

CHAPTER 3 PRESENT CONDITION AND ISSUES OF THE AGRICULTURE IN THE STUDY AREA

3.1. Present Conditions of the Study Area

The Nacala Corridor is started from Nacala Port in east side of Nampula province in northern Mozambique and connecting to Blantyre in Malawi and Zambia. Along the corridor, road and railway is developing in this moment.

The Nacala Corridor area where is the Study Area, is located across the provinces of Nampula, Zambezia and Niassa. The provinces of Nampula and Niassa are included in the north region and the province of Zambezia is included in the central region of Mozambique. Area and population of each province are as follows:

Table 3.1.1 Area and Population of the Three Provinces

| Province | Area (km ²) | Population (2010) | Population density (hab./km ²) |
|----------|-------------------------|-------------------|--|
| Nampula | 81,606 | 4,414,144 | 54.1 |
| Zambezia | 105,008 | 4,213,115 | 40.1 |
| Niassa | 129,056 | 1,360,645 | 10.5 |

Source: Statistic Yearbook 2010, INE.

The population of the Nampula province in 2010 was approximately 4.4 million inhabitants, being one of the most populated provinces in Mozambique, together with the Zambezia province. The population is concentrated in the municipalities of Nampula and Nacala which together with 6 coastal districts, concentrate more than 40% of the total population of the province. The Zambezia province has a population of approximately 4.2 million inhabitants, with the biggest province next to the Nampula province. The population is concentrated in the municipality of Quelimane and surrounding area. On the other hand, the Niassa province has a population of 1.4 million inhabitants, being the least populated province in the country. The population is concentrated in the municipalities of Lichinga and Cuamba, totaling approximately 30% of the total population of the province.

In these provinces, the Study Area was selected along the “Nacala Corridor” consisted of 14 districts. Total area of the Study Area is estimated as 65,907 km² and it is about 8.7% of whole territory.

In the second Joint Coordination Committee held in June 2012, two districts of Niassa, such as Manjune and Sanga, are integrated in the target area of ProSAVANA. So that, some topics are described about both districts.

3.1.1. Topography

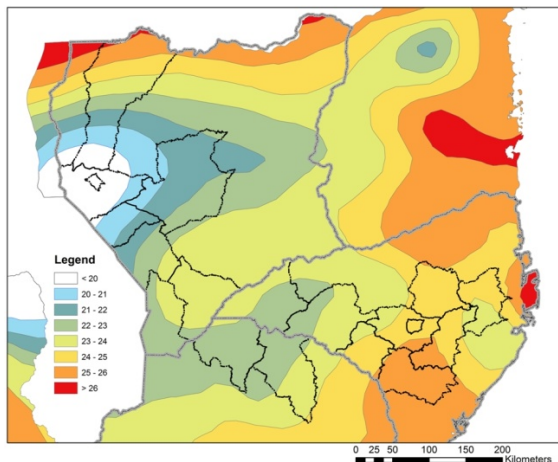
Altitude of the Study Area ranges from below 100m to over 2,400m above sea level. Flat and low coastal plain characterizes the eastern region (Meconta, Mogovolas and Monapo Districts). Altitude arises westward, and a hilly zone extends up to the central region (Muecate, Murrupula, Nampula, Ribaue Districts, also part of Alto Molocue and Malema Districts) with prominent peaks such as Mount Mepalue (1,777m asl). There is a massif of steep-sloped high mountains in the southern region (Alto Molocue, Gurue and Malema Districts), being Mount Namuli the highest point (2,419m asl) of the Study Area. In the middle-western region (Cuamba and Mandimba Districts) the topography is largely represented by floodplain along Lake Amaramba (630m asl). Lichinga Plateau extends in the northwestern region (Lichinga and Ngauma Districts) with relatively elevated altitude up to Monte Livigire (1,728m asl). To the west end, the terrain drops to the shore of Lake Niassa (470m asl). Through most part of the Study Area, the landscape is characterized by numerous inselbergs. The geological foundation of the Study Area consists of metamorphic rocks such as quartzite, schist and gneiss, occurring between them volcanic as well as sedimentary rocks. Almost all the river basins of the Study Area drain towards the Indian Ocean, with a few exceptions draining toward Lake Niassa.

3.1.2. Climate

The mean annual temperatures in the Study Area vary from 25 to 26 °C in the eastern (coastal) area, represented by Monapo, and it declines to from 22 to 23°C in the western (inland) area, represented by Cuamba. In the high land area of Lichinga, the mean annual temperature goes below 22 °C. The mean maximum and minimum temperature is from 32 to 33 °C and more than 20 °C in the eastern area, and from 28 to 29 and from 15 to 16 °C in the western area. Lichinga has cooler climate due to the high elevation, which is below 27 °C for maximum and below 16 °C for minimum. (Refer to Figure 3.1.1)

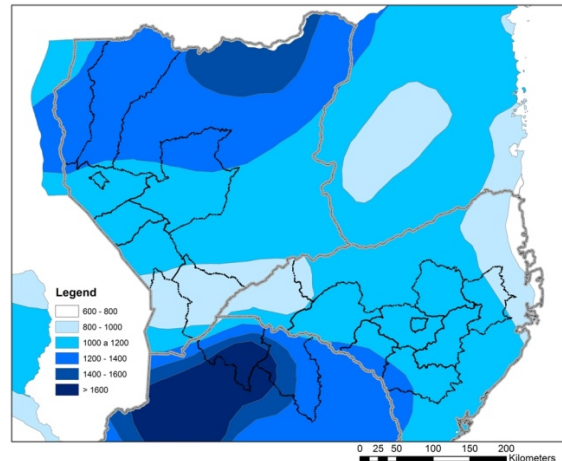
The rainy season goes from November to April and the dry season goes from May to October. According to the isohyet of annual precipitation shown in Figure 3.1.2, the mean annual precipitation ranges from 1,000 to 1,200 mm in the major part of the Study Area, besides there are the area with from 800 to 1,000 mm of precipitation in Monapo, Meconta, Mogovolas, a part of Malema and Cuamba, and the area over 1,200 mm of precipitation in Gurue and Alto Molocue. Some mountainous area in Gurue shows more than 1,600 mm of annual precipitation.

Table 3.2.1 shows the mean monthly precipitation of selected districts. Even though some difference is observed, the precipitation from October to April occupies more than 94% of annual one and more than 99% of precipitation is observed until June.



Source: IIAM

Figure 3.1.1 Annual Mean Temperature



Source: IIAM

Figure 3.1.2 Annual Precipitation

Table 3.1.2 Mean Monthly Precipitation of Selected Districts (unit : mm)

| Station | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Annual | Year / Source |
|----------|------|------|-------|-------|-------|-------|------|------|------|------|------|------|--------|--------------------|
| Malema | 12.5 | 71.8 | 278.5 | 445.2 | 295.9 | 151.5 | 44.7 | 2.8 | 0.9 | 1.6 | 0.0 | 0.0 | 1,241 | 98/99-10/11 DPA |
| | 1% | 6% | 28% | 62% | 85% | 96% | 100% | 100% | 100% | 100% | 100% | 100% | | |
| Nampula | 16.2 | 29.3 | 318.4 | 362.1 | 208.7 | 179.6 | 79.2 | 33.2 | 27.2 | 4.5 | 7.0 | 2.4 | 1,065 | 98/99-10/11 DPA |
| | 1% | 4% | 29% | 57% | 74% | 88% | 94% | 97% | 99% | 99% | 100% | 100% | | |
| Meconta | 10.1 | 49.6 | 128.5 | 230.5 | 193.5 | 145.2 | 62.7 | 4.0 | 14.6 | 4.9 | 1.5 | 1.0 | 857 | 98/99-10/11 DPA |
| | 1% | 7% | 22% | 49% | 72% | 90% | 97% | 97% | 99% | 100% | 100% | 100% | | |
| Cuamba | 21.6 | 88.5 | 232.5 | 353.3 | 220.6 | 123.3 | 49.9 | 6.8 | 0.5 | 4.2 | 3.6 | 4.7 | 1,087 | 96/97-06/07 INM |
| | 2% | 10% | 31% | 63% | 83% | 94% | 98% | 99% | 99% | 99% | 100% | 100% | | |
| Lichinga | 26.9 | 78.9 | 280.8 | 334.7 | 255.5 | 208.0 | 53.3 | 12.6 | 1.9 | 0.8 | 1.6 | 1.0 | 1,256 | 00-10 INM |
| | 2% | 8% | 31% | 57% | 78% | 94% | 99% | 100% | 100% | 100% | 100% | 100% | | |

Source: DAP Nampula, INM

3.1.3. Water Resources

The Study Area is divided to 2 major river basins, one is the Rovuma river basin and another is the Lurio and other river basins. The districts of the Study Area in Niassa Province except for Cuamba are located in the Rovuma river basin. They belong mainly to the Upper Lugenda Sub-basin, which is the most upper sub-basin in the south direction of the Rovuma Basin. A limited part of Lichinga District belongs to the Lucheringo and Middle Lugenda Sub-basin. Sanga and Majune District belongs to the Lucheringo and Middle Lugenda Sub-basin respectively. Cuamba and districts from Nampula and Zambezia Province are located in the major river basins of ARA-CN jurisdiction - from South to North, Licungo, Melela, Molocue, Ligonha, Meluli, Monapo, Mecuburi and Lurio. All of major basins and its rivers run through the Study Area to a greater or lesser. The districts of the Study Area stand on the upper reach of each river basin due to its inland location. The character of river basin and

runoff is summarized in Table 3.1.3. Due to the limitation of available data, the information on runoff is rather old and the effect of the recent development of the river basins is not considered. It is required to confirm the recent change of runoff especially for the Monapo River, which is quickly developed its water resources.

Table 3.1.3 Character of River Basin and Runoff of the Study Area

| Basin | Area of Basin (km ²) | Basin Rainfall (mm) | Station at the lowest reach | | | Annual Runoff of Basin (million m ³) | Related District |
|----------------|----------------------------------|---------------------|-----------------------------|-----------------------------------|--------------------|--|---|
| | | | Station | Catchment Area (km ²) | Annual Runoff (mm) | | |
| Licungo | 22,531 | 1,400 | E91 | 20,400 | 317 | 7,142 | Gurue |
| Melela | 8,287 | 1,330 | E99 | 5,500 | 181 | 1,500 | |
| Molocuè | 1,372 | 1,274 | E192 | 1,200 | 192 | 263 | Alto Molócue |
| Ligonha | 14,552 | 1,134 | E132 | 5,410 | 257 | 3,740 | Ribaue |
| Meluli | 9,398 | 1,160 | E127 | 5,200 | 256 | 2,406 | Mogovolas, Murrupula |
| Monapo | 7,734 | 1,095 | E140 | 6,000 | 126 | 975 | Monapo, Nampula, Muecate |
| Mecuburi | 8,925 | 1,258 | E122* | 1,438 | 57 | 509 | Muecate |
| Lurio | 61,423 | 1,029 | E128.* | 56,200 | 142 | 8,722 | Cuamba, Gurue, Malema, Ribaue |
| Malema | 1,000 | - | E142* | 1,000 | 769 | 769 | Malema |
| Upper Lugenda | 15,938 | - | E215 | 14,735 | 262 | 3,865 | Lichinga, Ngauma, Mandimba, Cuamba, Gurue, Malema, Ribaue |
| Middle Lugenda | 25,952 | - | E202* | 42,400 | 168 | 7,126 | Majune |
| Lucheringo | 11,184 | - | - | - | - | - | Sanga, Lichinga |

Remarks: * Observation was stopped before 1980's and not recovered at present.

Source: ARA-CN, ARA-N, Report of Development of the Ruvuma River Basin Monograph and Joint Integrated Water Resources Management Strategy

3.1.4. Soil

In Mozambique, several versions of soil map are available as shown in Table 3.1.4. It should be noted that large areas in northern region are only known at exploratory level or from satellite imagery interpretation without proper ground check. Detailed soil survey and mapping of the Study Area is under way by IIAM and ProSAVANA-PI.

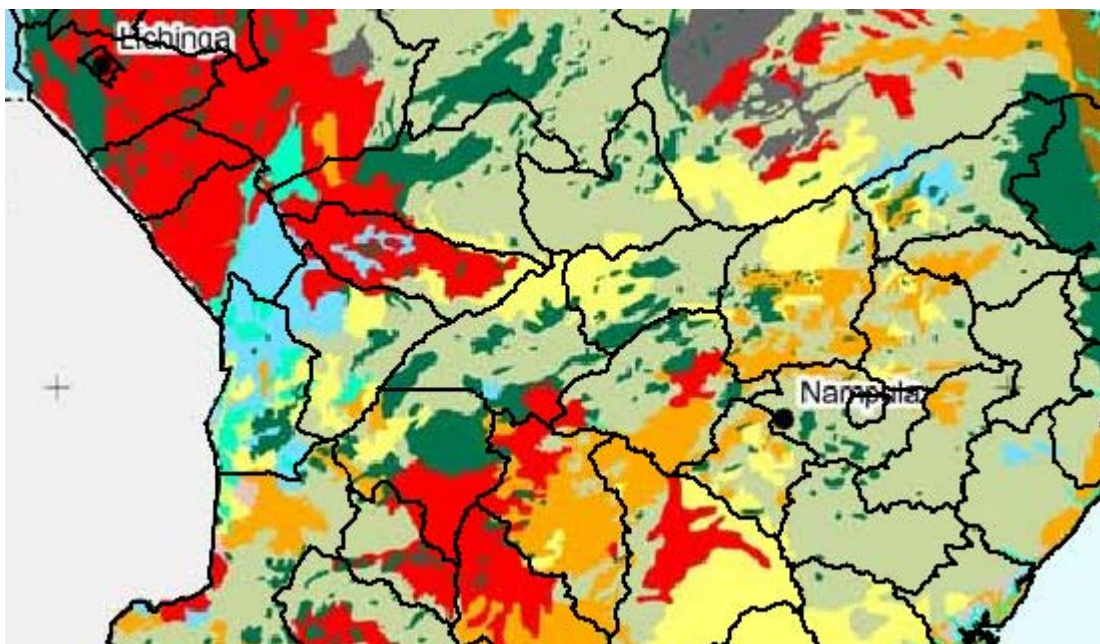
Table 3.1.4 Soil Maps of Mozambique

| Year | Elaborated by | Description |
|------|------------------------|--|
| 1994 | IIAM (formerly INIA) | Soil maps covering whole country at scale 1: 1,000,000 according to FAO/UNESCO soil classification system; Available for each province. |
| 2002 | IIAM (formerly INIA) | A new international standard of soil classification system (WRB: world reference base for soil resources) was applied to 1994 soil maps. |
| 2003 | ISRIC / FAO / UNEP | Soil and terrain digital database (SOTER) covering 8 countries of southern Africa which also provides estimate of soil parameters: In case of Mozambique, scale 1: 2,000,000 based on above soil maps. |
| 2010 | FUNDAG / IIAM | National soil map at scale 1: 250,000 according to WRB soil classification system, elaborated as part of "Agro-climatic Micro-Zoning Program (STABEX)" based on 2003 SOTER. |
| 2011 | EMBRAPA (in ProSAVANA) | Soil classification system of Brazil was applied to 1972 national soil maps of Mozambique elaborated by INIA at scale 1: 2,000,000. |

Source: JICA Study Team

In Nampula Province, soils of several districts such as Monapo, Muecate, Nampula and Ribaué were surveyed in more detail in 1995. Comparing the scale, applied soil classification system and published year of above soil maps, it would be most recommendable to use 2010 soil map elaborated by FUNDAG / IIAM for the purpose of the present study.

As shown in Figure 3.1.3, major soil types in the Study Area correspond relatively well to the relief. Lixisols dominate from the flat and low coastal plain of the eastern region, extending through the hilly zone of the central region, up to part of middle-western region. Ferralsols occupy most part of the Lichinga Plateau of the northwestern region, and also can be seen in the massif of steep-sloped high mountains of the southern region. Arenosols are distributed mostly in the southern region and partly in the central to eastern region. Gleysols and fluvisols represent the vast floodplain along Lake Amaramba in the middle-western region. Acrisols occur as relatively small spots through the Study Area except Lichinga Plateau. Finally, leptosols are distributed quite locally representing rock mountains and inselbergs.



Source: JICA Study Team (adapted from “Agro-climatic micro-zoning program, FUNDAG/IIAM 2010”)

| Legend | Soil Type | Characteristics |
|--------------|------------|---|
| Light Gray | Lixisols | Higher clay content in subsoil; Low-activity clays; High base saturation |
| Red | Ferralsols | Deeply weathered; Red or yellow; High content of sesquioxides |
| Orange | Arenosols | Sandy; Weak development by in situ weathering or on recent deposits |
| Blue | Gleysols | Wetland soils; Saturated with groundwater for long periods unless drained |
| Light Green | Fluvisols | Young soils developed in alluvial deposits |
| Light Yellow | Acrisols | Acidic; Higher clay content in subsoil; Low-activity clays; Low base saturation |
| Dark Green | Leptosols | Very shallow soils over rock; Extremely gravelly and/or stony. |

Figure 3.1.3 Soils in the Study Area

Very limited information is available on the soil fertility of the Study Area. 2003 SOTER (soil and terrain digital database) by ISRIC/FAO/UNEP provides estimate of soil parameters based on digital elevation model and interpolation among only 127 soil profiles for whole country, whereas real values of soil physico - chemical properties obtained by analysis or measurement are still critically insufficient. Detailed soil survey is being undertaken by IIAM and ProSAVANA-PI, but the results remains yet to be published. According to provisional data provided by ProSAVANA-PI team and JIRCAS, the soils of the Study Area are almost neutral or only weakly acidic, except for several samples in Gurue District with pH lower than 6, thus not having severe acidity problems. Salinity problem is not reported, either. Nutritional level of nitrogen, phosphorous and potassium is reported to be fair to deficient, especially low for potassium. Texture was mostly sandy with a few exceptional clayey soils. Other problems such as contamination, compaction, alkaline or sodic soils, depletion of organic matter, or existence of acid sulfate soil, are not reported (however, this does not guarantee that such problems do not exist currently or will not occur in the future).

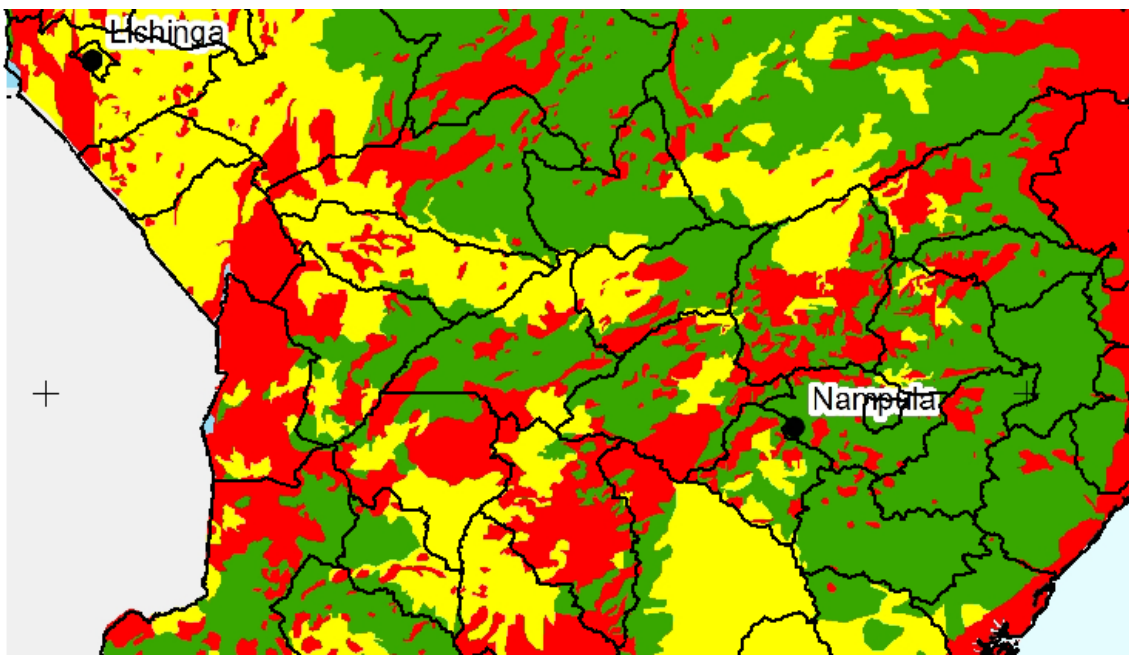
A map showing agricultural suitability of soils at national scale was produced in 2010 by FUNDAG/IIAM, as part of the “Agro-climatic Micro-Zoning Program (STABEX)”. This process involved evaluation of natural fertility, compaction, stoniness and depth of the soils based on the 2003 SOTER and recent additional information provided by IIAM. Though the details of evaluation methodology are not fully clear, this map can be cited as one of the most reasonable cases at present. As shown in Figure 3.1.4, lixisols gain good evaluation as “high suitability”; on the other hand, arenosols, gleysols, fluvisols and leptosols are classified as “low suitability”. Ferralsols and acrisols are evaluated as “middle suitability”.

Problems of soil erosion reported in several districts of the Study Area are shown in Table 3.1.5.

Table 3.1.5 Soil Erosion in the Study Area

| Province | District | Type and Cause of Erosion | Locally applied measures |
|----------|--------------|--|---|
| Nampula | Mogovolas | Gully (Rain, Disordered land use, Human activities) | Planting protection trees (acacias) and construction of barriers. |
| | Monapo | Gully (Rain, Disordered land use, Human activities) | Construction of barriers and planting vegetation (nacaraca). |
| Zambezia | Alto Molocue | Laminar, Gully, Landslide (removal of vegetation from mountain slopes) | - |
| | Gurue | Gully (Rain, Removal of bush) | - |

Source: Adapted from “Action Plan for Prevention and Control of Soil Erosion 2008-2018, MICOA 2007”



Legend (Green: High, Yellow: Middle, Red: Low)

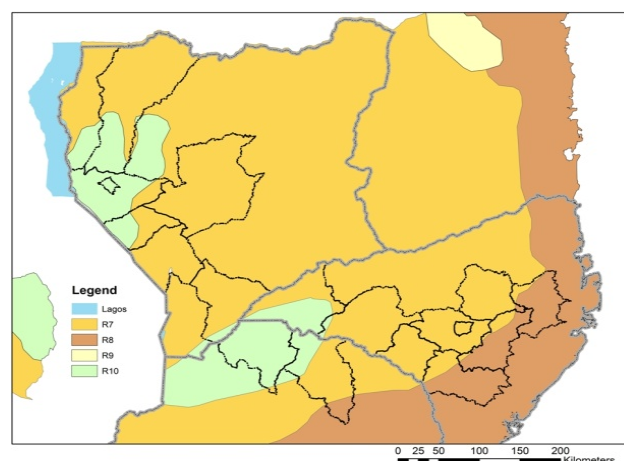
Source: JICA Study Team (adapted from “Agro-climatic micro-zoning program, FUNDAG/IIAM 2010”)

Figure 3.1.4 Agricultural Suitability of Soils in the Study Area

3.1.5. Agro-Ecological Zoning

The annual mean temperature in the Study Area varies from 20 °C around Lichinga district to over 25 °C around Mogovolas district, as shown in Figure 3.1.1. The Gurue district has lower temperature rather than surroundings caused by higher altitude. The annual precipitation is over 1,000 mm in the almost area except of Cuamba district and a part of Malema district. The precipitation in Gurue district is over 1,600 mm annually.

The Study Area is covered by the 3 agro-ecological zoning, such as R7, 8, and 10, as shown in the Figure 3.1.5 and Table 3.1.6. The eastern part of Nampula province is covered by R8 zone, which has high temperature more than 25 °C and precipitation between 800 and 1200 mm annually. The central part of Nampula province, Alto Molocue district in Zambezia province, and the south-east part of Niassa province is covered by



Source: IIAM

Figure 3.1.5 Agro Ecological Zoning in the Study Area

R7 zone, which has the temperature between 20 to 25 °C and precipitation between 800 and 1000 mm. The Malema district in Nampula province, the Gurue district in Zambezia province, and the Lichinga district in Niassa province is covered by R10 zone, which has much precipitation more than 1200 mm annually.

