

Technical Note – Land cover type mapping utilising pan-sharpened QuickBird and multi-spectral IKONOS images, Abemama, Kiribati



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SOPAC TECHNICAL NOTE (PR48)

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1 Introduction

Vegetation mapping for low lying islands started as a initiative related to the FAO programme **M**onitoring **A**ssessing and **R**eporting (MAR) in Tuvalu where SPC programme Forest and Trees worked together with SOPAC to plan future activities in this area. In 2009 a monitoring system was established in the Agriculture Department in Kiribati and initial training was provided through SPC/SOPAC. The Agriculture Department worked together with the Department of Environment and the Lands Department on the vegetation mapping task. Kiribati - like Tuvalu at a later stage - expressed more reasons to map the vegetation of their outer islands. They explained the importance of mapping the coconut resource because accurate figures are required to attract bio fuel related projects. Spatial and statistical information of the coconut resource is also required to be able to start regeneration activities as most coconut palm stands are getting senile. Another important reason to map the vegetation is the food security of low lying islands where the Agriculture Department needs to know the available amount and condition of pandanas, coconut and bread fruit to support management of this natural resource. Finally the vegetation cover is supposed to be documented to be able to record any changes through a re-mapping at a later stage. It is presumed that the impact of climate change will be visible through vegetation changes which refer especially to mangrove vegetation.

SPC Forest and Trees is financing one position at SOPAC's GIS&RS section where Taato Murdoch from Kiribati fills this position and did most of the mapping and supports the mapping in Kiribati's Environment, Agriculture and Lands Department.

All mapping is based on visual interpretation at 1:5,000 working scale. The mapping is based on geo-coded very high resolution image data (multi-spectral IKONOS). However, the geo-location accuracy is not at 1:5,000 scale level; there can be a linear shift, which can be corrected as soon as reference image points are established. If a geo-location correction will be applied, the area calculation will not be effected. To stratify the coconut cover into three density classes pan-sharpened QuickBird images displayed with Google Earth were used parallel to the multi-spectral IKONOS images.

2 Image Data Used

Satellite Image Type: IKONOS

Creation Date: 2004-04-15

Projection Information :

Projection Zone : 59

Spheroid Name : WGS 84

Georeferenced to : UTM, Zone 59

Hemisphere : North

3 Abemama Atoll Area Statistic, Summary 2004

Abemama		
Coconut dense	1,677	Hectares
Coconut plantation		Hectares
Coconut scattered		Hectares
Shrub	579	Hectares
Mangrove		Hectares
Settlement	208	Hectares
Bare land	268	Hectares
Water bodies	36	Hectares
Not clear	126	Hectares
Sum	2,894	Hectares

Table 3-1: Summary Access database display for different vegetation strata of Abemama. More about the different strata see chapter "Interpretation Key"

4 Area Statistic, by Islands (Villages)

4.1 ABAT (Abatiku)



Figure 4.1-1: Island section Abatiku

Abatiku		
Coconut dense		square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	748,031	square metres
Mangrove		square metres
Settlement		square metres
Bare land	2,177,995	square metres
Water bodies	19,404	square metres
Not clear		square metres
Sum	2,945,429	square metres

