AREAS
1989	Anakapalle	Co A 8401	10	150.0	AN EARLY CANE FIELD RESISTANT TO RED ROT AND EARLY SHOOT BORER
1989	Rudrur	Co 8014	10-11	110.0	MODERATELY RESISTANT TO SCALE INSECT. RESISTANT TO SMUT. TOLERANT TO GRASSY SHOOT AND SHOOT BORER RECOMMENDED FOR NIZAM SAGAR PROJECT AREA

## COTTON

Cotton is one of the leading commercial crops in India accounting for over 25 per cent of the total area under non-food crops. Although India occupies the foremost position among the cotton growing countries in the world with an area of 8 million hectares. Due to low productivity the country ranks only fourth in the world in total production accounting for about 10 million bales of 170 kg lint. In Andhra Pradesh cotton is being cultivated in an area of about 5.74 lakh hectares with a production of 5.37 lakh bales (1987-88). The State has witnessed a spectacular growth in area, production and productivity of cotton since 1970, due to the adoption of high yielding hybrids, varieties and improved technology.

Research in cotton has been taken up right from the beginning of the century. Nandyal and Lam are the two prominent research stations involved in cotton research. The priorities of cotton research have been changing from time to time and also from location to location.

Cotton research is being conducted at present at Lam, Nandyal, Adilabad, Mudhol and Adoni. Of these, major research work is being carried out at Lam, Nandyal and Adilabad.

### Lam

The Research Station at Lam was started as a composite Livestock-cum-Agricultural Research Station in 1922. Subsequently it was converted into an Agricultural Research Station in 1926 by the then Government of Madras with the objectives of improving local crops such as millets, chillies, tobacco, cotton and pulses under rainfed conditions. With the formation of Andhra State, it was redesignated as Millet Research Station in 1953 and later after its transfer in 1966 to APAU as Agricultural Research Station with the incep-

tion of the National Agricultural Research Project (NARP), it was upgraded to Regional Agricultural Research Station in 1980. The successive heads of the Research Station have been Sarvasri A.V. Parthasarathy (1954-74), Dr. C. Sreeramulu (1974-77), P. Appa Rao (1977-80), Dr. C. Sreeramulu (1981-82), Dr. I.V. Subba Rao (1982-88) and Dr. M. Rama Rao (1988-continuing).

Lam is the head-quarters of the Senior Scientist (Cotton), and is the main centre for All India Coordinated Cotton Improvement Project in Andhra Pradesh, working on various aspects of cotton improvement with a multi-disciplinary approach.

The main objective of research at Lam is to evolve high yielding, long and medium staple cotton varieties and to work out pest and disease management. Cocanada white (1964), Amaravathi (1978), LPS 141 as Kanchana (1987) and Lam Hybrid 1 (1988) are the varieties released from the station. LPS 141 is a whitefly resistant variety. Early sowings in the month of July, a spacing of 105 x 60 cm for varieties and 150 x 60 cm for hybrids and fertilizer schedule of 90 N, 45 P<sub>2</sub>O<sub>5</sub>, 45 K<sub>2</sub>O kg per hectare for varieties and 120 N, 60 P<sub>2</sub>O<sub>5</sub>, 60 K<sub>2</sub>O kg per hectare for hybrids have been recommended.

Pest management has become a major problem in the area. Application of granular insecticides like aldicarb, carbofuran and phorate 1 kg ai/ha has been recommended for the control of early sucking pests. Boll worms have been effectively controlled by the conventional insecticides like monocrotophos (0.05%) or carbaryl (0.15%) or Phosalone (0.07%) or quinolphos (0.07%) or acephate (0.1%). Subsequently synthetic pyrethroids like cypermethrin (60 g ai/ha) or decamethrin (15 g ai/ha) or fenvalerate (75 g ai/ha) were found very effective in controlling boll worms compared to the other conventional insecticides. However, continuous use of synthetic pyrethroids was found to

result in resurgence of the pest. Therefore, regulated use of synthetic pyrethroids for 2-3 rounds during crop growth with conventional insecticides was recommended. The incidence of whitefly and *Heliothis* has been threatening the cotton cultivation. Hence, intensive research has been taken up on whitefly and *Heliothis* management. Fungicidal schedules for disease control have also been worked out.

### Nandyal

The Agricultural Research Station, Nandyal, is centrally situated in Nandyal valley, which runs between the two ranges of hills, the 'Nallamalais' on the eastern side and 'Yerramalais' on the western side. The station is one of the oldest in the country having been established in the year 1906, mainly for the improvement of cotton and sorghum in the tract. During 30s and 40s, breeding work on cotton and sorghum was intensified. The Northern Cotton Improvement Scheme was initiated during that period with the financial assistance from Indian Central Cotton Committee. Research through Combodia Scheme on '*Gossypium hirsutum*' was also initiated during the same period for Rayalaseema. The station was designated as Cotton Research Station due to the location of the Head-quarters of the Cotton Specialist of the State. The station was upgraded to Regional Agricultural Research Station with the inception of NARP in 1980.

The successive heads of the research station have been Sarvasri K. Satyanarayana Murthy (1961-68), G.R. Padaki (1968-80), P. Appa Rao (1980-82), Dr. P. Raghavulu (1982-87), Dr. M. Shivsanth Reddy (1987-88) and Dr. A. Satyanarayana Reddy (1988-continuing).

During 1965-70, the main research emphasis was on White Northern Cotton improvement over N 14. Mahalaxmi was released in 1972 in place of Laxmi. To replace

Pandari *mungari*, a non-descriptive poor yielder, research work on *Arboreums* was re-oriented and finally Srisailam was evolved and released in 1978. Efforts were made to evolve high yielding and quality cotton in *G.hirsutum* and Vijaya Laxmi was released with 30 per cent increased yield over Mahalaxmi. Several inter-specific hybrids were tested and 'Bhagya Laxmi (NHB 80) was evolved and released in 1982 with a 21% increased yield over Varalaxmi. A promising upland American cotton straight variety NA 920 was released in 1989 under the name Priya with an increased yield of 25% over Vijayalaxmi. A fertilizer schedule of 20 N and 20 P<sub>2</sub>O<sub>5</sub> kg/ha for *desi* cotton and 40 N and 20 P<sub>2</sub>O<sub>5</sub> kg/ha for American cotton was recommended. New insecticides like Triazophos (0.05%) and Amitraj (0.05%) controlled whitefly effectively.

### Adilabad

The Research Station at Adilabad was started in 1958 for conducting research on rainfed paddy. In 1961 millet improvement was also introduced and in 1964 American Cotton Scheme for ghat areas was started.

The main objective of the research station was to improve the cotton varieties of the tract. Sarvasri J. Venkat Reddy (1967-68), M. Dharma Rao (1969), B.V. Venkatachari (1970-76), K.V.L. Narasimha Rao (1976-78), V.S.R. Anjaneyulu (1978-79), Dr. B. Ramaseshaiah (1981-85) and Dr. N. Ranganadha Charyulu (1985-continuing) have headed the station.

In 1981, Pawan variety was released with a duration of 165 days as against 180 days of B 1007.

### Mudhol

The station was established in 1934 as a testing centre for cotton varieties evolved at Nanded and was meant to evolve fine and

high yielding varieties of *desi* American type of cotton and also to develop suitable package of practices for Gaorani tract.

With the efforts made in this station, the variety *Saraswathi* was released in 1978. Optimum spacing of 75 x 30 cm for straight varieties and 120 x 60 cm or 90 x 90 cm for cotton hybrids and optimum date of sowing (15th June) were recommended to the cotton growers of the tract. A fertilizer dose of 40 N, 60 P<sub>2</sub>O<sub>5</sub> kg/ha for varieties and 75 N, 60 P<sub>2</sub>O<sub>5</sub> and 30 K<sub>2</sub>O kg/ha for hybrids under rainfed conditions and 120 N, 60 P<sub>2</sub>O<sub>5</sub> and 60 K<sub>2</sub>O kg/ha under irrigated conditions were recommended.

#### Adoni

The Research Station at Adoni has been in

operation since 1982 to conduct research for the improvement of *desi* cotton and was initially financed by ICMF Bombay.

The objective of the scheme was to evolve early maturing, high yielding and medium stapled, hard *Herbaceum* cotton varieties with a spinning capacity of 30 counts, suitable for the Semi-Arid areas of low rainfall zone of Rayalaseema districts of Andhra Pradesh. After extensive hybridization and selection programmes, culture 5865, a promising selection of *G.arboreum*, was isolated and found to be superior to local Jayadhar with 21 per cent increased yield. This is now in the final stage of testing. The following (Table 52) provides information on the cotton varieties released by the University.

Table 52 : Cotton Varieties Released

Year of Release	Popular Name	Duration days	yield in t /ha.	Remarks
Tenali 1968	KRISHNA	140	22	FOR RICE FALLOW AREAS OF KRISHNA, GUNTUR AND NELLORE DISTRICTS
1978	SANGAM	140	22	- do -
Nandyal 1972	MAHALAXMI	180	18	RAINFED AMERICAN COTTON TRACT OF RAYALASEEMA
1976	FEDRAJ	140	20	SUITABLE FOR RABI SEASON UNDER ID CONDITIONS IN THE COMMAND AREAS
1978	SRISAILAM	160	15	FOR MUNGARI AREAS (RED AND LIGHT SOILS) OF KURNOOL DISTRICT IN KHARIF SEASON
1978	MAHANANDI	180	16	FOR WHITE NORTHERN TRACT OF KURNOOL DISTRICT UNDR LATE KHARIF PLANTINGS
1982	VIJAYALAXMI	150	18	FOR SCARCE RAINFALL ZONE OF RAYALASEEMA DISTRICTS

(1)	(2)	(3)	(4)	(5)
1982	BHAGYALAXMI (INTERSPECIFIC HYBRID)	160	30	FOR ID CONDITIONS OF KURNOOL CUDDAPAH AND ANANTAPUR DISTRICTS
1989	PRIYA (NA 920)	160	15-20	FOR RAINFED BLACK SOILS OF RAYALASEEMA
Mudhol 1978	SARASWATHI	160	16	FOR KHARIF SOWINGS (JUNE) OF GAORANI TRACT
Amaravathi 1978	AMARAVATHI	165	20	FOR SOWING IN JULY AUGUST IN NSP AREA
Adilabad 1981	PAWAN	160	18	GHAT AREAS OF ADILABAD DISTRICT
Lam 1987	KANCHANA	150	28	SUITABLE FOR IRRIGATED AND RAINFED AREAS WHERE WHITEFLY IS A PROBLEM
1988	LAM HYBRID 1	150	20	FOR CULTIVATION IN KHARIF AND RABI IN COASTAL A.P. AND NORTHERN TELANGANA

### MESTA

Among the *mesta* growing states of India, Andhra Pradesh ranks first in acreage and production of fibre. Mesta is mostly confined to Srikakulam, Vizianagaram and Visakhapatnam districts, which together account for 97 per cent of the total area under the crop in the State during 1987-88. Research on *Mesta* is being carried out at Agricultural Research Station, Amadalavalasa in Srikakulam district.

#### Amadalavalasa

A research scheme jointly sponsored by the Indian Central Jute Committee and the State Government was initiated in 1958 at this station. The Mesta Research Station was established in 1966 after acquiring the required land. This scheme was merged with the All India Coordinated Research Project on Jute and Allied Fibers from 1968, and the scope of research was widened with the inclusion of Plant Breeding, Agronomy, Agricultural Chemistry, Entomology and Plant Pathology disciplines.

The objective of the project was to increase fibre yields per unit area, by way of developing high yielding and early maturing varieties, evolving suitable agronomic practices including fertilizer schedules and suggesting effective control measures for pest and diseases. The station was also a testing centre for groundnut, *ragi* and pulses. This research station has been successively headed by Sarvasri P. Appa Rao (1959-73) P. Prasada Rao (1974-76), M. Rama Rao (1976-78), R.V. Appa Rao (1978-88) and M. Venkateswara Rao (1988- continuing).

Variety AMV 1 released in 1966, was a land mark in *mesta* research, as this variety had surpassed all known varieties of *mesta* under cultivation in the country. In 1982, a variety, AMV 2 was evolved to replace AMV1. Surya (AMV 3) was released in 1989 with an yield potential of 17 q/ha. Under *Hibiscus cannabinus*, variety Bhimili 1 was released in 1981.

Table 53 : *Mesta* varieties released (1966-1989) from Amadalavalasa

Year of Release	Popular Name	Duration days	fibre yield Q /ha.	Remarks
1982	AMV 2	150	17.0	DROUGHT RESISTANT JASSID TOLERANT
1982	BHIMILI 1	150	10.1	RESISTANT TO FOOT-ROT, SUITABLE FOR HIGH RAINFALL REGIONS
1989	SURYA	190-200	17.0	RESISTANT TO FOOT-ROT AND STEM ROT. SUITABLE TO HIGH RAINFALL AREAS

The following are the technologies developed and recommended for better yields

- Line sowing has been found to be better than broadcasting of *mesta*
- A spacing of 30 x 10 cm was optimum for variety AMV 1 to obtain maximum yields
- Application of 20 kg N/ha either as basal dressing or top dressing, has enhanced fibre yields considerably and is economical
- To hasten retting, application of 25 kg DAP on 100 kg of *mesta* sticks was found to be very effective. With this treatment, there was also a reduction of 3 to 4 days in retting period over normal period of 15 days
- Foliar spraying of urea at 12.5 kg/ha + Anthio 0.05% between 45-60 days of crop was found to reduce the jassid incidence and increase the fibre yields upto 21.6 q/ha compared to urea spraying alone (17.6 q/ha)
- Seed treatment of *mesta* with carbofuran 3G at the rate of 50g/kg of seed before sowing increased the fibre yields of *mesta* to 25.3 q/ha compared to control (19.1 q/ha)
- Seed treatment with Dithane M 45 at 3 g/kg of seed followed by soil drench-

ing with 0.2% Dithane M 45 (2 g/litre of water) in the month of August reduced the incidence of foot and stem rot disease

#### TOBACCO

Research on tobacco improvement is being carried out at Venkataramannagudem. The station, now designated as Seed Production Farm, was taken over by the University from the Department of Agriculture in 1978. The All India Coordinated Research Project on Tobacco was originally initiated at Kavali in 1970 to work on Virginia tobacco in light soils. Subsequently, the Kavali sub-centre was shifted to Venkataramannagudem in 1978 to work on *natu* tobacco in light soils under irrigated conditions.

#### Venkataramannagudem

Dr. M. Radha Mohan Rao (1978-80), Dr. M. Nageswara Reddy (1980-82), Sri S. Ankaiah (1983-88) and Dr. D.A. Sarma (1988-continuing) have successively headed the Station. Apart from work on tobacco, seed multiplication (foundation seed) of various rainfed and light irrigated crops is also being taken up at this farm.

The following are the findings of research on tobacco at this Station.

- Out of 34 types of *natu* tobacco studied for their suitability, 11 were found to possess good yield potential and are being maintained for utilisation in future breeding programmes
- Second fortnight of September was considered as the best time for planting
- A combination of ammonical and nitrate forms of N when applied in the form of calcium ammonium nitrate gave significantly higher cured leaf yield than other forms and combinations
- Crop rotation of pearl millet - tobacco or water melon and lady's finger - tobacco- groundnut were found to be remunerative
- Application of FYM at 10 t/ha significantly increased cured leaf yield. Application of lime at 250 kg/ha was found to be optimum
- Alternate skip furrow irrigation with 10 cm wide ridge gave maximum cured leaf yield.
- Placement of fertilizer at 10 cm depth on both sides gave maximum cured leaf yield of *natu* tobacco.

## HORTICULTURAL CROPS

### VEGETABLES

Research work on vegetables is being carried out at Agricultural Research Institute, Rajendranagar and Lam.

#### Agricultural Research Institute, Rajendranagar

The main Research and Experimental Farm, Himayatsagar, was established in 1927 with the appointment of Economic Botanist in charge of crop improvement for the then Nizam State. During the visit of the first president of Republic of India, Dr. Babu Ra-

jendraprasad, the place was renamed as Rajendranagar in 1955. Research work and improvement of crops like paddy and oilseeds was initiated as early as in 1928. A fruit research scheme, sanctioned under the Industrial Trust Fund, was initiated during 1929-30. In 1941, research on grape financed by ICAR was initiated and Anab-e-Shahi a royal variety of grape was released from this station.

The posts of Pathologist and Entomologist were created in 1947-48 to conduct research and bring out suitable recommendations on pest and disease problems of the State. Work on oilseeds was also started in 1951-52 at this station. In 1952, Pulse Improvement Scheme was started and was later shifted to Lam in 1980. A research scheme in Agricultural Engineering was transferred from Agricultural College Bapatla, to Agricultural Research Institute, Rajendranagar during 1957-58.

In the Agricultural Research Institute, Rajendranagar, planned Development of Orchards, AICRP on Post-Harvest Technology of Horticultural Crops, AICRP on Floriculture and Scheme on Aromatic and Medicinal Plants were initiated in 1984. The AICRP on Agro-forestry and Agro-meteorological cell were also located at this Institute. The successive heads of the Station after the University came into being have been Sarvasri P. Govinda Rao (1966-68), S. Vittal Rao (1968-71), M. Krishna Reddy (1972-75), Dr. Y. Yogeswara Rao (1975-82), Dr. M. Nageswara Reddy (1982-83) and Dr. G. Satyanarayana (1983-continuing).

The scheme for improvement of vegetables was started in 1955 by the Government of Andhra Pradesh. Later, in 1966, financial assistance from ICAR was made available. Vegetable Breeding Scheme was initiated with State funds and later research work on vegetables was strengthened with the starting of the scheme for intensification of Vegetable Research in Andhra Pradesh (State



Plan) in 1978. For a short period (1981 to 1983) the scheme was in operation at Sangareddy and was later shifted to the Agricultural Research Institute, Rajendranagar in 1984. An ICAR Project for the improvement of vegetable crops in Andhra Pradesh was also initiated in 1988. In brinjal, 236 accessions were collected from different regions of the state and evaluated. In beans, 129 collections were evaluated and 24 promising lines were promoted to initial evaluation trials. One hundred and thirty five collections in cucurbits and 53 in pumpkin were evaluated. In pumpkin, CM 37, CM 42 and CM 39 were found promising. Janardhana, an induced mutant *bhendi*, with a duration of 100-110 days with short fruit size suitable for canning as a whole was released in 1985. Harita, a *bhendi* variety, was released in 1985 from Regional Agricultural Research Station, Lam, Guntur, having a high yield potential of 7-9 tonnes/ha and a maturity period of 100-110 days.

### Chillies

The research work on chillies in Andhra Pradesh was initiated at the Lam Farm in 1928 under the technical control of Cotton Specialist, Coimbatore. With the object of developing a thrips resistant chilli strain, a scheme was established in 1949 with the financial assistance from ICAR and from 1960 onwards, the State Government continued the scheme. The ICAR sanctioned a separate scheme in Telangana region at Sangareddy from 1957 to 1963 to tackle the local problems

affecting the chilli crop. In 1962, the Spices Development Council strengthened the chillies research efforts at Lam. In addition to the release of high yielding chilli strain G2 and G3, research on cultivation and plant protection were also carried out. The research work was further strengthened by the appointment of Breeder in the All India Coordinated Vegetable Improvement Project in 1975.