Table 3.1.6 Agro-ecological Zoning in the Study Area

| Zone | Description | Province and Districts |
|---------|---|--|
| Zone 7 | <p>This area includes the land between 200 and 1,000 meters in altitude (sub-planaltic, low planaltic, and midplanaltic).</p> <p>The annual rainfall and potential evapo-transpiration of the region ranges from areas above 25 °C (classified as warm region) and others with temperatures of 20-25 °C (moderately warm).</p> <p>The texture of the soils varies from sandy to clay, consistent with the topography.</p> | <p>Nampula Province: Monapo, Muecate, Meconta, Mogovolas, Nampula, Murrupula, Ribaua, Malema</p> <p>Zambezia: Alto Molocue</p> <p>Niassa: Cuamba, Mandimba, Ngauma</p> |
| Zone 8 | <p>The coastal littoral of Zambezia, Nampula and Cabo Delgado consists of a strip of land.</p> <p>The average temperature during the growing season is greater than 25 °C. The annual rainfall ranges is 800-1,200 mm, and the evapo-transpiration rate is 1,400-1,600 mm.</p> <p>Sandy soils, with heavier soils in the lowest areas.</p> | <p>Nampula Province: Monapo, Meconta, Mogovolas</p> <p>Zambezia: Alto Molocue</p> |
| Zone 10 | <p>The high altitude region of Zambezia, Niassa, notably in the planaltic regions of Lichinga, high Zambezia.</p> <p>The annual rainfall is greater than 1,200 mm and average temperature during the period is 15-22.5 °C.</p> <p>The soils are principally ferrasols.</p> | <p>Nampula: Ribaua, Malema</p> <p>Zambezia: Alto Molocue, Gurue</p> <p>Niassa: Ngauma, Lichinga</p> |

Source: Mozambique Agricultural Development Strategy, World Bank, February 2006
Arranged by JICA Study Team

3.1.6. Socio-economic Conditions

(1) The Study Area and Population

Nacala Corridor penetrates in the Study Area with length of more than 600 km from east to west in Mozambique. The Study Area is composed of 14 districts with the area approximately 66 thousand km² spreading with length of approximately 600 km east to west and width of 30 to 130 km from north to south.

The total population of the Study Area is approximately 3.73 million inhabitants in 2011, and the Monapo district of the Nampula province is the highest population density with 97.2 persons/km² and Chimbonila district of the Niassa province is the least densely populated with 20.4 persons/km². Population density of 14 districts of the Study Area is 56.2 persons/km² which is the high population density area compared with about two times of the national average with 29.2 persons/km².

Table 3.1.7 Area and Population of the Districts

| | Area (km ²) | Population (hab., 2011) *1 | Population Density (hab./km ²) |
|----------------------|-------------------------|----------------------------|--|
| Nampula Province | | | |
| Monapo | 3,528 | 342,946 | 97.2 |
| Muecate | 4,121 | 105,350 | 25.6 |
| Meconta | 3,690 | 174,358 | 47.3 |
| Mogovolas | 4,728 | 330,787 | 70.0 |
| Nampula City | 331 | 553,703 | 1,672.8 |
| Rapale (Nampula) | 3,675 | 243,908 | 66.4 |
| Murrupula | 3,104 | 158,877 | 51.2 |
| Ribaue | 6,271 | 220,178 | 35.1 |
| Malema | 6,075 | 182,531 | 30.0 |
| Total | 35,523 | 2,312,638 | 65.1 |
| Zambezia Province | | | |
| Alto Molocue | 6,363 | 319,867 | 50.3 |
| Gurue | 5,664 | 350,830 | 61.9 |
| Total | 12,027 | 670,697 | 55.8 |
| Niassa Province | | | |
| Cuamba | 5,363 | 216,098 | 40.3 |
| Mandinba | 4,698 | 159,175 | 33.9 |
| Nguama | 3,016 | 81,314 | 27.0 |
| Lichinga City | 257 | 177,886 | 692.2 |
| Chimbonila(Lichinga) | 5,438 | 110,703 | 20.4 |
| Total | 18,772 | 745,176 | 81.4 |
| Grand Total | 66,322 | 3,728,511 | 56.2 |

Source: Area, CENACARTA, 1997. Population, INE, 2007. *1: Estimated by the JICA Study Team

(2) Economic Conditions

In the Nacala Corridor areas, industrial activities are mainly concentrated between from the Nampula city to the Nacala city. In addition, the production plants are scattered to the district centers of coastal districts. Nampula city plays an important role as a relay point for distribution to the inland, which is the region that social infrastructures have been most developed in the Nacala Corridor areas. The rest of the area, main industry is agriculture in the inland zone and is fishing in coastal zone; subsistence economic activities have been carried out.

Regarding the economy scale of each province, Gross Regional Domestic Product (GRDP) of Nampula and Zambezia provinces having many populations are large. However, comparing with the large concentration of GRDP to the Maputo city, GRDP of the provinces of the Study Area is less than or equal to one-twentieth of that of the Maputo city.

Comparing the GRDP per capita of each province with the average of whole Mozambique as 439.2 US\$ in 2009, in Nampula was 332.0 US\$, the highest province in the Study Area, in Niassa was 225.6 US\$ and in Zambezia was 222.8 US\$. These are level of 51 to 76 percent of the national average, the region's economic activity of the Nacala Corridor area is a low level.

Table 3.1.8 GRDP in the Study Area

| Province | 1997 | 2003 | 2009 | GRDP % in the national (2009) |
|-------------|----------|----------|----------|-------------------------------|
| Nampula | 585.9 | 710.0 | 1,428.1 | 3.6% |
| Zambezia | 393.8 | 446.2 | 914.1 | 2.3% |
| Niassa | 130.3 | 147.5 | 295.2 | 0.7% |
| Maputo | 566.5 | 841.3 | 1,573.8 | 3.9% |
| Maputo City | 11,676.3 | 13,383.1 | 32,248.4 | 80.5% |
| Mozambique | 14,771.4 | 17,296.6 | 40,036.5 | 100.0% |

Source: Detailed Planning Survey Report for the Study on Nacala Economic Corridor Development in Mozambique, JICA, 2011.

Table 3.1.9 GRDP per Capita in the Study Area (US\$)

| Province | 1997 | 2003 | 2009 |
|------------------|-------|-------|---------|
| Niassa | 161.2 | 156.7 | 225.6 |
| Nampula | 191.3 | 203.7 | 332.0 |
| Zambezia | 127.2 | 125.3 | 222.8 |
| Maputo | 681.8 | 809.5 | 1,183.8 |
| Maputo City | 773.9 | 766.4 | 1,561.1 |
| National Average | 240.1 | 256.9 | 439.2 |

Source: Detailed Planning Survey Report for the Study on Nacala Economic Corridor Development in Mozambique, JICA, 2011.

(3) Poverty

Poverty incidence of Mozambique, between 1996 and 2003, was improved falling to 54.1% from 69.4%. However, between 2003 and 2009, the poverty incidence was nearly unchanged. Poverty incidence of Zambezia province, increased from 44.6% in 2003 to 70.5% in 2009 which was the worst province in 10 provinces and one city. Nampula province became also slightly worse. On the other hand, the poverty incidence of Niassa province has improved significantly. Deterioration in the poverty incidence in 2008, to fall in the agricultural sector due to unseasonable weather is the cause. In this manner, the region where main industry is agriculture, the stability of agricultural production to contribute significantly to the improvement of the poverty incidence is understood.

Table 3.1.10 Trends of Poverty Incidence

| Province | 1996/97 | 2002/03 | 2008/09 |
|------------------|---------|---------|---------|
| Nampula | 68.9 | 52.6 | 54.7 |
| Zambezia | 68.1 | 44.6 | 70.5 |
| Niassa | 70.6 | 52.1 | 31.9 |
| National average | 69.4 | 54.1 | 54.7 |

Source: PARPA 2011-2014, 2011.

(4) Education

Illiteracy rates of the three provinces are high; women's illiteracy rates were over 70% in particular. This situation has not been much improvement in 2009.

Table 3.1.11 Trends of Illiteracy Rate in the Three Provinces (%)

| Year Province | 1997 | | | 2003 | | | 2009 | | |
|------------------|------|--------|-------|------|--------|-------|------|--------|-------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| Nampula | 56.7 | 85.9 | 71.7 | 56.7 | 85.9 | 71.7 | 41.4 | 76.1 | 58.8 |
| Zambezia | 53.2 | 85.2 | 70.3 | 53.2 | 85.2 | 70.3 | 36.1 | 77.7 | 58.4 |
| Niassa | 52.2 | 84.2 | 69.0 | 52.2 | 84.2 | 69.0 | 42.9 | 77.2 | 60.8 |

Source: Statistic Yearbook 2010, INE.

Comparing the enrollment rate of primary education in 2002 and 2008, it can be seen that has improved. Enrollment rates of nearly 70 percent have been achieved in rural areas of the northern region where poverty incidence was high. This background is considered that primary education is free and also the result of the Government of Mozambique was tackled as priority development sector as the expansion of primary education. On the other hand, as with the quality of primary education, low enrollment rate of secondary education is also has become an issue. Enrollment rate of secondary education in rural areas of the northern region is very low as 6.4%. Reason for the gap between primary education and secondary education, that secondary education is not free of charge and there is access problem due to few secondary schools.

Table 3.1.12 Enrolment Rate of Primary School and Secondary School (%)

| Year Area | 2002/2003 | | 2008/2009 | |
|---------------------------------|----------------|------------------|----------------|------------------|
| | Primary School | Secondary School | Primary School | Secondary School |
| Urban Areas in the North Region | 63.9 | 12.5 | 73.7 | 33.3 |
| Rural Areas in the North Region | 52.2 | 0.2 | 67.5 | 6.4 |
| National Average | 66.8 | 8.2 | 76.5 | 22.0 |

Source: Understanding Poverty and Well-being Mozambique: Third National Poverty Assessment, MPD, 2010.

In rural areas, it can be seen primary schools in small villages. Schoolhouses are from which is built by only thatched roof and put logs as chairs on dirt floor, up to which is built by roof of galvanized iron and brick outer wall with glass windows. There are large differences by region. Early elementary school (1st level up 5 grades) has been established even in a small settlement, the late elementary school (2nd level up to 7 grades) has been established only in a large village. In addition, there is only secondary school in the city such as the district center. Tuition fees in primary education are free of charge, but for the household having a lot of children of school age, expenditure such as stationery and school transportation costs will be a burden.

(5) Health

In rural areas, health facilities such as health center (Centro de Saúde) and health post (Posto de Saúde) have been established, but number of medical personnel and equipment are insufficient. Access to the health facilities are progressing improvements in recent years, in rural areas of the northern region, from 31.5 percent in 2002 to 69.7 percent in 2008 and was significantly improved (Analysis of Poverty in Mozambique, JICA, 2011.). Major diseases are malaria, diarrhea, dysentery, cholera and venereal disease, in particular, incidence of malaria is many (in the Nampula province in 2011, cases suffering from malaria was 684 thousand, diarrhea was 154 thousand, dysentery was 29 thousand and cholera was 379, Provincial Government of Nampula, 2012 / 7).

In Mozambique, health care costs is a free and national treasury burden, in this sense, the poor class people has not burden of medical expenses. In addition to medical expenses the examination fee and basic cost of purchasing drugs are also included. Also, which is distributed free anti-retroviral drugs (ARV) for persons with HIV infection. Funding by the national treasury burden of medical expenses, are financed by the general budget support from donors.

In the Study Area, other social indicators are as follows:

Table 3.1.13 Social Indicators in the Study Area (2008)

| Province | Nampula | Zambezia | Niassa | National Average |
|---|---------|----------|--------|------------------|
| Under-five mortality rate per (average in 10 years prior to the survey, per 1,000), ¹⁾ | 140 | 205 | 123 | 138 |
| Percentage distribution by province of the prevalence of chronic malnutrition in under-fives, ²⁾ | 51 | 46 | 45 | 44 |
| Access Rate to Safe Water (%) ³⁾ | 43 | 24 | 44 | 44 |

Source: 1) Multiple Indicator Cluster Survey, MICS, 2008. 2) Report on the Millennium Development Goals, UNDP, 2010. 3) Multiple Indicator Cluster Survey, UNICEF, 2008.

(6) Rural Social Conditions

1) Ethnic and language groups

The main tribe in the Study Area is Makwa-Lomwe. Yao tribe is resident in the Niassa province, in the western part of the Study Area. Makwa-Lomwe tribe occupy in the northern part of Mozambique, is the largest number of ethnic group in country, accounting for 40% of the total population. They follow a system of matrilineal descent including inheritance of land. Their language belongs to the Bantu-group and Yao language also belongs to the same group. Makwa language is still the primary language of the inhabitants in the region; many inhabitants cannot understand the official language of Portuguese in rural areas.

2) Settlement

In the Study Area, except for the people living in urban areas, most people are living in settlements of rural areas. Village settlements are located mainly along roads (primary, secondary and tertiary roads). Many people live along roads and cultivate fields as far as 10 km away from their residence. In many cases, about 10 to 30 families/residences have been solidified to form a settlement, settlements are splendid widely. Along the main road, many settlements have been formed. People enjoy living along roads, where public facilities such as schools and health facilities, as well as grinding mills are available. On the other hand, the western part of the Nampula province (Ribaué and Malema districts), residences are scattered in rural areas and there is an area which group of residences is hardly seen.

3) Residence

Widespread small-scale farmer's family in rural areas is living in residence with thatched roofs, and exterior walls of brick, sun-dried brick or soil. There is the exterior walls of some braided bamboo and hey. In the house is a dirt floor. Size and quality of each residence are not observed large difference. Standard of living is presumed the same level. It should be noted, even in remote areas there is an enclosure of the rest room in the corner of the garden where it left a residence. Number of family members of an average family is five or six.

4) Drinking water:

Drinking water in rural areas, the shallow well of about 3 to 5 m deep (wells pumping in the bucket), locating in such as the center of garden of residence, forming of small embankment. In the village of a certain size, there is hand pump well (deep boreholes, it is assumed that was established with the international assistance) in the center of the village as in school, it is available throughout the village. In addition, residents living in a location away from wells and other water sources, carrying water from distant water sources every day, mainly work of women and girls. In addition, also be used digging the trench on the side of the creek and use seepage water as drinking water. Water bath and laundry are done in the vicinity streams and ponds. Because there are a lot of relatively shallow wells, pollution is a concern from the outside, from where it is difficult to secure safe drinking water, diseases such as diarrhea are commonly encountered.

5) Fuel

Cooking fuel is mainly firewood; women and girls are collecting firewood from the surrounding area every day. It is said that use of firewood indoor is a role of light, and the smoke is also useful for controlling the mosquitoes that transmit malaria and

other pests. Firewood for home consumption is taken anywhere without permission, and logging and collection of wood as materials for charcoal requires the consent of the community (by extensionista). However, it is seen situations where firewood and charcoal bringing and selling to the city, it may ignore such case in the community. For residents living in urban areas, the main fuel is also firewood, generally collecting in their land (machamba). It is also to purchase the charcoal as necessary. In city areas such as Nampula city, as a heat source for cooking, charcoal is used in addition to the firewood in many households. Therefore, the production of charcoal in the surrounding area of city is thriving, with direct sales along the main roads and being transported by mainly bicycle to the city areas.

6) Construction materials

Materials of thatched roof, woods required for working hut and farming, and as well as materials of a simple shop established along the roads, are collected from the cultivated lands (machamba) and the surrounding forests (secondary forest / shrubs). Local inhabitant has relationship with the Miombo forest (evergreen broad-leaved tropical dry forest) is traditionally deep, for harvesting of firewood and timber using in life, such as hunting of wild animals. In particular, the Mionbo forests are widely distributed in the western part of the Study Area (western part of Nampula, Zambezia and Niassa provinces).

7) Means of transport

Means of transport in rural areas, walking is fundamental in the short or medium distance (at a considerable distance). Transport of luggage, put on the head, carry on foot is common. Recently, the spread of bicycle is remarkable and round-trip every day to the arable land in the distance, being used in a range of several tens kilometers, such as transportation of production to the markets of the neighboring village. It is use of many men, women are also using. Bicycles are the most important transport modes in rural areas. It can also be seen motorcycles, transportation of materials and customers for commercial purposes.

The movements of the long-distance pickup trucks are frequently used. In the periphery of the urban area, small minibuses play the role bus. However also to long distance services large / medium-sized bus (depending on region) appear, to be a significant impact on the situation of the road, the duration of the rainy season has to be out of service.

8) Food in daily life

The main diet of a widespread small-scale farmer's family in rural areas, is maize or cassava porridge- or dough-like food (chima/sima). Maize, grain skin is removed by

mortar and pestle after threshing and brought to mill in the village for milling, is common. Each village has a mill, owns about one to three the mill, which provides services for a fee. Dry cassava is made to powder with mortar and pestle in each household. Chima is eating some meat or vegetable broth. Sometimes, small deep-fried fish is served. In addition, beans, ground nuts and other cereals (sorghum, millet), banana, sweet potato, taro, yam, amaranth, etc. such as alternative crops of cereals are often seen in the circumference area of the residence.

As vegetables, cassava leaves are common, and also to eat leaves of sweet potato and pumpkin. Tomato is cultivating in many areas, but, because fruits of tomato are small self-consumption is general and is sold in the front of garden and in the village market to get a little income. It may also build liquor by sugar cane. Cultivation form of common farmers, the basis of a small amount of production in many species in terms of life, to sell the surplus of major crops is observed. Numbers of meal, many families in the rural areas answer two times of mid-day and night. In general, it is observed the scenes that residents are eating drying cassava, boiled maize and sugar cane frequently, regardless of the time. Serious lack of food would not be considered in the Study Area,

3.1.7. Land Use

(1) Definition and Classification of Land Cover and Land Use

Land cover is defined in the FAO/UNEP Land Cover Classification System (LCCS) as the “(bio) physical features one can observe on the surface of the Earth” (Di Gregorio and Jansen, 2000). Land use is defined as “the type of human activity taking place at or near the surface” (Cihlar and Jansen, 2001). The Study Team collected two land cover and land use map, such as the one provided by National Center for Cartography and Remote Sensing (CENACARTA) and the other one provided by the Ministry of Agriculture (MINAG). The former one was based on mainly LANDSAT image acquired in 1997. The latter one was made based on mainly LANDSAT image acquired in 2004 and 2005. And the Study of “Integrated Assessment in Mozambique Forest” (AIFM) in 2006 was prepared by using mainly LANSAT images acquired in 2004. Both of them follow the classification of LCCS, and contain “land cover” and “land use”. In this report, both of them are not clearly discriminated and “land use” in the following sentence means “land cover and land use”.

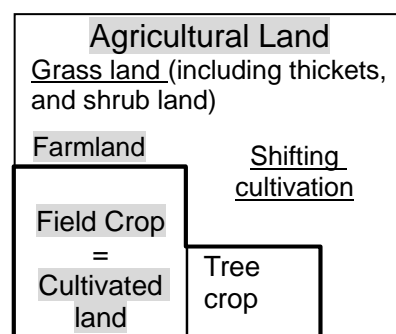


Figure 3.1.6 Classification of Agriculture Land

The classification of agricultural land is shown in Figure 3.1.6. Cultivated land in this report means the area cultivated by field crops. The area of farmland includes the area of field crop and tree crop. Agriculture land includes farmland, grass land and shifting cultivation area. The Shifting cultivation is common farming style in the Study Area and the figure of the area is hard to be estimated. The area of shifting cultivation and tree crops is sometimes hard to be distinguished.

(2) Agricultural Land

The area of total land and agricultural land between latitude south 13° and 17° is estimated to be 23.9 million and 12.5 million ha, respectively, according to the land use map by CENACARTA, as shown in Table 3.1.14.

Table 3.1.14 Land use in the Zone between Latitude South 13° and 17°

| Classification of land use | Area (000ha) | Share |
|----------------------------|--------------|-------|
| Agriculture land* | 12,508 | 52 |
| Forest | 10,794 | 45 |
| Others | 625 | 3 |
| Total | 23,927 | 100 |

*Agriculture land: Agriculture includes farmland, grass land, shrub land, thickets land, and bush land

Source: CENACARTA

The situation of land use in the Study Area is shown in the Table 3.1.15 and Figure 3.1.7, estimated by land use map by AIFM at the scale of 1 : 1,000,000. The MINAG also provided the land use map at the scale of 1 : 250,000. Table 3.1.15 should be revised based on the land use map at the scale of 1 : 250,000, when the map will become available.

The whole Study Area is about 30 % of the zone between latitude south 13° and 17° in Mozambique. Agricultural area is estimated to be 3,616 thousand ha and it shares 55 % of the whole Study Area.

Table 3.1.15 Land Use in the Study Area

| Classification of land use | | Area (000ha) | Share (%) |
|----------------------------|--|--------------|-----------|
| Agriculture land | Farmland ^{*1} | 1,831 | 28 |
| | Grass land and shifting cultivation area ^{*2} | 1,785 | 27 |
| | Total of agricultural land | 3,616 | 55 |
| Forest | | 2,925 | 44 |
| Others | | 71 | 1 |
| Total area ¹ | | 6,612 | 100 |

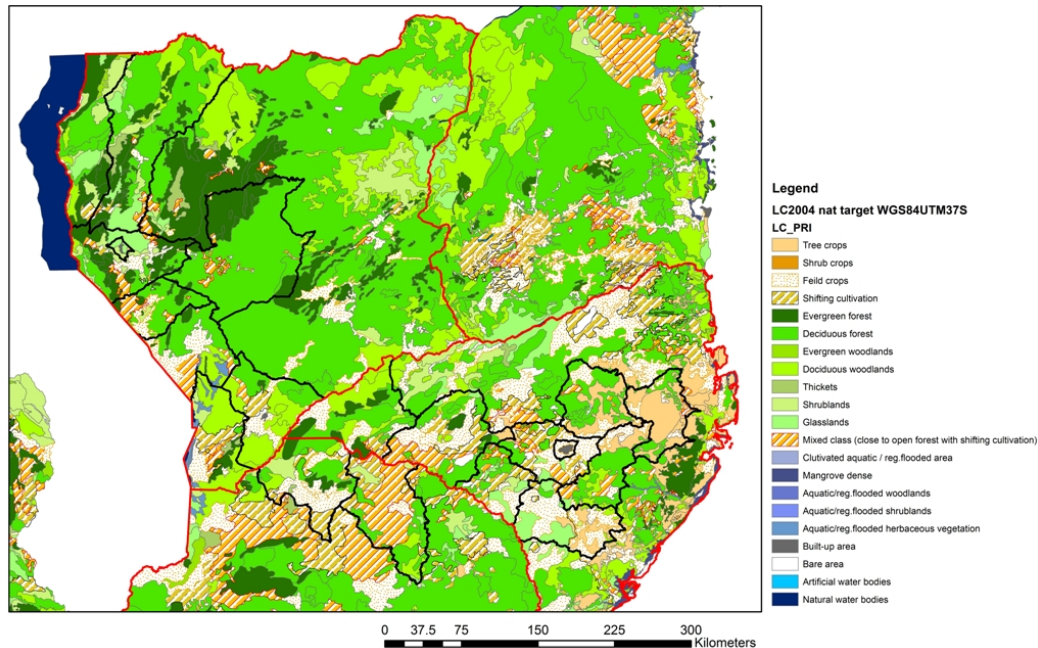
*1 Farmland: This classification includes field crop area, shifting cultivation area, and tree crop area in AIFM land use map.

*2 Grassland and shifting cultivation area:

This classification includes the land use classification of "Grass land", "Shrub lands",

¹ The total area covers the district of Monapo, Muecate, Meconta, Mogovolas, Namupula City, Nampula, Murrupula, Ribaue, Malema, Alto Molocue, Gurue, Cuamba, Mandimba, Ngauma, Lichinga City, and Lichinga.

“Thickets land”, and “Shifting cultivation” in AIFM land use map.
 Source: Estimated by the JICA Study Team based on the land use map in “Integrated Assessment in Mozambique Forest”, MINAG, 2006



Source: Land use map at the scale of 1 : 1,000,000 from Integrated Assessment in Mozambique Forest

Figure 3.1.7 Land Use in the Study Area

(3) Population Pressure to Land Use

The cultivated land in the Study Area is estimated to be 783 thousand ha by the number of farm households, the average farm size in 3 provinces, as shown in Table 3.1.16. The farmland without cultivation by local people is estimated to be 2,833 thousand ha in the Study Area by deducting 783 thousand in Table 3.1.16 from 3,616 thousand ha as farm land in Table 3.1.15. This 2,833 thousand ha includes the area of grass land and shifting cultivation. The shifting cultivation area is presumed to be several times of cultivated land area. Considerable area is also occupied by registered (DUAT) land. The cultivated land by local people, shifting cultivation area, and the area occupied by DUAT is scattering in the “farmland” and it is not easy to find large consecutive area. The figure of potential area for large scale development is not estimated in this report, caused by difficulty of estimating shifting cultivation area and DUAT area. The location of potential area for large scale development will be shown in 4.9 in this report.