Table 4.1-1: Polygons calculated for island section Abatiku

VegetationClassName	ID	Area
Shrub vegetation	ABEM_ABAT_0001	15,026
Shrub vegetation	ABEM_ABAT_0002	11,601
Shrub vegetation	ABEM_ABAT_0003	4,843
Shrub vegetation	ABEM_ABAT_0004	42,983
Shrub vegetation	ABEM_ABAT_0005	8,357
Shrub vegetation	ABEM_ABAT_0006	11,153
Shrub vegetation	ABEM_ABAT_0007	11,606
Shrub vegetation	ABEM_ABAT_0008	4,857
Shrub vegetation	ABEM_ABAT_0009	6,776
Shrub vegetation	ABEM_ABAT_0010	9,680
Shrub vegetation	ABEM_ABAT_0011	14,129
Shrub vegetation	ABEM_ABAT_0012	9,753
Shrub vegetation	ABEM_ABAT_0013	3,140
Shrub vegetation	ABEM_ABAT_0014	6,208
Water bodies	ABEM_ABAT_0015	19,404
Shrub vegetation	ABEM_ABAT_0016	5,774
Shrub vegetation	ABEM_ABAT_0017	2,846
Bare land	ABEM_ABAT_0018	6,670
Bare land	ABEM_ABAT_0019	3,589
Bare land	ABEM_ABAT_0020	3,920
Bare land	ABEM_ABAT_0021	2,723
Bare land	ABEM_ABAT_0022	5,266
Bare land	ABEM_ABAT_0023	3,763
Bare land	ABEM_ABAT_0024	9,530
Bare land	ABEM_ABAT_0025	2,727
Shrub vegetation	ABEM_ABAT_0026	8,904
Shrub vegetation	ABEM_ABAT_0027	2,648
Shrub vegetation	ABEM_ABAT_0028	2,511
Shrub vegetation	ABEM_ABAT_0029	133,290
Shrub vegetation	ABEM_ABAT_0030	194,878
Shrub vegetation	ABEM_ABAT_0031	11,980
Shrub vegetation	ABEM_ABAT_0032	72,163
Shrub vegetation	ABEM_ABAT_0033	152,925
Bare land	ABEM_ABAT_0034	2,139,805
Sum		2,945,429

Table 4.1-2: Area in m² for mapped vegetation strata of island section Abatiku

4.2 **BIKE (Bike)**



Figure 4.2-1: Island section Bike

BIKE		
Coconut dense	264,259	square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	78,942	square metres
Mangrove		square metres
Settlement		square metres
Bare land	8,531	square metres
Water bodies		square metres
Not clear		square metres
Sum	351,732	square metres

Table 4.2-1: Polygons calculated for island section Bike

VegetationClassName	ID	Area
Bare land	ABEM_BIKE_0001	3,731
Bare land	ABEM_BIKE_0002	3,736
Bare land	ABEM_BIKE_0003	1,064
Shrub vegetation	ABEM_BIKE_0004	11,550
Shrub vegetation	ABEM_BIKE_0005	10,471
Coconut dense	ABEM_BIKE_0006	264,259
Shrub vegetation	ABEM_BIKE_0007	22,253
Shrub vegetation	ABEM_BIKE_0008	25,788
Shrub vegetation	ABEM_BIKE_0009	8,879
Sum		351,732