Several varieties were evolved suitable to different chillies growing tracts. The present position indicates that one can pick and choose chilli varieties for any situation. The varieties evolved from this station have occupied almost the entire area under chillies in the State. Some of the varieties are recommended for either green chillies or dry chillies. The varieties released so far from Lam are G4 (Bhagya Lakshmi) in 1968, G5 (Andhra Jyothi) in 1977, CA 960 (Sindhur) in 1978, CA 1068 (Aparna) in 1982, X 200 (Kiran) in 1982 and LCA 235 in 1985. Out of these, varieties G4, G5 and LCA 235 have been released as national varieties. Optimum dates of sowing, fertilizer and plant protection schedules have been worked out for all the varieties and suitable recommendations made.

Spraying fluchloralin at 1.20 and 1.44 g ai/ha a week after planting between rows after removing weeds, or spraying butachlor at 2.5 kg ai/ha between rows 7 to 10 days after planting, for control of weeds has been recommended.

The Chilli varieties released from Lam, Guntur are summarised in Table 54 below :

Table 54 : Chilli Varieties Released (1966-1989) by APAU

Year of Release	Popular Name	Duration days	yield in q /ha.	Remarks
1968	BHAGYALAKSHMI G 4	180	200 (green)	IT IS A NATIONAL STRAIN SUITABLE FOR GREEN AND DRY CHILLIES.
1977	ANDHRA JYOTHI G 5	180	50	IT IS A NATIONAL STRAIN; PODS SHORT AND STOUT WITH 45% SEED CONTENT
1978	SINDHUR (CA 960)	166	250 (green)	LONG AND STOUT POD SUITABLE FOR GREEN AND DRY CHILLIES
1982	APARNA (CA 1068)	195	40 (Dry)	AN YELLOW POD FOR GOLLAPROLU REGION AND EAST GODAVARI DISTRICT
1982	KIRAN (X 200)	10	40	PUNGENT TYPE WITH HIGH TOLERANCE TO THRIPS AND MITES
1985	LCA 235	180	70	A NATIONAL STRAIN HAVING YELLOW ANTHAS AS MARKER GENE; HIGHLY PROLIFIC AND PUNGENT TYPE

Research work on irrigated chillies in red soils was initiated at Malyal in Warangal district in 1986.

#### Tuber Crops

Studies on tuber crops are under way at Kovvur, Rajendranagar and Venkatarama nagudem. The Agricultural Research Station, Kovvur, released 'Satamukhi' variety of *colacasia* in the year 1982-83. The station has also released elephant foot yam variety 'Gajendra' for general cultivation in 1989.

#### Coriander

The research work on coriander is being done at Lam. Two varieties, Sadhana and Swathi, were released in 1989. Sadhana is semi erect and medium maturing (90-105 days) with an yield of 10-11 q/ha. Swathi is semi erect, early maturing with a duration of 80-85 days and yields 9q/ha.

#### Flowers and Ornamentals

A scheme for floriculture and semi-arid fruit trees was started in 1977 with the object of collecting and evaluating different flowers and ornamentals, and also developing agro-techniques for floriculture. This was strengthened with another scheme for floriculture research in Andhra Pradesh, in 1986. In 1987, AICRP on floriculture was started for improving flowers and ornamentals and also for standardisation of agro-techniques at Agricultural Research Institute and Grape Research Station, Rajendranagar.

The following were the contributions of the Scheme :

One hundred and ten varieties of bougainvillia were studied for their suitability. A seedless selection of 'Baby Margaret' bougainvillia was re-

leased in 1976. Dipping of basal ends of cuttings in 6000 ppm IBA and planting in sealed polybags containing pure sand gave 80 per cent success

- In rose, a total of 350 collections were made. Twelve rose-varieties among hybrid teas, six in floribundas and four in dwarf polyantha were found to record consistently high yields. Rose varieties Super star, Montezuma, Eiffel Tower, Sea pearl, American Heritage, Acquarius, Landora, Queen Fabula, Maria callas, Kardinal, Mirs Harp American and First prize were found suitable for use as cut flowers
- Of the different jasmine species evaluated, *J. auriculatum* was found to have *prolific flowering, high fragrance and resistant to thrips*. It was also found to be suitable for extraction of jasmine concentrate.

#### Aromatic and Medicinal Plants

Another Horticultural Research Scheme for establishment of Aromatic and Medicinal plants was initiated in 1986 at Agricultural Research Institute, Rajendranagar. Twenty three types of aromatic plants and 29 types of medicinal plants have been collected and planted so far. Block plantation of *Khus*, lemon grass, geranium, palmarosa and citronella has been completed. The Andhra Pradesh Agro-Industries Development Corporation has agreed to establish a pilot plant for the distillation of aromatics.

#### Post Harvest Technology Of Horticultural Crops

A centre under All India Coordinated Research Project on Post-Harvest Technology of Horticultural Crops has been in operation at Agricultural Research Institute, Rajendranagar, since 1987, with the objectives of improving the quality and shelf life of grapes,

standardizing maturity indices and maximising the quality and storage of mango, and use of zero energy cool chamber to improve the storage of fruits and vegetables.

Results of experiments conducted so far indicated that pre-harvest (one month before harvest) dip of Thomson seedless and Anabe-Shahi grapes in 2 per cent calcium solution improved the shelf life of the fruits.

#### FRUIT CROPS

##### Mango

Mango, banana and citrus are the important fruit crops of the State.

Research on crop improvement in mango is being done at Anantharajupet, Sangareddy and Rajendranagar.

##### Anantharajupet

The Agricultural Research Station, Anantharajupet, was established in 1935 as Fruit Research Station. The station was upgraded as one of the eight Regional Fruit Research Stations in the country in 1960. The mandate crops of the station were mango, banana, turmeric, citrus, guava and sapota. The Turmeric Research Station at Pedapalem in Guntur district was shifted to this station during 1968. The objectives of the station were

- to standardize agro-techniques for tropical fruits viz: mango, sapota and guava
- to improve the existing varieties for obtaining higher yields
- to recommend suitable control measures for pests and diseases of fruit crops and turmeric
- to supply pedigree plant material to the farmers.

The successive heads of the station since the inception of Agricultural University have been Dr. S. N. Rao (1965-67).

Sri G. Satyanarayana Swamy (1967-71 and 1976-78), Sri Y. R. Sundara Rao (1972-73), Dr. M. Rama Rao (1973-75 and 1980-81), Sri P. V. S. Narayana Rao (1982-83), Dr. P. Venkata Rao (1983-84), Dr N. Thimma Reddy (1987-1989) and Dr. V. Padmanabham (1989 - continuing).

Five mango hybrids viz: Neeleshan, Neelgoa, Neeluddin, Swarna Jehangir and A.U. Rumani were released from this station.

Spraying 0.1% carbendazim 2-3 times to control black banded disease and monocrotophos @ 1.25 ml/l to control mango hoppers and to reduce fruit drop and increase fruit yields, spraying 2,4-D at 10 ppm at flowering and onemonth after fruit set and 30 ppm two months before harvest has been recommended. Large scale supply of plant material to District Rural Development Authority has been undertaken in recent years.

#### Sangareddy

The Fruit Research Station, Sangareddy, was established in 1918 as an Agricultural Farm. A scheme on Annonaceous fruits was started in 1941. The station was chosen as one of the centres for research on mango by the ICAR.

The objectives of the station were crop improvement by selection, hybridization and mutation breeding, standardization of agro-techniques including root stocks, studies on pre and post-harvest technology and control of pests and diseases.

The successive heads of the station have been Sri M.S. Sampat Kumar (1966-74), Sri B.V. Rama Rao (1974-76), Dr. A. Rameshwar (1976-78), Dr. S. N. Rao (1978-82), Dr. G. Satyanarayana (1982-84), Dr. V. J. Kulkarni (1984-86), Dr. V. Suryanarayana (1986-88), Dr. V.J. Kulkarni (1988-89), and Dr. R. Sri Hari Babu (1989-continuing).

'Manjeera', a mango hybrid between A.U. Rumani and Neelam was released in 1984.

Among the ten hybrids grown at this Station, Mallika and Amarpali have been found to be more vigorous in growth than others. Earlier, this station also released "Atemoya", a hybrid between Sitaphal and Ramaphal.

An improved technique of grafting, "Veener grafting" was evolved for successful propagation of mango. Many commercial varieties could be induced to flower and set fruit during off-season by grafting them on bearing trees of Royal Special.

Application of 1 kg N and 2 kg P<sub>2</sub>O<sub>5</sub> per tree per year was recommended for soils which were rich in potash. Large scale supply of plant material to District Rural Development Authority was undertaken.

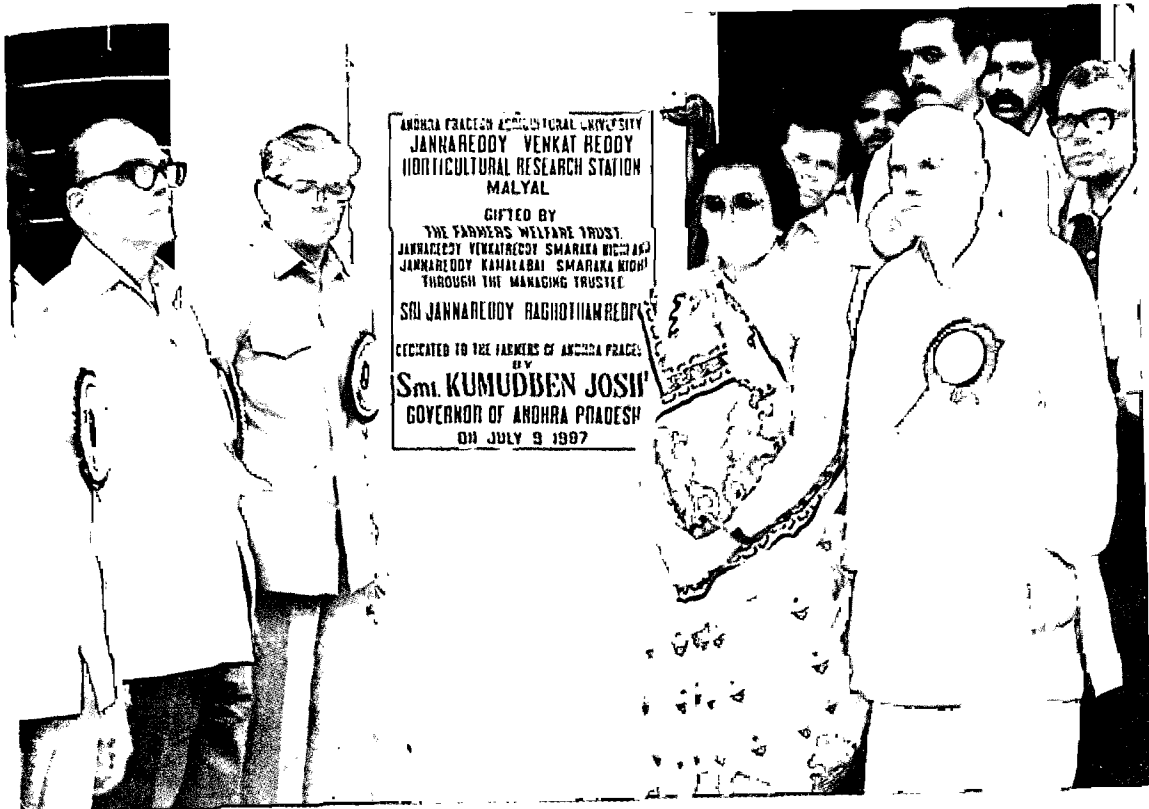
#### Malyal

The Jennareddy Venkat Reddy Fruit Research Station at Malyal has been donated by Jennareddy Venkat Reddy Memorial Trust in 1987. The assets donated include 62 hectares of land, most of which is planted with fruit trees like mango, guava, sapota etc., seven wells with energised pump sets with an irrigation grid of over 2 kilometers length of pipe lines, farm structures etc.

Research work on mango has been initiated. Apart from mango, intensive propagation and multiplication of other fruit crops like guava, sapota etc., is being done to meet the heavy demand by the farmers of the area and Tribal Area Development Agencies.

#### GRAPES

Research work on grapes is being done at Grape Research Station, Rajendranagar. As early as in 1941, research on grapevine was initiated through ICAR finance and a variety 'Anab-e-Shahi' was introduced. Later in 1964, a non-plan scheme was initiated with the objective of examining the feasibility of grape growing in and around Hyderabad. The All



ANDHRA PRADESH AGRICULTURAL UNIVERSITY  
JANNAREDDY VENKAT REDDY  
HORTICULTURAL RESEARCH STATION  
MALYAL

GIFTED BY  
THE FARMERS WELFARE TRUST,  
JANNAREDDY VENKATREDDY SMARAKA NICHUJ  
JANNAREDDY KAMALABAI SMARAKA NICHUJ  
THROUGH THE MANAGING TRUSTEE  
SRI JANNAREDDY RAGHOTILAM REDDY

DEDICATED TO THE FARMERS OF ANDHRA PRADESH  
BY  
**Smt. KUMUDBEN JOSHI**  
GOVERNOR OF ANDHRA PRADESH  
ON JULY 9 1987

Smt. Kumudben Joshi, Her Excellency the Governor of Andhra Pradesh  
inaugurating the Horticultural Research Station - Malyal.

India Coordinated Research Project on Grape has been functioning since 1977, with the objective of improving the production technology of grapes.

The Research Station has been headed by Sri B.V. Rama Rao (1975-80), Dr. G. Satyanarayana (1980-82), Sri V. Padmanabham (1982-85), Sri K. Nagaraja Sarma (1985-86), Dr.C.V. Ratnam (1986-87), Sri M.A. Rahim (1987-88) and Dr. P. Radhakrishnamurthy (1988-continuing)

The studies made so far indicated that fifteen grape varieties like Pusa Seedless, Anab-e-Shahi, Thompson Seedless, Bangalore Blue, Kalisahebi etc., were suitable for table purpose out of 60 varieties evaluated. Suitability was evaluated based on brix/acid ratio, crispness, taste, juice content, colour, flavour and yield. Five varieties were found to be useful for raisin making, nine for juice purpose and ten varieties viz., Rubi Red, Black Corinchen, Fesca neagra, Thompson Seedless, Queen of the Vineyards, Bian Shrai, Selection 94, Anab-e-Shahi and Karachigulabi for wine making.

Bower system of training was found better than Head system for getting good yields and quality fruits under Hyderabad conditions. Anab-e-Shahi and Arka Kanchan varieties when trained on Bower system were more vigorous compared to other varieties.

A fertilizer dose of 500 kg N, 500 kg P<sub>2</sub>O<sub>5</sub> and 500 kg K<sub>2</sub>O per hectare was found to be optimum for Thompson seedless variety of grape.

## BANANA

Banana research is being carried out at the Agricultural Research Stations located at Kovvur and Anantharajupet.

### Kovvur

The Agricultural Research Station, Kovvur, was started in 1959. Research work

on tuber crops like colocasia, turmeric and amorphophallus is also being carried out at this station.

Optimum plant population of banana and pine apple in 1:4 ratio with the application of 600 kg N/ha was found economical. Ansar 529 @ 15 l/ha applied as post emergence spray controlled nutgrass to the extent of 70 per cent.

It was found that in intercropping of banana + colocasia + turmeric and banana + amorphophallus + turmeric gave 34.6% and 33.2% higher net returns without adverse effect on the main crop of banana.

Mulching of Tellachekkra Keli with 15 tons of leaf trash per hectare resulted in early fruiting, superior bunches and suppressed weed growth. Application of nitrogen for all varieties beyond 350 kg/ha was found to be uneconomical. Application of N P K in three splits 1/3 at the time of planting and the remaining in two equal doses, once in three months after planting, was recommended.

### Anantharajupet

At Agricultural Research Station, Anantharajupet, research on banana showed that Robusta variety (Pedda Pacharati) gave higher yield with a spacing of 1.5 x 1.5m. Intercropping of *ragi*, *korra* and cluster beans was found to be remunerative during the early stage of banana growth. For the control of Sigatoka leaf spot disease, Dithane M-45 (0.3%), sprayed at fortnightly intervals starting from the first appearance of the disease, was effective.

## GUAVA

Research work on guava is being carried out at Sangareddy and Kovvur. Two guava hybrids 'Koheer safed' and 'Allahabad safed' were released in 1976. Research work on wilt disease of guava has been taken up at Kovvur.

## CITRUS

Research work on citrus in the University is being carried out at Anantharajupet and Tirupati.

### Anantharajupet

Studies made at Agricultural Research Station, Anantharajupet, on screening of root stocks for Satgudi, revealed that Sathugudi on Satgudi or Satgudi on Rangapur lime were more promising and disease resistant.

A fertilizer dose of 1.80 kg of N, 0.60 kg P<sub>2</sub>O<sub>5</sub> and 0.60 kg of K<sub>2</sub>O per tree for Sathugudi and acid lime was found optimum.

Spraying monocrotophos @ 1.25 ml/l of water at the time of new flush emergence controlled leaf minor on acid lime and sweet orange.

### Tirupati

A citrus certification scheme to identify virus disease in Andhra Pradesh and to multiply virus free plant material for supply to growers was initiated at Tirupati during 1977. In 1978, the scheme was enlarged as 'Citrus Improvement Project'.

Among the technologies developed and recommended are :

- Rangapur lime root stock was drought resistant, tristeza disease resistant and good for yield and quality. Hence, it has been recommended as the suitable rootstock for Satgudi sweet orange
- Combined spray of micronutrients significantly increased the yields and quality of Sathugudi and acid lime fruits
- Twig blight in acid lime could be controlled by pruning dead twigs before

the onset of the monsoon followed by three sprays of 0.1% carbendazim at monthly intervals

- Scab on Rangapur lime was effectively controlled by three sprays of 0.2% difolatan at monthly interval starting from petal drop
- Spraying carbendazim at 0.1% thrice at monthly interval in June, July and August could effectively control pre-harvest stem end rot in Satgudi sweet orange
- Canker in acid lime was controlled by pruning of infected twigs and spraying of agrimycin at 100ppm at monthly intervals during rainy season.
- Sathugudi budlings prepared with virus free Satgudi buds were long lived and productive
- Application of 20 kg neem or castor or pongamia cake per tree, once in six months reduced the population of citrus and root-knot nematodes in sweet orange and acid lime

## COCONUT

At present research work on coconut is being carried out at Agricultural Research Station, Ambajipet and of late at Agricultural Research Institute, Rajendranagar also.

### Ambajipet

The Agricultural Research Station, Ambajipet, in the heart of central delta of East Godavari district, was started in 1955 with the financial assistance of the State Agricultural Department to study the performance of different coconut varieties, collection of germplasm and to tackle the problems of coconut growers.

The successive heads of the station have been Sarvasri T. Kailasa Rao (1956-69), B.V. Rama Rao (1970-73), K.V. Subba Reddy (1974 - 77), M. Venkata Rao (1978 - 80), V. Suryanarayana (1981-82), M. Venkata Rao (1982-85), T. Srirama Rao (1986-87) and Dr. K. Pampapathi (1988-continuing).

East Coast Tall x Gangabondam (T x G) hybrid evolved at Ambajipet came to bearing within 3-4 years. Its yield performance was good with a mean annual yield of 100 nuts/palm.