Table 3.1.16 Population Density and Estimated Cultivated Area

| Provinces | Districts | Area (km ²) | Population (2011) | Population Density (No/km ²) | Farm household number (000 nos) | Average farm size (ha) | Estimated cultivated area (000ha) ² |
|--------------|---|-------------------------|-------------------|--|---------------------------------|------------------------|--|
| Nampula | Monapo, Muecate, Meconta, Mogovolas, Nampula City, Nampula, Murrupula, Ribaue, Malema | 35,524 | 2,312,637 | 65 | 346 | 1.25 | 433 |
| Zambezia | Alto Molocue, Gurue | 12,026 | 670,697 | 56 | 93 | 1.29 | 120 |
| Niassa | Cuamba, Mandimba, Nguama, Lichinga City, Lichinga, | 18,773 | 745,176 | 40 | 126 | 1.82 | 230 |
| Total | | 90,209 | 3,826,673 | 42 | 585 | | 783 |

Source Area: CENACARTA (1997), Population: INE (2007),

Farm household number: DPA of Nampula, Zambezia, Niassa, except of Lichinga City,

*1: Estimated by the JICA Study Team

*2: Estimated with 1.25 ha/household (hd) in Nampula, 1.29 ha / hd in Zambezia, 1.82 ha/hd in Niassa .

The green dot in Figure 3.1.8² shows the location of local villages and the cultivated area by local people. Considerable areas in Monapo, Nampula, and Mogovolas district are cultivated by local people, while few local villages are located and few area are cultivated by local people in Niassa province.

The distribution of population density in the Study Area overlay on the balance of supply and demand of woods in Figure 3.1.9. The red area, which consumption of wood surpasses its supply, located in the district whose population density is over 40 / km². Especially in Nampula, Mogovolas, and Gurue District, whose population density is over 60 / km², almost all of area is covered by red area. In those areas, shifting cultivation is limited. In Nampula, Ribaue, and Alto Molocue districts, large area is covered by shifting cultivation, while those districts have high population density. Shifting cultivation in those three districts will reach the limitation in the near future, caused by high population density and limitation of woods supply.

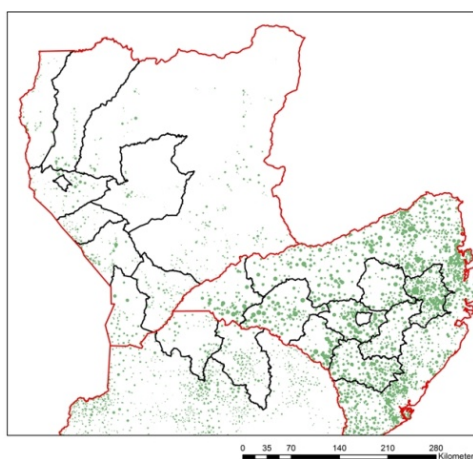


Figure 3.1.8 Location of Local Villages and Farm Land of Local People

Source: Location of villages and its population data source are ANE.

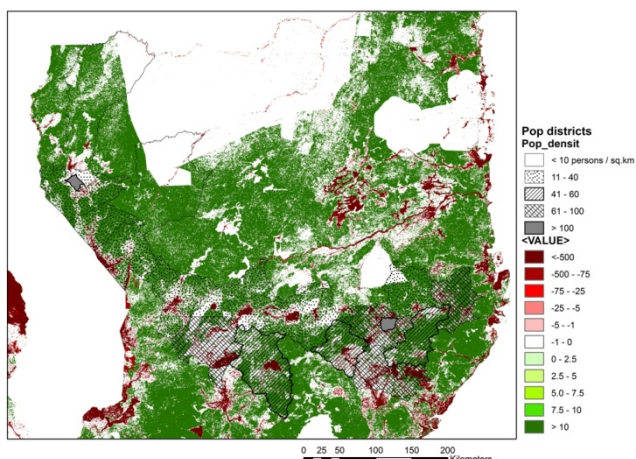


Figure 3.1.9 Population Density and Wood Energy Consumption

Source of the forest biomass figure: WISDOM Mozambique Final Report, DNTF, 2008

² The cultivated area is estimated by using average land hold size by province as shown in Table 3.1.16.

(4) Deforestation

Deforestation is one of the principal concerns in the Study Area. Rapid population growth means increasing demand for farmland, fuel wood, charcoal and timber, as well as shortening of fallow period in shifting cultivation. Expansion of forestry activities, associated sometimes with excessive or illegal logging and insufficient reforestation, also contribute to deforestation. As shown in Table 3.1.17, Nampula Province has the smallest forest area and the highest deforestation rate among the three provinces.

Table 3.1.17 Forest Area and Deforestation Rate by Province

| | Nampula | Niassa | Zambezia | Total Mozambique |
|-----------------------------------|-----------|------------|------------|---------------------|
| Territorial Area (ha) | 7,817,100 | 12,240,000 | 10,307,600 | 77,991,000 |
| Forest Area* (ha) | 2,771,400 | 9,429,100 | 5,063,600 | 40,068,000 |
| Percentage of Forest Area (%) | 35.5 | 77.0 | 49.1 | 51.4 |
| Non-productive Forest Area** (ha) | 454,600 | 3,379,200 | 951,100 | 13,160,900 |
| Productive Forest Area (ha) | 2,316,800 | 6,049,900 | 4,112,500 | 26,907,100 |
| Annual deforestation rate*** (%) | 1.18 | 0.22 | 0.71 | 0.58 |

* Definition = tree coverage > 10%, height > 5m

** National parks, national reserves, wetland forests, mangroves and other inaccessible forests.

*** A mathematical estimation based on 1990-2002 population trend and its correlation with forest area.

Source: Adapted from "AIFM Final Report, MINAG 2007"

3.1.8. Road and Social Infrastructure

(1) Road

The road network of Nacala Corridor consists of National Road No.1 (hereinafter called N1 road), N12, N13 and N14 mainly. The N1 road starts from Maputo to the north up to Tanzania. It passes Quelimane of Zambezia Province, Nampula of Nampula Province and reaches to Pemba of Carbo Delgado Province.

As the Nacala Corridor, N12 come from Nacala port to west and it connects to N1 at Nametil and the N1 reach to Nampula city. This part of road had been rehabilitated for two lane road with 7m wide. Connect to it, N13 runs from Nampula city to Lichinga. At the present, N13 is a dirt road and the road between Nampula and Cuamba is under rehabilitation to make two-lane paved road to be completed by February 2015.

In north of Nacala Corridor, the road N14 connects between Lichinga and Pemba and it will be paved by 2015. The Gurue of Zambezia is connecting to N1 at Nampevo by N103, which had been renovated to paved road.

Most of the other roads connect between district centers, administration posts and localities are dirt road in the Study Area. These major roads are maintained by ANE, National Authority of Road.

Community road and feeder road is categorized as Non-classified road in national classification. And development of the Non-classified road is responsible by district government. Its finance is provided by the Road Fund and technical support is provided by ANE. The district government make plan and implement the works. However, it budget is not used fully due to low number and capacity of staff in district, delay of budget delivery and delay of works. The fund is used manly for maintenance of the existing feeder road.

The road network density in Mozambique is 37 km/ 1000 km² (African Infrastructure Country Diagnostic (AICD) Study in 2011). As shown in the table 3.1.18 below, the density in Niassa Province is lower than other two provinces.

Table 3.1.18 Density of Road

| Province | Area (km ²) | Road Type | Category of Road | | | | | | Density(km / 1000km ²) |
|----------|-------------------------|-----------|------------------|-----------|----------|---------|-------|---------|------------------------------------|
| | | | Primary | Secondary | Tertiary | Vicinal | N/C | Total | |
| Nampula | 81,606 | Paved | 422.0 | | 3.0 | | 20.0 | 445.0 | 54.77 |
| | | Dirt Road | 495.0 | 166.0 | 1,927.0 | 935.0 | 501.8 | 4,024.8 | |
| Niassa | 129,061 | Paved | 252.0 | 92.0 | 42.0 | | | 386.0 | 26.53 |
| | | Dirt Road | 489.0 | 240.0 | 1810.0 | | 499.0 | 3,038.0 | |
| Zambezia | 103,127 | Paved | 692.0 | | 26.0 | | | 718.0 | 43.59 |
| | | Dirt Road | 288.5 | 645.2 | 1552.4 | 737.0 | 554.4 | 3777.5 | |

Source: ANE in Nampula, Quelimane and Lichinga

Note: Paved road data is in 2011, others are 2010.

(2) Transportation Infrastructure

1) Northern Railway (Nacala Railway)

Nacala Railway (Northern Railway Line) connects Nacala, Nampula, Cuamba and finally Central Africa Railway in Malawi at Entre Lagos. At Cuamba, one branch line goes to north to Lichinga. A pairs of passenger train is operating between Nampula and Cuamba everyday excluding Monday, and a train goes to Lichinga per a month. There is no regular service for cargo, but the cargo train between Nacala port and Malawi is dominant as 75% of total operation of the railway.

In 2011, total number of passenger is about 864,000 and total operation quantity of cargo is 241,000 ton.

2) Nacala Port

Nacala Port consists of container terminal (south terminal), bulk terminal (north terminal) and liquid bulk terminal. North terminal has length 631m and its depth

-7.5m to -10m (average -9.7m), the south terminal length is about 372 m and its depth is -14m.

Because of its natural depth, Nacala Port allows operation with large vessel. Due to its location closed to the Asia, regular lines are operating to India and Singapore in 2011, and it reaches to there within 12 days and 13 days respectively.

Handling of Nacala Port in 2010 is about 600,000 ton of bulk transportation and 70,000 TEU of Container.

The Nacala Railway and Nacala Port are operated by CDN (Corredor de Desenvolvimento do Norte: Northern Development Corridor) company since 2005 under concession agreement.

3) Airport

Major airports for air transportation in the area are Nampula airport and Lichinga airport. An air force airport is located in Nacala but it is under construction to be commercial airport by Brazilian Government's support.

(3) Social Infrastructure

1) Power Supply

Major source of national power network in Mozambique is Hydro Power Plant of Cahora Bassa (hereinafter called

Table 3.1.19 Electrification of Administration Post in the Study Area

| Province | Number of A/P | connect to Network | Generator | Solar Power | No Electricity |
|----------|---------------|--------------------|-----------|-------------|----------------|
| Nampula | 34 | 25 | 1 | 4 | 3 |
| Niassa | 11 | 3 | 3 | 1 | 4 |
| Zambezia | 5 | 3 | 2 | 0 | 0 |

Source: based on the interview Study team prepared

HCB). All district centers in the Study Area connected to national power supply exclude Ngauma in Niassa Province. The Ngauma district has a generator but it was broken down in 2010. Regarding electrification of the administration posts in the Study Area, 70% of it in Nampula Province connected to national network. However, no administration post exclude district centre connects to national network in Niassa. Even electricity is reached in the district or administration post, its service area is limited. Moreover, even no electricity come in administration post, some health centre and/or school has individual solar power system.

2) Communication

Dissemination rate of fixed telephone line is similar to the one of electricity. Every district center has fixed line but no administration post excludes Nampula and its surroundings. On the other hand, mobile phone is developed well in Mozambique by three companies. Movitel, last company started service in 2010, is expanding rapidly in rural area.

3) Water Supply

City water systems are developed in Nampula city, Cuamba city, Lichinga city and Gurue city. Only the Nampula city has treated water and the others are the water with clone injection. In district center, they have small water supply systems called PSAA (Small Water Supply System).

Major water source in rural area is wells with hand pump. Calculated "Average Cover rate of population water served" in the Study Area is 53.2%. In the Study Area, Cuamba, Malema, and Rebaue mark high covering rate caused by rich groundwater potential.

4) Education

Regarding the Education Infrastructure, as shown in Table 3.1.21 below, Number of student for 1 early elementary school (EP1, grade 1 to 5) in Zambezia is smaller than others. It means, Zambezia has enough number of the

teacher and schools. In the attendance rate, early elementary school (EP1) is over 100% but late primary school (EP2) for grade 6 to 7 years, it becomes small.

Table 3.1.20 Rate of Population Served for Water Supply

| District | Population in 2011 | Number of wells | Cover Ratio (%) |
|-----------------------|--------------------|-----------------|-----------------|
| Monapo | 285,816 | 247 | 40.4% |
| Mecuenta | 105,350 | 104 | 40.8% |
| Meconta | 129,895 | 178 | 52.3% |
| Mogovolas | 242,768 | 175 | 36.1% |
| Nampula | 243,908 | 135 | 23.4% |
| Murrupula | 140,685 | 200 | 60.0% |
| Ribaue | 156,754 | 291 | 79.9% |
| Malema | 126,408 | 236 | 96.7% |
| Sub Total/Ave | 1,431,584 | 1,566 | 49.1% |
| | | | |
| Alto Molocue | 247,614 | 280 | 56.7% |
| Gurue | 171,265 | 190 | 55.5% |
| Sub Total/Ave | 418,879.0 | 470.0 | 56.1% |
| | | | |
| 1) Cuamba | 123,638 | 250 | 91.0% |
| 2) Mandinba | 138,673 | 161 | 48.8% |
| 3) Ngauma | 81,314 | 99 | 45.4% |
| 4) Lichinga | 110,703 | 171 | 68.2% |
| Total/Ave | 454,327 | 681 | 64.4% |
| | | | |
| Grand Total / Average | 2,315,745 | 2,247 | 53.2% |

Source: Directorate of Public Works in 3provinces

Table 3.1.21 Present Situation of the Education

| | | Number in 1 School | | Attendance Rate | |
|-------------------------|------------|--------------------|---------|-----------------|---------|
| | | Teacher | Student | for EP1 | for EP2 |
| Nampula | Province | 7.0 | 467 | 124% | 54% |
| | Study Area | 8.4 | 503 | 144% | 55% |
| Niassa | Province | 4.9 | 328 | 200% | 51% |
| | Study Area | 7.0 | 477 | 171% | 44% |
| Zambezia | Province | 6.2 | 105 | 187% | 61% |
| | Study Area | 5.7 | 117 | 211% | 77% |
| National Average (2010) | | 6.3 | 420 | 130% | - |

Source: Directorate of Education and Culture in 3 provinces

3.2. Outline of Provincial and District Development Directions

The government of Mozambique has gradually promoted decentralization with the assistances of donors; administration and political organization are still centralized. Policies and development plans have been determined by central government. To understand the problems of poverty in rural areas and to be carried out measures effectively, there is a limit only from the central government. For the implementation of an effective development policy, accelerate further decentralization is required.

3.2.1. Local Government Administration

(1) Decentralization Policy

Decentralization of Mozambique has been promoting gradually since 2004, through legislations such as the followings:

- Law No. 8 on the State's administrative bodies decentralized at the local level of May 19, 2003 (LOLE: Law of Local Organs of the state)
- The Constitution of the Republic of Mozambique of 2004
- Decree No. 11 on the Regulation of the Law on the State's administrative bodies decentralized at the local level of June 10, 2005
- Decree No. 6 on the Organic Statute on District Governments of April 12, 2006; and
- Local Authority Package (Pacote Autárquico) consisting of Laws No. 2 on the Legal Framework for Municipalities of February 18, 1997, No. 11 on Finances and Assets of Municipalities, and No. 8 on the Organization and Functioning of the City of Maputo, all dated May 31, 1997.

The Law of Local Organs of the state (Law 8/2003; Lei dos Órgãos do Estado: LOLE) defined the district as a budgetary unit, having power to prepare district development plans and define priorities. With the Law and followed Decrees, districts became centers of planning and implementation, though the methodological/technical guidance is provided by line ministries through provincial government.

In 2006, the government began a scheme to give directly the development fund of an annual fixed amount to the district. From that amount per district was a 7 million MT and it has been referred to as "7 million". However, because district-level administrative capacity is not sufficient with lack of human resources, technology and experience; the districts do not fulfill the role that is expected.

(2) Administrative Organization

Mozambique is divided into ten provinces (Províncias) and one capital city (Cidade capital) with provincial status. The provinces are subdivided into 128 districts (Distritos). The districts are further divided in 405 administrative posts (Postos Administrativos), the main subdivisions of districts. Then the administrative posts are divided into localities (Localidades), the lowest geographical level of the central state administration. Since 1998, 43 municipalities (Municípios) have been created, 10 of them in April 2008 and are same administrative level of the district.

The provinces are ruled by a governor (Governador) appointed by the central government, instead of being elected by the residents of the province. Authorities who have the privileges of budgets of each sector are the provincial directors (Directores Provinciais) of the state agencies from the central government; the provincial government is limited budget and authority. This is similar to the lower local governments such as districts, administrative officials are appointed by provincial government, and are only the local agencies of central government.

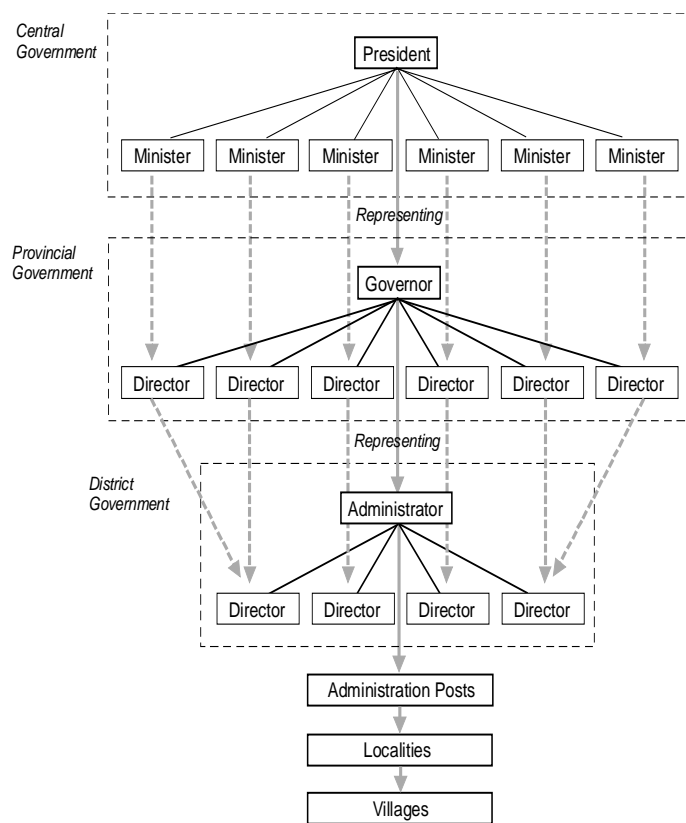


Figure 3.2.1 Administration Structure of Local Government

The districts are directed by administrators (Administradores). Administrative posts are headed by administrative secretaries (Secretários), which before independence were called post chief (Chefe de Posto), and localities are also headed by secretaries. The secretaries of administrative posts and localities are appointed by the administrator of the district to which they belong. In Mozambique, the localities are the lowest level of representation of the state in the rural level. When a town is urbanized it is called the village (povoação). In the districts may still be other ways to top-level urban villages, towns and cities.

In the decentralization policy, the sector departments of provincial-level are under the guidance of the Governor in the administrative political, but are technically under the supervision of the sector ministries. And in terms of sectors at each ministry, there are economic activity services at district level regarding agriculture, commerce and industry, fishery, environment, and tourism.

(3) Administrative Division of the Study Area

The Study Area, three provinces are composed of 14 districts. Administrative divisions of under the district-level are as shown in table 3.2.1.

(4) Community Participation and Traditional Leaders

Heads of administrative post and localities are government-appointed administrative officers, and members of the council (Conselho Consultivos) established for each level are elected by habitants. The council is composed of community leaders, religious leaders, etc. conduct a consultation with respect to residents in rural development projects such as school buildings and wells maintenance, have sucked up the local needs.

The Traditional Chief (Régulo, Mueune on the local language) is the leader of the community, according to the tradition. A position perpetrated by heredity within the family. (In Rapale, for example, where field research was conducted, Mr. Muithoo, the local Régulo, has the same name of the mountain of the region and his community or REGULADO). The social figure of the Régulo has been preserved with all his hierarchical authority. He is the spiritual leader, leading traditional rituals, and authorizes land work (Maquea) in his area of influence (can be more than one community). The Régulo must also be consulted in matters affecting the life, land, well-being and harmony of his communities.

The Leaders of hierarchy 1st, 2nd, and 3rd LEVELS are elected by the local population, following a criteria defined by the community, and always counts with the presence of state administrative authorities. Their duty is to keep the communities informed about administrative guidelines, and explain about state programs and actions, besides guiding and mitigating conflicts over land tenure. The Decree 15/2000 has legalized

Table 3.2.1 Administrative Division of the Study Area

| District *1(No. of Admin. Post) | administrative posts*2 (No. of Locality) |
|---------------------------------|---|
| Nampula Province | |
| 1) Monapo (3) | Itoculo(2), Monapo(2), Netia* Monapo Municipality (vila) (1) |
| 2) Muecate (3) | Imala(1),Mucoluone(1), Muecate(2) |
| 3) Meconta (4) | 7 de Abril(1), Corrane(3), Meconta(1), Namialo(1) |
| 4) Mogovolas (5) | Calipo(1), Ilute(1), Muatua(1), Nametil(1), Nanhupo Rio(1) |
| 5) Rapale (Nampula) (4) | Anchilo(5), Mutivaze (1), Namaita (1), Rapale (3) |
| 6) Murrupula (3) | Chinga (1), Murrupula (3), Nehessine (1) |
| 7) Ribaué (3) | Chinga (1), lapala (1), Ribaué (2), * Ribaué Municipality (vila) |
| 8) Malema (3) | Chihulo (1), Malema (4), Mutuali (2) |
| Total (28) | (46) |
| Zambezia Province | |
| 1) Alto Molócue (2) | Alto Molócue (9), Nauela (2) |
| 2) Gurue (2) | Lioma (5), Mepuaguiua (5) * Gurue Municipality (cidade) |
| Total (4) | (21) |
| Niassa Province | |
| 1) Cuamba (2) | Etarara(2), Lúrio (3) |
| 2) Mandimba (2) | Mandimba (2), Mitande (1) |
| 3) Nguama (2) | Itepela(1), Massangulo(2) |
| 4) Chimbonila (Lichinga) (3) | Chimbonila(4), Lione(1), Meponda(1) |
| Total (9) | (17) |
| Grand Total (41) | (84) |

the role of these leaders formerly known as Corporal, head Corporal, land Corporal, and Secretary of the neighborhood or village, a hierarchy that used to hold the community and localities leadership, by the choice of the population and by other legitimate social leaders, people recognized for their religious, cultural and healing tradition roles. A monthly subsidy for each leader such as leader of first grad is 400 MT, second grad is 250 MT and third grad is 150 MT (2012).

However in reality, because of not been a one-to-one correspondence with the area managed by Regulo (Regulado, the size is different depend upon Regulo) and locality or administrative post areas, it is difficult to understand exactly. Because the political system of immediately after independence denied these traditional authorities once, even on the awareness of residents, the following classification of the social structure underlying of the locality is often obscure. Furthermore, designations of leaders vary by region, for example, instead of Regulo called Mwene, and the social structures of communities are different also by region.

As an example:

According to the government of Rapale district of the Nampula province, Rapale district comprises four administrative positions and 16 localities (although it is different with the information of INE). The clan structure of clusters noted that the 16 regulated directed (Regulado) by the respective agents of the community authority. In the district of 244 thousand populations (2011), there are 172 leaders of first grade, 186 leaders of second grade and 194 leader of third grade (2012).

3.2.2. Strategic Plan for Development of Provinces and Districts

(1) Development Policy at Provincial Level

The Provincial Development Strategic Plan: (Plano Estratégico de Desenvolvimento Provincial: PEDP) is a medium-term plan for a period of 3 to 5 years should be based on the contents of the Government Five-Year Plan and the PARPA, and verified by an officer sent from the central government to be finally approved by the Ministry of Planning and Development (MPD). The PEDP is considered the umbrella to the Strategic Plan of District Development (PEDD). The financial plan is designed as the Economic and Social Plan Budget (Plano Económico e Social Orçamento: PESO).

The latest development plans of provinces have been established based on several following documents. Country's development strategy (Agenda 2025, Action plan for the reduction of poverty: PARPA, Strategies for marketing agricultural and rural development, etc.), regional (New Partnership for Africa's Development: NEPAD, etc.) and global (Millennium Development Goals, etc.). District development plans were also consulted.