Table 4.2-2: Area in m² for mapped vegetation strata of island section Bike

4.3 **ABE1 (Teriki-Kariatebike)**

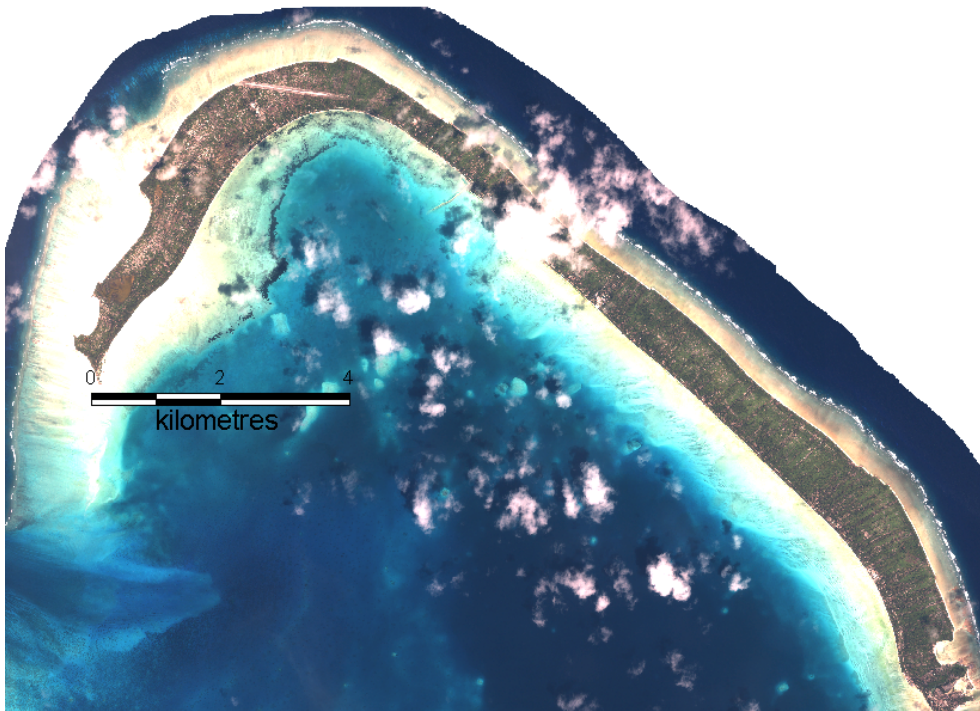


Figure 4.3-1: Island section Teriki-Kariatebike

CalculationForm_ABEM_ABE1 : Form

Teriki-Kariatebike		
Coconut dense	10,043,793	square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	2,251,749	square metres
Mangrove		square metres
Settlement	1,425,333	square metres
Bare land	307,495	square metres
Water bodies	191,852	square metres
Not clear	1,263,522	square metres
Sum	15,483,744	square metres

Table 4.3-1: Polygons calculated for island section Teriki-Kariatebike

VegetationClassName	ID	Area
Shrub vegetation	ABEM_ABE1_0001	19,742
Shrub vegetation	ABEM_ABE1_0002	51,571
Shrub vegetation	ABEM_ABE1_0003	17,920
Shrub vegetation	ABEM_ABE1_0004	29,312
Shrub vegetation	ABEM_ABE1_0005	21,268
Shrub vegetation	ABEM_ABE1_0006	8,072
Shrub vegetation	ABEM_ABE1_0007	52,999
Shrub vegetation	ABEM_ABE1_0008	14,425
Shrub vegetation	ABEM_ABE1_0009	97,396
Shrub vegetation	ABEM_ABE1_0010	45,669
Shrub vegetation	ABEM_ABE1_0011	12,621
Shrub vegetation	ABEM_ABE1_0012	29,443
Settlement	ABEM_ABE1_0013	173,313
Shrub vegetation	ABEM_ABE1_0014	3,258
Bare land	ABEM_ABE1_0015	5,051
Bare land	ABEM_ABE1_0016	4,794
Settlement	ABEM_ABE1_0017	186,028
Shrub vegetation	ABEM_ABE1_0018	39,466
Settlement	ABEM_ABE1_0019	86,325
Settlement	ABEM_ABE1_0020	173,110
Bare land	ABEM_ABE1_0021	5,740
Bare land	ABEM_ABE1_0022	6,742
Bare land	ABEM_ABE1_0023	11,952
Shrub vegetation	ABEM_ABE1_0024	7,194
Shrub vegetation	ABEM_ABE1_0025	18,515
Shrub vegetation	ABEM_ABE1_0026	3,992
Shrub vegetation	ABEM_ABE1_0027	3,600
Shrub vegetation	ABEM_ABE1_0028	5,216
Shrub vegetation	ABEM_ABE1_0029	11,216
Shrub vegetation	ABEM_ABE1_0030	29,310
Shrub vegetation	ABEM_ABE1_0031	31,356
Shrub vegetation	ABEM_ABE1_0032	18,203
Shrub vegetation	ABEM_ABE1_0033	78,376
Coconut dense	ABEM_ABE1_0034	12,501
Coconut dense	ABEM_ABE1_0035	54,671
Shrub vegetation	ABEM_ABE1_0036	75,643
Shrub vegetation	ABEM_ABE1_0037	62,924
Shrub vegetation	ABEM_ABE1_0038	10,850
Shrub vegetation	ABEM_ABE1_0039	4,760
Shrub vegetation	ABEM_ABE1_0040	48,926
Shrub vegetation	ABEM_ABE1_0041	71,943
Shrub vegetation	ABEM_ABE1_0042	77,037
Shrub vegetation	ABEM_ABE1_0043	17,548
Shrub vegetation	ABEM_ABE1_0044	37,571