Laccadive Ordinary, in terms of nut yield, was good and hence, recommended for release.

Among the exotic germplasm, Phillipines Ordinary, Laccadive Ordinary and Cochinchina were found to be high yielders. Mass multiplication of parasitoids of *Nephanthis serinopa* and supply to the pest infected coconut gardens has been a regular practice. A new technique of root feeding with 20% monocrotophos for the control of black headed caterpillar was standardised and recommended to the farmers.

#### Rajendranagar

At Agricultural Research Institute, Rajendranagar, out of eleven varieties planted,

T x G hybrid started flowering within three years whereas Gangabondam flowered in 4 years after planting.

#### CASHEW

The Cashew Research Station at Bapatla, was established in 1955 to improve cashew cultivation in the State through improved agronomic practices and also for the evolution of new economic types through introduction, selection and hybridization. The station was chosen as one of the subcentres under the All India Coordinated Cashew Improvement Project by ICAR. The station has been headed by Sarvasri B. Ranga Reddy (1966-68), Y. R. Sundar Rao (1969-71), R. Rajeswar Rao (1971-74), S. Nagabhushanam (1974-77), N. Subba Rao (1977-82), Dr. Rao Rama Rao (1982-86), K. Satyanarayana Reddy (1986-88), Smt M. Rama Devi (1988-89) and N. Subba Rao (1989-continuing).

The varieties BPT 5, 6, 3 and 4 were released from this station. In addition to these varieties, tree No. 40 and 120 were also selected as high yielders. Hybridisation efforts resulted in two promising hybrids, numbered BPT 1 and 2. Fertilizer and plant protection schedules were worked out and recommended. The following are the varieties released by APAU (Table. 55) :

Table : 55. Cashew Varieties Released by APAU

Year of release	Station	Popular name	Yield kg/year/tree	Remarks
1980	Bapatla	BPT 1	17	HYBRID, WITHSTANDS CYCLONES, DROUGHT TOLERANT
1980	- do -	BPT 2	19	- do -
1980	- do -	BPT 3	13	BIG SIZED NUT WITH HIGH SHELLING PER CENT
1980	- do -	BPT 4	9.5	- do -
1980	- do -	BPT 5	46	HEAVY YIELDER WITH BIG SIZED NUTS
1980	- do -	BPT 6	55	- do -
1980	- do -	BPT 7	35	BIG SIZED NUTS



## TURMERIC

Research work on turmeric is being done at Rudrur, Anantharajupet and Jagtial.

### Rudrur

At Rudrur, turmeric variety 'Duggirala' was found superior to local 'Armoor' variety in yield. Yields upto 30 t/ha fresh rhizome were obtained when grown with a fertilizer dose of 250 kg N, 80 kg P<sub>2</sub>O<sub>5</sub> and 200 kg K<sub>2</sub>O per ha with 30 x 15 cm spacing. Turmeric with maize as an inter-crop in proportion of 2 rows of turmeric and one row of maize recorded maximum monetary returns.

### Anantharajupet

At Agricultural Research Station, Anantharajupet, C 11 326 (Mydukuru type) and C 11 325 (Duggirala type) among long duration types and C 11, T 317 (Amruthapani, Kothapeta) among medium duration types and Ca 69 (Kasturi type), Ca 17/1 and Ca 146/4 among short duration types, were found superior in terms of yield and cured product. Optimum time of sowing of turmeric was found to be May, the first week of June and the second fortnight of June for short, medium and long duration types respectively. Sowing of finger rhizomes with a spacing of 30 x 15 cm gave higher yields. Optimum manurial schedule for turmeric was 300 kg N, 125 kg P<sub>2</sub>O<sub>5</sub> and 200 kg K<sub>2</sub>O/ha with a basal dose of 25 tonnes of FYM. Control of leaf spot disease and rhizome rot through chemicals was worked out and recommended.

### Jagtial

At Regional Agricultural Research Station, Jagtial, research on turmeric indicated the following:

- Two short duration (195 days) culture, PCT 13 and PCT 14 with an average yield of 28 tonnes and 26 tonnes of fresh rhizome yield per ha respectively, were performing better among

short duration cultures in the research station and in the farmers' fields. PCT 13 showed tolerance to rhizome rot, leaf blotch and leaf spot. Curcumin content was 5.8%. PCT 14 also showed tolerance to rhizome rot and leaf spot, but was susceptible to leaf blotch. Its curcumin content was 4.2%.

- The improved curing pan (curing pan with perforated trough) has been developed, which to an extent saves the fuel, time and labour
- Leaf spot of turmeric caused by *Colletotrichum capsici* was effectively controlled by 6 sprays of Dithane M-45 at 0.25% concentration at fortnightly intervals.

## BETELVINE

Research on betelvine is being conducted at Utukur in Cuddapah district and Chintalapudi in Guntur District.

### Utukur

The Agriculture Research Station, Utukur, was started in the year 1959 as a Coordinated Betelvine Research Scheme with the assistance of ICAR and subsequently, the University took over the research activity of the scheme. Research on rice was also being carried out at this station. The objectives of the station are :

- to assess the leaf yield potential of betelvine collected from inside and outside the State
- to determine the optimum manurial schedule for economic crop production
- to study the incidence of pests and diseases and to devise the most effective control measures
- to find out suitable packing material for storage of betel leaves.

The successive heads of the station have been Sarvasri M. Venkat Rao (1964-68 and 1970-73), P.V.S. Narayana Rao (1968-70), S. MadhavaChary (1973-79), R. Narayana Reddy (1979-82), Dr. V. Venkateswara Rao (1983), K.V. Seshadri (1983-84), R. Narasimha Reddy (1984-87) and M. Ramakrishna (1987-continuing).

An improved variety 'Safed' was developed and released in 1974 for cultivation. This variety recorded maximum yield of 38.48 million leaves per hectare which was 92.4 per cent more than that of the local Kuljedu variety. The variety possesses better keeping quality. Among the technologies developed at this Station, the following were recommended :

- Irrigation once in two days during summer and once in three days during winter recorded higher yields. It was found that live standards were better compared to dry bamboo and the vines trailing under the live standard of *Avisi (Sesbania grandiflora)* gave maximum leaf yields. Application of 600 kg N/ha supplied through organic fertilizer in the form of FYM (25%) and cakes (25%) and inorganic fertilizers in the form of urea (50%) gave highest yields. Leaf spot sclerotial wilt were effectively controlled by spraying 1% Bordeaux mixture at monthly intervals, starting from south-west monsoon till the end of north-east monsoon.

Leaves when packed in wet cloth, moistened once every 24 hours, could be stored for longer period than the prevalent practice of packing in straw.

### Chintalapudi

The following were the technologies developed at Agricultural Research Station, Chintalapudi, in AICRP on betelvine.

- Application of gypsum (2.5 tonnes/ha) and draining of irrigation water coupled with manuring of betelvine with organic fertilizers (either castor or neem cake @ 300 kg/N/ha) satisfactorily controlled betelvine decline disorder.
- Application of neem cake (3 tonnes/ha) was found to be effective in reducing the root gall formation by root knot nematode, *Meloidogyne incognita* with a significant increase in leaf yield in two and three years old betelvine gardens. This effect was negligible in one year old gardens.
- Manuring in the form of castor cake and ammonium sulphate in 3:1 ratio at 400 kg N/ha in four split doses at bi-monthly intervals significantly increased the growth and yield of betel leaves.

## DISCIPLINE ORIENTED PROJECTS

### AGRONOMY

The All India Coordinated Agronomic Research Project (AICARP) has been in operation in Andhra Pradesh since 1968-69. Later the scheme was modified as Experiments on Cultivators Fields and became a part of AICARP with its inception in 1972-73.

The AICARP has two components: Cropping Systems Research Programme and Ex-

periments on Cultivators' Fields. The third component, production potential trails were added from 1986-87 to be implemented at Regional Agricultural Research Station, Jagtial, under Sreerama Sagar Project (SRSP) Command Area. The cropping systems research programme is now in operation at Rajendranagar, Rudrur and Maruteru. Experiments on Cultivators' Fields are in operation in Nizamabad, Guntur and Vizianagaram districts.

The main objective of the scheme was to study the best cropping system suitable for the track and conduct experiments on cultivators' field to create perceptible impact on the production based on the technologies developed at research stations and to offer solutions to local problems. The successive heads of the scheme have been Sarvasri Dr. V. Sreeramamurthy (1969-75 and 1980-83), Sri Mohd. Yaseen (1975-76), Dr. K. Raj Reddy (1976-80), Dr. Mir Mustafa Hussian (1983-87) and Dr. K. Anand Reddy (1987-continuing).

The following have been significant technologies developed:

- Rice- rice sequence gave the highest net income at Maruteru
- Rice - wheat - *bhendi* sequence gave the highest net income followed by rice - wheat - greengram and rice - wheat - sunflower sequence at Rudrur
- At Tirupati, rice - groundnut - *moong* gave the highest income compared to other crop sequences
- Manurial requirement and fertilizer dose, and residual effect of application of fertilizers were worked out for a fixed crop rotation at Maruteru, Rudrur, Tirupati and Nandyal on rice crop
- Agro-technology for newly released crop variety/hybrid was worked out at Nandyal and Maruteru
- Nitrogen economy through organic manure in cereals based crop sequence was estimated at Rudrur and Nandyal
- Experiments on slow release nitrogenous fertilizer and nitrification inhibitor in rice-based cropping systems were conducted at Maruteru, Rudrur and Rajendranagar and significantly higher yields were obtained with the use of these fertilizers
- Effective weedicides for rice, maize, sesamum and groundnut crops were recognised in weed control trails and suitable recommendations were made
- In East Godavari District, it was found that application of 120 kg N, 60 kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O/ha to the rice varieties, Gowtami, MTU 9416, Sowbhagya and Jaya during *kharif* gave maximum yields
- During *rabi* rice variety Dhanyalakshmi was found to give better response to potash application
- In Srikakulam district, it was found that the rice variety, Nagavali, gave better yields with the application of 120 N, 60 P<sub>2</sub>O<sub>5</sub> and 40 kg K<sub>2</sub>O/ha
- During *Kharif* season in Vizianagaram district, application of 80 kg N, 40 kg P<sub>2</sub>O<sub>5</sub> and 40 kg K<sub>2</sub>O/ha was optimal for higher rice yields
- JL 24 and TMV 2 groundnut varieties responded well to 40:80:40 N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O kg/ha both during *kharif* and *rabi* seasons
- Gowri gingelly gave maximum yield during *rabi* with a fertilizer dose of 60 kg N, 40 kg P<sub>2</sub>O<sub>5</sub> and 60 kg K<sub>2</sub>O/ha.

#### WEED CONTROL

A scheme for control and eradication of weeds was initiated in 1955 at Agricultural College, Bapatla. The objective of the scheme was to test and evaluate herbicides for the control of weeds and to recommend to the farmers the economic doses and methods of chemical weed control. Several Adhoc Research Projects on weed control financed by

Government agencies, international agencies and private agencies were undertaken in different field crops. The successive heads of the research scheme have been Sarvasri Y.R. Sundara Rao (1966-68), Dr. J. Chandrasingh (1968-78), and Sri. K. Narayana Rao (1979-continuing). The following recommendations emerged out of the scheme.

## RICE

### a) Rice nursery

Spraying of benthocarb @ 1.25 to 2.5 kg a.i./ha (2.5 and 5.0 l/ha) at 3rd or 7th day after sowing against *Echinochloa* spp.

### b) Transplanted rice

Applying 2,4-D ethyl ester granules @ 0.8 to 1.0 kg/a.i./ha (20 to 25 kg/ha) applied at 3-5 days after transplanting paddy seedlings

or

Applying 2,4-D ethyl ester granules @ 0.4 kg a.i./ha (8.0 kg/ha) + benthocarb @ 1.25 kg a.i./ha (2.5 l/ha) mixed with sand applied at 3-5 days after transplanting

or

Applying 2, 4-D ethyl ester granules @ 0.4 kg a.i./ha + butachlor @ 1.25 kg a.i./ha (8.0 kg + 2.5 l/ha) mixed with sand at 3-5 days after transplanting.

## SORGHUM

Spraying atrazine at 0.62 kg a.i./ha (0.78 kg/ha) within 3 days after sowing.

## MAIZE

Spraying atrazine @ 1.68 to 2.80 kg a.i./ha (2.1 to 3.5 kg/ha) within 3 days after sowing.

## PULSES

Spraying fluchloralin @ 1.25 kg a.i./ha (2.60 l/ha) as pre-sowing incorporated spray.

## SUGARCANE

A spray of atrazine @ 2.80 kg a.i./ha (3.5 kg/ha) immediately or within 3 days after planting sugarcane setts

or

Spraying alachlor at 3.5 to 3.75 kg a.i./ha (5 to 7.5 l/ha) immediately after planting of setts

## GROUNDNUT

Spraying alachlor at 2.5 to 3.75 kg a.i./ha (5 to 7.5 l/ha) at or within 3 days after sowing

or

Fluchloralin @ 1.25 kg a.i./ha (2.60 l/ha) prior to sowing.

## GINGELLY

Spraying alachlor @ 3.0 kg a.i./ha (6.0 l/ha) just after sowing gingelly or the next day.

## CHILLIES

Spraying fluchloralin @ 1.20 to 1.44 kg a.i./ha (2.5 to 3 l/ha) one week after planting between rows, after removing existing weeds or spraying butachlor at 2.5 kg a.i./ha (5 l/ha) between rows 7 to 10 days after planting, after removal of existing weeds.

## TURMERIC

Spraying butachlor @ 3.12 to 3.75 kg a.i./ha (6.25 to 7.50 l/ha) immediately or within three days after sowing rhizomes.

## WEED CONTROL SCHEME

An All India Coordinated Research Project on Weed Control with the objectives viz., (1) Ecological study of weeds in different regions of Andhra Pradesh and its utilisation in Agriculture and (2) Studies on the effect and persistence of certain herbicides under different cropping systems was started in 1986, initially for a period of four years. It is being

funded by 'FERRO' (PL 480) through ICAR. The scheme is presently in operation in the department of Agronomy, College of Agriculture, Rajendranagar.

The following is the summary of the technologies developed :

- In *cuscuta* infested rice fallows, it is better to rotate cereal crops rather than pulses and oilseeds since *cuscuta* infestation was not observed in cereal crops
- Pre-emergence application of pronamide @ 1.5 kg/ha was found to be highly effective in controlling *cuscuta* in greengram
- Pre-emergence application of metolachlor, fluchloralin @ 1.5 kg/ha followed by one hand weeding on 40th day was effective in controlling weeds and increasing yields in groundnut + pigeonpea intercropping system
- Pre-emergence application of butachlor @ 1.5 kg/ha mixed with large granular urea (applied @ 6 kg N/ha) was found to be better and economical method than spraying or granular application of herbicides in transplanted rice.

## AGRO-FORESTRY

The All India Coordinated Research Project on Agro-forestry, Rajendranagar was started in 1987 with the following objectives:

- to identify the existing agro-forestry systems
- to evaluate the real potentials and growth pattern of different multipur-

pose tree species for introduction in different agro-forestry systems

- to identify the research needs in relation to the productivity and suitability to the agro- forestry systems.

Simultaneously, the Department of Non-conventional Energy Sources, Government of India, sanctioned a project on energy plantation to produce fuel wood for meeting the needs of the domestic sector, to improve the soil fertility of waste lands and to bring a general awareness among farmers and others regarding fast growing species appropriate for waste lands.

The following technologies were developed

- Among the 12 tree species evaluated, *Eucalyptus* sp. *Leucana leucacephala*, *Acacia albida*, *Albizia lebbeck* and *Dalbergia sisso* were fast growing
- Mulching with paddy husk 3" thick, in the basins of tree species proved to be highly effective in conserving soil moisture and was economical as compared to *Jalashakti* application
- Management practices like irrigation, fertilization and weeding in one year old subabul resulted in five fold increase in height and girth of plants compared to unmanaged plants.

Under the energy plantation programme an area of 45 hectares was covered by planting with important tree species.

## AGRO-METEOROLOGY CELL

An Agro-meteorological cell is presently functioning at the Agricultural Research Institute, Rajendranagar, with the objective of studying the effect of climatic factors on crops like castor and rice and also to record day to day weather data.

## SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

### Radio Tracer Laboratory

The Radio Tracer Laboratory (non-plan scheme) was established in the year 1967 at the Agricultural Research Institute, Rajendranagar with the following objectives.

- to exploit the potentialities offered by Radio Isotopes in the economic use of phosphate fertilizers and to maximise phosphate availability in the soils of Andhra Pradesh
- to carry out research on soil fertility and fertilizer use, soil plant relationship, plant nutrition and pesticide usage employing tracer techniques involving radio active isotopes like  $P^{32}$ ,  $Ca^{45}$ ,  $S^{35}$ ,  $Zn^{65}$ ,  $C^{14}$ , and  $N^{15}$ .

Sarvasri Dr. J. Venkateswarulu (1967-71), Dr. I. V. Subba Rao (1972-77), Dr. P. Krishna Murthy (1978-80) and Dr. M. Badrinarayana Rao (1980 - 1989) have been the successive Radio Tracer Agricultural Chemists at the laboratory.