1) Development Plan of the Nampula province

In the Nampula province, the Strategic Provincial Plan Nampula 2010-2020 (PEP), was established in October 2009 by the Coordination Unit of the Integrated Development of Nampula (UCODIN). The pillars of the development strategy are following four, which basically continue to give the previous strategic plan:

- Economic growth;
- Participatory Governance;
- Infrastructures and promotion of the environment; and
- Development of human and social capital.

The 5 goals of the strategy for economic growth are follows:

1. To reach an economic development based on local resources;
2. To reform the family agriculture in micro and small scales and medium entrepreneurs;
3. To encourage the business sector to adopt technologies that allow improve business competitiveness;
4. To create an environment that favors the formation of partnerships between business and the family sector and between the public and the private sector in order to facilitate the rapid transition; and
5. To engage in actions that encourage universities, institutions, research centers and professionalized to create strategic alliances with innovative elements that can absorb directly and rapidly in family and business sectors of micro and small scale.

In this plan, the goal of real GDP growth rate of the province is 7.5% by 2010, 8.5% by 2015, and 8.3% by 2020

2) Development Plan of the Zambezia province

In the Zambezia province, the Strategic Plan of Development of Zambezia 2011-2020 (PEDZ), for 10 years from 2011 to 2020 was established in May 2011. The four pillars of the development are as follows:

1. Development of human and social capital;
2. Economic growth and development;
3. Good governance, decentralization, anti-corruption and promoting the culture of accountability; and
4. Cross-cutting issues.

The pillar of 2: Economic growth and development constitutes the backbone of the plan's objectives are to:

- (i) Relaunching production and improve the productivity of the agricultural sector on the basis of the strategic focal points of development;

- (ii) Promoting local entrepreneurship, attraction of investment and expansion of the financial system; and
- (iii) Improve the planning and management of public finances at the provincial level.

This pillar incorporates the areas of agriculture, livestock, forestry and fauna; industry; fisheries; mineral resources; trade, tourism; transport and communications; public works; energy; and employment, work, hygiene and safety. PEDZ sets out guiding principles on the development of the province with a view to inducing the annual production growth of around 7% per year by 2020.

3) Development Plan of the Niassa province

In the Niassa province, the Strategic Provincial Plan Niassa 2017 (PEP 2017), for 10 years from 2008 to 2020 was established in December 2007. In the development of this plan, the Office for Strategic Studies and Development (GED) established by the Niassa government has suffered a central role. This plan, continuing the previous plan, aiming to "sustainable development" as the goal, accelerate and integrate the economic, social and cultural development of the province, to reduce the poverty rate by 15% by 2017.

In order to achieve this goal, the three development pillars are as follows:

1. In the agriculture and forestry sector, to promote investment of 240,000 ha of commercial forestry;
2. To promote private investment to the agriculture and agro-processing (especially near the Lichinga city); and
3. To promote investment to the ecotourism of the Niassa nature reserve area.

(2) Development Policy at District Level

The Strategic Plan of Development of District (Plano Estratégico de Desenvolvimento Distrital: PEDD) is medium term of five years, is a guidance and strategic management of the district, and is jointly developed in a participatory manner involving the district government and civil society at the district level, and is aligned with the Government's Five Year Program 2010-2014 and the Strategic Development Plan of the Province (PEDP). In addition, they are based on current laws and decrees of local administration (Decreto 15/2000: Estabelece as formas de articulação dos órgãos locais do Estado com as autoridades comunitárias; Lei 8/2003: Lei dos Órgãos do Estado; Lei 11/2012: Procede a revisão pontual da Lei 8/2003). And this indicates the main strategic directions that the district must follow to achieve the economic well-being and social development of its population.

Currently, PEDD III as the third period (the target year are different by district, such as 2010 to 2014, 2009 to 2013 or 2010 to 2015) is being created under the guidance of the provincial government, but a district has been completed is slightly. Therefore,

PEDD II as the second period has been continued actually. PEDD II covered the period 2006 to 2010, but according to the district, the plan period varied slightly. However, they are basically prepared in accordance with the Provincial Development Strategic Plan and the contents are similarly targeting the eradication of poverty and economic development. The annual budget plan is prepared as the District Economic and Social Plan (Plano Económico e Social do Distrito: PES or Plano Económico e Social e Orçamento Distrital: PESOD), this is annual implementation plan.

(3) District Fund of Development (Fundo Distrital de Desenvolvimento: FDD)

In 2006 the government launched a scheme of directly providing districts with annual discretionary development funds, namely OIL (Local Initiative Investment Budget). This scheme is so called “7 million” because the amount of the fund made available to each district is about 7 million MT. Priority projects are selected in consultation with District Consultative Councils District formed by local representatives including traditional chiefs, religious leaders and civil servants. The budget has been used mostly for agriculture and small-scale industries, aimed at producing food and creating jobs. Based on these resources are running projects such as buying tractors and financing services to small farmers in districts.

In addition, the district governments receive 2 million MT per year as Fund for Investment Development (FID), which covers small-scale infrastructure investment including feeder roads, maintenance of schools, etc. Provincial Directorate of Planning and Finance, together with other Provincial Directorates, guides and supports the District Government in the process of planning and budgeting. However the administrative capacity of Districts is still not developed enough to fulfil the expected roles, due to the limitation of human resources, technical capacity, and experiences.

3.3. Production of Crops and Animal Husbandry

Agricultural production in the Study Area analyzed by districts has shown similar characteristics to those seen in the rest of the country, except for some specific locations. These similarities are expressed in both aspects of cultivated area of farm-households and farm management and production technologies, as described below.

3.3.1. Land Scale of Farm- households

According to Agricultural Census 2009-10, the average cultivated area of farm-household in Mozambique is 1.47 ha. Niassa province has a slightly higher average of 1.82 ha, while the area in Nampula of 1.25 ha and Zambezia of 1.29 ha are below the national level (see Table 3.3.1). In Niassa, 99.7% of farm-households

are classified as small-scale, while the rate in Zambezia and Nampula are the same of 99.9%, according to criteria of the National Statistics Institute (INE) shown in Table 3.3.2.

Table 3.3.1 Cultivated Area and Farm-households in Concerned Districts

| Province | Cultivated area | | Farm-households | | Average farming size (ha) |
|-------------------|------------------|--------------|------------------|--------------|---------------------------|
| | (ha) | (%) | (number) | (%) | |
| Niassa | 409,473 | 7.3 | 225,151 | 5.9 | 1.82 |
| Nampula | 1,037,748 | 18.4 | 829,642 | 21.7 | 1.25 |
| Zambezia | 1,071,170 | 19.0 | 828,801 | 21.7 | 1.29 |
| Mozambique | 5,633,850 | 100.0 | 3,827,797 | 100.0 | 1.47 |

Source: Agriculture Census in 2009-2010, INE

Table 3.3.2 Criteria of Farm Scale

| | |
|---------------------|---|
| Small scale farmer | Meet all of the following criteria: - Non-irrigated area : less than 10ha, - Area of irrigation/ orchard/ plantation/ floriculture :less than 5ha, - less than 10 cattle, 50 goats, sheep or pigs or 2,000 poultry. |
| Medium scale farmer | Exceed any of above criteria, but meet all of those below: - Non-irrigated area : less than 50ha, - Area of irrigation/ orchard/ plantation/ floriculture :less than 10ha, - less than 100 cattle, 100 goats, sheep or pigs or 10,000 poultry. |
| Large scale farmer | Exceed any of above criteria |

Source: Agriculture Census in 2009-2010, INE

Table 3.3.3 Summary of Farm-households in Target Districts

| Province/District | Number of Farm households | Area (ha) | |
|-------------------|---------------------------|----------------|-------------|
| | | Total | Average |
| NAMPULA | 346,218 | 401,795 | 1.16 |
| Monapo | 55,898 | 79,058 | 1.41 |
| Muecate | 20,529 | 18,037 | 0.88 |
| Meconta | 33,968 | 44,401 | 1.31 |
| Mogovolas | 61,712 | 61,758 | 1.00 |
| Nampula | 73,914 | 51,669 | 0.70 |
| Murrupula | 30,582 | 23,548 | 0.77 |
| Ribáuè | 36,028 | 53,065 | 1.47 |
| Malema | 33,587 | 70,259 | 2.09 |
| ZAMBÉZIA | 93,000 | 194,514 | 2.09 |
| Alto Molócuè | 35,000 | 121,059 | 3.46 |
| Guruè | 58,000 | 73,455 | 1.27 |
| NIASSA | 111,948 | 159,143 | 1.42 |
| Cuamba | 42,079 | 64,184 | 1.53 |
| Mandimba | 30,165 | 42,771 | 1.42 |
| Ngauma | 15,537 | 11,128 | 0.72 |
| Lichinga | 24,167 | 41,060 | 1.70 |
| TOTAL | 551,166 | 755,452 | 1.37 |

Source: Corresponding DPAs (number) and CENACARTA, 1997 (area)

In target districts in the Study Area, the total number of farm-households accounts 551,166 according to corresponding DPAs. They cultivate the total of 755,452 ha (CENACARTA, 1997), with an average of 1.37 ha per household (see Table 3.3.3)

3.3.2. Farm Management and Marketing

The farming activities, by those farm-households classified as small- and medium-scale, are basically conducted with the use of family labors, and occasionally supplemented by temporary hired workers in the system called "ganho-ganho" (win-win) in which the payment is commonly made based on an allocated farmland size to the workers. Most of the farmers manage subsistence agriculture, with production of food crops, such as cassava, maize, sorghum, millet, rice and beans (haricot beans, cowpea, mungbean and pigeon pea).

A part of the farmers, those who mostly manage more than several ha of farmland also manage farming for commercial purposes, with cultivation of cash crops such as cotton, tobacco, soybean, sesame and some vegetables. Planting of cotton and tobacco are performed by contract farming in which the buyer provides out growers some inputs for a price such as seeds, fertilizers and pesticides, as an incentive to the production. In the case of cotton, corresponding companies usually provide basic inputs, mainly seeds and pesticide to the contract growers with subsequent payment after the harvest. The companies also lent out equipment for spraying pesticide.

Farmers usually determine the production of cash crops on the condition that a reliable buyer of the crops is available in the area. In fact, the production of cash crops in the Study Area is concentrated in several particular districts where commercial or industrial companies specialized in such crops promote the production. In Gurue district, international NGOs such as CLUSA work to promote the cultivation of soybean by distributing seeds to interested farmers without payment, however, CLUSA doesn't concern to the marketing of their production.

Less income generation opportunities cause prevalence of poverty in rural area in the Study Area. Available cash income sources of general farmers are limited to farm-labor works, construction labor works and sales of their products according to the Study team's field survey. Many farmers are, however, not able to have surplus of their products due to their limited farming-scale. Only less than 10 % of farm-households sell their surplus in the country (PEDSA 2011-19, MINAG).

The Study team's field survey and other information sources confirmed that crops marketed by farmers were mainly their staple food crops. This implies that many farmers only sell their produced crops when they luckily have surplus or they suddenly need cash for unexpected occasions. Marketing of the surplus production is usually made through middlemen, who buy directly from producers at farmgate or at local market for reselling the products in near cities. It is commonly considered that a profit margin of the middlemen is relatively high. The following crops are the marketed crops declared by the interviewee farmers.

<Marketed Crops>

Cassava, Maize, Beans, Groundnut, Sorghum, Sweet potato, Potato, Soybean, Paddy, Vegetables (tomato, onion, cabbage, carrot, garlic, green sweet pepper, pumpkin, kale, etc.), Sesame, Cotton, Tobacco, Cashew nut, Banana

3.3.3. Cultivations Technology and Cropping Pattern

The cropping system of the farm-households in the target districts are characterized by low use of technology and inputs, with traditional system of crop management and land use, such as mixed cropping and shifting cultivation.

In Mozambique, the cropping calendar is divided into two seasons, called the First Season and the Second Season. In the First Season, seeding is done at the beginning of the rainy season (November-January) taking advantages of the rainy season (November-April) for agricultural production, while planting in the Second Season is done after the rainy season in the area where water sources are available. Manual irrigation is common practice while some farmers use a small irrigation pump.

It was observed by the Study team through its field surveys that most of subsistence farm households had only family labor power to work in the land by using basic tools like hoe, machete and ax. Seeds used for planting were usually produced in the last harvest. The seeds were harvested from the own land or acquired from neighborhoods. The application of inputs like improved seeds, fertilizers and pesticides is practically negligible, as shown in Table 3.3.4.

Table 3.3.4 % of Farm-households using Farm Inputs in 2007

| Province | Inputs (%) | | |
|-----------------|-------------|-------------|-----------|
| | Maize seeds | Fertilizers | Pesticide |
| Nampula | 6 | 2 | 3 |
| Zambazia | 11 | 1 | 1 |
| Niassa | 5 | 7 | 3 |
| National | 10 | 4 | 5 |

Source: TIA 2007, MINAG

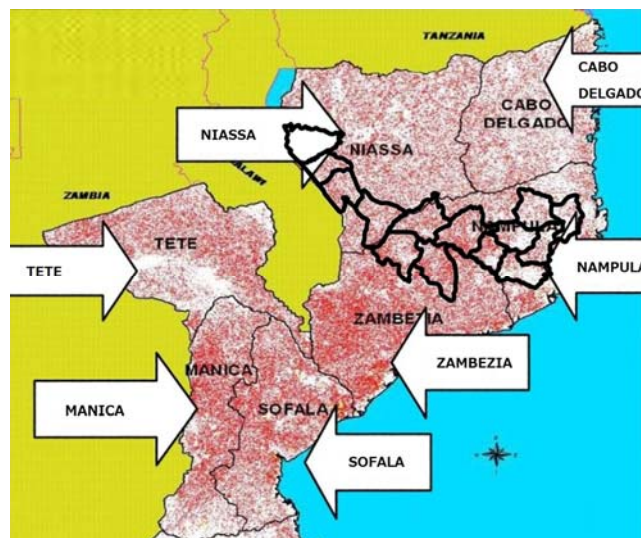
Most of farmers don't buy chemical fertilizers, which are the basic inputs, because they have no financial resources needed, or they could not see due return from the use of chemical fertilizers. Farmers, in general, have knowledge about a benefit of fertilizers that they can bring high productivity of crops. Among limited farmers who use fertilizers, few of them use fertilizers correctly, because they haven't proper knowledge or no technical orientation from agricultural extension agents.

In case of cash crop cultivation, the situation is different. Many farmers use inputs, even at a minimum level, for vegetables, cashew nut, etc. In case of cotton and tobacco, a commercial or industrial company is often behind the production, and

provides necessary inputs for a price. Farmers are also able to expect technical orientations from the company's staff.

Farmland use in the Study Area still obeys traditional practices which are characterized by low use of technology and inputs. These traditional practices consist of non-systematic mixed cropping, slash and burning farming and shifting cultivation. Slash and burning cum shifting cultivation is popular in the Central and Northern regions, where is also the center of agricultural production in the country. Farmers in those areas have enjoyed relatively favorable annual rainfall and vast arable land for long time. It is assumed that the practices are deeply rooted in the area, including the Study Area.

Figure 3.3.1 shows occurrence of fire in most affected area in Mozambique in 2008. According to UN-REDD program material in September 2011, the peak incidence of the fire was observed between August and September when is the typical period of land preparation for agriculture. This means the figure almost represents an occurrence of fire for agricultural land preparation. The fire occurrence points (red-colored) thoroughly scattered over the area except for the eastern part, where the shifting cultivation farming has been outdated due to the high pressure of population increase. Figure 3.3.1 implies that slash and burning cum shifting cultivation is a dominant farming practice in the Study are, and there are very limited free lands which are not used for farming, as well as for fallow land reserved in the shifting cultivation cycle.



Source: The JICA Study team modified the original map of DNTF/MINAG

Figure 3.3.1 Occurrence of Fire in 2008 in Most Affected Area

Farmers in the Study Area usually have several cultivated lands in different places. The reason may be that each of husband and wife has own inherited land (or rights to use a certain acreage of land) individually in their original communities even after

get a marriage. Then, they should keep cultivating the land if they don't want to lose the land rights.

3.3.4. Agricultural Production by Districts

Agricultural production in the Study Area varies with the locations. Both of food crops and cash crops are planted according to favorable climatic conditions for each crop. Table 3.3.5 shows the 5 years (2006/07–10/11) average of planted area of major crops in the Study Area, based on statistic data collected from DPAs in Nampula, Zambezia and Niassa provinces. Maize, cassava, sorghum, beans, ground nut, cotton are very popular crops among them.

The planted area and production of major crops by target districts are also shown in Table 3.3.6. While 5-years averaged data from 2006/07 to 2010/11 are calculated for the planted area and the production, based on statistics from respective DPAs and INCAJU (only for cashew nut), some data calculations are still provisional or incomplete due to unavailability of the statistic data at present.

Table 3.3.5 Planted Area of Major Crops in the Study Area (Average: 2006/07- 2010/11)

| CROPS | Planted Area (ha) |
|-------------------------------------|-------------------|
| Cassava (Mandioca) | 336,304.7 |
| Maize (Milho) | 262,669.1 |
| Sorghum (Mapira/Sorgo) | 110,103.5 |
| Millet (Mexoeira/Milhetos) | 7,154.6 |
| Paddy (Arroz) | 26,317.7 |
| Beans (Feijões) | 110,061.3 |
| Ground Nut (Amendoim) | 90,036.5 |
| Sunflower (Girassol) | 5,425.0 |
| Sesame (Gergelim) | 19,351.4 |
| Soybean (Soja) | 2,650.2 |
| Sweet Potato (Batata doce) | 10,093.7 |
| Potato (Batata reno/Batata inglesa) | 1,264.3 |
| Vegetables (Hortícolas) | 5,583.0 |
| Cotton (Algodão) | 49,856.8 |
| Tobacco (Tabaco/Fumo) | 6,143.7 |
| Total | 1,043,015.3 |

Source: DPAs of respective provinces

(1) Food Crops

1) Maize

The average of planted area and production of maize in the Study Area were 262.7 thousand ha and 366.4 thousand ton, respectively, with a yield of 1.39 t/ha. Maize was grown much in the target districts in Zambezia and Niassa provinces, with the planted area of 162.4 thousand ha (61.8% of the Study Area) and production of 244.1 thousand ton (66.6% of the Study Area).

2) Cassava

The average of planted area and production of cassava in the Study Area were 336.3 thousand ha and 2.03 million ton, respectively, with a yield of 6.03 t/ha. Cassava was grown much in the target districts in Nampula province, with 267.1 thousand ha (84.8% of the Study Area) and production of 1.67 million ton (82.6% of the Study Area). The production in the districts in Niassa province was very small and contributes with 103.0 thousand ton or only 5.1% of the Study Area.

3) Sorghum

The average of planted area and production of sorghum in the Study Area were 101.1 thousand ha and 92.4 thousand ton, respectively, with a yield of 0.84 t/ha. The production was concentrated in the districts of Nampula province, cultivating 72.1 thousand ha (65.5% of the Study Area) and producing 67.8 thousand ton (73.3% of the Study Area), beside the largest planted area was in Cuamba in Niassa province, with 18.5 thousand ha (16.8% of the Study Area). But Cuamba produced only 11.7 thousand ton (12.7% of the Study Area), less than Ribaue which recorded much smaller planted area than that of Cuamba.

4) Millet

The average of planted area and production of millet in the Study Area were 7.2 thousand ha and 6.4 thousand ton, respectively, with a yield of 0.88 t/ha. Millet was grown much in the target districts in Nampula province, with 5.5 thousand ha (77.1% of the Study Area) and production of 5.6 thousand ton (86.9% of the Study Area).

5) Paddy

The average of planted area and production of paddy in the Study Area were 26.3 thousand ha and 43.9 thousand ton, respectively, with a yield of 1.67 t/ha. The major production districts were located in Nampula province, while there was a certain production in Niassa province. The productivity is much higher in Niassa province than that of in Nampula. The data of Lichinga district is doubtful, since there are fewer areas suitable for paddy cultivation in Lichinga district according to the collected information.

6) Beans

Several kind of beans (Haricot beans, Cowpea, Mungbean and Pigeon pea) were widely cultivated in all target districts, with the average planted area of 110.1 thousand ha and the production of 71.8 thousand ton. The average productivity was 0.65 t/ha. Though the production center of each kind of beans is different as described in sub-chapter 3.3.5, detailed production data by the beans are not available.

7) Ground nut

The average of planted area and production (in terms of with shell) of ground nut in the Study Area were 90.0 thousand ha and 64.4 thousand ton, respectively, with a yield of 0.72 t/ha. Ground nut was grown much in the target districts in Nampula province, with 77.7 thousand ha (86.3% of the Study Area) and production of 55.8 thousand ton (86.7% of the Study Area). The main production districts are Meconta and Mogovolas in Niassa province. The two (2) districts produced 39.1% of the total production in the Study Area.

8) Sweet potato

Production of sweet potato was quite concentrated in Alto-Molocue and Gurue in Zambezia province and Mandimba in Niassa province, with 72.3% of the total production in the Study Area. The average of planted area and production in the Study Area were 10.1 thousand ha and 35.2 thousand ton, respectively, with a yield of 3.49 t/ha.

9) Potato

Potato production was much concentrated in Gurue in Zambezia province, followed by a limited number of production districts, such as Lichinga in Niassa province and Alto -Molocue in Zambezia province. The average of planted area and production in the Study Area were 1.2 thousand ha and 9.1 thousand ton, respectively, with a yield of 7.2 t/ha.

10) Vegetables

Mandimba in Niassa province produced 35.1% of the total production in the Study Area, followed by Gurue and Alto-Molocue in Zambezia province that produced 29.2% of the total production together with. The average of planted area and production in the Study Area were 5.6 thousand ha and 45.0 thousand ton, respectively, with a yield of 8.06 t/ha. While tomato, onion, cabbage, carrot and garlic are popular vegetables in the Study Area, detailed production data by vegetable crops are not available. The vegetables are actually rather cash crops than food crops for producing farmers.

(2) Cash Crops

1) Cotton

The production centers were in the eastern-side and the western-side districts in Nampula province. Since data in Niassa province are missing, total figure in the Study Area is unclear at present. There was a substantial production of cotton in Niassa province according to an observation and collected information.

2) Tobacco

According to the available information of DPAs, tobacco production in the Study Area was concentrated in the western-side districts of Nampula province. As same as cotton data, total figure in the Study Area is unclear at present, since data in Niassa province are missing. Considering that Niassa province is a production center of tobacco in the country and an observation by the Study team, there must be a substantial tobacco production in the target districts in Niassa province.

3) Cashew nut

The commercial production of cashew nut is centralized in the eastern-side districts in Nampula. According to the INCAJU, those districts in the Study Area produced at the average of 21.0 thousand tons/year (with shell) in last nine years, and Mogovolas and Nampula districts produced 65.7% of the total production.

4) Sunflower

The sunflower production in the region is relatively concentrated in the targeted districts located in the middle zone of the Study Area, according to the available data. Total figure in the Study Area is, however, unclear at present, since data in Niassa province are missing.

5) Soybean

The Soybean production is centralized in the targeted districts located in the middle zone of the Study Area, according to the available data. Though total figure in the Study Area is unclear, as same as other cash crops due to the same reason, the production center of soybean could be in the middle zone in the Study Area according to an observation of the field survey and collected information. It is noted that the productivity in Gurue in Zambezia province is still lower than that of the neighbor districts, even though the district is expected to have a big potential of soybean production.

6) Sesame

The production of sesame in the region is concentrated in the target districts in Nampula province. Monapo and Meconta districts stand out from other districts in the production. The production center could be in those districts, even after total figure in the Study Area becomes to be clear, according to an observation of the field survey and collected information. The production center may change to other districts in the future depending on an expansion of pest damage.

(3) Crop Calendar.

Crop calendar of the both type of crops in the Study Area is shown in Figure 3.3.2 below.