Shrub vegetation	ABEM_ABE1_0045	71,996
Shrub vegetation	ABEM_ABE1_0046	10,112
Shrub vegetation	ABEM_ABE1_0047	9,158
Shrub vegetation	ABEM_ABE1_0048	14,082
Shrub vegetation	ABEM_ABE1_0049	4,044
Settlement	ABEM_ABE1_0050	373,851
Bare land	ABEM_ABE1_0051	2,779
Shrub vegetation	ABEM_ABE1_0052	9,583
Shrub vegetation	ABEM_ABE1_0053	10,237
Shrub vegetation	ABEM_ABE1_0054	11,842
Shrub vegetation	ABEM_ABE1_0055	22,045
Shrub vegetation	ABEM_ABE1_0056	5,946
Shrub vegetation	ABEM_ABE1_0057	10,129
Shrub vegetation	ABEM_ABE1_0058	5,739
Shrub vegetation	ABEM_ABE1_0059	3,109
Shrub vegetation	ABEM_ABE1_0060	4,660
Coconut dense	ABEM_ABE1_0061	236,853
Unclear	ABEM_ABE1_0062	1,010,031
Shrub vegetation	ABEM_ABE1_0063	25,416
Shrub vegetation	ABEM_ABE1_0064	8,683
Shrub vegetation	ABEM_ABE1_0065	43,578
Unclear	ABEM_ABE1_0066	34,548
Unclear	ABEM_ABE1_0067	43,300
Unclear	ABEM_ABE1_0068	14,576
Unclear	ABEM_ABE1_0069	4,293
Settlement	ABEM_ABE1_0070	61,866
Unclear	ABEM_ABE1_0071	21,089
Bare land	ABEM_ABE1_0072	1,514
Shrub vegetation	ABEM_ABE1_0073	34,939
Shrub vegetation	ABEM_ABE1_0074	8,336
Shrub vegetation	ABEM_ABE1_0075	44,543
Shrub vegetation	ABEM_ABE1_0076	25,787
Bare land	ABEM_ABE1_0077	148,032
Bare land	ABEM_ABE1_0078	6,991
Settlement	ABEM_ABE1_0079	63,163
Bare land	ABEM_ABE1_0080	12,663
Bare land	ABEM_ABE1_0081	7,830
Shrub vegetation	ABEM_ABE1_0082	1,618
Bare land	ABEM_ABE1_0083	3,462
Coconut dense	ABEM_ABE1_0084	11,760
Shrub vegetation	ABEM_ABE1_0085	18,748
Unclear	ABEM_ABE1_0086	60,236
Unclear	ABEM_ABE1_0087	31,269
Bare land	ABEM_ABE1_0088	10,947
Bare land	ABEM_ABE1_0089	15,852

Shrub vegetation	ABEM_ABE1_0090	30,182
Shrub vegetation	ABEM_ABE1_0091	19,099
Bare land	ABEM_ABE1_0092	39,478
Water bodies	ABEM_ABE1_0093	17,531
Water bodies	ABEM_ABE1_0094	166,246
Shrub vegetation	ABEM_ABE1_0095	15,205
Shrub vegetation	ABEM_ABE1_0096	31,714
Shrub vegetation	ABEM_ABE1_0097	39,094
Shrub vegetation	ABEM_ABE1_0098	23,704
Shrub vegetation	ABEM_ABE1_0099	14,367
Water bodies	ABEM_ABE1_0100	5,254
Shrub vegetation	ABEM_ABE1_0101	12,709
Bare land	ABEM_ABE1_0102	2,270
Water bodies	ABEM_ABE1_0103	2,822
Bare land	ABEM_ABE1_0104	1,327
Shrub vegetation	ABEM_ABE1_0105	21,063
Bare land	ABEM_ABE1_0106	20,072
Shrub vegetation	ABEM_ABE1_0107	154,434
Shrub vegetation	ABEM_ABE1_0108	89,560
Shrub vegetation	ABEM_ABE1_0109	164,462
Coconut dense	ABEM_ABE1_0110	1,544,396
Coconut dense	ABEM_ABE1_0111	3,247,976
Shrub vegetation	ABEM_ABE1_0112	27,236
Settlement	ABEM_ABE1_0113	307,676
Unclear	ABEM_ABE1_0114	44,181
Shrub vegetation	ABEM_ABE1_0115	147,246
Coconut dense	ABEM_ABE1_0116	4,935,635
Sum		15,483,744

Table 4.3-2: Area in m² for mapped vegetation strata of island section Teriki-Kariatebike