Technology developed using radioactive isotopes :

- Lowland rice yields could be increased the placing by 5-10 q/ha the N-fertilizer at 5-10 cm depth
- Studies on different methods of phosphate application to rice indicated that the basal application of P - fertilizer during last puddling was most effective
- Efficiency of complex fertilizers like micro - phosphates, urea - ammonium phosphate in *Chalka* and *Regur* soils was studied with rice, *jowar* and wheat. The results showed the superiority of urea ammonium phosphate

over ammonium nitrate phosphates in low and medium P soils. Basal application of these complex fertilizers was found to be more efficient

- A minimum of 50% water solubility of P - fraction in nitrophosphate was found to be essential, against 30% water solubility in this type of fertilizers, for the best use of these complexes. This has been accepted for adoption in the manufacture of nitrophosphates
- Ammonium sulphate was better utilised by *Jowar* crop when phorate, an organo-phosphorus granular systemic insecticide was added to the soil at 15-30 kg/ha and this was in addition to its insecticidal action
- Application of gypsum increased the yields of groundnut. Both calcium and sulphur increased the yields, but the effect of the latter was more. Calcium and sulphur in gypsum had a complementary and beneficial effect on groundnut
- Tellahamsa and Mahsuri varieties of rice utilised the fertilizer phosphorus more efficiently than RP 4-14 and MTU 8002. For better and efficient utilisation of phosphorus, a closer spacing of 15 x 10 cm was found necessary for Sona, Tellahamsa, RP 4-14 and C 12329
- The effect of new polyphosphate fertilizers like tri and tetra ammonium pyrophosphates were evaluated with sorghum and rice crops. The Polyphosphate fertilisers were found to be good source of 'P' to sorghum and rice crops
- $C^{14}O_2$  fixation was more in Jagannath, RNR 12329, Tellahamsa and Ratna - in that order than Jaya variety of rice

- There were significant differences for  $C^{14}O_2$  fixation among the *jowar* varieties studied.-
- Intercropping of sorghum + green gram (2 : 1) by maintaining the same population as in a sole crop was advantageous as phosphorus applied was better utilised by the crops and there was an additional benefit in the yield
- The order of crops for the per cent P utilisation and their abilities to feed on soil phosphorus at harvest was sunflower, *ragi*, *bajra*, blackgram, groundnut and greengram
- Application of sulphur increased the drymatter production, pod yield of blackgram, content and uptake of sulphur and per cent 'S' derived from fertilizer, irrespective of sulphur source, over control
- Application of Urea Super Granules @ 90 kg N/ha to rice (Tella-hamsa) either applied basal or incorporated 7 - 10 days after transplantation gave better yields than the normal recommended dose of 120 kg N/ha through prilled urea applied in splits
- Increased application of nitrogen from 0-90 kg N/ha at all levels of phosphorus application increased the drymatter production and yield of green fruits of *bhendi*. Similarly nitrogen content and uptake in *bhendi* shoot and fruit increased with all levels of phosphorus application
- Application of nitrogen and phosphorus increased the yield of safflower, N and P content and uptake and per cent P utilisation
- Application of sulphur and calcium increased the drymatter production of sesamum. As gypsum is a cheap source of sulphur, application of gypsum @ 215 kg/ha to supply 40 kg S/ha was recommended for sesamum where sulphur free fertilizers were used
- The results of the investigation, taken up to study the uptake and utilisation pattern of P by *jowar* crop as affected by different methods of tillage, using  $P^{32}$  radio isotope revealed that deeper ploughing with tractor or mould board plough was better than shallow ploughing with cultivator or country plough
- The influence of potassium on drought tolerance and sulphur utilisation of groundnut under different water regimes indicated that the application of 60 kg  $K_2O$  / ha to groundnut was beneficial under drought conditions. Under water stress, potash enhanced the dry matter production through better utilisation of applied sulphur
- Phosphorus was utilised better by maize in the presence of nitrogen rather than in its absence. Based on the results of this experiment, application of 90 kg N/ha along with 60 kg  $P_2O_5$ /ha seems to be optimum for maize variety, CM 119
- From root activity studies in rice it was found that Jagannath, MTU 8043, Tella-hamsa, RP 5 - 46 and RP 5 - 40 have root system capable of drawing the plant nutrients from the soil more efficiently
- Root activity of dwarf sorghum varieties was more in surface layers while in tall varieties it was more in deeper layers
- In *bajra*,  $HB_1$  fed better at greater depths than  $HB_4$  and hence with stood drought

- In maize  $P^{32}$  soil infection technique data revealed that Ganga - 5 feeds upto a depth of 30 cm while lateral spread was confined to 5 to 10 cm from the plant.

### Micronutrient Scheme

An adhoc Scheme on Soil Fertility Evaluation Studies, was started in 1970. The Coordinated Micronutrient Scheme was started in 1975.

The soil fertility evaluation study with special reference to zinc in maize was initiated at Agricultural Research Institute, Rajendranagar. The Coordinated Micronutrient Research Scheme was started with the objective of delineating areas deficient in micronutrients and establishing critical levels of micronutrients in soils of Andhra Pradesh.

Sarvasri Dr. J. Venkateswarlu, Dr. I. V. Subba Rao, Sri V. Venkata Subbaiah, Dr. P. Krishna Murthy and Dr. M. Badrinarayana Rao have headed this scheme. The following have been the major achievements.

- The work on delineating micronutrient deficient areas has been completed in all the districts of Andhra Pradesh for rice crop. From the information available it was concluded that zinc was the major micronutrient deficient in the State in all the districts
- Critical limits of zinc for rice were found to be 8.0 to 10.0 ppm (3rd leaf) in plant and 0.6 to 0.75 ppm in soil
- Soil application of zinc sulphate at the rate of 50 kg/ha was the best for correcting zinc deficiency in soil.
- Zinc application had strong residual effects in correcting deficiency of zinc for two to three seasons
- Application of FYM at 15 t/ha every

year increased the micronutrient uptake in rice - rice rotation

- Survey of citrus gardens in Nellore district revealed moderate to severe deficiencies of N,P and Zn
- Application of higher doses of K and Zn (100 kg  $K_2O$  and 50 kg  $Zn SO_4$ /ha) to chillies in Warangal district reduced the high content of Mg and corrected the deficiencies of potash and zinc.

### Soil Physical Conditions Improvement Project

The Soil Physical Conditions Improvement Project was started in 1967 at Rajendranagar. The project was originally sanctioned by ICAR as an All India Coordinated Scheme for studies on measurement, evaluation and improvement of soil structure. During 1975-76 this centre was upgraded with the following objectives :

- identification of physically problematic soils of Andhra Pradesh
- to prepare maps of moisture retention capacity of different soil series or associations occurring in the State
- to understand the mechanism of soil hardening and crust formation in different soils of the State and to develop suitable methodology for management of such soils
- to develop technology for the management of rice soils for the cultivation of *rabi* crops
- to develop suitable technology for the management of soils with different permeabilities.

Sarvasri V. V. Kumarasastry (1967), Dr. R. L. Narasimham (1968-69), Dr. M. S. R. Mohan



Rao (1969-70), M. A. Quaiser (1970-78), Dr. D. Subbarami Reddy (1978-82), Dr. A. Padma Raju (1982-87), Dr. M. Singa Rao (1987 - continuing) have been the successive heads of the scheme. Technologies developed and recommended were :

- Application of paddy husk or groundnut shell @ 5 t/ha to reduce hardening in red *chalka* soils
- Ridge and furrow formation for *insitu* moisture retention

#### Soil Test-Crop Response Correlation Scheme

The All India Coordinated Soil Test-Crop Response Correlation Project was started in 1967 with the objective of establishing a relationship between soil test and crop response to fertilizers in different soil and agro-climatic regions of the state and providing a basis for fertilizer recommendation for crops, based on soil testing. Sarvasri T. G. Pacheco (1967-69), Dr. M. Ramesam (1970-75), S. Medekkar (1976-79), L. Nageswara Rao (1980-81) and Dr. M. Ramesam (1981 - continuing) have been the successive heads of this Scheme.

Based on soil testing, equations were derived for recommending fertilizer doses to rice, maize, *jowar*, wheat, groundnut, sugarcane, greengram, cotton, chillies, *mesia* and sunflower both for maximum profits and for specific yield targets.

#### Long Term Fertilizer Experiment Scheme

The Long Term Fertilizer Experiment Scheme, an All India Coordinated Research Project, was started in 1971 with the objective of studying the long term effects of use of fertilizers and manures on yield of rice under intensive cultivation and also studies on soil characteristics under rice - rice rotation.

Sarvasri Dr. P. Krishnamurthy (1971-74), Sri M. A. Kareem (1974-80), Sri V. Shantaiah (1980-83), Dr. M. Singa Rao (1983-85) and Dr. A. Sriramulu (1985 - continuing) have been the successive heads of this Research Scheme. The salient findings of the scheme were :

- The 100% optimum recommended NPK dose represented application of 115 kg N, 20 kg P<sub>2</sub>O<sub>5</sub> and 30 kg K<sub>2</sub>O per hectare to Tellahamsa rice variety, in soils where initial P<sub>2</sub>O<sub>5</sub> content was in high range. The soil texture of the experimental plot was red sandy loam to sandy clay loam
- Incorporation of Farm Yard Manure @15 t/ha along with 100% optimum NPK has consistently recorded the highest grain and straw yield of rice
- Addition of FYM once a year maintained the same fertility conditions of the soil as initially, with respect to major and micro-nutrients, besides showing improvement in soil physical conditions over the years

#### Watershed Development Project :

The World Bank funded Watershed Development Project (Maheswaram) was started in 1987. The A. P. Agricultural University took up the responsibility of research component of the Project and started a centre during 1987-88 with its head quarters at Pahadisharif, Rangareddy district. The Scheme has been implemented with the active cooperation and involvement of the staff of Department of Agriculture. The concept of Watershed Development in the rainfed areas envisaged the need for efficient utilization of natural resources like soil and water for increasing agricultural production.

The objectives of the project are :

- Crop production activities
- Soil and moisture conservation
- Pastures and forage development
- Rain water harvesting and management
- Staff training and research

Dr. A. Padma Raju has been heading the Project since its inception. The following technologies have been developed and recommended :

- Soil moisture and conservation practices like sowing along contour lines and opening of dead furrow in case of *jowar*
- Cultivation of castor in ridges and furrows along contour lines
- Raising of vegetative barrier with *khus*

## ENTOMOLOGY

### Scheme on Economic Ornithology

All India Coordinated Research Project on Economic Ornithology started functioning from 1973 and as a Coordinated Project in A. P. Agricultural University from 1985, with Rajendranagar as the main centre and a sub-centre at Regional Agricultural Research Station, Nandyal.

The main objectives of the scheme were : identifying the bird pests causing damage,

estimation of crop losses under different ecological zones in the State, studying the feeding habits of birds of agricultural importance, assessing the beneficial role of birds in agriculture and finding out methods of crop protection from bird damage. The crops selected under the Scheme were sorghum, sunflower and *bajra*.

Dr. N. Shivanarayan has been the head of this Scheme since 1975

The following have been the findings.

- Birds associated with rice panicle damage have been identified and the loss has ranged between 3 and 10%. It was found that short duration variety suffered more damage than the medium and long duration varieties
- In sorghum, the loss due to damage by birds ranged between 10 and 20%. Awned variety of sorghum was less affected by birds
- The percentage of loss due to bird damage was between 5 and 10% in maize crop. Varieties DHM 101 and DHM 103 suffered less damage due to bird pests than other varieties
- Shining polythene reflective tape tied across the sunflower field reduced the bird damage to a considerable extent. The cost of the tape to protect one hectare area was about Rs.100/-

### Biological Control of Crop Pests

The All India Coordinated Research Project on Biological Control of Crop Pests was started in 1983, at the College of Agriculture, Rajendranagar. The objectives of the scheme

were to encourage the existing natural enemies as well as exotic natural enemies by field evaluation and lab studies and to study the effect of insecticides on parasites and predators. The mandate pests were sugarcane scale insect and pod borer of pulses.

Sarvasri K. Lakshminarayana (1983) and Dr. S. A. Aziz (1984-continuing) have been the successive heads of the scheme.

The studies made so far under the scheme have revealed that :

Endosulfan 0.07% was effective in controlling sugarcane scale insects and did not affect the development of the predominant parasites, *Anabrolepis mayurai* Subba Rao and *Azotus sp* adversely

At Rudrur, it was noted that the pest density of sugarcane scale had a pronounced influence on the degree of parasitisation. The predominant parasite recorded was *A. mayurai* at Rudrur and Vuyyur. The parasitoid *Azotus fumipennis* was noted in maximum numbers during November at Vuyyur

A Survey has revealed three new parasites *Cybocephalus sp.* *Aprostocetus sp.* and *Botryoidoclava bharatiya* on sugarcane scale insect

Survey conducted for natural enemies of grape mealybug around Hyderabad indicated the existence of indigenous coccinellid predators, *Scymnus coccivora* Aiyar and *S. gratiosus*.

#### Project on Pesticide Residues

The All India Coordinated Project on Pesticide Residues started functioning from 1983, at the College of Agriculture, Rajendranagar. The objectives of the project are :

- to organise, promote and coordinate research on pesticide residues in agricultural produce and other components of environment on All India level
- to study the dissipation of pesticides in crops and work out safe time limits between pesticide application and consumption of the produce
- to assist the pesticide laboratories of the Central Directorate of Plant Protection in testing and analysis of market samples for quality control
- to examine the effect of processing food commodities for removal of pesticide residues

Dr. B. Narasimha Rao has been heading the Scheme since its inception.

The findings of this Project are :

- The effects of monocrotophos and phosalone spray on grapes could be removed from berries to a maximum extent i.e. below tolerance level, by washing the fruits in 2% salt solution for 10 minutes and subsequent cleaning with water
- dimethoate and Oxydemeton methyl dissipated in grape berries to below tolerance limits in 2 and 10 days after spray
- No residues were recorded in grape berries where carbofuran G was applied at 4 and 6 kg ai/ha in soil, 20 days after pruning
- Quinolphos residues were recorded above the tolerance limit in the grape market centres. Mancozeb and ridomil (fungicides) applied four times after

pruning decreased the residues to below tolerance limit at harvest

- In green ear heads of paddy, quinolphos dissipated to below tolerance limits in 12 days after application
- Monocrotophos, endosulphan and carbaryl dissipated in green leaves of tobacco to below tolerance level in 11, 4 and 2 days respectively
- In cabbage, quinolphos E.C. deposits dissipated to below tolerance limits in 14 days after two applications and the quinolphos dust dissipated to below tolerance limits in 11 days
- In cauliflower, the quinolphos E.C. deposits dissipated to below tolerance limits in 10 days
- In creeping beans, monocrotophos, dimethoate and malathion deposits dissipated to below tolerance limits in 10, 2 and 2 days respectively. Washing with 2% salt solution and steam cooking of leaves removed the chemicals to the extent of 46, 37 and 80% respectively. Carbofuran G. at the rate of 40 and 60 grammes per banana sucker at planting and also at 5 months after planting recorded the residues below tolerance in whole fruit, peel and pulp of banana.

## AGRICULTURAL ENGINEERING

### Farm Implements and machinery

The All India Coordinated Scheme for Research and Development of Farm Implements and Machinery was started in 1968, at Agricultural Research Institute, Rajendranagar.

Originally, the unit was started as Research, Testing and Training Centre. In 1975,

the Scheme was taken up as the Coordinated Project.

In 1980, Prototype Manufacturing Workshop and Feasibility Trials were added on to the Research and Development of Farm Implements and Machinery Scheme.

The main objectives of the Scheme were :

- to design, develop, adapt and modify farm tools, implements and machinery on the basis of research information available to suit the different regions and for human, animal, mechanical and electric power units with a view to increase production and productivity and reduce drudgery
- to work out the field economics of use and cost benefit ratio of crop - implement system
- to fabricate the newly improved or designed implements
- to have the prototypes inventory list under different agro-climatic conditions at various prototype feasibility test centres.

The successive heads of the project have been Sarvasri P. V. Narayana Rao (1968-69, 1971-76 and 1979-82), G. Ramana Reddy (1969-71), Ch. Venkata Ramaiah (1976-1978 and 1979), K.S.V.V.Siva Rao (1978-79) and R. Subramanyam Reddy (1982-continuing).

The following implements have been developed in the Scheme and found very useful by the farmers.

- APAU Puddler was developed in 1969 in two sizes i.e. 750 mm and 1000 mm for puddling in heavy and light soils respectively. The implement saved fifty percent of time and covered double the area compared to a wooden plough

- Star weeder has become popular among the farmers. Paddy row seeder was developed in 1971 for planting pre-germinated paddy seed in four rows in puddled soils. The capacity of the seeders is about 0.6 ha. per day
- Fertilizer applicator for puddled soils was developed in 1971 and used for placing basal dose of fertilizer in puddled paddy soils
- Multi crop thresher developed in 1973 was useful in separating the seed from straw and also winnow the seed. Its capacity is about 6 quintals per hour
- Hand-operated castor thresher was developed in 1976
- Paddy top dresser was developed in 1977 and was useful in placing the fertilizer below the soil surface in between rows
- Sugarcane planter was developed in 1977 to plant sugarcane setts and to place fertilizers in two rows. It could plant about 2 - 2.5 ha, per day
- Animal drawn ferti-seed planter was developed in 1980
- Hand and power operated paddy straw balers were developed in 1981
- Sunflower thresher bench was developed in 1982
- Soil crust breaker was developed in 1982, which could cover 3 ha. per day
- A 4-row manually pulled paddy transplanter was developed in 1984, which could cover about 0.5 ha. per day
- Urea Super Granules applicator was developed in 1984. It could be used in paddy field transplanted in rows
- Ferti-seed planter attachment to 9 tyned cultivator with a capacity of 3 ha. per day was developed in 1986
- Multi-crop cleaner (power-operated) was developed in 1987 for cleaning all types of seed
- Power-tiller mounted paddy transplanter was developed in 1987. It could transplant 1 ha. per day with a spacing of 15 cm (plant to plant) and 20 cm (row to row)
- Core thresher, groundnut pod stripper cum paddy threshing bench and, sulphur duster were also developed from this centre.

#### Agricultural Drainage Scheme

The All India Coordinated Research Project on Agricultural Drainage was started in 1982. The project site was located at Endakuduru near Machilipatnam in Krishna District. The objectives of the scheme were :

- to evolve and criteria for drainage investigation
- to develop and design criteria for sub-surface drains and open drainage system
- to establish the drainage requirements of principal crops
- to establish appropriate reclamation measures for saline and alkaline soils

The successive heads of the Scheme have been Dr. D. Appa Rao (1982-83), Dr. K.C.S.Reddy (1983-85) and Sri K.R.K.Prasad (1985-continuing).

The technologies developed were the

surface and sub-surface drainage which facilitated early transplantation of paddy.

### SEED TECHNOLOGY RESEARCH

The Government of India launched a National Seed Project with the objective of procuring, multiplying and making available, necessary quantities of quality seeds of various crops to the farmers at reasonable price, season after season. The Seed Technology Research Unit under the first phase of National Seed Project started functioning from 1979 with interdisciplinary research involving the departments of Genetics and Plant Breeding, Plant Pathology, Plant Physiology and Entomology.

Initially the scheme was started with financial assistance from the World Bank. Subsequently, it continued as an All India Coordinated Project on Seed Technology Research with 100% assistance from ICAR. Besides, as per the provision made in the World Bank Appraisal Report on National Seed Project (1976) the Andhra Pradesh State Seed Development Corporation (APSSDC) extended financial support with a fixed deposit, the interest of which was being made available from time to time for meeting contingent expenditure for the experiments under the project.

The All India Coordinated Research Project on Seed Borne Diseases was started in May 1980, for which the budget was shared on 75 : 25 basis between ICAR and the State Government.

The following were the objectives of the Scheme :

- to conduct inter - disciplinary research on the problems faced by seed growers and seed industry in the areas of seed production, seed certification, seed processing, seed storage and seed health and to solve problems that may arise

- to conduct investigations on the distribution of seed borne micro-organisms infecting seeds of major agricultural crops and to map out areas where least incidence of damaging seed borne/ seed transmitted micro-organisms occurred so that the production of quality seeds could be taken up in these areas
- to work out effective control measures and tolerance limits for important seed pathogens so as to ensure production of healthy seeds of major crops.

Dr. S. H. Hussaini (1979-89) and Dr. B.M.Reddy (1989-continuing) have headed this scheme.

The technologies developed in different disciplines are as follows :

- Identified stable diagnostic characters in maize inbreds that could be utilised by Seed Certification Agencies
- Genotypic differences were observed in storability of sorghum seed stored in different containers. Seed with 9% initial moisture, when stored in moisture proof containers like polythene bags (600 gauge), aluminium foil and cikatainer containers maintained germinability above certification standards (75%) for over 2 years under ambient conditions existing at Hyderabad
- Pre-storage seed treatment with *Karanja* oil @ 10 ml/kg seed, inert clay @ 5 g/kg seed and Chitin inhibitor, diflubenzuron (0.002%) were found effective in controlling storage pests in greengram (PS-16) besides maintaining germination above certification standards for over one year.