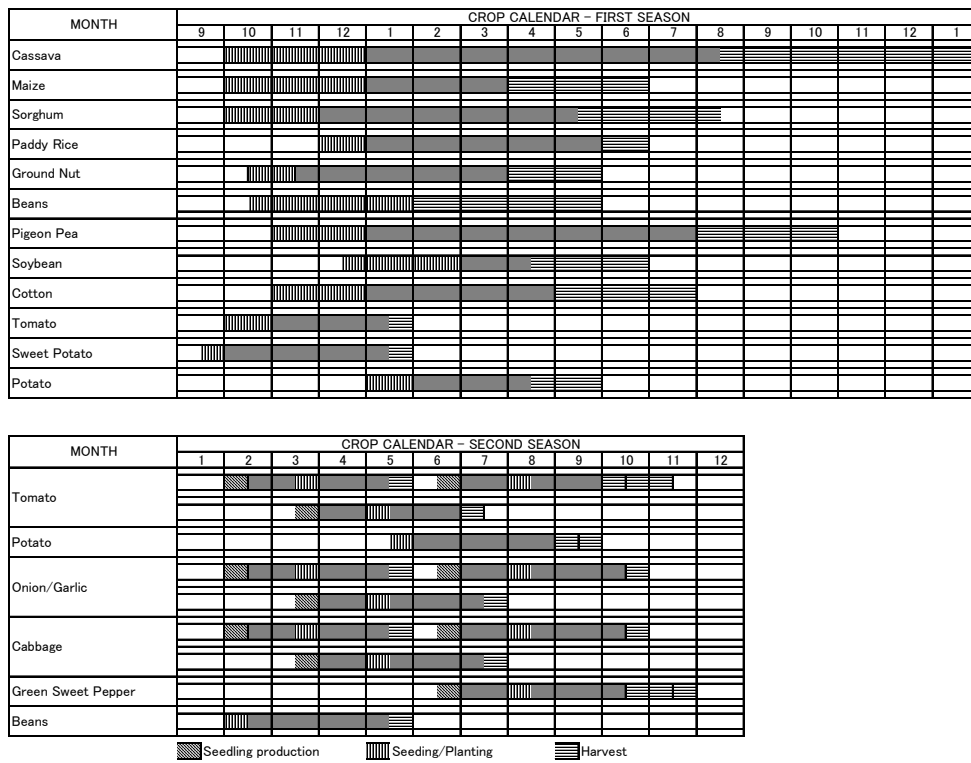


Figure 3.3.2 Crop Calendar in the Study Area

Table 3.3.6 Planted Area and Production by Crops in the Target Districts of the Study Area

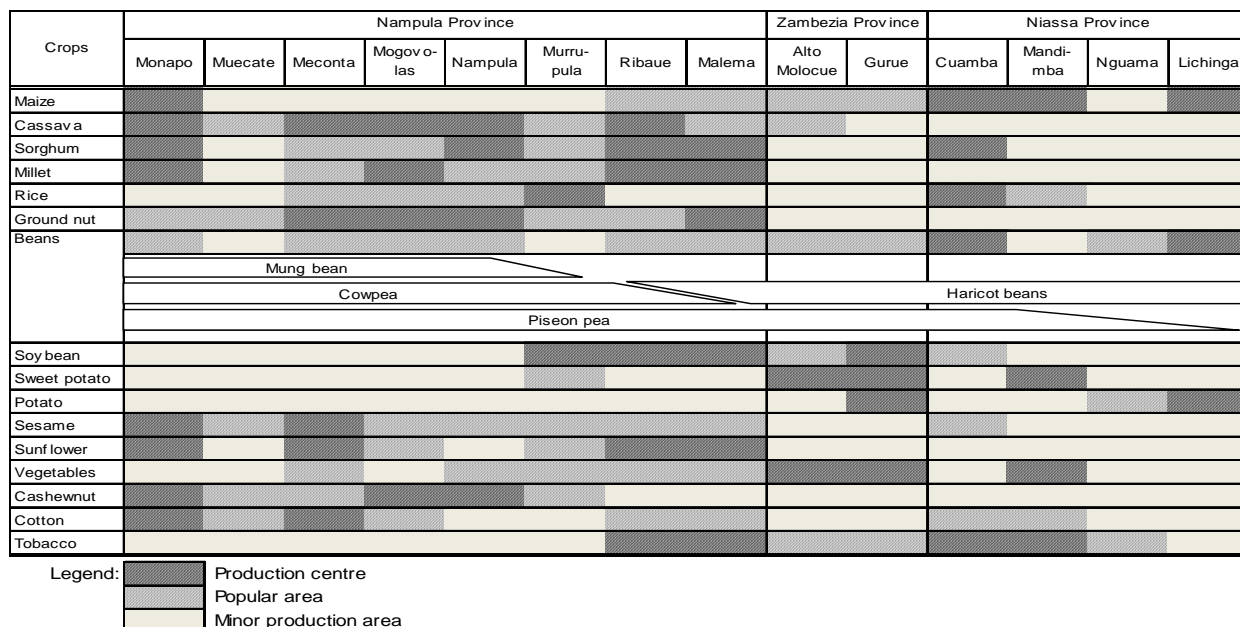
| Crops | Monapo | Muecate | Meconta | Mogovolas | Nampula | Murruvula | Ribáuè | Malema | Alto Molócuè | Guruè | Cuamba | Mandimba | Ngaúma | Lichinga |
|-------------------------------------|----------------|---------|---------------|----------------|----------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|--------|---------------|
| Planted AREA(ha) | | | | | | | | | | | | | | |
| Maize | 15,573 | 6,237 | 13,090 | 9,951 | 12,047 | 7,539 | 16,692 | 19,173 | 33,760 | 26,833 | 51,012 | 21,409 | 9,280 | 20,072 |
| Cassava | 47,360 | 24,646 | 30,709 | 44,033 | 37,785 | 28,820 | 29,098 | 24,666 | 31,083 | 22,461 | 7,287 | 5,830 | 1,570 | 955 |
| Sorghum | 13,912 | 1,975 | 7,670 | 6,058 | 12,118 | 7,540 | 11,563 | 11,271 | 8,683 | 6,893 | 18,477 | 3,299 | 645 | - |
| Millet | 1,523 | 125 | 360 | 852 | 307 | 566 | 848 | 935 | - | 600 | 57 | 778 | 203 | - |
| Paddy* ² | 2,344 | 1,239 | 2,473 | 4,291 | 3,280 | 4,786 | 805 | 840 | 1,215 | 620 | 2,447 | 1,364 | 614 | - |
| Beans | 6,052 | 3,428 | 6,991 | 5,642 | 7,328 | 5,303 | 8,398 | 10,937 | 8,428 | 9,783 | 13,940 | 6,653 | 5,445 | 11,733 |
| Ground Nut | 6,363 | 7,976 | 16,986 | 16,172 | 11,779 | 5,596 | 4,338 | 8,521 | 5,642 | 4,100 | 1,181 | 709 | 345 | 328 |
| Sunflower* ³ | 504 | - | 656 | 471 | - | 421 | 844 | 854 | 1,675 | - | - | - | - | - |
| Sesame* ³ | 5,520 | 813 | 7,021 | 1,320 | 1,060 | 1,256 | 963 | 984 | 140 | 275 | - | - | - | - |
| Soybean* ³ | - | - | - | - | - | 185 | 625 | 605 | 210 | 1,025 | - | - | - | - |
| Sweet Potato | 523 | 73 | 126 | 366 | 515 | 781 | 316 | 450 | 2,500 | 3,333 | 228 | 568 | 132 | 183 |
| Potato | - | - | - | - | - | - | 7 | 13 | 50 | 510 | - | - | 113 | 571 |
| Vegetables | 98 | 14 | 298 | 34 | 310 | 332 | 271 | 285 | 540 | 920 | 108 | 2,083 | 177 | 114 |
| Cashew nut with shell* ⁴ | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Cotton* ³ | 28,229 | 3,776 | 6,208 | 2,010 | 275 | 4 | 2,145 | 5,535 | 1,675 | - | - | - | - | - |
| Tobacco | - | - | - | - | 24 | 150 | 2,669 | 2,058 | 723 | 520 | - | - | - | - |
| PRODUÇÃO (t) | | | | | | | | | | | | | | |
| Maize | 21,222 | 5,873 | 14,548 | 8,307 | 14,017 | 8,965 | 22,471 | 26,867 | 50,825 | 39,583 | 61,629 | 33,107 | 15,000 | 43,976 |
| Cassava | 291,665 | 152,660 | 196,606 | 253,497 | 242,316 | 180,345 | 194,971 | 166,139 | 163,743 | 86,000 | 36,970 | 42,795 | 11,519 | 11,700 |
| Sorghum | 12,254 | 2,134 | 5,928 | 5,151 | 10,745 | 6,916 | 12,492 | 12,144 | 5,850 | 4,153 | 11,757 | 2,573 | 151 | 188 |
| Millet | 1,538 | 122 | 340 | 781 | 319 | 546 | 931 | 977 | - | 120 | 254 | 272 | 194 | - |
| Paddy* ² | 2,143 | 1,158 | 2,784 | 4,004 | 2,612 | 4,324 | 722 | 713 | 873 | 782 | 9,048 | 2,841 | 1,459 | 10,452 |
| Beans | 4,522 | 1,850 | 4,946 | 3,319 | 4,021 | 2,878 | 5,665 | 6,574 | 6,333 | 6,902 | 9,357 | 2,841 | 3,270 | 9,312 |
| Ground Nut | 4,570 | 5,407 | 12,774 | 12,400 | 6,442 | 4,200 | 3,130 | 6,913 | 3,402 | 3,455 | 911 | 371 | 177 | 241 |
| Sunflower* ³ | 572 | - | 639 | 292 | - | 220 | 667 | 728 | 208 | - | - | - | - | - |
| Sesame* ³ | 2,706 | 537 | 4,331 | 745 | 670 | 715 | 714 | 688 | 62 | 138 | - | - | - | - |
| Soybean* ³ | - | - | - | - | - | 390 | 1,105 | 1,105 | 300 | 513 | - | - | - | - |
| Sweet Potato | ,233 | 178 | 322 | 929 | 1,108 | 2,093 | 829 | 1,199 | 8,787 | 8,744 | 1,001 | 7,918 | 336 | 514 |
| Potato | - | - | - | - | - | - | 150 | 150 | 750 | 6,793 | - | - | 367 | 892 |
| Vegetables | 829 | 198 | 2,558 | 345 | 3,099 | 2,670 | 2,137 | 2,228 | 6,197 | 6,980 | 538 | 15,795 | 338 | 1,115 |
| Cashew nut with shell* ⁴ | 2,691 | 1,191 | 2,003 | 8,963 | 4,841 | 1,317 | - | - | - | - | - | - | - | - |
| Cotton* ³ | 15,623 | 1,838 | 3,583 | 1,153 | 211 | - | 1,234 | 2,346 | 208 | - | - | - | - | - |
| Tobacco | - | - | - | - | 12 | 75 | 1,642 | 1,226 | 580 | 423 | - | - | - | - |

*1 - Averages among 2006/11 / (Souce; DPAs of respective provinces), *2 - Data of Lichinga district is missing; *3 - Data of Niassa province is missing;

*4 - Production Average among 2003/11 Only in Nampula province (Source: INCAJU)

3.3.5. Localities of Crops

Familiar crops in the Study Area vary with the locations. The crops gradually changes from the eastern part to the western part, mainly in accordance with climate and altitude conditions in the area. Figure 3.3.3 shows the popularity of crops by districts. They are also illustrated in sub-chapter 4.2.2.



Source: The JICA stud team made based on DPAs' data and its field observation.

Figure 3.3.3 Localities of Crops in the Study Area

The Study Area are broadly divided into 3 types of zones in terms of staple food crops production and consumption, i.e. maize, cassava, sorghum, millet and rice, while maize and cassava are major staples in the area. The eastern part of the area is characterized by much consumption of cassava, while the other crops are placed in the supplementary position (Cassava dominant zone). On the contrary, the western part is characterized by much maize consumption (Maize dominant zone). Then, the middle area in between is characterized by mixed consumption of several staple crops, not only maize and cassava, but also sorghum, rice (paddy), etc. (Mixed zone). There are actually transition zones in between the 3 zones.

In addition, several kinds of beans and pulses are also important crops in the area. Haricot beans, cowpea, mungbean and ground nut are popular among farmers. As same as the staple crops, popularity of those crops varies with the locations (see Figure 3.3.3). Ground nut, which is also one of important crops, is grown mainly in the eastern part of the area. While soybean is attracted considerable attention in recent years in accordance with growth of chicken industry, the production is still limited mainly within the middle area.

Among traditional popular cash crops, cashew nut is concentrated in the eastern part of the area, while tobacco is just opposite. Cotton production areas are evenly scattered in the area. Sesame has been popular among farmers, mainly in the eastern part of the area.

3.3.6. Production Costs and Farmgate Prices of Agricultural Products

(1) Production Costs

A calculation of actual agricultural production costs in the Study Area is simple, since most of farmers inject a minimal capital into agricultural activities even for commercial purposes. Farmers fully depend on manual works, and limited farmers use inputs and paid labors for growing their basic crops. It is considered that the costs can be calculated based on a total man-day of the labor inputs and a common daily wage of farm labors.

Table 3.3.7 shows production costs of major crops in the Study Area, calculated in accordance with the above understanding. Farmers actually don't bear the calculated costs fully in terms of cash, since most of farmers much depend on family labor forces for their farming. The daily cost of labor forces in the calculation, 40MT/man-day, was determined by collected information through a field survey conducted in the targeted districts. The amounts paid to workers in the system of "win-win" practice (paid on ha basis) were mainly referred for the calculation, even though the amount varied with locations and kind of works. Though information of farm-labor wedge on daily or monthly basis was also collected by the survey, many interviewees tended to declare the wedge amount based on the government minimum wage instead of an actual wage. Then, total working man-days for each crop in the table were calculated based on collected information from DPA of Nampula province and TechnoServe.

Table 3.3.7 Estimated Production Costs of Major Crops

| Works | Crops (unit: man-day/ha) | | | | | | |
|---------------------|--------------------------|---------|---------|-------|---------------|------------|---------|
| | Mize | Cassava | Sorghum | Rice | Haricot Beans | Ground nut | Soybean |
| 1 Land preparation | 15 | 15 | 15 | 25 | 25 | 15 | 15 |
| 2 Crop management | 20 | 16 | 36 | 36 | 32 | 22 | 53 |
| 3 Harvesting & P/H | 19 | 20 | 11 | 11 | 11 | 16 | 20 |
| Total man-day | 54 | 51 | 62 | 72 | 58 | 53 | 88 |
| Total Costs (MT/ha) | 2,160 | 2,040 | 2,480 | 2,880 | 2,720 | 2,120 | 3,520 |

Note: 40MT/man-day is the base of cost calculation.

Source (man-day/ha): DPA, Nampula Province and TechnoServe (for soybean only)

(2) Farmgate Prices

The JICA study team made the following 3 kinds of surveys concerning farmers' selling price of major crops in the Study Area till August 2012.

- 1) Agricultural Field Survey (March – April, 2012)
- 2) Trade Inventory Survey (April – May, 2012)
- 3) Agricultural Market Survey in Nampula (July, 2012)

Table 3.3.8 shows an integrated result of the surveys. The prices actually varied with the locations and the seasons.

Table 3.3.8 Farmers' Selling Price of Major Crops (March – July, 2012)

| No | Crop | Price (MT/kg) | | No | Crop | Price (MT/kg) | |
|----|----------------------|---------------|-------------|----|-------------------|---------------|-------------|
| | | Average | Range | | | Average | Range |
| 1 | Maize (grain) | 4.2 | 3.0 - 5.0 | 14 | Sweet potato | 2.9 | 2.5 - 3.5 |
| 2 | Cassava (dry) | 2.4 | 2.0 - 3.5 | 15 | Potato | 4.8 | 4.5 - 6.0 |
| 3 | Sorghum (grain) | 4.9 | 4.0 - 6.5 | 16 | Onion | 15 | 10.0 - 20.0 |
| 4 | Millet (grain) | 14.9 | 14.5 - 15.0 | 17 | Tomato | 7.1 | 5.0 - 7.5 |
| 5 | Rice (paddy grain) | 4.2 | 3.5 - 5.0 | 18 | Cabbage | 8.8 | 8.0 - 10.0 |
| 6 | Wheat | - | - | 19 | Sesame seed | 23.0 | 20.0 - 25.0 |
| 7 | Ground nut (shelled) | 21.5 | 17.5 - 25.0 | 20 | Sunflower seed | 5.0 | 5.0 |
| 8 | Ground nut (w-shell) | 5.9 | 5.0 - 7.0 | 21 | Cashew-nut | 12.8 | 10.0 - 17.5 |
| 9 | Haricot beans | 19.5 | 18.0 - 25.0 | 22 | Banana | 6.7 | 6.0 - 7.0 |
| 10 | Cowpea | 5.6 | 5.0 - 7.5 | 23 | Sugarcane (plant) | 1.5 | 1.5 |
| 11 | Mungbean | 10.6 | 7.0 - 13.0 | 24 | Cotton | 15.0 | 15.0 |
| 12 | Pigeon pea | 12.8 | 10.0 - 18.0 | 25 | Tobacco | 60.0 | 60.0 |
| 13 | Soybean | 12.1 | 10.0 - 15.0 | | (high-quality) | | |

Source: The JICA study team

3.3.7. Animal Husbandry

Animal husbandry in the target districts of the Study Area, as well as the rest of the areas in the country, is characterized by a large predominance of extensive breeding except for a commercial production of broiler. The broiler industry has introduced an intensive breeding system using high inputs and technology. The following describes animal husbandry in the Study Area, according to collected data from the respective DPAs for the year 2011.

(1) Cattle

Total number of cattle in target districts was 42.1 thousand heads. Those districts in Nampula province grew 36,002 heads, representing 85.4% of the Study Area. The total number of the whole herds in three concerned provinces, 114.5 thousand heads, is less than 10% of the national total.

Table 3.3.9 Number of Cattle in the Study Area

| CATTLE | Target Districts (Study Area) | | | Province | |
|--------------|-------------------------------|---------------|--------------|----------------|--------------|
| | Head | % of Province | % of Country | Head | % of Country |
| Nampula | 36,002 | 57.9 | 2.9 | 62,213 | 5.0 |
| Zambezia | 3,778 | 9.1 | 0.3 | 41,345 | 3.3 |
| Niassa | 2,365 | 21.5 | 0.2 | 10,987 | 0.9 |
| Total | 42,145 | - | 3.4 | 114,545 | 9.2 |

Note: National total number is 1,250,000. (FAO 2010), Source: DPAs of respective provinces (2011)

(2) Goats

The three provinces grew 982.4 thousand heads, representing 20.5% of the national total. Only in the target districts, there were 294.4 thousand heads in total and the total number of the Study Area were divided by 86.6%, 3.9% and 9.5% by Nampula province, Zambezia province and Niassa province, respectively.

Table 3.3.10 Number of Goats in the Study Area

| GOATS | Target Districts (Study Area) | | | Province | |
|--------------|-------------------------------|---------------|--------------|----------------|--------------|
| | Head | % of Province | % of Country | Head | % of Country |
| Nampula | 254,928 | 38.7 | 5.3 | 658,603 | 13.7 |
| Zambezia | 11,429 | 4.5 | 0.2 | 254,375 | 5.3 |
| Niassa | 28,024 | 39.1 | 0.6 | 71,669 | 1.5 |
| Total | 294,381 | - | 6.1 | 984,647 | 20.5 |

Note: National total number is 4,800,000. (FAO 2010)

Source: DPAs of respective provinces (2011)

(3) Sheep

The data of DPAs in 2011 indicates that the target districts had 59.7 thousand heads of sheep, representing 25.0% of the total number of sheep of 238.4 thousand heads in the three provinces. However, these figures need to be confirmed, because the FAO statistics for 2010 indicates that the total number in of Mozambique was only 200 thousand heads, and the similar data of the Agricultural Census 2009-10, INE, counts the total of 220 thousand heads.

Table 3.3.11 Number of Sheep in the Study Area

| SHEEP | Target Districts (Study Area) | | | Province | |
|--------------|-------------------------------|---------------|--------------|----------------|--------------|
| | Head | % of Province | % of Country | Head | % of Country |
| Nampula | 46,204 | 26.5 | - | 174,093 | - |
| Zambezia | 6,372 | 11.5 | - | 55,395 | - |
| Niassa | 7,114 | 79.8 | - | 8,917 | - |
| Total | 59,690 | - | - | 238,405 | - |

Source: DPAs of respective provinces (2011)

(4) Swine (Pig)

The total number of swine in the three provinces was 243.2 thousand heads, representing 18% of the national total, and the target district grew only 78 thousand heads. The target districts in Nampula represent 89.6% of the Study Area.

Table 3.3.12 Number of Swine in the Study Area

| SWINE | Target Districts (Study Area) | | | Province | |
|--------------|-------------------------------|---------------|--------------|----------------|--------------|
| | Head | % of Province | % of Country | Head | % of Country |
| Nampula | 69,929 | 59.4 | 5.2 | 117,788 | 8.7 |
| Zambezia | 6,575 | 5.6 | 0.5 | 117,498 | 8.7 |
| Niassa | 1,544 | 19.5 | 0.1 | 7,900 | 0.6 |
| Total | 78,048 | - | 5.8 | 243,186 | 18.0 |

Note: National total number is 1,350,000. (FAO 2010)

Source: DPAs of respective provinces (2011)

(5) Chickens

The provinces of Namibia, Zambezia and Niassa had a total of 6.6 million chicken heads, representing 34.7% of the national total of 19 million (FAO). The target districts in the provinces of Nampula and Niassa contributed with 14.9% of the national total, and chicken breeding is an important agribusiness activity in those provinces.

Table 3.3.13 Number of Chicken in the Study Area

| CHICKENS | Target Districts (Study Area) | | | Province | |
|--------------|-------------------------------|---------------|--------------|------------------|--------------|
| | Head | % of Province | % of Country | Head | % of Country |
| Nampula | 1,181,188 | 53.0 | 6.2 | 2,227,000 | 11.7 |
| Zambezia | - | - | - | 1,204,104 | 6.3 |
| Niassa | 1,648,749 | 52.3 | 8.7 | 3,152,612 | 16.6 |
| Total | 2,829,937 | - | 14.9 | 6,583,716 | 34.7 |

Note: National total number is 19,000,000. (FAO 2010)

Source: DPAs of respective provinces (2011)

While aviculture in the Study Area is mainly shouldered by small-scale producers, a broiler chicken breeding by intensive system is realized mainly by agribusiness companies based in or in the suburbs of major cities. There are two (2) such companies in Nampula province. They manage a vertical production system from feed production, production of chicks, broiler breeding and slaughter until the marketing of the products. The increased demand for chicken feed in parallel with the demand for chicken meat impels the expansion of feed crops cultivation, mainly soybean in the east of Nampula province and in Gurue in Zambezia province. According to information from a poultry company, the company estimates that a market demand for chicken meat in the Study Area is from 30 to 50 ton/month and shows a very positive trend, and the local production is still insufficient to meet that demand. A considerable part of the marketed chicken in the Study Area is, therefore, supplemented by the imported chicken.

3.4. Agricultural Infrastructure and Irrigation

3.4.1. Present Condition and Issues of Irrigation Systems

(1) Inventory of Irrigation System

The development of irrigation systems had been proceeded and peaked in 1980's in the Study Area, as same with the remaining part of the country. After that, most of systems face the aging and malfunctioning of the facilities due to lack of adequate maintenance during and after the civil war period. As a result, the actual irrigated area had reduced significantly. The national inventory survey of the existing irrigation system was implemented in 2001 by the Irrigation Development Fund (Fundo para o Desenvolvimento da Hidráulica Agrícola : FDHA), and the provinces of the Study Area, Nampula, Zambezia and Niassa, were also included in the survey. The developed

inventory has been maintained and updated by DPAs with big effort, even though frequency is not sufficient due to lack of financial source. In addition, the inventory does not cover all of the systems and many of scattered small systems are not included. Thus, it is necessary to note that the inventory does not show the accurate area of irrigation farming. Furthermore, the inventory is not sufficient for appropriate management of irrigation systems, because of the insufficient accuracy of information as well as lack of location data in the inventory. Even though above problems, the inventory still has a considerable value because that is the only one information source which covers existing irrigation systems exactly.

(2) Present Condition and Use of Existing Irrigation Systems

Table 3.4.1 shows the number, area equipped and in-use³ and distribution of size of existing irrigation systems. According to the inventory of irrigation systems updated by DPAs, the irrigation equipped area in Nampula Province is 41,459 ha. Among that, the area in-use actually is 3,575 ha and it is less than 10% of the equipped area. This ratio is significantly lower than that of Zambezia Province, 26.7%. The reason of this difference is assumed that the data of Nampula includes some large scale developments for paddy by private investor in the coastal area, which are in quite preliminary stage. On the other hand, Niassa shows high ratio of in-use such as 81.3%. It is considered that irrigation had not been developed in Niassa and the area is still small.