4.4 ABE2 (Temarama-Tabonaekana)

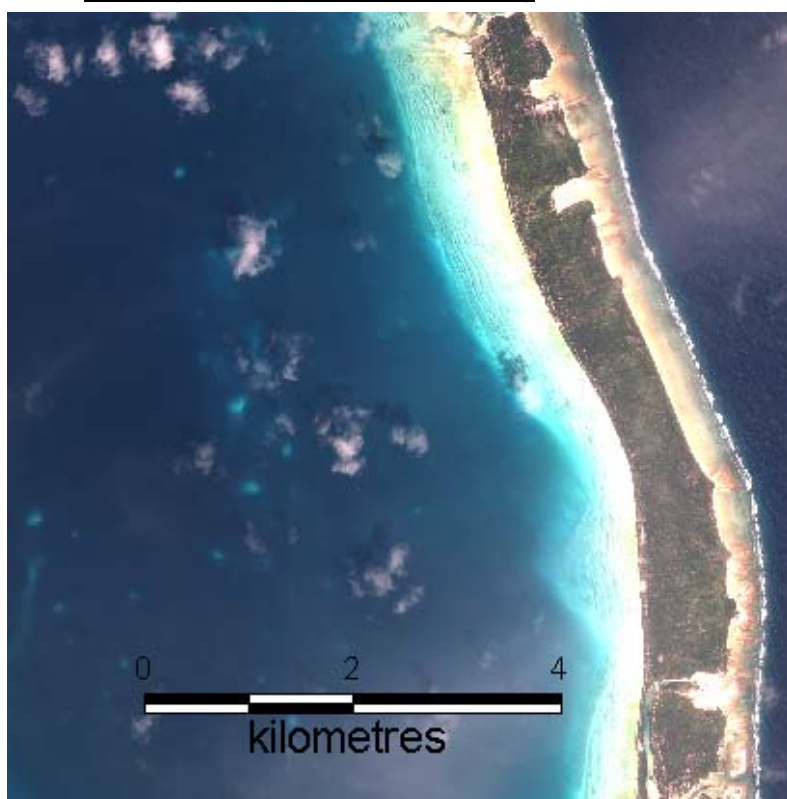


Figure 4.4-1: Island section Temarama-Tabonaekana

Temarama-Tabonnaekana		
Coconut dense	3,086,509	square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	1,191,344	square metres
Mangrove		square metres
Settlement	417,479	square metres
Bare land	65,687	square metres
Water bodies	3,552	square metres
Not clear		square metres
Sum	4,764,570	square metres

Table 4.4-1: Polygons calculated for island section Temarama-Tabonaekana

VegetationClassName	ID	Area
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Shrub vegetation	ABEM_ABE2_0001	104,441
Shrub vegetation	ABEM_ABE2_0002	53,565
Shrub vegetation	ABEM_ABE2_0003	15,692
Bare land	ABEM_ABE2_0004	7,976
Shrub vegetation	ABEM_ABE2_0005	11,154
Settlement	ABEM_ABE2_0006	115,068
Shrub vegetation	ABEM_ABE2_0007	26,700
Settlement	ABEM_ABE2_0008	49,787
Shrub vegetation	ABEM_ABE2_0009	132,040
Shrub vegetation	ABEM_ABE2_0010	9,452
Shrub vegetation	ABEM_ABE2_0011	22,291
Shrub vegetation	ABEM_ABE2_0012	72,696
Shrub vegetation	ABEM_ABE2_0013	17,610
Shrub vegetation	ABEM_ABE2_0014	48,800
Shrub vegetation	ABEM_ABE2_0015	58,944
Shrub vegetation	ABEM_ABE2_0016	56,376
Shrub vegetation	ABEM_ABE2_0017	30,937
Shrub vegetation	ABEM_ABE2_0018	51,926
Shrub vegetation	ABEM_ABE2_0019	32,766
Shrub vegetation	ABEM_ABE2_0020	114,142
Shrub vegetation	ABEM_ABE2_0021	17,421
Shrub vegetation	ABEM_ABE2_0022	40,121
Settlement	ABEM_ABE2_0023	84,236
Settlement	ABEM_ABE2_0024	16,075
Water bodies	ABEM_ABE2_0025	3,552
Settlement	ABEM_ABE2_0026	63,908
Settlement	ABEM_ABE2_0027	33,817
Bare land	ABEM_ABE2_0028	5,548
Bare land	ABEM_ABE2_0029	4,951
Bare land	ABEM_ABE2_0030	16,483
Shrub vegetation	ABEM_ABE2_0031	8,299
Coconut dense	ABEM_ABE2_0032	34,076
Bare land	ABEM_ABE2_0033	3,334
Bare land	ABEM_ABE2_0034	1,392
Bare land	ABEM_ABE2_0035	2,578
Shrub vegetation	ABEM_ABE2_0036	3,067
Coconut dense	ABEM_ABE2_0037	13,851
Bare land	ABEM_ABE2_0038	5,072
Shrub vegetation	ABEM_ABE2_0039	5,493
Settlement	ABEM_ABE2_0040	12,040
Bare land	ABEM_ABE2_0041	8,240
Bare land	ABEM_ABE2_0042	3,437
Coconut dense	ABEM_ABE2_0043	2,738
Coconut dense	ABEM_ABE2_0044	1,915
Bare land	ABEM_ABE2_0045	6,675