### POST HARVEST TECHNOLOGY

A special centre on 'Post Harvest Technology'

was sanctioned under NARP at Bapatla to tackle post-harvest problems in Krishna-Godavari Zone particularly so, because of the heavy monsoon rains in September, October and cyclonic rains in November a common phenomenon, which cause heavy damage to rice crop at the time of harvest. The main objectives of the centre are :

- to evaluate and demonstrate post-harvest machinery especially for rice
- to evaluate and demonstrate improved storage practices and also to study the activity of stored grain insect pests/micro-organisms and formulate control measures and
- to study the various biochemical quality factors involved in storage of food grains.

The successive heads of the research scheme have been Dr. T. Ratna Sudhakar (1981-82) and Dr. P.V.Narayana Rao (1982-continuing). Threshing bench with weld mesh top or perforated sheet have proved better. Rasp bar type thresher was found to fare well. Husk fired furnace with a drying tray size of 120 x 160 x 70 cm was designed, fabricated and tested. This drier was advantageous over the traditional driers in use.

A hand operated winnower was fabricated for winnowing threshed grains obtained in small lots. Storage structures for safe storage of food grains were tested. Plant materials for controlling insect and microbial populations during storage were evaluated.

#### WATER MANAGEMENT

The Research on water management in the University was started in the year 1970 at Rajendranagar campus as a Coordinated Project. The Scheme was shifted to Garikapadu in the year 1983 and since 1987 it has continued as a non-plan project.

The successive heads of the scheme at Garikapadu have been Dr. D. M.V. Prasada Rao (1983-1988) and Dr. G. Venkateswara Reddy (1988 - continuing).

The following have been the achievements of the Scheme :

- Irrigation at 5 cm depth recorded higher yield in rice both in heavy and light soil
- In groundnut, sprinkler irrigation applied at the rate of 4 cm depth of water at IW/CPE ratio of 0.75 was found to record maximum pod yield of 25.9 q/ha and the water use efficiency was found to be 39 kg/ha/cm. For *bajra* also, sprinkler irrigation was found to be better than check basin irrigation, because of higher water use efficiency
- In sandy soils of Rajendranagar, groundnut was found to require 11 irrigations at 5 cm depth. Pegging to pod formation stage was found to be more critical for water than other stages
- In maize, maximum grain yield was obtained at IW/CPE of 0.9 in both *kharif* and *rabi* seasons which was on par with 0.6 IW/CPE ratio at 80 kg N/ha. Hence, 0.6 IW/CPE ratio was found to be optimum
- In sandy loam soils of Rajendranagar, maize was found to record maximum grain yield of 33.0 q/ha with 9 irrigations at 5 cm depth each time at 80 kg N/ha
- It was established that greengram based cropping system was more remunerative than the paddy-groundnut cropping system for the light red soils of Nagarjuna Sagar Project (NSP) left command area. Irrigation at IW/

CPE ratio of 0.6 gave maximum greengram and groundnut pod yield in greengram based crop sequence under NSP.

For both greengram and blackgram sown either as second or third crop, two irrigations i.e., one light irrigation before flowering (25-30 days) and another at pod development stage (45-50 days) in case of greengram and 50-55 days after sowing in case of blackgram are required for obtaining higher yields.

## LIVESTOCK

The University took up the responsibility for research on livestock in 1967 and has since, pursued research on the improvement of cattle, sheep, poultry and livestock management.

### Cattle Improvement

#### Livestock Research Station, Lam, Guntur :

This research station was started in the year 1926 as Government Livestock Farm, in the composite Madras State. The farm was originally started with 200 heads of Ongole cattle. Subsequently, a small herd of pure bred and graded Murrah buffaloes were added and maintained. In the poultry Unit exotic breeds like Rhode Island Red and White leghorn were also introduced later.

The Research Station has maintained 250 Ongole cattle and 70 buffaloes. There was a record of Ongole cow No 416 during 1953-54 with milk performance record of 1905 kg of milk in 349 days of lactation with daily average yield of 5.5 kg. During 1954-55, an Artificial Insemination Centre was located at this Station. Before reorganisation of the farm, a good Ongole pedigree herd was built by selective breeding and systematic care, feeding and management. The milk yield ranged from 1135 to 2725 kg per lactation as against the yield for lactation in Ongole tract which

barely exceeded 908 kg. The Government Livestock Farm was transferred to APAU in 1967 and continued as Livestock Research Station. In the year 1970, this Research Station was selected as one of the centres for the cross breeding programme under All India Coordinated Research Project on cattle with the following main objectives :

- to evolve a breed of dairy cattle from local breed by cross breeding suitable for specialised dairy farm and intensive milk production areas
- The ideotype of the cow to be so evolved was to be such that it had minimum milk production of 2000 kg per lactation
- For the above purpose, to produce different combinations of crosses of Ongole cows with exotic bulls of Holstein-Friesian, Brown-Swiss and Jersey breeds and to test them for growth, production and reproductive efficiency and economics of milk production.

Subsequently, since September 1986, the AICRP on Cattle has been upgraded as the Project Directorate on Cattle. The Project Directorate on Cattle was established with a larger mandate, attaching importance to cattle improvement programmes in the country. Under this project the following schemes have been sanctioned for cattle project, Lam unit with effect from 1986.

#### A) ICAR - Plan :

1. Ongole Cattle Germplasm Unit
2. Ongole Cattle Germplasm Unit - Data recording
3. Adaptation studies on 3/4th exotic crossbred cattle.



## B) ICAR - Adhoc :

Nutritional studies on  $3/4$ th exotic Crossbred cattle.

The successive heads of the Research Station have been :

Dr. M. Rama Rao (1967-69), Dr. V. Jayaramakrishna (1969 - 71 and 1974 - 82), Dr. K. Narasiah Naidu (1971-74) and Dr. A. Sreerama Murthy (1983-continuing).

Through the earlier projects, a number of crossbred cattle were developed and their performance was studied. Studies on Physiological adaptation of crossbred cows developed, showed that crossbreds involving Jersey inheritance were better adapted to local climate compared to those involving Holstein - Friesian inheritance. Studies on nutritional requirement and nutritional efficiency of the crossbreds revealed that crossbred heifer cows could grow at an average rate of 600 g per day and that crossbred cows could produce, on an average, 10 kg milk per day. A progeny testing programme to improve the milk production and draft capacity of world famous Ongole breed of cattle, which was the pride of Andhra Pradesh, was launched with the assistance of ICAR and cooperation of the department of Animal Husbandry, Government of Andhra Pradesh. Under this programme, Ongole bulls are being tested in the University and Animal Husbandry Department farms and superior bulls selected on the basis of performance of their progeny in different herds, would be used for improvement of the breed at field level.

### Livestock Research Station, Chintaladevi :

The Station was started in 1918 with the object of improving Ongole breed of cattle and to meet the demand for breeding bulls. This Station was closed in 1932, but re-started in 1949. The station was transferred to APAU in 1972, to serve as sub-centre for the AICRP

on cattle, Lam, to maintain dry and young stock of the project. Now the station mainly maintains Nellore breed of sheep consisting of varieties such as Todepi and Palla.

Dr. M. Rama Rao (1977-81), Sri K. Srinivasulu (1981-82), Dr. V. Prabhakar Rao (1982-83), Dr. G. Narasimha Rao (1983-85), Dr. K. Sivaiah (1985-87), Dr. D. Gowrisankar (1987-89) and Dr. S. Kodandarami Reddy (1989-continuing) have been the successive heads of the research station.

## SHEEP

The work on sheep breeding has been conducted at Palamaner through All India Coordinated Research Project on Sheep Breeding for Mutton. The Livestock Research Station, Palamaner was started in 1954 with the following objectives :

- Cross breeding of Punganur breed of cows with Kerry breed of Ireland
- Producing Hallikar young bulls for distribution to the villages and using Hallikar bulls for breeding in the farm
- Studying the adaptability and evolving goats for milk
- Maintaining Mandya sheep for the supply of stud rams to the people

The cross breeding programme involving Punganur cows and Kerry bulls was terminated in 1966. There was an all round improvement in cross-breds. The average lactation yield of Punganur cow was 1040 kg and Hallikar 848 kg and that of Kerry cross was 2427 kg. Consequent to starting AICRP on Sheep for mutton, the goat unit was shifted to Kavali during 1970-71.

The successive heads of the station have been :

Dr. V. Srirama Murthy (1971 - 75),

Dr. E. Krishnamacharyulu (1975-82), Dr. V. Srirama Murthy (1982 - 83), Dr. G.V. Krishnamohan (1983), Dr. K.Krishna Reddy (1983-87), Dr. B.T. Jairam (1987-88) and Dr. E. Krishnamacharyulu (1988-continuing).

The All India Coordinated Research Project on Sheep for mutton was started in 1971 with the following main objectives :

- to evolve a suitable breed which will produce lambs that can attain 30 kg body weight at six months
- to study the sheep husbandry practices
- to study nutrient requirement

Crossbred sheep developed through the project involving 50% exotic Dorset and 50% indigenous Nellore inheritance have become popular with the farmers and there is a great demand for their supply from all over the State. These crossbreds have very well adapted to the local conditions.

## POULTRY

The All India Coordinated Research Project on Poultry for Eggs was established by ICAR at Rajendranagar during the year 1971, with the objective of developing a strain of chicken with high yielding potential.

The successive heads of the project have been Dr. M. R. Choudhary (1971-73), Dr. P.L.N. Sarma (1973-74), Dr. D. Subbarayudu (1974-79), Dr. P. L.N. Sarma (1979-86), Dr. D. Subbarayudu (1986-88) and Dr. P.L.N.Sarma (1988- continuing).

The selection and breeding programme evolved in this project over the years, resulted in considerable improvement of per year egg production upto 280 days of age among the three pure strains. Also it has yielded high yielding lines of chicken that could be made available to the poultry industry.

Simultaneously with the improvement of pure strains over the period, strain crosses were also produced to study the performance of various strain cross combinations. Based on the performance of the various strain-cross combinations, two strain crosses viz: D x F and D x K have been identified as promising. These two strain-crosses have also been made available to the random Sample Laying Test Units of the Government of India located at Bangalore, Bombay and Bhubaneswar and also to ICAR Common Testing Centre at Anand.

Out of these two strain crosses, the cross 'D x F' showed encouraging performance even when compared to the commercials available in the country, yielding 250 eggs (hen day) in 72 weeks of age, with an average egg weight of 54 gm. The results also revealed that crosses excelled the pure strain performance for most of the economic traits measured, indicating the presence of heterosis.

The day old chicks of this cross are being distributed to the poultry farmers for field testing programme under field conditions. This year, it is contemplated to distribute as many as 10,000 chicks of this cross in Palem area for field testing. After receiving the feedback from these tests, it is proposed to approach the varietal release Committee of ICAR to release this cross for commercial exploitation.

## PIGGERY

The All India Coordinated Research Project on Pigs was started in 1971 at college of Veterinary Science, Tirupati. The successive heads of the project have been Dr. V. Jayaramakrishna (1973-74), Dr. K. Narasaiah Naidu (1975-76), Dr. D. Anjaneya Prasad (1976-77), Dr. A Sreerama Murthy (1977-82), Dr. E. Krishnamacharyulu (1982-87) and Dr. K. Krishna Reddy (1987- continuing). The following technologies were developed :

- The breeding gilts could be fed 3 kg of concentrate and sow 2.5 kg concentrates
- *Variga*, a drought resistant crop grown under rainfed conditions could be used to replace maize in the ration for pigs
- Tamarind seed powder or tamarind seed waste could be used as source of energy in place of maize

#### FORAGE CROPS

The All India Coordinated Research Project on Forage crops, Rajendranagar started functioning from 1970, to find out the high yielding cereal and legume forage crops for all seasons. The successive scientists incharge of the project have been Dr. N. P. Purushotham (1970 - 1971), Dr. Y. Gurunath Rao (1971-72), Dr. B. Lingam (1972-78 & 1981-87), Sri Md. Saleemkhan (1978-80), Sri S.O.A. Malik (1980-81) and Dr. Balakrishna Reddy (1987 - continuing).

Since the inception of this Project, 45 varieties of maize (*Zea mays*) were evaluated for their production potential during *kharif* and summer. The green yield was to the tune of 400 to 450 q/ha. Among the balanced populations evaluated, Puerto rica, African tall and Palampur local proved better. The African tall and Palampur local are high yielders with a green yield capacity of 450 to 500 q/ha. Several legume forages were also evaluated at this centre. A pure crop of cowpea had a yield of 250 to 300 q/ha, with a crude protein yield of 500 to 600 kg/ha. Berseem (*Trifolium alexandrinum*) had a high production potential in winter and was grown in southern Telangana, northern Telangana and parts of Rayalaseema. Velvet bean (*Stizolobium* sp.) was fairly free from pests and diseases and the potential of a pure crop was 30-35 tonnes/ha. Different cultures of field bean have also been evaluated and

have shown an yield of 40 to 45 tonnes/ha. It has combined well with *bajra* as intercrop.

#### FISHERIES

Andhra Pradesh is endowed with a long coastline and vast inland water resources. The University's Fisheries Research Stations at Kakinada, Kovvali, Palair and Bapatla have undertaken studies on brackish water as well as fresh water fishes and prawns and the technology of improved cultural practices has been transmitted to the growing number of fish farmers.

##### Fisheries Research Station, Kakinada

Dr. M. Babu Rao, Professor of Fisheries has been heading this research station. The research on Integrated Fresh Water Aquaculture revealed that poultry manure application at the rate of 10 - 12.5 tonnes/ha/year and duck manure at 10 tonnes/ha/year were suitable for optimum water quality and plankton production. The poultry manure application reduced the feed cost in addition to plankton production.

##### Fisheries Research Centre, Rajendranagar

Dr. P. Sambasiva Rao has been incharge of this Centre. The utilization of cattle farm yard wastes and gobar gas plant slurry for fish culture was studied. Plankton production was observed on sixth day in slurry, 11th day in cattle dung and 15th day in cattle-shed washings.

##### Fisheries Research Station, Palair

Dr. G. Sai Prasad, has been the Scientist-in-charge.

The experiments conducted at the Fisheries Research Station, Palair, showed that grass carp faecal matter was utilised by common carp for faster growth and neem cake could be used by replacing groundnut cake in fish feed.

### **Fisheries Research Station Kovvali**

The Scientist-in-charge has been Sri P.V.A.N. Rama Rao.

The work on the fresh water prawn culture unit at Kovvali in Kolleru lake area revealed that polyculture of fishes and prawns yielded higher returns than mono-culture of fishes or prawns.

### **Fisheries Research Station, Bapatla**

Dr. O. Ramachandra Reddy is heading this station, which has just started functioning.

### **HOME SCIENCE**

Research activity in Home Science faculty was initiated in 1968 with the starting of post graduate programme in Foods and Nutrition. This activity was limited to student research till 1974. Faculty research started from 1974, with a project on the assessment of the biological quality and acceptability of sunflower oil and *mesta* oil. Special Nutrition Programme (SNP) was implemented by the Government in the State to improve the health and nutrition status of the vulnerable segments of the population. On request by the Government of Andhra Pradesh, an evaluation of this Special Nutrition Programme was taken up by the faculty during 1973-74. The degree of success of this programme in all the urban towns was assessed and suitable recommendations for improving the operational aspects of the programme for increasing the benefits were submitted to the government.

An ICAR funded project "Food and Nutrient intake of rural people in Andhra Pradesh and losses of nutrients in cereal and legume preparations commonly consumed in Andhra Pradesh" was taken up by the department of Foods and Nutrition in 1975. In this project it was envisaged to develop a

data base on food and nutrient intake of different age groups living in rural areas, to identify the inadequacy in the nutrient intake in different regions of Andhra Pradesh, to assess the meal pattern and methods adopted for processing cereals and legumes and to estimate the nutrient losses in the cereal, millet and legume preparations commonly consumed in Andhra Pradesh. As a result of the work carried out in the Project, a publication entitled "Nutritive value of traditional recipes of Andhra Pradesh" was published in English and Telugu, in which nutrient composition of nearly 200 food preparations were documented. This document was the first of its kind in India.

Several projects covering different aspects of health and nutritional status of population in dryland region have been taken up.

The project on "Quantitative and Qualitative changes in some selected dryland crops grown in different Agro-climatic regions of Andhra Pradesh" was taken up with the financial assistance from Ford Foundation in 1976. This two year project aimed at assessing the post production system of cereals, legumes, millets and oilseeds in Andhra Pradesh. Qualitative and Quantitative changes in food grains during storage in rural conditions were assessed. The project helped in establishing data base for the different aspects of post harvest system in vogue of cereals, millets, legumes and oilseeds.

To estimate the nutrient inadequacies in the diets of population in dryland regions of Andhra Pradesh, a project on "Food and Nutrient intake of population subsisting on dryland agriculture" sponsored by the Ford Foundation was taken up in 1981 for one year. The data in this project revealed higher vitamin and mineral inadequacies in dryland region. This information emphasised the need for new thrust in nutrition programmes planned for dryland regions of the State.

Another project on "Utilisation of dryland crops with special reference to sorghum" was sanctioned by Ford Foundation in 1983-84. As a result of this project, bioavailability of protein and calcium from sorghum products was evaluated through animal and human feeding experiments. The results suggested a difference in bioavailability between age groups and the products.

Another project financed by Ford Foundation on "Effect of processing on selected varieties of groundnuts grown in Andhra Pradesh" was taken up in 1982-84. The objectives of this project were to compare the consumption pattern and nutritional status of population in areas cultivating groundnuts, with those not cultivating groundnuts and to evaluate the effect of home processing on nutrient availability and biological quality in traditional and high yielding varieties of groundnuts. As a result, the role of groundnuts in improving the diets of population in dryland region was evaluated. The importance of groundnuts as a supplement in feeding programmes was also brought out.

The project financed by IDRC (1977-1985) on "Stimulating rural women towards better utilisation of locally available foods" was taken up to study the post production system adopted with respect to millets and legumes in Andhra Pradesh and for estimating quantitative and qualitative losses in millets and legumes in the prevalent post production situation. As a result of this project, a data base on post harvest practices, quantitative and qualitative changes was developed. This generated interest to improve the storage systems, reduce the drudgery of women in dehulling grains and to develop products for alternative use.

As a continuation to Phase I (1977-80) of this Project, a second phase comprising of a detailed study on biological quality of unprocessed, dehulled and processed millets and legumes was taken up. New products were developed with millets to encourage

their alternative use. The use of mechanical dehuller as against traditional dehulling in terms of yield and quality of product was evaluated. These studies indicated the potential for developing value added products with mechanically dehulled millets.

The third phase (1987-90) of this Project has been designed to obtain exhaustive economic and market data as a guide to appropriate industrial design management, to design and evaluate equipment for dehulling sorghum and legumes at three different levels - household, village and semi-urban, to elaborate appropriate technical and management systems for establishing small sorghum/legume processing business for women in rural Andhra Pradesh, to evaluate the use of sorghum, millets and legumes in Government supplementary feeding programmes in Andhra Pradesh and to integrate the small enterprise into these programmes and also to promote and popularise the use of weaning foods based on sorghum and other dryland crops.

So far, some improvisations in the design of dehulling machines have been attempted and tested for improving the quality of grain. Appropriate millet legume combinations for infant food formulations have been developed using sorghum, pearl millet, chickpea and soybean. The best of these combinations have been tested on commercial scale and standardised for bulk production. Studies on consumer reactions to the use of dehulled grain and its products have been undertaken. Consequent to this work, a sorghum-soya and sorghum-chickpea biscuit production unit in three districts of Andhra Pradesh for use in ICDS programmes is under way.