In the Study Area, the irrigation area in-use is 3,022 ha, which is equivalent to 44.8% of the area equipped, 6,746 ha. The irrigation area not in-use at present, which is approximately 3,700 ha, is considered as the area which has a potential of recovery of the irrigation farming by rehabilitation of the existing facilities. In the most systems, small family farmers are doing their farming in the beneficiary area of the irrigation system regardless using irrigation or not. By rehabilitating and recovering the function of the system, it is expected to introduce new users in small and medium scale as well as to expand the irrigation use of the existing farmers with increased capacity of irrigation water supply. However, due to existence of scattered irrigation users, it is difficult to invite a large scale irrigation user to the rehabilitation of existing irrigation system.

The shares of small scale irrigation system less than 50 ha of equipped area are 55.6%, 59.5% and 90.6% for Nampula, Zambezia and Niassa Province respectively, which is higher than the national average of 51%. These provinces have a character that small scale system occupies larger part and the large scale system more than 500 ha is rare. This tendency is significant in the districts of the Study Area, where the system less

³ The area equipped irrigation system means the area where irrigation system had been developed once regardless in-use or not in-use at present, while the area in-use shows the area actually used for irrigation at present.

than 50 ha occupies 70.2% and only 1 large irrigation system more than 500 ha exists in Monapo District of Nampula Province. Furthermore, the irrigation system of which the area in-use is less than 10 ha occupies extremely high portion of 85.4% in the Study Area. That shows that only small irrigation systems are available in the Study Area.

Table 3.4.1 Number, Area, Operation and Size of Irrigation Systems in Nacala Corridor

| Province | Number of Systems | Irrigation Area (ha) | | Area equipped (No.) | | | Area in-operation (No.) | | |
|-------------------|-------------------|----------------------|----------------|---------------------|-------------|-----------|-------------------------|-------------|-----------|
| | | In operation | Area equipped | <50 ha | 50-500 ha | >500 ha | <10 ha | 10-100 ha | >100 ha |
| 1. Nampula | 128 | 3,575 8.6% | 41,459 100% | 69 55.6% | 50 40.3% | 5 4.0% | 108 90.0% | 11 9.2% | 1 0.8% |
| Within Study Area | 64 | 2,318 40.8% | 5,685 100% | 38 61.3% | 23 37.1% | 1 1.6% | 58 95.1% | 2 3.3% | 1 1.6% |
| 2. Zambezia | 74 | 3,427 26.7% | 12,850 100% | 44 59.5% | 27 36.5% | 3 4.1% | 44 59.5% | 23 31.1% | 7 9.5% |
| Within Study Area | 20 | 226 49.5% | 456 100% | 15 75.0% | 5 25.0% | 0 0.0% | 13 65.0% | 7 35.0% | 0 0.0% |
| 3. Niassa | 64 | 634 81.3% | 780 100% | 29 90.6% | 3 9.4% | 0 0.0% | 25 78.1% | 6 18.8% | 1 3.1% |
| Within Study Area | 22 | 478 79.0% | 605 100% | 20 90.9% | 2 9.1% | 0 0.0% | 17 77.3% | 4 18.2% | 1 4.5% |
| Study Area Total | 106 | 3,022 44.8% | 6,746 100% | 73 70.2% | 30 28.8% | 1 1.0% | 88 85.4% | 13 12.6% | 2 1.9% |

*1: Including Matanuska Banana Farm of 1,300/2,000 ha in Nampula Province

*2: Area data is not available for 3 systems in Nampula Province.

Source: DPA Nampula, DPA Zambezia, DPA Niassa

(3) Development of Irrigation System

In Nampula Province, 13 systems were completed the construction or rehabilitation till 2012 among 59 systems requiring construction or rehabilitation. These construction or rehabilitation work are conducted by the provincial government budget as a part of the improvement of productivity of the Action Plan for Food Production (PAPA). Some systems are implemented under the District Development Funds (FDD). The irrigation development implemented by those lines consists of construction or rehabilitation of dam and canal facilities, procurement of pump and related equipment, installing plastic or concrete tank, and delivering watering can.

As for the project implemented by DPAs, after the appraisal of request of farmers, all costs are covered by the government budgets for survey/design to construction, applicant farmers provide their labor during the construction without payment, and responsible to operation and maintenance after construction. In the case of FDD, districts approve the application of farmers/ associations and decide the project. FDD is operated as a revolving fund and farmers/ association shall return the cost. In general, the project cost of each project done by FDD is 300,000 to 400,000 MT for irrigation project.

In parallel with government support on irrigation schemes, many NGO and Funds support the farmers to install irrigation as a part of agricultural or rural development programs.

The DPA Nampula formulated the Strategic Plan of Development of Irrigation in Nampula (PEDHAN), which includes 5 years development plan, even though it has not yet approved officially at present. DPAs of Zambezia and Niassa Province have not yet formulated such plan at present.

3.4.2. Present Condition and Issues of Irrigation Farming

(1) General Situation

In the Study Area, the large scale irrigation farming can be observed in enterprise farm producing cash crop but the number is very limited. Most of irrigation is carried in small size farmland with small scale irrigation system. The small scale irrigation takes water for irrigation by direct withdrawal from rivers or ponds with man-power or pump, small dam constructed in small rivers/streams, or small reservoir excavated in the farmland. After collapse of state farms, the irrigation area distributed to small scale farmers. Additionally, the small scale irrigation is becoming popular in the area along the river or nearby the lake and marshes recently for cultivating valuable vegetables, where the manual irrigation with watering can or using small mobile pump. Not only the valuable vegetables but also grains such as maize are irrigated as supplemental irrigation in some area. Because the majority of irrigation in the Study Area is scattered small scale irrigation, the actual area of irrigation farming is difficult to clarify.

(2) Large Scale Irrigation

As mentioned above, large scale irrigation farm is very few in the Study Area as shown in Table 3.4.2. Enterprise farm with large scale irrigation is observed 1 in Nampula Province and 3 in Niassa Province. Large scale irrigation farms operated by enterprise adopt the modern irrigation technology and produce cash crop for export. Matanuska Company, which located in Monapo District of Nampula Province, operates 1,300 ha of irrigation area with water source of the Monapo River and its tributary and produces banana for export. It has a plan to expand irrigation area to 3,000 ha in near future. Micro sprinkler system is introduced for irrigation. Luambala Jatropa Company is located in Majune District of Niassa Province. It produces soybean in 145 ha of irrigation area with center pivot sprinkler system, besides producing Jatropa in 200 ha. Tenga Comapy in Majune District operates farmland with irrigation and produces Macadamia nuts for export. The Matama Irrigation System which was operated by the Malonda Foundation is transferred to a private company and cultivates 100 ha of soybeans at present. Those companies are established with foreign capital for

producing export materials, and private or company farm with Mozambican capital using large scale irrigation or adopting modern irrigation technology is not observed.

Table 3.4.2 Large Scale Irrigation Users in the Study Area

| Irrigation User | District/ Province | Water sources | Major Crop | Irrigated area / Total area (ha) | Irrigation system |
|-----------------------------------|--------------------|-----------------------------------|------------|----------------------------------|------------------------------|
| Matanuska | Monapo/ Nampula | Monapo River, Dam in Mikate River | Banana | 1,300/ 3,000 | Pump, Micro sprinkler |
| Tenga Ltd. | Majune/ Niassa | Lucheche River | Macadamia | | Pump |
| Luambala Jatrofa | Majune/ Niassa | Luambala Rlver | Soybean | 145/ 345 | Pump, Center pivot sprinkler |
| Insumos Agricola e Pecuraia (IAP) | Lichinga · Niassa | Lucheringo River | Soybeans | 100/ 300 | Canal |

Source: Study Team

(3) Small and Medium Scale Irrigation

1) Crop and Farm Management

Even though the medium scale irrigation system occupies 29% besides the small scale does 70% in the Study Area, the 85% of the system has less than 10ha of actual irrigation area. Furthermore, the majority of the irrigation users are small scale farmers whose irrigation area is less than 1 ha. In Nampula Province, most small users cultivate vegetables, such as onion, tomato, carrot, cabbage, spinach, kale, garlic, pepper, etc., with irrigation in a part of farm land where major part is used for food crop such as cassava and maize and cash crop such as tobacco and cotton by rain-fed cultivation. The produced vegetables are brought to local market by farmers and some of farmers bring to town market in Nampula. Most small irrigation farmers point out the transportation of product to market as one of the challenges on irrigation farming.

It is also observed that farmers cultivate paddy in the rainy season in the low and swampy land and cultivate vegetables in the same land just after harvesting paddy. Manual irrigation using watering can is used for supplemental irrigation for the vegetables in those area. This cropping pattern is considered as the one which fully uses of soil water effectively. The situation of mixed farming of rain-fed and irrigation farming is common in Zambezia and Niassa Province as well. In the Study Area of those provinces, supplemental irrigation for maize and beans are also observed widely. In Niassa Province, it is observed supplement irrigation is applied for potato as well.

2) Irrigation Practice and Management

It is general that farmers take and uplift water from streams or reservoirs by watering can manually or using small mobile pump. Gravity canal system is used where it is available, however, it is limited due to lack or abandon of system. Farmers apply water

to crops by furrow irrigation with gravity or localized basin irrigation manually. The number of farmers possessing own pump is still few and most farmers use watering can for conveying and applying water. Because the major part of labor work of irrigation is occupied by manual water conveyance, the demand of mobile pump is high among the small irrigation farmers. However, the cost of fuel is constraints for pump users due to lack of electric power in the rural area. Furthermore, the heavy labor work of manual irrigation of vegetables limits the irrigation area of each farm household and causes difficulty to expand their irrigation area.

As for the management of farm land in the small irrigation, three types are observed:

- Cooperative development, use and operation and maintenance (O/M) of irrigation facilities among the individual farm management
- Collaboration in specific farming practice among individual farm management
- Cooperative farming in the irrigation area

Collaboration in farming practice is observed in irrigation and transplanting of vegetable crops which take concentrative labor work. Cooperative farming is limited to the farming in the irrigation area and each farmer cultivates rain-fed farm land individually besides the cooperative irrigation land. Those cooperative work or collaboration works are carried out by farmers groups or associations. Irrigation system is also operated and maintained by farmers group or association which using the system. It is sometimes observed that community takes part into development and operation of small irrigation system.

In general, irrigation fee is not charged to users in small irrigation system, besides associations collect membership fee. The necessary activity for operation and maintenance work is implemented by labor participation of users, while users pay fuel cost in case pump is applied. When some amount of budget is necessary for repairing facilities or equipment, ad-hoc charge is collected from users, however, it is difficult to collect enough budget due to economic condition of small farmers. This causes the limitation of maintenance work by farmer's group or association and causes malfunctioning or abandon of irrigation system.

3) Irrigation System and Facility

The water source of small irrigation system is i) direct withdrawal from natural rivers by manual or small mobile pump, ii) small dams constructed in small rivers or streams, and iii) farm pond dug in a part of farmland. The irrigation area which developed in the former state farms divided among small farmers after collapse. Due to lack of knowledge, experience and finance source of small farmers, those irrigation systems are not maintained appropriately and the damage of dam and canal causes malfunction and abandon of the system.

Small dams in small rivers are usually constructed with concrete and reservoir using swamp and stream is built by earth dam in most case. The water stored in the dam or reservoir is delivered to farm lots through gravity canal, by manual or by pump. Because most small system has limited capacity of storing water, the available period of irrigation depends on the seasonal river flow. The systems rely the water source upon seasonal stream in Nampula Province, that is majority of small irrigation, can provide irrigation only 2 to 3 months after the dry period started, that is up to June or July. Even in the rivers which have relatively abundant flow, the water level decreases significantly in October and November so that farmers face difficulty to take water. Thus, the cultivation in the small irrigation system is limited to vegetable crops, of which cultivation period is short, or supplement irrigation of rain-fed crops.

In general, the structure of small scale irrigation facility is simple and there are many cases that inadequate treatment of foundation or lack of stability of dam body is observed. In Nampula Province, some concrete dams built by DPA/MINAG are damaged and collapsed by water leaking and scoring under the foundation. It can be considered that there are problems in the investigation and design of dam body and foundation as well as quality management during the construction stage.

(4) Issues in Irrigation Development

Issues in irrigation development found in the Study are summarized as below:

- 1) Technical level of construction of hydraulic facilities
 - Lack of construction company which has adequate technical skill and experience of hydraulic structure.
 - Lack of knowledge and experience of administrations for supervising the construction work from technical aspects.
- 2) Investment for irrigation development
 - Lack of financial source of farmers for procuring pump, repair and re-construction of irrigation facilities.
- 3) Target crop and market
 - Development of market, shipping and distribution of products
- 4) Operation and maintenance of irrigation system
 - Lack of knowledge and experience of farmer, farmer's group and association
 - Lack of finance for maintaining facilities,
- 5) Irrigation practice and water management in the field
 - Labor intensive irrigation and cultivation management of vegetables limit the expansion of irrigation area of each household.
- 6) Capability of administration for managing irrigation development

- Inventory and database of irrigation systems is necessary to be developed and updated for adequate management by administrations.
- 7) Collection and organizing agricultural climate and hydrological data
- Lack of basic data for planning and designing irrigation such as agricultural climate and hydrological data.

3.4.3. Use and Management of Water Resources

(1) Water License⁴ and Water Fee Collection

ARA is responsible for development and management of water resources. In the Study Area, the districts of Niassa Province except for Cuamba are under the jurisdiction of ARA Norte (ARA-N), while the remaining districts are under the jurisdiction of ARA Centro Norte (ARA-CN). ARA controls use of water resources such as rivers, lake and marshes and dams by registration of users and issuing the water license. ARA is required to manage its activity by financial autonomy through collecting water fee from users under its jurisdiction. At present, water fee is charged only to large scale users such as FIPAG, water authority to supply city water, industrial users and irrigation users more than 500 ha. Small irrigation users or small consumers are neither registered nor charged water fee.

(2) Water License in the Study Area

The present issued water license in the Study Area is summarized as shown in Table 3.4.3. In the jurisdiction of ARA-CN, 6 licenses, of which total amount is 60.8 million m³/year, are concluded and issued in the Study Area. 3 licenses are for the purpose of public water supply in Nampula, Cuamba, Gurue, 1 license is for irrigation, and 1 license is for forestry use. The license for irrigation purpose occupies 84.6% of the amount of water, of which is prior user is Matanuska Banana Farm of 3,000 ha (Monapo River). Besides this, the water users in forestry sector uses irrigation of nursery trees in Gurue District (Licungo River). By the water source, the Monapo River including the Nampula Dam consists of half of licenses issued and the total amount of water occupies 94.5% among whole licenses. The River is considered as one of the most developed water resources in the Study Area.

In ARA-N jurisdiction, 7 licenses with total amount of 3.9 million m³/year are concluded and issued, of which 1 is for public water supply in Lichinga, 3 for irrigation purpose (2 in Majune and 1 in Lichinga District), 3 for forestry purpose (2 in Lichinga and 1 in Sanga District). The forestry purpose is standing out comparing with ARA-CN. For the amount of water, irrigation purpose occupies 55.6% and forestry purpose occupies 20.7%. The licenses for irrigation purpose are issued to Luamba Jatropa Farm which

⁴ Water license includes License and Concession as described in 2.5.1.

produces jatropa and soybean in Majune District, Tenga Farm which produces macadamia nuts in Majune District, and IAP Farm which produces soybean in Lichinga District. The licenses are concentrated in the Lichinga and Majune District and it shows the water resource in those districts is well developed. All license issued by ARA-N in the study Area at moment are provisional license which shall be renewal every year. These licenses are in the transition period for inspecting actual usage and are planned to be switched to the regular license in near future.

Table 3.4.3 Registered License/ Concession for Water Use in the Study Area

| a) By Purpose of Water Use | | | | | b) By River Basin / District | | | | |
|----------------------------|---------------------|-------------------|------------------------|-------|------------------------------|-------------------|------------------------|-------|--|
| ARA | Purpose | Number of License | Amount of water | | ARA | River / District | Amount of water | | |
| | | | (m ³ /year) | (%) | | | (m ³ /year) | (%) | |
| Centro-Norte | Public water supply | 3 | 6,963,600 | 11.4% | Centro-Norte | Monapo River | 57,500,000 | 94.5% | |
| | Irrigation | 1 | 51,500,000 | 84.6% | | Licungo River | 3,360,000 | 5.5% | |
| | Forestry | 1 | 2,400,000 | 3.9% | | Metucue River | 3,600 | 0.0% | |
| | Total | 6 | 60,863,600 | 100% | | Total | 60,863,600 | 100% | |
| Norte | Public water supply | 1 | 924,840 | 23.7% | Norte | Lichinga District | 1,633,374 | 41.8% | |
| | Irrigation | 3 | 2,174,454 | 55.6% | | Majune District | 2,160,000 | 55.2% | |
| | Forestry | 3 | 810,720 | 20.7% | | Sanga District | 116,640 | 3.0% | |
| | Total | 7 | 3,910,014 | 100% | | Total | 3,910,014 | 100% | |

Source: ARA Norte, ARA Centro-Norte, as of 2012

(3) Small and Medium Scale Irrigation Users in the Water Resources Management

According to the concept of the Water Law, common use including small scale farming is free and except from license. Besides that, only large irrigation user more than 500 ha is considered in the water resources management through water license system at present. It is necessary to take account of small and medium irrigation users in order to implement appropriate and effective water resources management. In consideration with the economic situation of small and medium irrigation farmers and the fact that irrigation farming is still in developing stage, it is necessary that all users shall be registered their water use, even though charged or not.

3.5. Agricultural Supporting System

3.5.1. Agricultural Research

(1) IIAM's Zonal Research Centers

IIAM has 2 zonal research centers covering the Study Area, i.e. the North East Center (IIAM CZnd) in Nampula and the North West Center (IIAM CZnw) in Lichinga. Among

districts in the area, the IIAM CZnd covers all districts in Nampula province except for Malema district, while the IIAM CZnw covers Malema district and all districts in Zambezia and Niassa provinces. The both centers have experimental units as shows in Table 3.5.1.

Table 3.5.1 Experimental Units of IIAM CZnd and CZnw

| Research Center | Experimental Unit | Province/ District | Area (ha) | Agro-ecological Region | Notes |
|-------------------------|--|-----------------------|-----------|------------------------|----------------|
| IIAM CZnd ^{*a} | Nampula agriculture station | Nampula | 330 | R7 | |
| | Namialo cotton seed multiplication and research center | Nampula/ Maconta | 347 | R7 | |
| | Mapupulo research center | C. Delgado/ Montepuez | 40 | R7 | |
| | Nacaca agriculture sub-station | C. Delgado/ Namuno | 50 | R7 | |
| | Napaha agriculture sub-station | C. Delgado/ Namuno | 8,000 | R7 | No functioning |
| | Nametil agriculture sub-station | Nampula/ Mogovolas | 1,014 | R8 | |
| | Ribaue agriculture sub-station | Nampula/ Ribaue | 2,572 | R7 | |
| | Namapa agriculture sub-station | Nampula /Namapa | 1,000 | R7 | |
| | Caju research sub-station | Nampula/ Meconta | 12,394 | R7/R8 | |
| | Veterinary regional laboratory | Nampula | - | R7 | |
| IIAM CZnw ^{*b} | Lichinga agriculture station | Niassa/Lichinga City | NA | R10 | |
| | Mutequelese (Gurue) agriculture sub-station | Zambezia/Gurue | NA | R10 | |
| | Mutuari agriculture sub-station | Nampula/Malema | 3,000 | R7 | |

Source: ^{*a}. Plano Estratégico do Centro Zonal Nordeste para o período 2011-2015, 2011, IIAMCZnd

^{*b}. The Preparation Survey on Triangular Cooperation for Tropical Savannah Agricultural Development in Mozambique

(2) Research Strategy

Each of the IIAM CZnd and the IIAM CZnw has strategic crops for their R&D activities in 2011 to 15 as shown in Table 3.5.2. The IIAM CZnd defined the high influence and medium to high influence crops in their research jurisdiction area.

Table 3.5.2 Strategic Crops and Commodities of the IIAM CZnd and CZnw

| Zonal Center | High influence crops/commodities | Medium to high influence crops/commodities |
|--------------|--|---|
| CZnd | Cassava, Maize, Beans (cowpea, mung-beans), Ground nut, Cotton, Cashew nut, Poultry | Sorghum, Paddy, Sesame, Pigeon pea, Eggs, Meat (cattle, pigs, goats), Woods |
| CZnw | Cereals (Maize and Sorghum), Legumes, Cassava, Sweet potato, Vegetables, Ground nut, Wheat, Sesame, Potato, Soybean, Tobacco, Cotton, Tea, Chicken | |

Source: Plano Estratégico do Centro Zonal Nordeste para o período 2011-2015, 2011, IIAMCZnd

The IIAM CZnd and CZnw set the practical strategic targets based on the following IIAM 5 strategic targets, as well as their strategic crops.

- 1) High productivity, stable yield, basic sustainability of supply chains
- 2) Establishing competitive cash crop supply chain
- 3) Food security, nutrition and health
- 4) Sustainable use of ecosystem

5) Interaction and integration for IIAM's sustainability

(3) Human Resources

The IIAM CZnd has 32 researchers (PhD, Masters and Graduates) and 33 technical support agricultural researchers, in addition to 22 basic level and 71 elemental level technicians. The IIAM CZnw has 12 researchers (Masters and Graduates). Some experts play a leading role in the national research in the field of grains, legumes, roots and tubers, cashew nuts, sesame and cotton, and in multidisciplinary subjects (soils, entomology, plant pathology, and socio-economics). While few specialized researchers exist in the both centers, they are concentrated to headquarters of the centers.

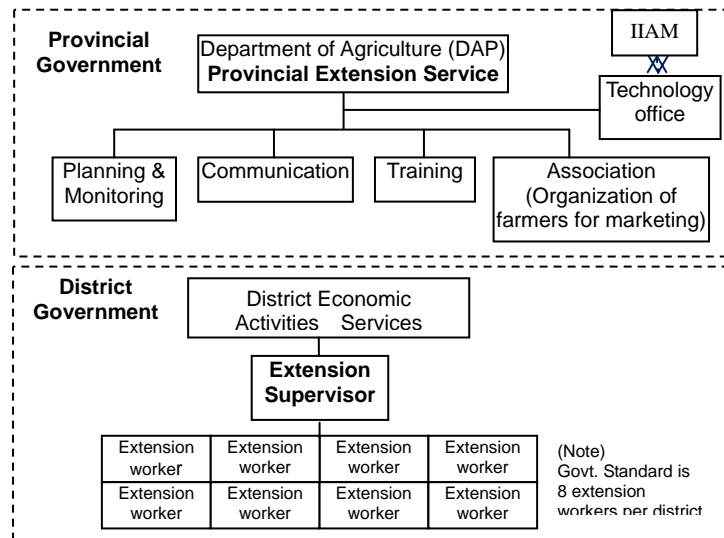
(4) Partners

In addition to research partners mentioned in 2.4.1, IIAM has launched joint research activities with JICA and EMBRAPA in Brazil through the Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique. This project is based on the tropical savannah agricultural development framework by Japan and Brazil cooperation (ProSAVANA), and aim to develop appropriate agriculture technologies to the Nacala Corridor area and to encourage research capacity of the IIAM CZnd and CZnw.

3.5.2. Agricultural Extension

The District Economic Activities Services (SDAE) is responsible for agricultural extension service at field level after decentralization of the extension governance. Before the year of 2000/01, an extension supervisor who supervises the activities of extension workers was allocated to each post which is the lower administrative unit after district. A district consists of several posts in general. There were 8 extension workers under an Extension Supervisor or in each Post according to the government standard at that time.

After 2000/01, only one extension supervisor has been allocated to each district (SDAE). Simultaneously, the number of extension workers in each district has been reduced. Only 8 extension workers are working in a district according to the present government standard. The actual number of the extension workers is, however, below the government standards, 5



Source: JICA Study Team (Interview from DAP, Nampula Province)

Figure 3.5.1 Concerned Government Organizations to Agricultural Extension Service

to 6 workers per district in average. Consequently, the total number of extension workers has been drastically reduced since 2000/01.

The extension workers are providing technical support mainly to small-scale farmers in their jurisdiction area. The following services are covered by their regular activities. The extension workers are expected to provide a technical service under close linkage with other institutions, such as research, agricultural services and marketing institutions, according to SUE (the United Extension System) of MINAG

- 1) Providing a technical support to 8 farmers groups
- 2) Facilitating farmers to organize farmers associations (2-3 associations)
- 3) Managing of a demonstration field through entrusting to a contact farmer
- 4) Managing a demonstration field (1 ha) under supervision of IIAM/IITA (PITA)

Beside the above regular works, they are working for many government or donor funded programs to distribute farming inputs to farmers.