Settlement	ABEM_ABE2_0046	42,548
Shrub vegetation	ABEM_ABE2_0047	27,683
Coconut dense	ABEM_ABE2_0048	2,529,590
Shrub vegetation	ABEM_ABE2_0049	71,575
Coconut dense	ABEM_ABE2_0050	409,684
Shrub vegetation	ABEM_ABE2_0051	158,153
Coconut dense	ABEM_ABE2_0052	94,655
Sum		4,764,570

Table 4.4-2: Area in m² for mapped vegetation strata of island section Temarama-Tabonaekana

4.5 **ABE3 (Manoku-Kabangaki)**



Figure 4.5-1: Island section Manoku-Kabangaki

Manoku_Kabangaki		
Coconut dense	2,710,579	square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	1,406,291	square metres
Mangrove		square metres
Settlement	235,796	square metres
Bare land	103,689	square metres
Water bodies	146,828	square metres
Not clear		square metres
Sum	4,603,182	square metres

Table 4.5-1: Polygons calculated for island section Manoku-Kabangaki

VegetationClassName	ID	Area
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Shrub vegetation	ABEM_ABE3_0001	25,101
Shrub vegetation	ABEM_ABE3_0002	9,559
Shrub vegetation	ABEM_ABE3_0003	24,050
Shrub vegetation	ABEM_ABE3_0004	61,971
Shrub vegetation	ABEM_ABE3_0005	6,590
Shrub vegetation	ABEM_ABE3_0006	34,871
Shrub vegetation	ABEM_ABE3_0007	87,240
Shrub vegetation	ABEM_ABE3_0008	17,217
Shrub vegetation	ABEM_ABE3_0009	5,212
Shrub vegetation	ABEM_ABE3_0010	52,131
Shrub vegetation	ABEM_ABE3_0011	37,401
Shrub vegetation	ABEM_ABE3_0012	48,857
Shrub vegetation	ABEM_ABE3_0013	10,331
Shrub vegetation	ABEM_ABE3_0014	6,907
Shrub vegetation	ABEM_ABE3_0015	53,377
Shrub vegetation	ABEM_ABE3_0016	24,802
Shrub vegetation	ABEM_ABE3_0017	5,074
Shrub vegetation	ABEM_ABE3_0018	25,455
Shrub vegetation	ABEM_ABE3_0019	4,460
Shrub vegetation	ABEM_ABE3_0020	84,389
Shrub vegetation	ABEM_ABE3_0021	7,779
Shrub vegetation	ABEM_ABE3_0022	9,406
Shrub vegetation	ABEM_ABE3_0023	14,118
Shrub vegetation	ABEM_ABE3_0024	55,008
Shrub vegetation	ABEM_ABE3_0025	8,398
Coconut dense	ABEM_ABE3_0026	5,015
Coconut dense	ABEM_ABE3_0027	2,186
Coconut dense	ABEM_ABE3_0028	15,867
Coconut dense	ABEM_ABE3_0029	7,250
Coconut dense	ABEM_ABE3_0030	22,787
Coconut dense	ABEM_ABE3_0031	390,904
Bare land	ABEM_ABE3_0032	8,169
Coconut dense	ABEM_ABE3_0033	9,987
Bare land	ABEM_ABE3_0034	49,920
Bare land	ABEM_ABE3_0035	24,727
Shrub vegetation	ABEM_ABE3_0036	24,546
Shrub vegetation	ABEM_ABE3_0037	3,842
Water bodies	ABEM_ABE3_0038	64,034
Shrub vegetation	ABEM_ABE3_0039	220,850
Water bodies	ABEM_ABE3_0040	82,794
Bare land	ABEM_ABE3_0041	20,873
Coconut dense	ABEM_ABE3_0042	2,140,903
Shrub vegetation	ABEM_ABE3_0043	238,921
Coconut dense	ABEM_ABE3_0044	115,680
Shrub vegetation	ABEM_ABE3_0045	71,255