In 1977, International Foundation of Science sanctioned a three year project on 'Intake of legumes and vegetables and losses of certain essential nutrients in commonly consumed recipes of cereals, legumes and green leafy vegetables in Andhra Pradesh'. This project provided an insight into the per capita

consumption of vegetables and legumes, individually and in combination. This data formed the basis for future programme planning and development of nutrition education materials used for extension work.

"Nutritional quality of vegetable legumes grown in Andhra Pradesh" was another project sanctioned by International Foundation of Science (IFS) in 1983-84. In this project, nutritional quality of vegetable legumes at different stages of maturity was assessed. Consequently, nutrient composition and varietal differences in different legumes, at different stages of maturity, was documented.

A Project on "Evaluation of health and nutrition profile of tribals of Godavari district in Andhra Pradesh" was taken up in 1983-84. This project, financed by UNICEF, brought out the profile of health and nutritional situation of the vulnerable population in the tribal areas of Andhra Pradesh and emphasized the need for strengthening the system of health services in tribal areas, for increasing the income of tribal families and the necessity for disseminating nutrition information among such people.

As a sequel to this Project, another Project with the same financing agency on "Development of suitable nutrition education materials for women in adult education centres on nutritional problems of women and children" was taken up in 1984-85. In this Project, short term courses with definite nutrition messages were developed and given to UNICEF for use in different programmes. Training for group leaders, women, etc., was also organised in the areas of health, nutrition and child care.

The Department of Civil Supplies, Ministry of Food and Agriculture, Government of India, sanctioned a two year Project in 1984 on "Developing, testing and popularisation of nutritious soybean products" which could be blended with cereal and millet prepara-

tions. This Project helped in developing a home level technology for processing soybean *dal* and flour from whole soybean, developed acceptable recipes for incorporating soy-flour as a substitute for other expensive legumes in cereal and millet preparations and developed and tested the growth efficacy of low cost infant foods using soy-rice, soy-sorghum and soy-wheat combinations. Consumer studies indicated a wide acceptability of these products. Nutrition education material on production, processing and advantages of soybean was also developed.

With the financial assistance of United States Wheat Associates (USWA), a project to bring out a change in food habits to reduce the demand for rice was taken up in 1984-85. Education material for popularising wheat was developed. Annual competitions on wheat foods helped to promote its consumption. Short term courses in bakery for housewives also helped in popularising wheat. This has resulted in an increased offtake of wheat through the public distribution system in Andhra Pradesh.

In 1987, an FAO Project funded by UNDP on "Strengthening Post-graduate Education in Foods and Nutrition and Child Development at Agricultural Universities" was taken up jointly by the departments of Foods and Nutrition and Child Development. The objectives of this Project were to strengthen the capabilities in the departments to supply post-graduate trained teachers/researchers to generate new strategies, tools for intervention in local community nutrition problems and to disseminate and propagate these improvements to other colleges of Home Science with Child Development and Nutrition Programmes. Consequently, Fellowship training programmes in Foods and Nutrition and Child Development started in 1988.

A Project on "Identification of causes leading to malnutrition in deprived communities" has been sanctioned by the Ministry of

Human Resource Development in Feb., 1989. This project proposes to identify the causes of malnutrition in the different districts of Andhra Pradesh.

A multi centred study on "Relationship between work load and income of women to health and nutritional status of the family", financed by ICMR, was taken up in 1986, for a period of two years at College of Home Science, Bapatla. This Project started with the aim of assessing the work pattern of working and non-working women in rural areas, womens' contribution to the total family income and the workload of women and its impact on health and nutritional status of women and their pre-school children.

In addition to the above adhoc research schemes, introduction of All India Coordinated Projects in Home Science (Foods and Nutrition, Child Development, Resource Management and Energy requirements in Agricultural sector and Tribal area Research) in 1983, took Home Science Research beyond the four walls of the college to remote areas of the State like the tribal area in Rastakuntabai.

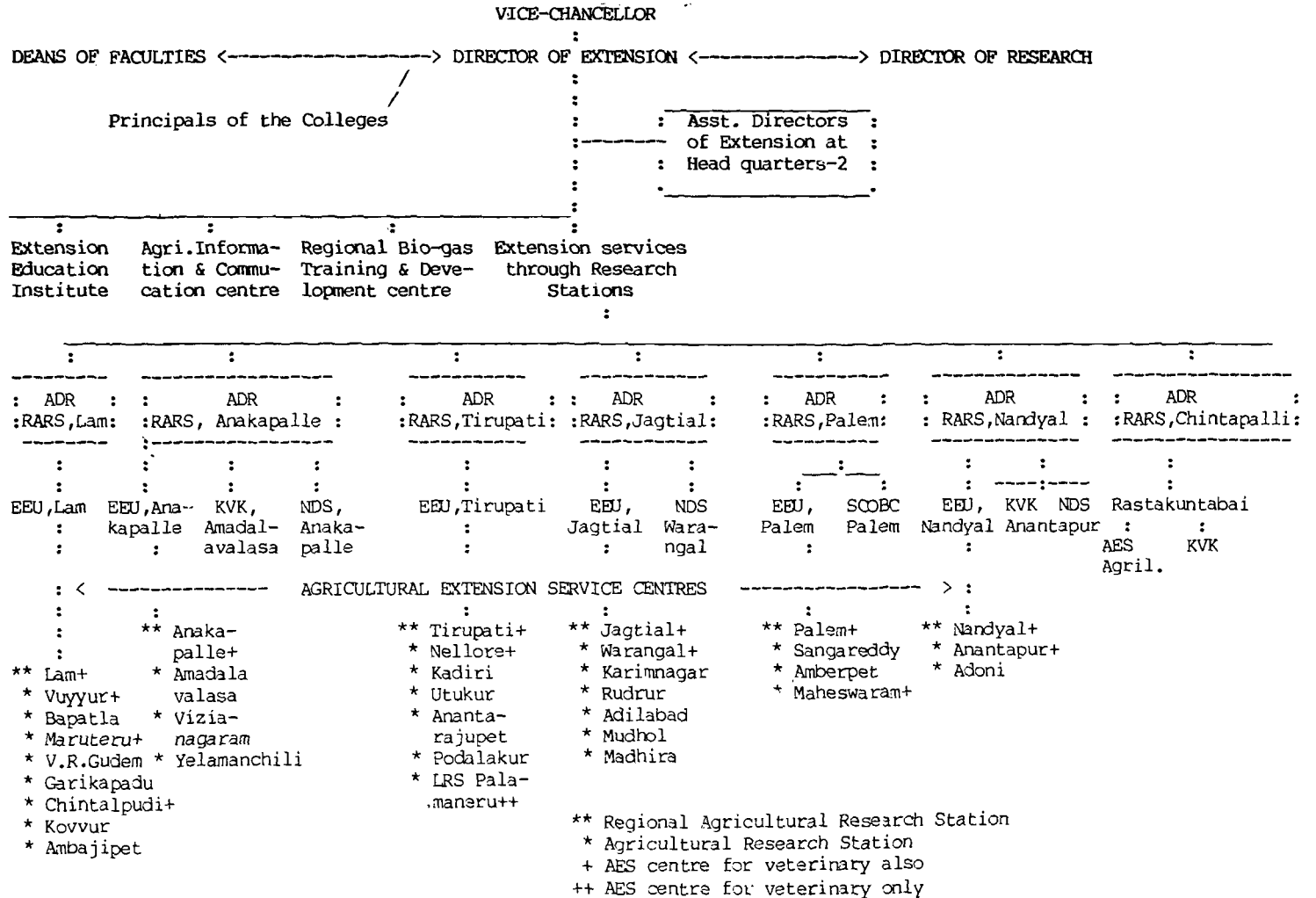
AICRP in Foods and Nutrition led to screening of new food-grain varieties developed at various research stations of the State and outside the State. Consumer preferred characteristics of grains have been established.

So far, growth norms for Indian rural children were not established. This area of research has been taken up by the AICRP in Child Development, wherein growth and developmental norms for 0-6 years old children in rural and urban sector through both longitudinal and cross sectional studies are being established.

In the energy requirement component in the AICRP Project, methodology for obtaining reliable estimates of fuel energy consumption through weighment and periodic recording by the Department of Non-conventional Energy Source, New Delhi, has been modified to make it more fuel effective to suit the local needs of the Telangana region in Andhra Pradesh. This modified *chula* has been popularised in the rural and urban households and its use and performance have been evaluated.

In the project on "Resource Management of Farm Families" survey to assess the availability and utilisation pattern of resources in rural families was completed. Consequently, training programmes for women on effective utilisation of resources have been conducted, minikits to popularise kitchen garden have been distributed and social forestry was introduced with the assistance of the State Forest Department.

ORGANISATIONAL STRUCTURE OF EXTENSION SERVICES OF ANDHRA PRADESH AGRICULTURAL UNIVERSITY





## CHAPTER – VIII

### EXTENSION

The Andhra Pradesh Agricultural University Act of 1963 (Section 4) provided for the establishment of Agricultural Extension Services for taking up extension programmes covering the entire State of Andhra Pradesh. The courses in Extension Education were started for the undergraduate programmes in 1962 and for post-graduate programmes in 1966-67. The extension service of Andhra Pradesh Agricultural University (APAU) was introduced in 1967 in Hyderabad district consisting of eight blocks and were subsequently extended to Chittoor (1968) and Guntur (1970).

The Extension Education Department of College of Agriculture, Rajendranagr trained 190 undergraduates in extension and carried out extension work in 50 villages by popularising new practices, new strains and methods of cultivation. Due to the success of this programme, the Government of A.P. further approved attaching of 43 more villages to the College of Veterinary Science, Rajendranagar, for undertaking field activities by the students of the veterinary science degree programme. At Tirupati also, the extension wing of the College of Veterinary Science was merged with the Extension wing of S.V. Agricultural College in 1967.

National Demonstration Scheme (NDS) was established during 1970-71 in the University at four locations. Earlier to this, these programmes were handled jointly by the university and the State Department of Agriculture, Govt. of Andhra Pradesh.

With the aim of disseminating research information to the farmers through various mass media, an Agricultural Information and Communication Centre was started in 1969 with the assistance of KSU-USAID and through this Unit, a broadcast of daily news

bulletin on agriculture and allied subjects through All India Radio was started on January 3, 1969 and is continuing as 'Vyavasaya Suchanalu'.

In 1970, new schemes of Extension service at the three major Research Stations in the State, viz., Regional Agricultural Research Station, Anakapalle, Regional Agricultural Research Station, Nandyal, and Agricultural Research Station, Warangal were started.

As a result of research work carried out in colleges as well as in research stations, a vast amount of research data accumulated, some of which could not find avenues for publication. In order to help the scientists to publish their research work, a decision was taken in 1973 to publish a scientific periodical namely, "The Journal of Research APAU."

In commemoration of the Golden Jubilee Year of ICAR, a Lab to Land programme was launched by the A.P. Agril. University in June, 1979 adopting 6,000 farm families initially. So far, this scheme has covered 24,633 farm families.

In order to improve the productivity of pulses and oilseeds in different regions of the State, two Extension Education Centres were sanctioned by the ICAR at Anantapur and Rastakuntabai which started functioning from December, 1980 and December, 1981 respectively.

To ensure optimum development of the villages, and increase of agricultural production, the University implemented the Village Adoption Scheme under the Prime Minister's new 20-point programme from June, 1982.

Consequent to the reorganisation of the extension services in A.P. Agril. University,

to optimise the utilization of available resources in the Extension units of the University and also to bring in proper integration of Teaching, Research and Extension, six Extension Education Units (EEUs) at Regional Agricultural Research Stations located at Palem, Jagtial, Nandyal, Tirupati, Lam and Anakapalle came into operation from April, 1982. In the same year, the Project for Socio-economic upliftment of Scheduled Castes and Other Backward Communities with a view to develop and process rapidly appropriate technological capsules for the benefit of SC/OBC target groups was started at Palem.

Krishi Vigyana Kendras (KVKs), the grass root level vocational training institutions designed for bridging the gap between the available technologies and their application was started at Anantapur (1983), Rastakuntabai (1983) and Amadalavalasa (1965). It is proposed to start another K.V.K. at Malyal during 1989. The latest land-mark in extension activities of the University is the establishment of a Regional Bio-gas Training and Development Centre at Rajendranagr in November, 1988 financed by Government of India.

#### A. ORGANISATIONAL SET UP

The University has a Directorate of Extension Education headed by the Director of Extension with the overall responsibilities of conducting Extension Education Programmes of the University with the following objectives :

- Dissemination of latest information on all agricultural aspects to the farmers and feed back information from farmers to researchers through adaptive trials, early demonstrations, scientists advisory services etc.,
- Training the officials of the State Development Departments like Agricul-

ture, Horticulture, Animal Husbandry, Women and Child Welfare etc., and personnel from other organisations like Banks, Non-governmental organisations

- Keeping liaison with farmers and general public through press, radio, T.V., technical publications etc.

In view of the reorganisation of the research activities of the University with the inception of NARP in 1979 and the implementation of the Training and Visit (T & V) system by the State Department of Agriculture, field extension programmes of the University were streamlined in 1982.

To optimise the utilisation of available extension resources, the resources of District Extension Education Programme, extension department of College of Agriculture, extension services around research stations and National Agricultural Research Project (NARP) were integrated and reorganised to form six Extension Education Units. The extension activities of these units were entrusted with the respective Associate Directors of Regional Agricultural Research Station for integrating research and extension activities. The Associate Directors of Research in turn were made responsible to the Director of Extension. However, the A.I. & C.C., and E.E.I. were kept under the direct control and supervision of the Director of Extension. The following are the extension units working in the University :

- Extension Education Units (EEUs) at six Regional Agricultural Research Stations (RARSS)
- Agricultural Information & Communication Centre (AI & CC)
- Krishi Vigyan Kendras (KVK)
- National Demonstration Scheme (NDS)

- Project for upliftment of Scheduled Castes and Other Backward Communities
- Extension Education Institute (EEI)
- Lab to Land Programme

## B. MANPOWER GROWTH

The extension education programmes of the University have been diversified and strengthened over the years. Consequently the staff strength has also increased (Table 56).

**Table : 56 Manpower Growth in Extension**

Cadre	Year					
	1967	1970	1975	1980	1985	1989
Professor	1	1	2	2	2	2
Assoc. Professor	6	8	9	13	19	23
Asst. Professor/Instructor	7	31	39	58	104	112
Supporting staff	31	125	129	175	195	188

## C. EXTENSION PROGRAMMES

### DISTRICT EXTENSION EDUCATION PROGRAMMES :

Prior to the implementation of extension education units, one for each agro-climatic zone, Extension wing comprising District Education Programmes and Extension Serv-

ices were in operation upto 1979 around research stations.

The District Extension Education Programmes were started in Hyderabad (1967), Chittoor (1968) and Guntur (1970) districts. These programmes had a good impact on transfer of technology. The following are the summary of achievements.

**Table : 57 Achievements of District Extension Education Programmes (1967-79)**

Activity	District		
	Hyderabad	Chittoor	Guntur
Result demonstrations	4248	5866	5424
Method demonstrations	6182	6180	7892
Office calls	7344	7291	9212
Farm visits	40728	42438	46194
Radio talks	121	123	167
Training programmes	108	122	165
Discussion meetings	8772	9143	1263
Exhibitions	73	79	91
Film shows	36	42	62



**Dr. A. Appa Rao, Vice - Chancellor and Dr. Y. Shivaji, M.P. & Member,  
Board of Management,APAU on a visit to farmers' fields**

## EXTENSION EDUCATION UNITS

Consequent to the reorganisation of Extension Education programmes into six Extension Education Units (EEUs) at Lam, Anakapalle, Tirupati, Nandyal, Palem and Jagtial, the staff of the District Extension Education Programmes were redeployed at different Extension Education Units with the following functions :

- Organising field trails for testing new technologies
- Training the Subject Matter Specialists of the State Department of Agriculture under the T & V System in the monthly workshops
- Assisting the implementation of the RAWE programme for final year B.Sc. (Ag.) students

- Establishing first stage early demonstrations on proven technologies in the villages around research stations
- Organising specialised training programmes for progressive farmers and extension personnel of the State Departments including regular monthly workshops
- Organizing exhibitions, field days/ kisan melas etc.,

The extension education units since their inception have been headed by extension specialists who are under the administrative control of the Associate Director of Research. The successive heads of the extension education units are :

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1. Lam	:	1. Sri B. Rama Murthy Naidu (1983-84) 2. Dr. N. Sreeramachandra Muthy (1984-86) 3. Dr. K. Ranga Rao (1986-88) 4. Dr. M. Veeraraghava Reddy (1988-continuing)
2. Anakapalle	:	1. Sri M. Veeraraghava Reddy (1983) 2. Dr. S. Eswara Reddy (1984) 3. Dr. M.R. Naidu (1985) 4. Dr. I.V. Narasimha Rao (1986) 5. Dr. B. Sesha Reddy (1986-continuing)
3. Tirupati	:	1. Sri C. Varada Reddy 2. Dr. Daivadeenam 3. Dr. D.R. Rayapa Reddy (1984-continuing)
4. Nandyal	:	Sri B. Sankara Rao (1983-continuing)
5. Palem	:	1. Dr. P. Venkatramaiah (1985-88) 2. Sri K. Veeraraghava Reddy (1988-continuing)
6. Jagtial	:	1. Dr. N. Mruthumjayam (1987) 2. Sri M. Manohara Rao (1987-continuing)

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The Achievements of EEU's have been impressive as shown in Table 58.