Agricultural extension service has largely been undertaken by private sector, such as NGOs and service providers in the country. The extension service has historically been carried out or associated with specific commercial activities, such as cotton and tobacco production. Many farmers were given technical information on the use of chemical fertilizers and pesticides through their experience as an out grower of cotton or tobacco industry under contract.

Considering the situation, the SUE seeks functional partnerships between public and private extension services, including the development of public contract with non-government service providers. The following NGOs and cotton companies are

recognized by Nampula DAP as agricultural extension service providers. Nampula DPA organizes an annual coordination meeting with major NGOs.

- 1) NGOs
Save the Children, CLUSA, Care/Proj Sementes, Adap/SF, Essor, OIKOS, V.Mundial, Actined, Olipa Odes, Ophavela, Kulima, Africare
- 2) Cotton companies
Sanam, OLAM, CANAM, SAM, PLEXUS

3.5.3. Farmers Organization

(1) Present Status of Farmers' Organization

In the Study Area, there are many farmers' associations at the village level. Complex of two or more farmers' association is a forum (Foro) (referred to as the Union (União) by province), and there are rural forum (Faro rural) and district forum (Faro detrital). DPA is promoting that the farmers' association will be formed to the forum. In addition, there is a federation (Federação) of provincial level in some province (referred to as the Union (União provincial) by province).

The role and object of each organization are as follows:

Association: a group of people who get together to pursue a common objective. In Mozambique, the legislation states that the minimum number of people to constitute an association is 10. Their objects are as follows:

- To defend the interests of members (farmers and pastoralists);
- To hear the wishes and desires of the residents of the area;
- To promote the socio-economic development of the area, proposing business ideas or alternative projects;
- To sell the agricultural and livestock productions in the area; and
- To strengthen the spirit of solidarity and mutual aid.

Forum: a group of legal associations of the same geographical area facing the similar constraints who get together to facilitate problem solving. **Regional Union:** is equivalent to forum. This concept is used in the Niassa province. **District Union:** a group of forums based in the same district. Their objects are as follows:

- To defend the interests of members;
- To assist members in preparing projects for the development of the associations;
- To find markets to assist in marketing products of members;
- To help solve the existing problems within the association;
- To sensitizes and morality association so that does not dissolve.

Federation: a group of district unions which is open for forum and association to join directly. Their objects are as follows:

- To mobilize the assist and organize agricultural cooperatives and associations affiliated;
- To promote the development of activities of cooperatives or associations affiliated to them;
- To provide technical assistance in agricultural machinery and equipment and livestock to its members;
- To provide appropriate mechanisms for commercialization of the production with a view to realizing a profit;
- To provide facilities together credits from banks or other;
- To promote programs, training courses and charities for members of affiliated associations and cooperatives and their families to foster the spirit of saving.

Regarding the relationships with the Association and the Forum is as follows: 1) The forum is the home of associations; 2) The forum outlines policies and implementation strategies within their states that are members; and 3) The associations are accountable to the forum which they belonging. If the association of two or more gathered is considered to be the forum. The number of average, about 15 associations is the principle. The quota set for the associations by each forum usually would be 100.00 to 200.00 MT annually.

(2) Inventory Survey

1) Methodology

In this Study, Inventory Survey of farmers' organizations was conducted. The objective of the Inventory Survey was to identify the present conditions and the problems on management as well as the development of each farmers' organization. In order to achieve this objective, following activities were carried out. Primary and secondary data have been collected from the Provincial Directorate of Agriculture (DPAs) of the 3 provinces, District Services of Economic Activities (SDAEs) and Districts Government of the 14 districts. In every district 10 farmers' associations were selected as sample to fill in the questionnaire, and data collection was done through direct contact with each farmers' organization in sample of 10 organization in each district for an exhaustive assessment of the information about the structure, functioning, legal and financial situation. There were four workshops to be run with representatives of farmers' organizations at forum and district levels.

2) Result of Survey

Results of the inventory survey on farmers' organizations are as follows.

Table 3.5.3 Number of Farmers' Associations

| Province | District | Total No of Ass. | Legal Ass. | Number of Members | | | Non Legal Ass. | Number of Members | | | Total Members |
|--------------------|---------------------|------------------|---------------|-------------------|---------------|---------------|----------------|-------------------|---------------|---------------|---------------|
| | | | | M | W | Total | | M | W | Total | |
| Nampula | 1) Monapo | 108 | 77 | 1,108 | 513 | 1,621 | 31 | 258 | 129 | 387 | 2,008 |
| | 2) Muecate | 44 | 23 | 303 | 136 | 439 | 21 | 183 | 115 | 298 | 737 |
| | 3) Meconta | 114 | 93 | 1,508 | 760 | 2,268 | 21 | 217 | 168 | 385 | 2,653 |
| | 4) Mogovolas | 92 | 52 | 582 | 290 | 872 | 40 | 447 | 166 | 613 | 1,485 |
| | 5) Rapale (Nampula) | 151 | 61 | 707 | 583 | 1,290 | 90 | 927 | 500 | 1,427 | 2,717 |
| | 6) Murrupula | 90 | 50 | 499 | 452 | 951 | 40 | 456 | 422 | 878 | 1,829 |
| | 7) Ribaua | 70 | 23 | 396 | 142 | 538 | 47 | 654 | 272 | 926 | 1,464 |
| | 8) Malema | 114 | 94 | 1,822 | 559 | 2,381 | 20 | 196 | 89 | 285 | 2,666 |
| | Total | 783 | 473 | 6,925 | 3,435 | 10,360 | 310 | 3,338 | 1,861 | 5,199 | 15,559 |
| Zambebe | 1) Alto Molocue | 65 | 31 | 364 | 381 | 745 | 34 | 517 | 349 | 866 | 1,611 |
| | 2) Gurue | 279 | 107 | 2,932 | 1,413 | 4,345 | 172 | 3,737 | 2,256 | 5,993 | 10,338 |
| | Total | 344 | 138 | 3,296 | 1,794 | 5,090 | 206 | 4,254 | 2,605 | 6,859 | 11,949 |
| Niassa | 1) Cuamba | 102 | 11 | 156 | 99 | 255 | 91 | 1,589 | 716 | 2,305 | 2,560 |
| | 2) Mandimba | 72 | 34 | 488 | 519 | 1,007 | 38 | 399 | 731 | 1,130 | 2,137 |
| | 3) Nguama | 27 | 9 | 62 | 67 | 129 | 18 | 124 | 91 | 215 | 344 |
| | 4) Lichinga | 49 | 20 | 215 | 143 | 358 | 29 | 223 | 168 | 391 | 749 |
| | Total | 250 | 74 | 921 | 828 | 1,749 | 176 | 2,335 | 1,706 | 4,041 | 5,790 |
| Grand Total | 1,377 | 685 | 11,142 | 6,057 | 17,199 | 692 | 9,927 | 6,172 | 16,099 | 33,298 | |

Source: JICA Study Team

In the Study Area, a total number of 1,377 farmers' associations is existing. Half of the total is legal organization. There are 783 associations in the Nampula province, 344 associations in the Zambezia province and 250 associations in the Niassa province. The average number of association members, is 19.9 members in Nampula, 34.7 members in Zambezia and 23.2 members in Niassa, a very large number of members is observed in Zambezia. The overall average is 24.2 members per association. Configuration of the ratio of male to female is 66:34 in Nampula, 63:37 in Zambezia and 56:44 in Niassa, and the proportion of women in the Niassa province is relatively high. The overall average is 63:37. Unionization rates for the whole farm household are lower 2 to 8%. However, only in the Gurue district is high as 17.8%. In the Nampula province is 5.0%, 12.8% in Zambezia province, 5.2% in Niassa province, and the overall average is 6.4%.

In addition, the results of a survey on federation and forums are shown in Table 3.5.4:

Table 3.5.4 Number of Federations and Forums

| Province | District | Total Number | Number of Legal Organization | Number of Member's Forum/Union or Association | Number of Members | | Number of Non Legal Organization | Number of Member's Forum/Union or Association | Number of Members | |
|--------------------|--|--------------|------------------------------|---|-------------------|----------|----------------------------------|---|-------------------|-------|
| | | | | | Men | Women | | | Men | Women |
| Nampula | Number of Federation/Union at Provincial Level | 1 | 1 | | | | | | | |
| | Number of Forum/Union at District Level | 7 | 7 | | | | | | | |
| | 1) Monapo | 5 | 5 | 2,008 | 1366 | 642 | 0 | | | |
| | 2) Muecate | 4 | 4 | 737 | 486 | 251 | 0 | | | |
| | 3) Meconta | 3 | 4 | 2653 | 1,725 | 928 | 0 | | | |
| | 4) Mogovolas | 5 | 5 | 1485 | 1029 | 456 | 0 | | | |
| | 5) Nampula Dist (Rapale) | 7 | 7 | 2717 | 1634 | 1083 | 0 | | | |
| | 6) Murrupula | 10 | 6 | 919 | 485 | 434 | 4 | 910 | 470 | 440 |
| | 7) Ribaua | 8 | 7 | 1464 | 1050 | 414 | | | | |
| | 8) Malema | 16 | 16 | 2666 | 2018 | 648 | 0 | | | |
| Total | 66 | 62 | 14,649 | 9,793 | 4,856 | 4 | 910 | 470 | 440 | |
| Zambezia | Number of Federation/Union at Provincial Level | - | - | | | | | | | |
| | Number of Forum/Union at District Level | 2 | 2 | | | | | | | |
| | 1) Alto Molocue | 6 | 6 | 1,611 | 881 | 730 | | | | |
| 2) Gurue | 21 | 21 | 10,398 | 6,669 | 3,669 | 0 | | | | |
| Total | 29 | 29 | 11,949 | 7,550 | 4,399 | 0 | 0 | 0 | 0 | |
| Niassa | Number of Federation/Union at Provincial Level | 1 | 1 | | | | | | | |
| | Number of Forum/Union at District Level | 3 | 3 | | | | | | | |
| | 1) Cuamba | 9 | 9 | 2,560 | 1,745 | 815 | 0 | | | |
| | 2) Mandimba | 8 | 8 | 2,137 | 887 | 1,250 | 0 | | | |
| | 3) Nguama | 4 | 2 | 155 | 74 | 81 | 2 | 189 | 112 | 77 |
| | 4) Lichinga | 7 | 7 | 749 | 438 | 311 | 0 | | | |
| Total | 32 | 30 | 5,601 | 3,144 | 2,457 | 2 | 189 | 112 | 77 | |
| Grand Total | 127 | 121 | 32,199 | 20,487 | 11,712 | 6 | 1,099 | 582 | 517 | |

Source: JICA Study Team

In the Zambezia province, a federation of provincial level does not exist. There is also district has no forum of district level. Each district has local forums of 2 to 16, with a total of 127 local forums in the Study Area. Forums are mostly legal organizations.

However, it is considerable a part of the survey results is problematic. The data provided by DPAs and SDAEs are not consistent if compared with the real number of associations provided by NGOs that operate in the same district. And most of cases there are no detailed data regarding the number of associations, its legal situation and number of members. For example, in Monapo SDAE provided 44 as total number of associations and AFRICARE is assisting more than 200 associations. The data collected from SDAE in Gurue gives a number of 145 associations and CLUSA assists around 177 associations and local federation has 127 members associations. It clearly shows that SDAE does not have the updated data about existing farmers' organizations in the district.

3) Case Analysis

Best practice of the organization activity and its success factors

Some of the best practices that farmers have reported during the workshops are use of grain storage for conservation of agricultural products, such as maize, beans, and other grains. Another good practice is the use of some plants leaves and animal excrements as fertilizers. And also the use of some plant leaves as pesticides to combat some pests. Apart from these practices a good collaboration between the unions, negotiating and managing contracts for market intermediation, and training associations in access to information are practices to be incentivized.

Case of failure of the organization activity and its failure factors

- Failure of Fulfillment of contract due to low production quantity of each member;
- Low credit repayment due to lack of management skills and viability of agriculture;
- and
- Lack of member ownership due to internal governance.

3.5.4 Agricultural Inputs

(1) Seeds

Only a few farmers use quality seeds in Mozambique. Table 3.5.5 shows that 6-10 % of farm-households used improved seeds for maize, which is the most popular crop among farmers in Mozambique, in 2005-2007. The JICA study team confirmed through its field survey in 2012 that most interviewee farmers use their own seeds or exchanged/purchased seeds from neighbors, except for vegetables, cotton and tobacco. Seeds of cotton and tobacco are provided for a price from a contracted company together with other necessary inputs, e.g. fertilizers and pesticides.

Table 3.5.5 % of Farm-households using Improved Maize Seeds

| Province | 2005 | 2006 | 2007 |
|-----------------|----------|----------|-----------|
| Niassa | 6 | 9 | 5 |
| Cabo Delgado | 1 | 2 | 3 |
| Nampula | 6 | 7 | 6 |
| Zambezia | 5 | 9 | 11 |
| Tete | 11 | 17 | 24 |
| Manica | 10 | 18 | 20 |
| Sofala | 5 | 9 | 8 |
| Inhambane | 4 | 3 | 5 |
| Gaza | 2 | 10 | 5 |
| Maputo | 10 | 13 | 14 |
| National | 6 | 9 | 10 |

Source: TIA 2007, MINAG

Basic seeds are only produced by USEBA (Basic Seed Production Unit) of IIAM, while USEBA sometimes contracts to produce the seeds to a private seed grower. The basic seeds are, then, multiplied to certified seeds by seed growing companies. There are only 18 companies producing the seeds, while there are 35 registered seed companies according to Business Indicators Mozambique, World Bank, April 2012. They produced around 6,000 to 7,000 ton of certified seeds per year in 2007/08-09/10 as shown in Table 3.5.6 The seeds produced were mainly cereals and

beans seeds. There was no production of certified seeds of vegetables in Mozambique.

A legal and regulatory framework of seed quality control and registration has already been established in Mozambique. But the framework is not functioning well at field level due to lack of field inspectors, seed testing laboratories, etc.

There are several small-scale seed companies newly started their business within recent years at district level. While they have already registered to MINAG through DPA, no information is available whether they are included in

Table 3.5.6 Certified Seed Production in Mozambique

| Crop | Year (unit: ton) | | |
|------------|------------------|---------|---------|
| | 2007/08 | 2008/09 | 2009/10 |
| Maize | 3,388.6 | 793.1 | 1,739.7 |
| Rice | 1,070.2 | 3,379.4 | 4,143.0 |
| Millet | 479.6 | 100.4 | 36.0 |
| Sorghum | 30.0 | 6.0 | 4.0 |
| Wheat | 150.0 | - | - |
| Beans | 221.8 | 5.5 | 7.1 |
| Cowpea | 458.6 | 520.9 | 60.9 |
| Pigeon-pea | 2.0 | - | - |
| Soybean | 112.4 | 17.5 | 18.0 |
| Sunflower | 53.6 | - | - |
| Groundnut | 346.9 | 342.5 | 13.3 |
| Sesame | 34.5 | 191.4 | - |
| Potato | 774.0 | 400.0 | 115.0 |
| Total | 7,122.2 | 5,756.7 | 6,137.0 |

Source: Seed Department/DNSA, MINAG

the 35 companies mentioned above or not. Most of them get a financial assistance from NGO or donor agency. They have following problems for running the seeds business.

- 1) Heavy government intervention to seed business (SEMOC) and distribution
- 2) Lack of working fund (difficult to get a bank loan)
- 3) Low quality of basic seeds distributed by IIAM
- 4) Difficult to access to seed processing plants

The government program, through the Seed Department of MINAG and PDAs, has been promoting seed production by individual farmers and farmer groups in cooperation with NGOs. The seeds of maize, rice, groundnut, sesame and beans are produced under the program. About 6,000 ton of seeds were produced per year in 2005/06-2009/10, according to the Seed Department of MINAG. Though the produced seeds are not certified seeds, they are distributed to local farmers through farmer groups, cooperatives, private traders and even government support programs.

Table 3.5.7 shows that around 10,000 ton of certified seeds were sold in 2011. The table also implies that only three companies, SEMOC, MozFoods and PANNER dominate the local seeds market. They are also major seed growing companies in the country.

Table 3.5.7 Estimates of Certified Seed Sales in Mozambique in 2011

| Company | Type of Seeds | Quantity (ton) |
|--------------------|---|----------------|
| 1 SEMOC | maize(OPV), beans, rice, sorghum, peanuts | 5,000 |
| 2 MozFoods (MIA) | rice, maize (OPV & Hybrid), wheat, beans | 2,050 |
| 3 PANNAR | maize (OPV & Hybrid), sorghum, peanuts | 1,500-2,000 |
| 4 Dengo Comercial | maize (OPV & Hybrid), beans, sorghum, etc. | 555 |
| 5 Morais Comercial | maize (OPV & Hybrid), beans, peanuts, horticulture crops | 270 |
| 6 IKURU | maize (OPV & Hybrid), soybeans, peanuts, beans, sesame | 250 |
| 7 Lozane Farms | maize (OPV & Hybrid), beans, sorghum, soybeans | 168 |
| 8 others | maize (OPV & Hybrid), beans, horticulture crops, sesame, etc. | 136.5-141.5 |
| Total | | 10,182 |

Source: SDC (Swiss Development Corporation) Seed Study, 2011

A gap between the seeds produced and sold must be complemented by the import, while PANNAR exports its products to neighboring countries 2,500-3,000 ton/year. The amount of imported seeds is unknown. It is estimated that the seeds of maize, wheat, horticultural crops (vegetables) and potato might be major imported one.

The government is the main supply source of seeds to farmers through PAPA as shown in Table 3.5.8. The PAPA seeds are procured from local companies through public tenders, and SDAEs are responsible for the distribution. The PAPA seeds distributed to farmers at about 50% of the actual costs. SEMOC must be a major supplier of PAPA seeds, since it sells about 90 % of its seeds to MINAG programs.

SEMOC has been fully owned by the government after withdrawal of a partner shareholder, who had a majority of the share.

IFDC (International Fertilizer Development Centre) also implemented a subsidized inputs distribution of program in cooperation with EU and FAO in 2009/10 and 2010/11. Packaged inputs (seeds and fertilizers) for maize and rice were distributed through voucher system in Sofala, Zambezia, Manica, Nampula and Tete provinces. Figure 3.5.2 shows seed distribution flow to farmers in Mozambique.

Table 3.5.8 PAPA Seed Distribution

| Crop | Unit | Year | |
|--------------------|------|---------|---------|
| | | 2008/09 | 2009/10 |
| Maize | ton | 1,679.0 | 2,127.0 |
| Rice | ton | 697.8 | 2,000.0 |
| Wheat | ton | 1,152.0 | 1,350.0 |
| Beans | ton | - | 107.0 |
| Soybean | ton | 300.0 | 100.0 |
| Sunflower | ton | 75.0 | - |
| Potato | ton | 1,265.0 | 1,995.0 |
| Horticulture crops | kg | - | 2,204.0 |
| Total | | 5,168.8 | 7,681.2 |

Source: Seed Department/DNSA, MINAG

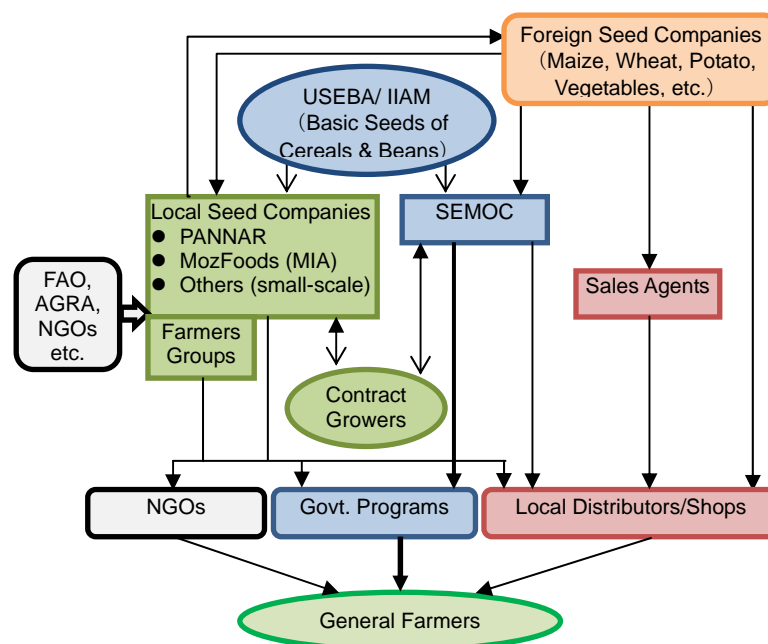


Figure 3.5.2 Seed Production and Distribution in Mozambique

(2) Fertilizers

As same as quality seeds, only a limited number of farmers use chemical fertilizers in Mozambique as shown in Table 3.5.9. While the % in Niassa, Tete and Maputo provinces is higher than the other provinces, the high % represents a larger planted are of crops, tobacco, sugarcane and vegetables on which fertilizers are manly used.

It is estimated that only around 30–50 thousand ton of chemical fertilizers were used per year in 2006 - 2010 as shown in Table 3.5.10. They were mainly applied to

tobacco and sugarcane. Few fertilizers were used on cotton while it is also an important cash crop in the country. The fertilizers popular among farmers in the country are, NPK (12-12-12 & 12-24-12), Urea, DAP and CAN.

Several sources suggest that the fewer farmers' demand on fertilizers is because of limited access to input credit and high

price of fertilizers in Mozambique. There is no government program to distribute subsidized fertilizers, while the government has provided seeds and farm machinery through PAPA. Subsidized fertilizers are

distributed together with other inputs only by NGOs and donor's supporting projects.

In contrast to the seed business, fertilizer business in Mozambique is totally operated by private sector. All fertilizers used in the country are imported from other countries. Only a fertilizer blending company, MFC (the Mozambique Fertilizer Company), is in operation in Chimoio. MFC even exports modest amount of its products to neighboring countries, mainly to Malawi. MFC's market share is expected to be about 50% in Mozambique. While Agri-focus is the next largest importer after MFC, there are also small-scale fertilizer importers who handle other agricultural inputs as well as various commodities.

The imported fertilizers are distributed through about 250 agro-inputs dealers who are scattered over the country. Table 3.5.11 implies that their high profit margin causes high retail price of fertilizers in Mozambique.

Table 3.5.9 % of Farm-households using Chemical Fertilizers

| Province | 2002 | 2003 | 2005 | 2006 | 2007 |
|-----------------|----------|----------|----------|----------|----------|
| Niassa | 8 | 12 | 18 | 15 | 7 |
| Cabo Delgado | 3 | - | 2 | 5 | 1 |
| Nampula | 3 | 0.3 | 3 | 3 | 2 |
| Zambezia | 1 | 1 | 0 | 2 | 1 |
| Tete | 15 | 12 | 17 | 18 | 21 |
| Manica | 3 | 3 | 2 | 1 | 1 |
| Sofala | 1 | 2 | 1 | 2 | 1 |
| Inhambane | 2 | 2 | 1 | 2 | 4 |
| Gaza | 5 | 2 | 4 | 2 | 2 |
| Maputo | 4 | 3 | 7 | 7 | 12 |
| National | 4 | 3 | 4 | 5 | 4 |

Source: TIA 2007, MINAG

Table 3.5.10 Estimated Fertilizer Consumption in Mozambique

| Year | Tobacco | Sugarcane | other crops | Total |
|------|---------|-----------|-------------|--------|
| 2006 | 13,000 | 10,000 | 5,500 | 28,500 |
| 2007 | 13,000 | 10,000 | 5,000 | 28,000 |
| 2008 | 15,000 | 12,000 | 5,000 | 32,000 |
| 2009 | 16,000 | 12,000 | 5,000 | 33,000 |
| 2010 | 31,400 | 15,000 | 5,000 | 51,400 |

Source: DNSA/MINAG

Table 3.5.11 Price Structure of Urea in 2011

| Kind of prices | Price (US\$/ton) | % at Retail price |
|----------------------------|------------------|-------------------|
| FOB (at Saudi Arabia) | 449.0 | 43.9 |
| CIF (at Beira) | 623.8 | 61.0 |
| Ex-factory (at Chimoio) | 720.0 | 70.4 |
| Delivery price at retailer | 748.0 | 73.1 |
| Retail price | 1,023.0 | 100.0 |

Source: Agribusiness Indictors Mozambique, World Bank, April

According to several agro-input dealers, the reasons of the high profit margin are “low handling amount due to low demand” and “high financial burden for keeping the stock”.