Shrub vegetation	ABEM_ABE3_0046	82,587
Settlement	ABEM_ABE3_0047	235,796
Shrub vegetation	ABEM_ABE3_0048	44,586
Sum		4,603,182

Table 4.5-2: Area in m² for mapped vegetation strata of island section Manoku-Kabangaki

4.6 **ABE4 (Kenna)**

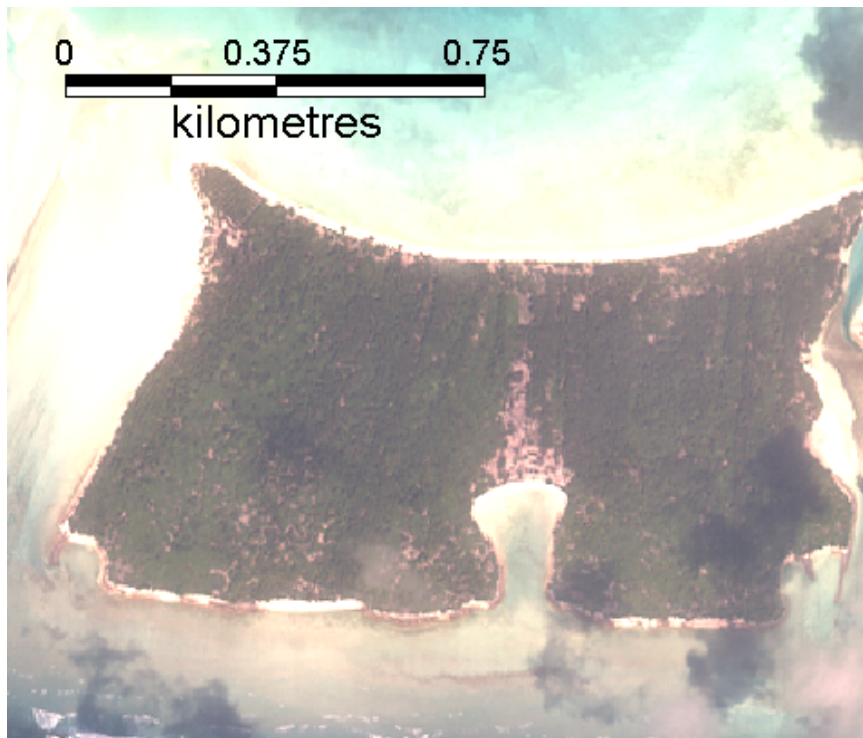


Figure 4.6-1: Island section Kenna

Kenna		
Coconut dense	665,068	square metres
Coconut plantation		square metres
Coconut scattered		square metres
Shrub	109,776	square metres
Mangrove		square metres
Settlement		square metres
Bare land	15,315	square metres
Water bodies		square metres
Not clear		square metres
Sum	790,159	square metres