**Table 58. Activities of Extension Education Units**

Activity	Cumulative total number	
	1985	1989
Training Programmes	167	630
Participants in the training programmes	1603	12044
Demonstrations/Trials	252	2032
Field days/Kisan Melas	38	77
Publications (Information material)	66	171
Radio talks	133	987
T.V. Programmes	-	21

#### **AGRICULTURAL INFORMATION & COMMUNICATION CENTRE**

The Agricultural Information and Communication Centre (AI & CC), established on a modest way in 1969 with financial assistance from KSU-USAID initially and later from ICAR and State Government, has been taking up a number of activities to reach the farmers with the latest information on improved agricultural technology and other aspects of farm and home management. The Centre is equipped with a printing press, recording studio and an audio-visual unit. It also takes up press, photo and movie coverage of the various activities of the University. The following are the functions of AI & CC:

- Disseminating agricultural information to the farmers and extension personnel on the latest technology in agriculture, animal husbandry and home science through printed literature, radio and television
- Organising exhibitions to educate the farmers and the general public on the latest changes in agriculture and allied fields
- Producing short films and video cassettes for extension educational purpose.
- Answering queries raised by the farmers through mail

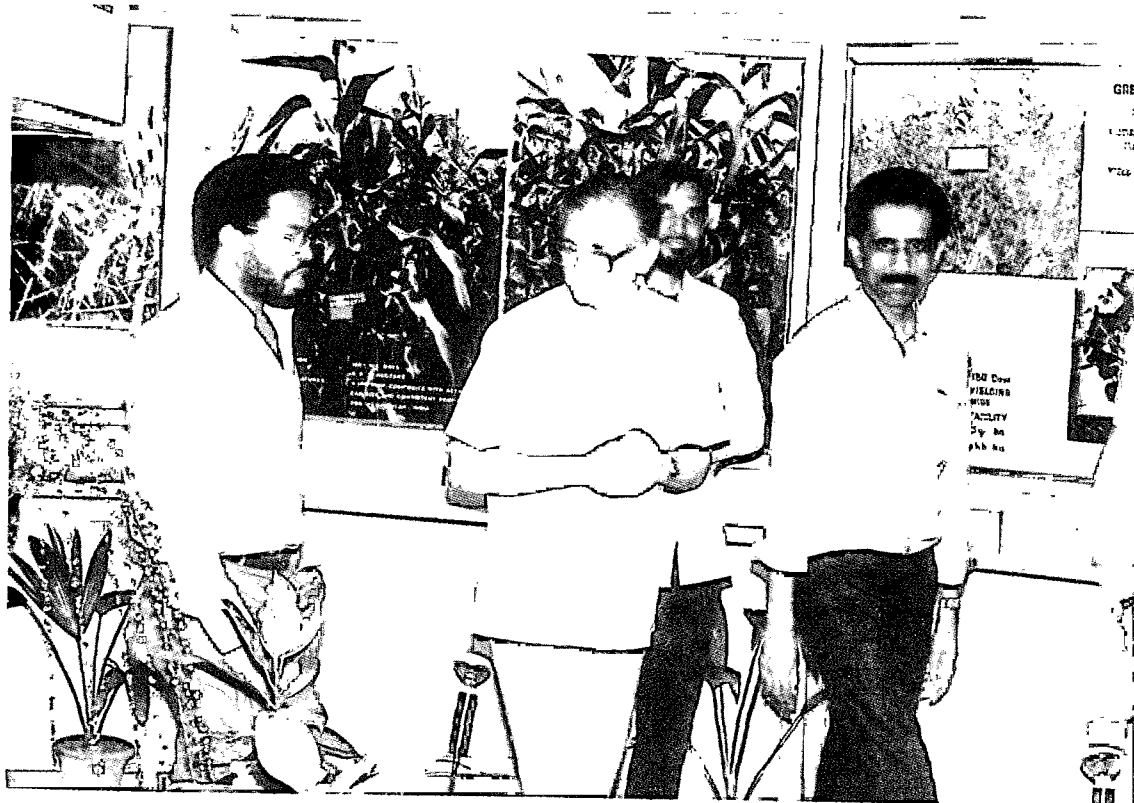
- Acting as a liaison between the University, the AIR, T.V. Centre and other developmental departments on aspects concerning agricultural information

The successive heads of the AI & CC are Mr V. Dhananjaya Rao (1978-80 & 1983-88), Dr. M. Waliullah (1980-83), and Dr. K. Pandarinath Reddy (1988-continuing)

#### **ACHIEVEMENTS**

The AI & CC has brought out several publications on agricultural and allied subjects:

- APAU News : This english News-letter was started in 1969 and continues to be released every month
- The Telugu version of the News-letter including a special supplement on crops, practices of animal husbandry and a feature on home science was started in 1971 with the title '*Samachara Masa Patrika*'. This was renamed as '*APAU Varthalu*' in 1980 and continues to be released every month.
- The '*Vyavasaya Panchangam*', a compendium of information on agriculture, animal husbandry and allied fields with day-wise package of practices put in a cogent form in colloquial



APAU at the National Agricultural Fair 1989,  
Pragati Maidan, New Delhi

language of the farmers, was started in 1969. This publication has acquired significance as a package schedule, for all the farmers of Andhra Pradesh and the adjoining States. It was renamed 'Adhunika Vyavasayam' and was issued in 1981-82. From 1988-89, 'Vyavasaya Panchangam' in its original but in an enlarged format is being released for the benefit of farmers

- The Journal of Research APAU, is yet another prestigious publication brought out by this Centre since September, 1973, to propagate the research findings of the scientific community. It was published as a bi-monthly journal initially from 1973 to 1974, and as a quarterly from 1974 to 1984, half yearly from 1985 to 1989 and has been again made a quarterly journal from 1989

onwards. This has acquired a very wide reputation and its membership has been steadily increasing

- To provide information handy to extension personnel as well as to farmers and agricultural scientists, the publication named 'Package of Practices' in agriculture and horticulture, both in English and Telugu, was brought out in 1984. Two more such publications are also being brought out in home science and animal husbandry
- From 1969 onwards, the AI & CC has also published brochures, bulletins, leaflets, folders, pamphlets, posters on items of topical interest to the farming community. The summary of the achievements of AI & CC are listed below (Table. 59) :

**Table 59 : Achievements of the Agricultural Information and Communication Centre, APAU**

Activity	Cumulative total number				
	1970	1975	1980	1985	1987
Radio Scripts *	365	1827	3653	5479	6575
Special Broadcasts under School-on-AIR programmes	4	27	74	146	196
Telecasts	-	-	15	33	42
Number of farmers' letters replied	-	790	4670	7353	8610
Number of press notes issued	15	88	322	530	610
<b>APAU News</b>					
a) English	12	60	120	180	216
b) Telugu	12	60	120	180	216
Journal of Research APAU (Issue No)	-	8	28	42	48
Books published	1	2	5	10	20
Folders/Bulletins	1	42	140	284	33

\* Broadcasting time increased from 5 to 10 minutes from November 14, 1976.



## KRISHI VIGYAN KENDRAS

With the objective of bridging the time gap between the available technologies and their application in the farmers' fields for increasing production, grass root level vocational training institute, Krishi Vigyan Kendras (KVKs) with the financial assistance of ICAR-was started at Anantapur and Rastakuntabai (1983) and at Amadalavalasa (1985).

The KVK at Rastakuntabai mainly caters to the economically and socially backward communities in that area. Efforts have been made to modify the production technology suitable to the hilly regions and also to train the tribals in various aspects of agriculture, horticulture, animal husbandry, home science and method of changing "Podu" cultivation to one of improved cultivation.

The KVK at Amadalavalasa was established to serve technically and economically backward farmers. The main stress was on harnessing effectively the abundant manpower available. Subsidiary income generating enterprises like poultry farming and fish culture were made available to the people.

Krishi Vigyan Kendra at Anantapur was started in 1983 with the idea of imparting the skill oriented training programmes to the poor, small and marginal farmers to improve their agriculture and other walks of life.

Improved technologies pertaining to dry farming like *insitu* moisture conservation practices, introduction of short duration improved varieties specially in redgram and groundnut crops were demonstrated in farmers' fields. Planting of fruit trees that come up well under scarce rainfall conditions and water management practices were also suggested. Training and demonstrations were conducted on profitable poultry rearing.

Training was given to farm women on nutrition education, child care, tailoring and embroidery, health and hygiene and home

management. The following are the functions:

- To organise skill and production oriented short and long term training programmes, both on and off campus for practicing farmers - men, women and field level extension workers on their immediate agricultural problems
- To organise training programmes and non-formal educational activities for young farmers, especially the school drop-outs to develop competence and confidence in them for modern farming either on their own farm or for self-employment
- To develop and organise field days, farm visits, farmers' fairs, radio talks, *charcha-mandals* etc., with a view to strengthen the scientific information support to farmers
- To organise functional literacy programmes for farmers in collaboration with local agencies concerned
- To develop gradually practical training facilities in all fields including agriculture, animal husbandry, home science and allied fields like crafts and cottage industries, to meet the requirements of integrated rural development.

The successive training organisers of the KVKs are: Anantapur: Sri A. G. Venkataramana Reddy (1983-continuing), Rastakuntabai : Dr.P. Jayaraj Naidu (1984-1989) and Dr.K. Prabhakara Rao (1989-continuing), Amadalavalasa: Sarvasri R.V. Appa Rao (1985-86) and A.B. Sankara Rao (1986-continuing).

The total number of courses conducted together with participants in agriculture, animal husbandry and home science are presented in table 60.

**Table 60: Farmers' Training Programmes Organised by Three KVKs  
(Anantapur, Rastakuntabai and Amadalavalasa)**

Year	Total number of	
	Courses conducted	Farmers participated
1983-84	739	1120
1984-85	390	7480
1985-86	324	5048
1986-87	833	13951
1987-88	594	8236

#### **NATIONAL DEMONSTRATION SCHEME**

Since 1967, APAU has been collaborating with ICAR in conducting National Demonstrations on new strategies of increasing production through adoption of intensive rotation of crops using new varieties with short duration to the farmer. This scheme was expected to indicate a cropping pattern which would be most economical for a given situation.

National Demonstration Schemes (NDS) are one of the oldest transfer of technology programmes sponsored by ICAR. The local Coordination Committee of the district was earlier headed by the District Agricultural Officer of the State Department of Agriculture i.e. DDA/JDA of the district concerned to formulate the National Demonstration programmes. However, in the bi-annual workshop held at Kanpur in 1987, the Directors of Extension of the respective universities were made Chairmen for these committees. The demonstrations laid out under this Scheme by the Scientists of National Demonstration Team were widely used by the staff of the State Department of Agriculture to educate the farmers by organising farmers' days as well as by bringing trainees of the farmers' training centres to these demonstrations. The following are the functions of the Scheme

- Maximising the production per unit area/unit time on farmers' fields
- Popularising the multiple cropping and cropping sequence systems along with the package of practices among the farming community by organising demonstrations
- Minimising the time lag between research output and their application in the farmers' fields
- Organising entire farming systems demonstrations by raising crops, rearing livestock and determining optimum level of profitable livestock adjustments with crop production
- Identifying the technological and socio-economic constraints in transfer of technology.

The N.D. Scheme has undergone several changes with regard to concept of approach, scope and infrastructure. At the initial stages, emphasis was on increasing production of cereal crops with demonstrations of the production potentialities of the High Yielding Varieties (HYV). Later, the emphasis was also on increasing the production of oilseeds and pulses under various agro-climatic conditions and also demonstration of the potentialities of rainfed agriculture.

Till 1970-71, the personnel working in the research and extension schemes of the University were conducting these demonstrations around the research farms. During the same year, ICAR sanctioned special staff for these programmes in selected districts of Andhra Pradesh.

National Demonstration Scheme was implemented in Hyderabad, Kurnool, Chittoor, West Godavari, Guntur and Nalgonda districts during 1970-71. The scheme was further extended to Krishna district in 1972-73. However, due to financial constraints, the scheme was restricted to Chittoor, Guntur and Hyderabad districts from 1974-75 to 1980. Consequent to the decision taken at the All India Workshop on National Demonstration Schemes in 1980 to shift these schemes regularly every five years to districts hitherto not covered, the districts of Cuddapah, Medak and Vizianagaram were covered from 1980 to

1985. Since then, these schemes have been shifted to Anantapur, Warangal and Visakhapatnam districts.

The successive team leaders for the various districts are Sri S.A. Aziz (1970-71), Sri P.V. Ramana Rao (1971-81), Sri G.W.L. Jayakumar (1981-83), Dr. C.V. Ratnam (1983-86), Dr. A. Venugopala Rao (1986-88), Dr. E.V. Ranga Reddy (1988-1989), Sri C. Subba Rao (1971-72), Sri P. Narasimha Rao (1972-77), Dr.A. Sanandachari (1978-79), Sri Y. Narasimha Rao (1980-81 and 1982-83), Sri A. Ananda Rao (1981), Sri K. Krishna Murthy (1983), Dr.I.V. Narasimha Rao (1984-88), Sri K.V. Ramalingaswamy (1982-86) and Sri G.V. Muralimohan Rao (1986-continuing).

The details of the achievements of the scheme are furnished in table 61. The demonstrations include single crop, two-crop, three-crop, four-crop rotations, special demonstrations, etc.

**Table 61: Achievement of National Demonstration Scheme**

Year	District	Total Number of demonstrations organised	Field days conducted	
			Number	Participants
1970-71	Chittoor, West Godavari, Hyderabad, Kurnool	61	-	-
1971-72	Chittoor, West Godavari, Hyderabad, Kurnool, Nalgonda, Guntur	130	166	7765
1972-73	Chittoor, West Godavari, Hyderabad, Kurnool, Nalgonda, Guntur, Krishna	151	451	12863
1973-74	Chittoor, West Godavari, Hyderabad, Kurnool, Nalgonda, Guntur, Krishna	166	558	13096
1974-80	Chittoor, Guntur, Hyderabad	423	1641	37014
1980-85	Cuddapah, Medak, Vizianagaram	306	595	10677
1985-88	Anantapur, Visakhapatnam, Warangal	450	208	4121

The yields obtained under the scheme showed an increase from 50 to as high as 300%. The demonstrations convinced the farmers involved, about the new technology and they in turn impressed upon the neighbouring farmers to follow the package of practices advocated under the scheme.

#### **PROJECT FOR THE SOCIO-ECONOMIC UPLIFTMENT OF SCHEDULED CASTES AND OTHER BACKWARD COMMUNITIES**

The project started functioning at Regional Agricultural Research Station, Palem, in Mahboobnagar district, from 1983 onwards. The scheme was first implemented in two villages, namely Vattam and Waddeman of Bijanepalli Panchayat Samithi, and was in operation till 1986-87. As the period of operation of this project at these two villages was completed, the area of operation was shifted to four newly adopted villages, namely Mahadevanpet, Sainpally, Mammaipalli and Alipoor of Bijanapalli mandal, and the project activities were implemented at these villages starting from *kharif*, 1987.

#### **Objectives**

- Improving agriculture, livestock production and horticulture through the introduction of modern technologies
- Formulating an inventory of economically viable and practical/ancillary vocations allied to feasible agriculture, livestock, fish production, sericulture, bee keeping and implementing them in order to bring home the fact that these are the ways by which the economic problems of this strata of society could be purposefully tackled
- Establishing a suitable infrastructure and the knowledge to approach the problems of the area in an integrated and scientific manner to create better rural employment opportunities

- Organisation of informal training programmes to impart skills and to upgrade the professional efficiency
- To create a cooperative base for supplies and services and marketing operations
- To establish links between the people and the various development agencies
- Promote nutritional programmes through establishing nutritional gardens, kitchen gardening based on scientific techniques and resources available in the region
- Educating the people about the importance of sanitation, promoting technical literacy through adult education.

The successive persons in charge of the project are Dr.G.V. Narayana Reddy (1983-85), Sri V. Gopala Krishna Rao (1985-86) and Dr.K. Veera Raghava Reddy (1987-continuing).

#### **Achievements**

Twenty nine training programmes were conducted for farmers with 402 participants. 586 demonstrations and 26 farmers' field days and two exhibitions were conducted. Under health programmes/camps, 3744 women and children were advised on health aspects. 1426 animals were treated, 63 kitchen gardens were started under nutrition gardens programme. 55 SC & OBC women were trained in stitching. The farmers were convinced about the usefulness of the new technology for increasing crop yields.

#### **EXTENSION EDUCATION INSTITUTE**

The Extension Education Institute, Rajendranagar, is one of the three premier institutes for training of extension personnel in India. It was established on September 17,

1962, at the College of Agriculture, Rajendranagar, under the administrative control of the Osmania University. It was shifted to its present building in July, 1963 and was later transferred to APAU in July, 1964. The Institute is fully financed by the Directorate of Extension, Ministry of Agriculture and Cooperation, Government of India. It was started primarily as a "Trainers" Training Institute to upgrade the capabilities and competence of the instructional staff of village level workers' training centres. Later it extended its activities to the staff of the Regional Extension Training Centres, the staff of Agricultural schools, Farmers Training Centres and extension personnel of the State Development Departments of Andhra Pradesh, Karnataka, Orissa, Tamil Nadu, West Bengal, Pondicherry and the rural credit organisations and financial institutes of Andhra Pradesh. It also undertakes post-graduate programmes leading to M.Sc. and Ph.D. in extension education.

As per the decision of the Directorate of Extension, Ministry of Agriculture and Cooperation, Government of India, a Management Committee was constituted in April, 1985 to help in its effective functioning under the Chairmanship of the Vice-Chancellor, APAU. It is being strengthened substantially as a sub project funded by the Government of India and the World Bank.

The successive heads of the Extension Education Institute are : Dr. Hussain Ali Razvi (1962-66), Prof. K. Bhaskaram (1966 to 1969 and 1970 to 1979), Dr.A. Adivi Reddy (1969-70), Dr.B.H. Krishnamurthy Rao (1979-80), Dr: H.N. Byra Reddy (1980-81), Prof. I. Reddy Babu (1981-82), Dr.S. Venku Reddy (1982-85 and 1986-87), Dr.K. Jayarama Reddy (1985-86) and Dr.Ch. Satyanarayana (1987-continuing).

The Institute diversified its activity in a phased manner:

#### 1st Phase : 1958-67

- Training of trainers of Gramsevak Training Centres for three months in extension teaching methods and techniques
- Post-graduate teaching in Extension Education leading to M.Sc. degree

#### 2nd Phase : 1967-84

- Training of Officers of the Department of Agriculture, Animal Husbandry and Cooperation in the High Yielding Varieties programmes
- Training of staff of Farmers Training Centres and Village Development Officers Training Centres
- Training of trainers working under the vocational agricultural schools and pre-vocational training centres under Ministry of Education, Government of India
- Training of T & V functionaries in extension communication
- Staff training programmes conducted for Farm and Home units of All India Radio, Home Science wings, rural credit banks, and nationalised banks, social forestry and monitoring and evaluation units
- Village adoption programme at Pedda Golconda and Bahadurguda villages.

#### 3rd Phase : 1985-89

In addition to the above activities, the following activities were also organised during the third phase :

- Special indepth training programmes on "Training and Communication" to Subject Matter Specialists at the sub-divisional and district level
- Specialised courses in monitoring and evaluation and extension management

- Un-anticipated special programmes relating to subject matter in the field of information and communication media, extension teaching methods and training

Apart from training the personnel from various Government departments and other voluntary organisations, the Institute also had the distinction of training the personnel deputed from foreign countries like Afghanistan, Nepal, Thailand, Srilanka, Mauritius and others.

**Achievements :**

Particulars	Number
Training programmes conducted	308
Participants in the training programmes	5854
Problem oriented research projects undertaken	13
Publications	31
Script broadcasts on AIR	4
T.V. programme telecasts	5

The Institute also offers courses leading to M.Sc. and Ph.D. programmes. From this institute, 213 M.Sc. and 24 Ph.D. scholars have so far obtained their post-graduate degrees in Extension Education.

**Lab-to-Land Programme**

The Lab-to-Land programme was started from June, 1979 on the eve of the Golden Jubilee Celebrations of the ICAR. The main emphasis of the programme was on motivating the small and marginal farm families to adopt new technology to increase farm productivity and ultimately improve their economic conditions. The programme was started and continued in a phased manner. Under this programme, the University adopted 6000 farm families in the first phase (1979-82), 8483 families in the second phase

(1982-84), 6100 families in the third phase (1984-86), 4050 farm families in the first stage of the fourth phase (1986-88) and 300 families in the second stage of the fourth phase (1988-90).