Table 4.6-1: Polygons calculated for island section Kenna



VegetationClassName	ID	Area
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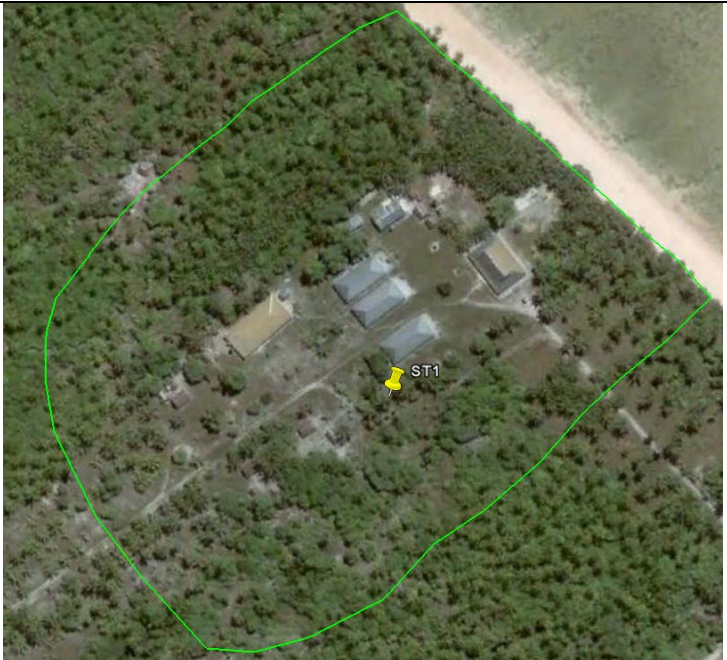

Shrub vegetation	ABEM_ABE4_0001	86,923
Shrub vegetation	ABEM_ABE4_0002	22,854
Bare land	ABEM_ABE4_0003	15,315
Coconut dense	ABEM_ABE4_0004	665,068
Sum		790,159


Table 4.6-2: Area in m² for mapped vegetation strata of island section Kenna

5 Interpretation Key

Vegetation Type	Description	Interpretation Key Images
DCO (Abaiang)	<p>Dense coconut palm is recognised by its texture. A single palm has a star like shape.</p> <p>DCO has 150 to 300 coconuts per hector</p>	 <p>An aerial photograph showing a dense, green coconut plantation. A yellow pushpin marker is placed on the image, labeled 'DCO 1'. The plantation is outlined with a green line. The texture of the palm leaves is visible, and the overall appearance is a thick, uniform canopy.</p>
PCO (Abaiang)	<p>Coconut plantation is recognised by the systematic planting lines.</p> <p>PCO has 75 to 100 coconuts in a hector</p>	 <p>An aerial photograph showing a coconut plantation with distinct, systematic planting lines. A yellow pushpin marker is placed on the image, labeled 'PCO'. The plantation is outlined with a green line. The rows of palm trees are clearly visible, creating a grid-like pattern in the canopy.</p>

<p>SCO (Abaiang)</p>	<p>Scattered coconut palm is characterised by its texture in contrast to other vegetation types. The star like texture of single palms is the dominant feature SCO has 75 and less coconuts in an hecter</p>	 <p>An aerial photograph showing a dense forest of coconut palms. A large, irregular area is outlined in green. A yellow pushpin is placed in the center of this area, with the label 'SCO1' next to it. The forest has a distinct star-like texture.</p>
<p>BL (Abaiang)</p>	<p>Bare land is considered as areas where no vegetation exists. This can be caused by deforestation or through other natural processes.</p>	 <p>An aerial photograph showing a dense forest of coconut palms. A small, irregular area is outlined in green. A yellow pushpin is placed in the center of this area, with the label 'Bare Land 1' next to it. The area appears to be a clearing or a patch of bare ground within the forest.</p>

<p>ST (Abaiang)</p>	<p>Settlement is defined as the buffer of 75 m around houses. The green line shows this 75 meter boundary.</p>	 <p>An aerial photograph showing a cluster of buildings and structures surrounded by dense green vegetation. A bright green line outlines a 75-meter buffer zone around the buildings. A yellow pushpin is placed on the image with the label 'ST1' next to it.</p>
<p>SHRUB (Abaiang)</p>	<p>Shrub is vegetation under 5 meters in height. It has a light green colour in visible band combination. There is not much shade that can be seen.</p>	 <p>An aerial photograph showing a dense area of low-lying vegetation, identified as shrubs. A bright green line outlines a specific area within this vegetation. A yellow pushpin is placed on the image with the label 'SHRUB' next to it.</p>

<p>WB (Abaiang)</p>	<p>Any form of inland water is classified as "water body". The plain dark surface without any texture identifies it. These can be ponds, lakes and swamps.</p>	
<p>MG (Bonriki, Tarawa)</p>	<p>Mangroves live at the edge of the land and grow at sea level. It can be identified by its texture like a woollen carpet. It appears darker than closed by vegetation. Mangroves grow normally at the beach and in low lying parts of islands with salt water infiltration also inland.</p>	