Villages with a large proportion of small and marginal farmers, landless agricultural labour, scheduled castes and scheduled tribes were selected as beneficiaries of the programme. Usually, a cluster of villages were selected for the programme for effective supervision and management. Another criterion for selection was the proximity to the research station. Consequent to the baseline survey, assistance of up to Rs.500/- per family per year was made available for the implementation of the programme. This assistance was in the form of critical inputs like fertilizers, insecticides, seeds, etc., to help them to adopt new technologies. Also the major thrust in the programme has been to introduce the most appropriate technology to help in the diversification of labour use and introduction of supplementary sources of income. Keeping the mandate of the programme in view, the objectives of lab to land programme are :

- To study and understand the background and resources of the selected farmers and landless agricultural labourers to introduce low cost relevant agricultural and allied technologies on their farm/homes for increasing their employment, production and income
- To assist the farmers to develop feasible farm plans keeping in view the availability of technologies, needs and resources of the farmers
- To guide and help the farmers in adopting improved technologies as per their farm plans, and demonstrate to them the economic viability of these technologies as well as methods of cultivation and farm management

- To organise training programmes and other extension activities in relation to their adopted practices and prepare them for active participation in the development programmes
- To enlighten the farmers of the various opportunities and agencies which they could utilize for their economic advantage
- To develop functional relations and linkages with the scientists/institutions for future guidance, advisory services and assistance and to utilize this programme as a feed-back mechanism.

An important feature of this programme is that the scientists have an opportunity to work directly with the farm families to get first hand feedback on the suitability and appropriateness of the technologies, including the constraints in their adoption.

The inputs provided to the farmers and other beneficiaries through this programme have resulted in significant improvement in the technic-economic status of the villages. The success of this programme is reflected in its achievements which are as follows :

**Table 62: Achievements of Lab to Land Programme**

Activity	Number of programmes undertaken				Total
	I Phase 1979-82	II Phase 1982-84	III Phase 1984-86	IV Phase 1986-88	
Beneficiaries	6000	8483	6100	4050	24633
Demonstrations	15573	23650	13659	4074	56956
Field days	258	150	76	53	537
Extension fortnights	42	30	29	10	111
Kisan melas	32	38	23	14	107
Exhibitions	33	26	21	19	99
Study tours	40	48	42	13	143
Publications	20	94	60	22	196
Training programmes	-	-	306	50	356

## CHAPTER - IX

# INSTITUTIONAL LINKAGES

The Andhra Pradesh Agricultural University has developed close functional linkages with various organizations at Regional, State, National and at International level in its endeavour to promote agricultural production and development in the country.

### INTERNATIONAL LEVEL

Inter-institutional linkages with Kansas State University (KSU), United States Agency for International Development (USAID) existed from 1964 to 1972. This facilitated the training of the teachers of APAU for M.Sc. and Ph.D. programmes at the Kansas State University, USA and also in equipping the laboratories in the colleges substantially. There are 60 faculty members in the University who received training under the USAID programme. Expert scientific know-how was also made available for initiating several developmental programmes.

The Andhra Pradesh Agricultural University has Inter-institutional agreement with International Crop Research Institute for Semi-Arid Tropics (ICRISAT, Hyderabad) for training of scientists. Some of the inservice Ph.D. students, after completion of course work in APAU are sent to the above Institutes for conducting doctoral research. Some faculty members are deputed for advanced training in agro-forestry to U.K., and Common Wealth Programmes and advanced training in Food and Nutrition and Child Development under UNDP and IDRC.

Some of the research schemes, being operated by this University, were sponsored by International Organisations like the Food and Agriculture Organisation (FAO), International Development Research Centre (IDRC), United Nations International Childrens' Educational Fund (UNICEF), United States

Agency for International Development (USAID), Cooperative for American Relief Everywhere (CARE), United Nations Development Programme (UNDP), International Foundation for Sciences, Ford Foundation and US Wheat Associates. Under collaborative research programmes, exchange of technical data and plant material are taken up with IRRI, ICRISAT etc.

### NATIONAL LEVEL

The University has developed close linkages with several national organisations like Indian Council of Agricultural Research (ICAR), University Grants Commission (UGC) and The Government of India. It has collaborative research programmes with most of the All India Coordinated Research Projects (AICRP) for which funds are being received from ICAR. Apart from research funding, ICAR also provides financial assistance for education, student amenities and for equipping the existing laboratories etc., A number of workshops of the Coordinated Research Projects have been arranged by the University in collaboration with ICAR and other agencies. The University conducts summer institutes with the financial assistance from ICAR. The ICAR also provides funds for the first line Extension/Transfer of Technology Programmes like ORPs, NDS, Lab to Land and Land to Land.

The University undertakes specific projects funded by Government of India. The University has been implementing several extension education programmes sponsored by Government of India like Regional Extension Education Institute, Regional Biogas Training and Development Centre, KVKs etc.

The APAU has linkages with other agricultural universities in India and is a member



of the Indian Agricultural Universities Association and the Association of Indian Universities and thus exchanges printed material, information etc. The University invites examiners at post-graduate level from other agricultural universities. The university

- deputed inservice candidates for higher education in specialised fields to other universities/institutes
- reserves seats in APAU for inservice teachers of other agricultural universities to avoid in-breeding
- interacts with scientists through sponsoring the faculty to summer institutes and other training programmes conducted by agricultural universities and other academic institutions.

The post-graduate students of this University work for doctoral thesis problem with the scientists of Directorate of Rice Research (DRR), All India Coordinated Sorghum Improvement Project (AICSIP) and IARI Regional Research Stations, Directorate of Oil seeds Research (DOR), Central Research Institute for Dryland Agriculture (CRIDA) etc. The staff members receive training from National Academy of Agricultural Research Management (NAARM) for specific courses. The senior officers of the University often deliver guest lectures at National Institutes located at Hyderabad and other locations.

#### STATE LEVEL

The University has established good linkages with State Departments of Agriculture, Horticulture, Animal Husbandry, Irrigation, Command Area Development, Tribal Welfare, Forestry, Women Welfare etc., and corporations like A.P. State Seed Corporation, A.P. Agro-Industries Development Corporation, A.P. Dairy Development Co-operative Federation, A.P. Meat and Poultry Corporation etc.

The linkages between the APAU and the State Department of Agriculture are at two levels :

#### i) State Level

##### State Level Research and Extension Coordination Committee

The State Level Research and Extension Coordination Committee with the Director of Agriculture as the Chairman and Deans, Directors and Senior Scientists of APAU and Senior Officers of the Department of Agriculture as members is responsible for the promotion of research and extension programmes of the University.

##### State Level Research and Extension Advisory Council

The Research and Extension Advisory Council of APAU with the Vice-Chancellor as Chairman, Director of Research as Convenor and all the Deans of Faculties, Director of Extension of APAU, Director of Agriculture, Director of Animal Husbandry, three farmers, four members of the Board of Management of APAU and all Associate Directors of Research as members, suggest research strategies based on the feed back of the problems encountered by the farmers.

##### Pre-seasonal Workshops

Before the *Kharif* and *rabi* seasons commence, pre-seasonal workshops are held at District level and State level (which are organised by the Department of Agriculture), wherein the scientists of APAU, ICAR and other institutes and officers of the Department of Agriculture participate. In these workshops, production programmes for the districts are thoroughly discussed.

## ii) Regional level

Zonal Research and Extension Advisory Councils consisting of Associate Directors of Research and Scientists of the Zone, Officials of State Department of Agriculture like Joint Directors, Deputy Directors and Assistant Directors of Agriculture and representatives of farmers of the zone meet and discuss the field problems of the zone twice a year, for 2 days at the headquarters of each of the seven Agro-climatic zones of the State to finalise the technical programme for *kharif* and *rabi* seasons respectively.

Apart from ZREAC meetings, joint diagnostic teams are constituted from time to time for investigating specific problems which require immediate attention in the zone involving both the Scientists of the University and Officers of the State Department of Agriculture. Minikit trials are carried out jointly both by the University and the Department of Agriculture. Inservice training programmes for the departmental officers are conducted at Zonal Research/Lead Research Stations, Extension Education Institute (EEI) and seven campus colleges. Joint Committee consortia are constituted to develop and implement university programmes like KVKs and extension education units, special development

projects, etc. National Demonstration and Lab to Land Programmes are implemented by APAU in collaboration with the Departments of Agriculture and Animal Husbandry and other development departments of the Government of Andhra Pradesh.

With the inception of NARP by APAU and T & V system by the State Department of Agriculture, the linkages between APAU and extension personnel of the Department of Agriculture and Horticulture have been greatly strengthened and improved. Regular monthly workshops facilitate transfer of technology and feed back mechanism. Thus the university maintains linkages with Development Departments and organisations for better coordination of developmental activities.

The university also has established linkages with the non-governmental organisations in the State which are directly concerned with Agricultural and Rural Development.

In addition, the faculty as well as university officers are often called upon on bilateral contracts or to serve upon expert study groups and committees to assist in Evaluation/Preparation of study reports by State, National and International Organizations.

## CHAPTER - X

### PLANNING AND MONITORING CELL

The planning of various activities of the University was done by individual officers concerned and the plan was implemented with the approval of the competent authorities. However, with the expansion of teaching, research and extension activities and the linkages with several State, National and International Development Institutions, the responsibilities of the University became increasingly complex, requiring overall comprehensive planning with information obtained from different sections of the University and a proper data base. A need was felt for evolving a suitable mechanism for planning and monitoring the activities and resources, for collecting statistical information from various branches of the University and for creating a data bank at the University. Apart from this, the mechanism was also to be responsible for programme appraisal, monitoring and evaluation of different schemes and suggesting corrective measures for their implementation from time to time. The need for such a cell was also reiterated by the ICAR Review Committee for Agricultural Universities in 1978. Consequently, the Board of Management considered the issue and decided to establish the Planning and Monitoring Cell in 1987 with the following functions :

- Preparation of an overall perspective development plan of the University - academic, physical and financial. A long range plan of development covering a period of ten to fifteen years should be prepared by the University after review of various factors like student enrolment, staff requirements, development of colleges and research departments, infrastructure needs etc.

These should further be sub-divided into a short-term operation plan for a five-year period and also annual plans

- Sponsoring specific research studies in different problem areas like manpower requirements, admission policies, examination reforms, internal efficiency, pooling of resources etc. and to assess performance of current programmes of higher education and research as well as future needs
- Appointing specific teams or task forces consisting of internal or external experts from time to time for evaluation of the work of different departments, colleges and programmes within the university
- Building up a sound knowledge base including statistical information on various activities of the University which would help in making proper projections for the future
- To maintain linkages with State, National and International funding agencies to the various programmes in the University and to serve as a clearing house for information related to these agencies
- Preparing feasibility reports of projects for the University.

The cell came into existence with its own establishment headed by a Coordinator under the direct control of the Vice-Chancellor. The Planning and Monitoring Cell comprised of a Coordinator, 3 technical officers (one

from each faculty), an economist, statistician and adequate supporting staff. So far, information pertaining to students' admission and out turn, staffing pattern, staff directory, staff bio-data, budget allocations and information on various schemes under operation have been collected and computerised. Proposals for annual plans have been formulated and annual reports of the university from 1984-85 have been brought out. The Planning and Monitoring Cell has also been acting as a clearing house for information to several national and international agencies like the Association of Commonwealth Universities, ICAR, UGC, Government of India, Association of Indian Universities, Institute of Applied Manpower Research, and Govt. of Andhra Pradesh, Department of Higher Education etc. The Planning and Monitoring Cell has been working as a nodal agency for Agricultural Planning based on agro-climatic regions and has assisted in bringing out status paper and strategy paper for East Coast Plains and hills region (zone 11) and Southern plateau and Hills region (zone 10) which were submitted to the Planning Commission, Government of India. Under its purview, the planning and monitoring cell also has a computer centre which was established in 1982 with a DCM Micro-computer as a central facility primarily to attend to the statistical analysis of research data of post-graduate students and the faculty of the University. In 1984, it was strengthened with another Micro computer with 132 Col. printer in order to meet the increasing needs of the students and administration. It was further equipped with

the latest generation system PC-AT 286 with two P.C.'s in 1987-88 and this is being used as a single user as well as multi-user system. The computerisation activities have been extended to accounts, administration, teaching and research of the University. A mini-computer system initially with five terminals was procured in 1989. It is proposed to provide terminals to the Deans and Directors and Comptroller to speed up the administrative process in the University. This would be further expanded to 15 terminals with large storage capacity and high speed printer in a phased manner during the VIII Plan.

The Computer Centre is currently attending to various computerisation programmes, i.e. computer analysis of research projects of Agro-climatic zones, monthly pay roll of the staff at Rajendranagar, monthly pensions of all pensioners, General Provident Fund (GPF) accounts of the employees of the University and admissions to under-graduate and post-graduate programmes of the University.

The Computer Centre is offering courses in Computer science to post-graduate students in order to develop computer awareness and programming skill.

It is being contemplated further to computerise the academic information of the students, question banks of the courses in all the disciplines of the three faculties, personnel information, library services, budgeting, accounting of the University etc.

## CHAPTER - XI

# STAFF WELFARE

### FACULTY RECRUITMENT

At the time of taking over of the colleges by the University, the staff was borne on the registers of either the Government of Andhra Pradesh or the Osmania University. Thus, they inherited service rules from their parent organisations. The University had its own service rules. During the initial stages, there was a confusion about the service rules and regulations. The University, however, solved the problems of the staff and finally started implementing its own policies fully protecting the interest of transferred employees. Recruitment rules and regularisation of services of the staff was taken up on firm line during the late seventies. Recruitment of the staff was made entirely on All India merit basis. Massive recruitment was undertaken during the eighties.

### FACULTY IMPROVEMENT PROGRAMMES

The University right from the beginning encouraged its staff members to acquire higher qualification either by deputing them to USA under Inter-Institutional arrangements with KSU-USAID or subsequently granting deputation/study leave for the period spent for higher studies within the country. As a part of the faculty improvement programme, under the Inter-institutional arrangements with the KSU-USAID, several teachers of this University were deputed for advanced training to the United States of America (USA). This programme was later modified to train some of these teachers, partly in USA and partly at IARI, New Delhi, so that, while they learnt advanced technology in USA, they could translate that knowledge to suit the Indian conditions at IARI. This programme came to an end in July, 1972.

Subsequent to KSU-USAID staff exchange programme, an inter-institutional arrangement with the ICRISAT and the Ford Foundation was made in 1975 to train students and staff in non-degree as well as post-graduate training programmes, leading to the master's and doctoral degrees. Under this programme, collaborative research was undertaken between the University and the ICRISAT. The project also provided for the post-graduate training particularly in dry-land agriculture both in India and abroad. Consequently, professors in agronomy, population genetics, economics and crop physiology were appointed with an initial assistance from ICRISAT.

Several teachers were also deputed with full salary for prosecuting higher studies within India. The faculty members are also being deputed for higher studies to different institutes to study subjects which are identified as deficient areas in the APAU. Those who secure ICAR fellowships are being granted a matching grant of Rs.1000/- per month which is now enhanced to Rs.1800/- per month for prosecuting Ph.D. studies. The University is constantly reviewing the deputation programmes from time to time to assist the staff in acquiring higher qualification.

### STAFF INCENTIVE SCHEME

Based on the guidelines of the UGC, a scheme on promotion policy for the scientists of APAU was cleared by the standing committee of the Academic Council and was implemented in the year 1984. This scheme envisaged the recognition of outstanding work turned out by the University scientists. The main feature of the scheme was to end the stagnation for want of clear vacancies.

## AWARDS AND HONOURS

Several teachers of the University have been the recipients of different awards and honours instituted by National and International agencies.

The Andhra Pradesh Agricultural University was included by the State Government as one of the Universities eligible for consideration of the STATE BEST TEACHER AWARDS and 2-3 teachers of this University get this award every year.

In line with the State Best Teacher Awards, the University has instituted the best teacher awards since 1985. This has been a source of encouragement to the middle and junior level staff members who have exhibited dedication to duty and excelled in their teaching, research and extension duties.

### Recipients of State Best Teacher Awards

Year	Name of the Awardee
1981-82	... 1. Prof. G.H. Sankara Reddi 2. Dr.K. Satyanarayana Rao
1982-83	... 1. Dr.M.V. Reddi 2. Dr.A. Ramamohana Rao
1983-84	... 1. Dr.D. Anjaneya Prasad 2. Sri T. Lohi Das
1984-85	... 1. Dr.D. Venkayya 2. Dr.J. Subbayya
1985-86	... 1. Dr.B. Venkateswara Rao 2. Dr.M. Raj Reddy
1986-87	... 1. Dr.M. Rama Rao 2. Dr.T.D.J. Nagabhushanam
1987-88	... 1. Dr.P. Varadarajulu 2. Dr.(Mrs.)K. Chittemma Rao

### Recipients of University Awards for the Best Teachers and Meritorious Research and Extension Workers

Year/Activity	Name of the Awardee
1985 Teaching	1. SriM.Seshagiri Rao 2. Dr. T.Goverdhan Reddy 3. Sri P. Narasimha Reddy 4. Dr.S.M.Siddiqui 5. Dr.Y.S. Chakravarthi 6. Dr.(Mrs.)R. Vatsala
1986 Teaching	1. Dr.D. Subramanyam 2. Smt.A. Mahalakshmi 3. Dr.K. Chandrasekhara Rao 4. Dr.K.V. Sundara Rao 5. Dr.V. Ravindra Reddy 6. Dr.(Mrs.)V. Vimala
1987 a) Teaching	1. Dr.Shaik Mohiddin 2. Dr.A. Sreenivasa Raju 3. Sri V.Parthasarathy Reddy 4. Dr.M. Vikram Reddy 5. Dr.N. Krishna 6. Dr.(Mrs.)A. Laxmi Devi
b) Research	1. Dr.Y. Satyanarayana 2. Dr.S. Shankarlingam 3. Dr.N.Ranganandhacharyulu 4. Sri G.P. Prasada Rao 5. Dr.D.V.G. Krishna Mohan 6. Smt.Gita Dendukuri
c) Extension	1.SriA.G.Venkataramana Reddy 2. Dr.N. Mrutyunjayam
1988 a) Teaching	1. Dr.P.S. Sarma 2. Sri V. Satyanarayana Rao 3. Dr.K. Seetaram Reddy 4. Dr.V. Prabhakara Rao 5. Dr.V. Ramasubba Reddy 6. Dr.(Mrs.) G. Sarojini

- b) Research 1. Sri P.S.N. Murthy  
2. Dr.N. Venugopal Rao  
3. Dr.R. Saikumar  
4. Sri M. Satyanarayana  
5. Dr.K. Krishna Reddy
- c) Extension 1. Sri A.B. Shankara Rao  
2. Sri M. Ravindrakumar Reddy

#### **SAVING SCHEMES**

The insurance-cum-savings scheme known as the Group Insurance Scheme was implemented with effect from 1987. However, in lieu of this scheme, the University has decided to extend the benefit of LIC Group Savings - linked insurance scheme from 1989.

#### **REVISED PAY SCALES**

The Third Plan UGC Pay Scales were extended from January 1966 to the teachers of APAU. It was, further, decided to extend the same pay scales to the research and extension

personnel also from January 1969. In 1976, the 5th Plan UGC scales were extended to the technical staff of APAU. The VII Plan UGC scales have also been implemented to the teaching staff of APAU with effect from January, 1986.

Similarly, the revised pay scales of the Government of Andhra Pradesh are being implemented to the non-teaching staff of the University from time to time.

#### **INTERNATIONAL VISITS/TRAINING**

Several teachers of the University have attended seminars, workshops and training programmes conducted both in India and abroad.

#### **HEALTH CARE FACILITIES**

There are three health clinics, one in each campus, to attend to the medical needs of the staff members.