Figure 3.5.3 shows fertilizer distribution flow to farmers in Mozambique. The flow may change drastically after several years, since several projects to construct fertilizer plant are in the planning stage in Mozambique.

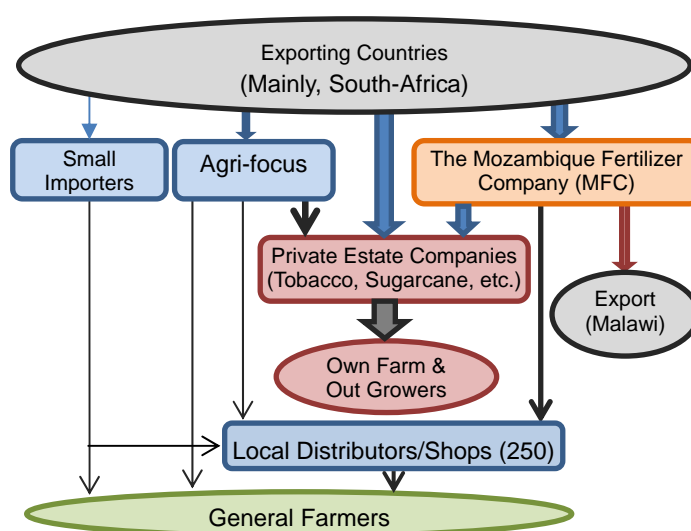


Figure 3.5.3 Fertilizer Processing and Distribution in Mozambique

(3) Agricultural Chemicals (Pesticide)

As same as seeds and chemical fertilizers, very few farmers use pesticide, i.e. insecticides, fungicides and herbicides, in Mozambique as shown in Table 3.5.12.

According to FAOSTAT, the annual pesticide use was around 900-1,000 ton in 2006-2010, except for the year 2007 (see Table 3.5.13). Since there is no production of pesticide in the country, all pesticide used were imported. Agri-focus is the only major pesticide importer in the country. While the company is also a major fertilizer importer, pesticide is its main business commodity.

No detailed information available about the use of pesticide. According to collected information by the JICA Study team, the pesticide for agriculture use is mainly used for cash crops, e.g. cotton, tobacco, cashew, etc. and vegetables. INCAJU

Table 3.5.12 % of Farm-households using Pesticide

| Province | 2002 | 2003 | 2005 | 2006 | 2007 |
|-----------------|----------|----------|----------|----------|----------|
| Niassa | 5 | 7 | 7 | 11 | 3 |
| Cabo Delgado | 11 | 9 | 11 | 17 | 10 |
| Nampula | 15 | 10 | 10 | 4 | 3 |
| Zambezia | 1 | 1 | 1 | 2 | 1 |
| Tete | 9 | 5 | 7 | 9 | 13 |
| Manica | 3 | 2 | 2 | 1 | 1 |
| Sofala | 3 | 8 | 8 | 9 | 6 |
| Inhambane | 4 | 2 | 1 | 1 | 1 |
| Gaza | 6 | 2 | 3 | 1 | 3 |
| Maputo | 5 | 2 | 6 | 7 | 8 |
| National | 7 | 5 | 5 | 5 | 5 |

Source: TIA 2007, MINAG

Table 3.5.13 Pesticide Use in Mozambique (unit: ton)

| Year | Insecticides | Herbicides | Fungicides | Total |
|------|--------------|------------|------------|----------|
| 2006 | 439.24 | 378.15 | 74.13 | 891.52 |
| 2007 | 172.34 | 320.37 | 54.6 | 547.31 |
| 2008 | 437.12 | 391.17 | 60.22 | 888.51 |
| 2009 | 180.23 | 617.29 | 115.35 | 912.87 |
| 2010 | 398.46 | 648.42 | 139.88 | 1,186.76 |

Source: FAOSTAT

distributes a free pesticide for an incentive to cashew growers. However, the beneficial growers are charged for the spraying service, according to the growers in Nampula province.

The government stated pesticide regulation in March 2002. It regulates registration, packing and labeling.

Figure 3.5.4 shows pesticide distribution flow to farmers in Mozambique.

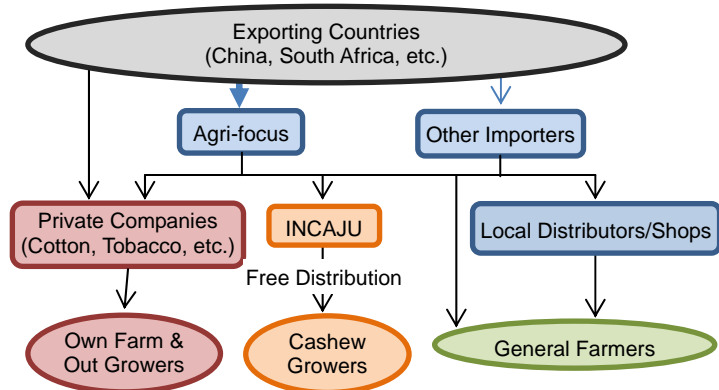


Figure 3.5.4 Pesticide Distribution in Mozambique

(4) Agricultural Machinery

The information about number of tractors in use in Mozambique varies between the sources. While the Agriculture Census in 2009-2010 (INE) says there are 59,467 tractors, FAO data say there were only 6,540 tractors in 2006. Considering the number of imported tractors that was 524 units per year in 2008-10 according to a customs data and economic life of tractors (around 10 years), it is assumed that FAO data would be more reliable. In any case, the number is too small to meet the 5,633,850 ha of total cultivated area in the country.

Tractor hire service is not well developed in Mozambique. Some large scaled farmers provide custom land preparation service after they have finished all land preparation works in their own fields. Farmers associations and cooperatives also provide the tractor hire service. They have got a tractor through donor or government supporting programs including the District Development Fund.

Tractors are imported by individuals and private companies who are mainly sales agents/dealers of major international tractor makers, i.e. John Deere, Massey Ferguson and New Holland. Since the demand from private sector has been still low and some regular user import tractors by their own, a substantial part of imported tractor by the major distributors in 2008-11 went to public sector (see Table 3.5.14).

Government plays a significant role in distributing agricultural tractors as shown in Table 3.5.15. There are discrepancy between the numbers in Table 3.5.14 and 3.5.15, because the government didn't necessarily procure the tractors only through the major dealers.

Table 3.5.14 Imported Tractors by the Major Distributors (2008-11)

| Year | Number | % distributed | |
|-------|--------|---------------|--------|
| | | Private | Public |
| 2008 | 38 | 0 | 100 |
| 2009 | 77 | 26 | 74 |
| 2010 | 284 | 21 | 79 |
| 2011 | 70 | 86 | 14 |
| Total | 469 | - | - |

Source: Agribusiness Indicators Mozambique, World Bank, April 2012

Table 3.5.15 Government Distributed Tractors (2008-2010)

| Year | Number | Original/ Program |
|---------|--------|-------------------|
| 2008 | 50 | FDA |
| 2009 | 50 | PAPA |
| 2009/10 | 110 | Commodity Aid |
| 2009/10 | 220 | GPZ |
| Total | 430 | - |

Source: NDSA/MINAG

3.5.5 Agricultural Finance

(1) Agriculture Finance for Agribusiness Operators

Commercial banks have no specific conditions for agriculture/agribusiness loans, except for the special mechanisms applied through the development program⁵. Apart from commercial banks, GAPI⁶ also provides financial services to rural agribusiness enterprises and farmer organizations by offering loans with slightly lower interest rates than those of other financial institutions, conducting training for entrepreneurs in business management, and providing advisory services for business planning through branch offices located in each province.⁷ GAPI also has a plan for providing financial services in rural areas through the establishing of micro-banks. Table 3.5.16 shows the specific conditions for GAPI's operations.

Table 3.5.16 Details on the Operational System of GAPI

| Items | Conditions |
|-------------------------------|--|
| Credit line | - 10,000 to 400,000 US\$ (for small/medium enterprises) |
| Interest rate | - 6 to 8 % lower than that of commercial banks - A specific interest rate is decided upon based on the nature of the business and quality of collateral |
| Approval of loan applications | - Amount of loan is less than 25,000 US\$: by the branch manager - Amount of loan is greater than 25,000:US\$ by the GAPI headquarter or the regional manager |
| Default rate | - Approximately 20% to 25% (for loans to small/medium enterprises) |
| Proportions of loans | - 70 % for small/medium enterprises; 30% for farmers organizations |
| Others | - GAPI does not receive deposits and only provides loans |

Source: Interview from GAPI, JICA Study Team

(2) Agriculture Finance to Small-scale Farmers by Microfinance Institutions

Microfinance institutions (MFIs) have limited experience in agricultural lending, which form a small share of MFI portfolios.⁸ The conditions for agriculture lending to

⁵ Many donor funded programs include access to finance for agriculture/agribusiness development using different financing tools, such as subsidized credit lines, guarantee funds, catalytic funds, and technical support.

⁶ GAPI (Sociedade de Investimentos) was originally set up as a government financial institution to support small-scale industries, and thereafter evolved into a private company though the government still retains a 30% ownership share.

⁷ In the Nacala Corridor, GAPI has branch offices in Nampula and Cuamba.

⁸ Economic and Sector Work: Agribusiness Indicator : Mozambique, World Bank 2012

small-scale farmers differ from those of commercial banks, particularly in collateral requirements. Since the value of the loan is much lower than commercial banks, MFIs require collateral adapted to rural contexts, such as domestic goods, savings, third-party guarantors, solidarity groups, and animals.⁹ The interest rate of loans for agriculture activities is usually lower than that of other activities, ranging from 3% to 4% per month, while the normal rate is from 4.5% to 6% per month; a rate with which most small-scale farmers would be reluctant to accept as they perceive it to be too high to repay with their earnings.¹⁰

Looking at a specific example in Ribaue district in Nampula province, the local microfinance institution, Modelo Microcredit established in 2009, has worked with CEPAGRI and a private agribusiness in planning a contract farming project involving over 300 small-scale farmers. The role of Modelo Microcredit is to provide loans to contract farming members with which the members may purchase agriculture inputs such as quality seed and fertilizer from a private business partner. Though a normal interest rate for agriculture lending, 4% per month, is applied for this loan arrangement, the members may be granted a 6-month grace period, which allows the members to repay the loan after the harvest when a private business partner purchases the crops from the members with cash. As explained above, Modelo Microcredit accepts collateral that adapted to rural context for the loans, specifically screening the recipient's attitude toward work as well as personal reputation with neighbors so as to establish their credibility as a borrower. Table 3.5.17 summarizes Modelo Microcredit's operational system.

It is expected that this effort, involving 3 parties (the government, a microfinance institution and a private agribusiness), would seek to overcome the critical barrier of access to finance, which small-scale farmers encounter, in order to improve productivity and market access. The collaborative project will commence in October 2012.

Table 3.5.17 Details on the Operational System of Modelo Microcredit

| Items | Conditions |
|----------------------|---|
| Credit line | - 20,000 MT to 200,000 MT (agriculture activities) - 10,000 MT to 150,000 MT (commercial activities) |
| Interest rate | - 4 % per month with a 6-month grace period (agriculture activities) - 5% per month (without a grace period) (commercial activities) |
| Collateral | - Domestic goods, third-party/family guarantor, personal interview, etc. |
| Default rate | - Approximately 17% |
| Proportions of loans | - 17 % for agriculture activities; 83 % for commercial activities |
| Offices | - Ribaue (main office), Malema, Cuamba, Mecuburi |

Source: Interview from Modelo Microcredit, JICA Study Team

lands available for large investments at local level, IIAM 2008"

⁹ Ditto,

¹⁰ Ditto

3.6. Agricultural Logistics

3.6.1. Agricultural Logistic System

(1) Agriculture Products on Market Flow

1) Staple food crops

Table 3.6.1 shows volume and percentage of produces. For staple foods like cassava and maize, the larger the volume, more sales volume, because volume of self-consumption is limited. Cassava losses are relatively high in Monapo, Cuamba and Mandimba accounting for 4.7%, 5.6%, and 4.2% respectively. Maize losses in Ribaué and Malema is very high accounting for 12.8% and 10.6% respectively. In general, 66% of cassava and maize in the Study Area are sold, 30% are for self-consumption, and loss accounts for 4%.

Table 3.6.1 Output Structure of Produce from Producer of Staple Food

| Products | Province | District | Sales | | Self-consumption | | Losses | | Total | | |
|--------------|----------|-----------|--------------|--------------|------------------|--------------|---------------|-------------|----------------|---------------|--------|
| | | | (tons) | (%) | (tons) | (%) | (tons) | (%) | (tons) | (%) | |
| Cassava | Nampula | Monapo | 99 | 20.2% | 367 | 75.1% | 23 | 4.7% | 489 | 100.0% | |
| | | Muecate | 1007 | 47.3% | 1102 | 51.8% | 18 | 0.8% | 2127 | 100.0% | |
| | | Meconta | 367 | 43.6% | 450 | 53.5% | 24 | 2.9% | 841 | 100.0% | |
| | | Mogovolas | 339 | 41.6% | 450 | 55.3% | 25 | 3.1% | 814 | 100.0% | |
| | | Nampula | 785 | 45.7% | 902 | 52.5% | 30 | 1.7% | 1717 | 100.0% | |
| | | Murrupula | 300 | 30.9% | 651 | 67.0% | 20 | 2.1% | 971 | 100.0% | |
| | | Ribaué | 5500 | 74.0% | 1800 | 24.2% | 130 | 1.7% | 7430 | 100.0% | |
| | Niassa | Malema | 3800 | 92.2% | 200 | 4.9% | 120 | 2.9% | 4120 | 100.0% | |
| | | Cuamba | 2500 | 66.5% | 1050 | 27.9% | 210 | 5.6% | 3760 | 100.0% | |
| | | Mandimba | 2300 | 76.8% | 570 | 19.0% | 125 | 4.2% | 2995 | 100.0% | |
| | | Ngauma | 1220 | 63.8% | 680 | 35.5% | 13 | 0.7% | 1913 | 100.0% | |
| | | Lichinga | 1560 | 67.0% | 700 | 30.1% | 67 | 2.9% | 2327 | 100.0% | |
| | | Zambezia | Alto Molocue | 850 | 64.8% | 450 | 34.3% | 12 | 0.9% | 1312 | 100.0% |
| | | | Gurue | 880 | 78.4% | 208 | 18.5% | 34 | 3.0% | 1122 | 100.0% |
| Total | | | 21507 | 67.3% | 9580 | 30.0% | 851 | 2.7% | 31938 | 100.0% | |
| Maize | Nampula | Monapo | 300 | 52.2% | 250 | 43.5% | 25 | 4.3% | 575 | 100.0% | |
| | | Muecate | 145 | 42.9% | 178 | 52.7% | 15 | 4.4% | 338 | 100.0% | |
| | | Meconta | 89 | 31.9% | 175 | 62.7% | 15 | 5.4% | 279 | 100.0% | |
| | | Mogovolas | 130 | 42.6% | 150 | 49.2% | 25 | 8.2% | 305 | 100.0% | |
| | | Nampula | 331 | 46.8% | 343 | 48.5% | 33 | 4.7% | 707 | 100.0% | |
| | | Murrupula | 307 | 38.4% | 477 | 59.7% | 14.6 | 1.8% | 798.6 | 100.0% | |
| | | Ribaué | 1460 | 58.0% | 660 | 26.2% | 312 | 12.4% | 2519 | 100.0% | |
| | Niassa | Malema | 2400 | 63.6% | 975 | 25.8% | 400 | 10.6% | 3775 | 100.0% | |
| | | Cuamba | 1600 | 66.1% | 702 | 29.0% | 120 | 5.0% | 2422 | 100.0% | |
| | | Mandimba | 2000 | 72.1% | 760 | 27.4% | 13 | 0.5% | 2773 | 100.0% | |
| | | Ngauma | 1769 | 72.2% | 560 | 22.9% | 120 | 4.9% | 2449 | 100.0% | |
| | | Lichinga | 1450 | 68.3% | 550 | 25.9% | 123 | 5.8% | 2123 | 100.0% | |
| | | Zambezia | Alto Molocue | 1560 | 76.3% | 479 | 23.4% | 6 | 0.3% | 2045 | 100.0% |
| | | | Gurue | 1543 | 69.8% | 655 | 29.6% | 12 | 0.5% | 2210 | 100.0% |
| Total | | | 15084 | 64.7% | 6914 | 29.7% | 1233.6 | 5.3% | 23318.6 | 100.0% | |

Source: Trade inventory survey, JICA study team, 2012

2) Beans

For beans (Table 3.6.2), more volume than its of staple foods are sold outside the production areas, because of strong price competitiveness comparing with staple foods. Percentage of sales in cowpea, mung bean and haricot bean account for 61.3%, 89.9% and 74.5% respectively.

Table 3.6.2 Output Structure of Produce from Producer of Beans

| Products | Province | District | Sales | | Self-consumption | | Losses | | Total | |
|--------------|----------|--------------|-------------|--------------|------------------|--------------|-------------|-------------|--------------|---------------|
| | | | (tons) | (%) | (tons) | (%) | (tons) | (%) | (tons) | (%) |
| Cowpea | Nampula | Ribaue | 994 | 57.0% | 540 | 30.9% | 211 | 12.1% | 1745 | 100.0% |
| | | Monapo | 275 | 59.5% | 175 | 37.9% | 12 | 2.6% | 462 | 100.0% |
| | | Muecate | 275 | 52.2% | 230 | 43.6% | 22 | 4.2% | 527 | 100.0% |
| | | Meconta | 201 | 41.9% | 254 | 52.9% | 25 | 5.2% | 480 | 100.0% |
| | | Mogovolas | 450 | 53.8% | 375 | 44.8% | 12 | 1.4% | 837 | 100.0% |
| | | Nampula | 585 | 51.4% | 530 | 46.5% | 24 | 2.1% | 1139 | 100.0% |
| | | Murrupula | 272 | 56.7% | 200 | 41.7% | 8 | 1.7% | 480 | 100.0% |
| | | Malema | 986 | 58.1% | 433 | 25.5% | 278 | 16.4% | 1697 | 100.0% |
| | | Cuamba | 780 | 63.4% | 440 | 35.8% | 10 | 0.8% | 1230 | 100.0% |
| | Niassa | Mandimba | 860 | 75.4% | 220 | 19.3% | 60 | 5.3% | 1140 | 100.0% |
| | | Ngauma | 660 | 74.3% | 188 | 21.2% | 40 | 4.5% | 888 | 100.0% |
| | | Alto Molocue | 780 | 70.4% | 320 | 28.9% | 8 | 0.7% | 1108 | 100.0% |
| | Zambezia | Gurue | 1232 | 65.4% | 430 | 22.8% | 223 | 11.8% | 1885 | 100.0% |
| Total | | | 8350 | 61.3% | 4335 | 31.8% | 933 | 6.9% | 13618 | 100.0% |
| Mung bean | Nampula | Nampula | 15 | 85.7% | 1 | 5.7% | 1.5 | 8.6% | 17.5 | 100.0% |
| | | Malema | 152 | 83.5% | 20 | 11.0% | 10 | 5.5% | 182 | 100.0% |
| | Niassa | Cuamba | 230 | 95.0% | 10 | 4.1% | 2 | 0.8% | 242 | 100.0% |
| Total | | | 397 | 89.9% | 31 | 7.0% | 13.5 | 3.1% | 441.5 | 100.0% |
| Haricot bean | Nampula | Malema | 220 | 69.2% | 89 | 28.0% | 9 | 2.8% | 318 | 100.0% |
| | | Ngauma | 1600 | 84.4% | 280 | 14.8% | 15 | 0.8% | 1895 | 100.0% |
| | Niassa | Lichinga | 654 | 56.2% | 430 | 36.9% | 80 | 6.9% | 1164 | 100.0% |
| | | Alto Molocue | 340 | 86.7% | 37 | 9.4% | 15 | 3.8% | 392 | 100.0% |
| | Zambezia | Gurue | 470 | 74.5% | 127 | 20.1% | 34 | 5.4% | 631 | 100.0% |
| Total | | | 3284 | 74.6% | 963 | 21.9% | 153 | 3.5% | 4400 | 100.0% |

Source: Trade inventory survey, JICA study team, 2012

3) Commercial Crops

For other crops showed in table below, self-consumption of sesame, cashew nut and peanut account for 4.2%, 9.7% and 27.6% respectively. Loss in sesame is relatively high accounting for 9.5%. For soybean, no self-consumption appears and loss is quite high rate accounting for 15.0%.

Table 3.6.3 Output Structure of Produce from Producer of Others

| Products | Province | District | Sales | | Self-consumption | | Losses | | Total | |
|--------------|----------|--------------|---------------|--------------|------------------|--------------|---------------|--------------|---------------|---------------|
| | | | (tons) | (%) | (tons) | (%) | (tons) | (%) | (tons) | (%) |
| Sesame | Nampula | Monapo | 150 | 80.2% | 2 | 1.1% | 35 | 18.7% | 187 | 100.0% |
| | | Muecate | 45 | 64.3% | 10 | 14.3% | 15 | 21.4% | 70 | 100.0% |
| | | Meconta | 85 | 72.0% | 18 | 15.3% | 15 | 12.7% | 118 | 100.0% |
| | | Mogovolas | 85 | 69.1% | 15 | 12.2% | 23 | 18.7% | 123 | 100.0% |
| | | Nampula | 50 | 76.3% | 3 | 4.6% | 12.5 | 19.1% | 65.5 | 100.0% |
| | | Murrupula | 45.5 | 81.3% | 7 | 12.5% | 3.5 | 6.3% | 56 | 100.0% |
| | | Ribaue | 111 | 92.5% | 1 | 0.8% | 8 | 6.7% | 120 | 100.0% |
| | | Malema | 129 | 90.2% | 3 | 2.1% | 11 | 7.7% | 143 | 100.0% |
| | | Niassa | Cuamba | 330 | 93.2% | 9 | 2.5% | 15 | 4.2% | 354 |
| | Zambezia | Alto Molocue | 460 | 93.9% | 5 | 1.0% | 25 | 5.1% | 490 | 100.0% |
| Total | | | 1490.5 | 86.3% | 73 | 4.2% | 163 | 9.4% | 1726.5 | 100.0% |
| Cashew nuts | Nampula | Monapo | 468 | 93.0% | 17 | 3.4% | 18 | 3.6% | 503 | 100.0% |
| | | Muecate | 200 | 87.0% | 25 | 10.9% | 5 | 2.2% | 230 | 100.0% |
| | | Nampula | 550 | 82.7% | 100 | 15.0% | 15 | 2.3% | 665 | 100.0% |
| | | Murrupula | 630 | 91.1% | 34.25 | 5.0% | 13.7 | 2.0% | 691.65 | 100.0% |
| | | Mogovolas | 650 | 83.9% | 100 | 12.9% | 25 | 3.2% | 775 | 100.0% |
| | | Total | | | 2498 | 87.2% | 276.25 | 9.6% | 76.7 | 2.7% |
| Peanut | Nampula | Monapo | 450 | 92.8% | 11 | 2.3% | 24 | 4.9% | 485 | 100.0% |
| | | Muecate | 375 | 75.5% | 98 | 19.7% | 24 | 4.8% | 497 | 100.0% |
| | | Meconta | 450 | 60.6% | 275 | 37.0% | 18 | 2.4% | 743 | 100.0% |
| | | Mogovolas | 750 | 71.8% | 250 | 23.9% | 45 | 4.3% | 1045 | 100.0% |
| | | Nampula | 235 | 43.4% | 281 | 51.9% | 25 | 4.6% | 541 | 100.0% |
| | | Murrupula | 442 | 69.7% | 173 | 27.3% | 19.5 | 3.1% | 634.5 | 100.0% |
| Total | | | 2702 | 68.5% | 1088 | 27.6% | 155.5 | 3.9% | 3945.5 | 100.0% |
| Soybean | Zambezia | Alto Molocue | 30 | 90.9% | | | 3 | 9.1% | 33 | 100.0% |
| | Nampula | Ribaue | 130 | 59.9% | 0 | | 87 | 40.1% | 217 | 100.0% |
| | | Malema | 210 | 91.3% | 0 | | 20 | 8.7% | 230 | 100.0% |
| | Niassa | Cuamba | 120 | 93.8% | 0 | | 8 | 6.3% | 128 | 100.0% |
| | Zambezia | Gurue | 250 | 95.4% | 0 | | 12 | 4.6% | 262 | 100.0% |
| Total | | | 740 | 85.1% | 0 | 0.0% | 130 | 14.9% | 870 | 100.0% |

Source: Trade inventory survey, JICA study team, 2012

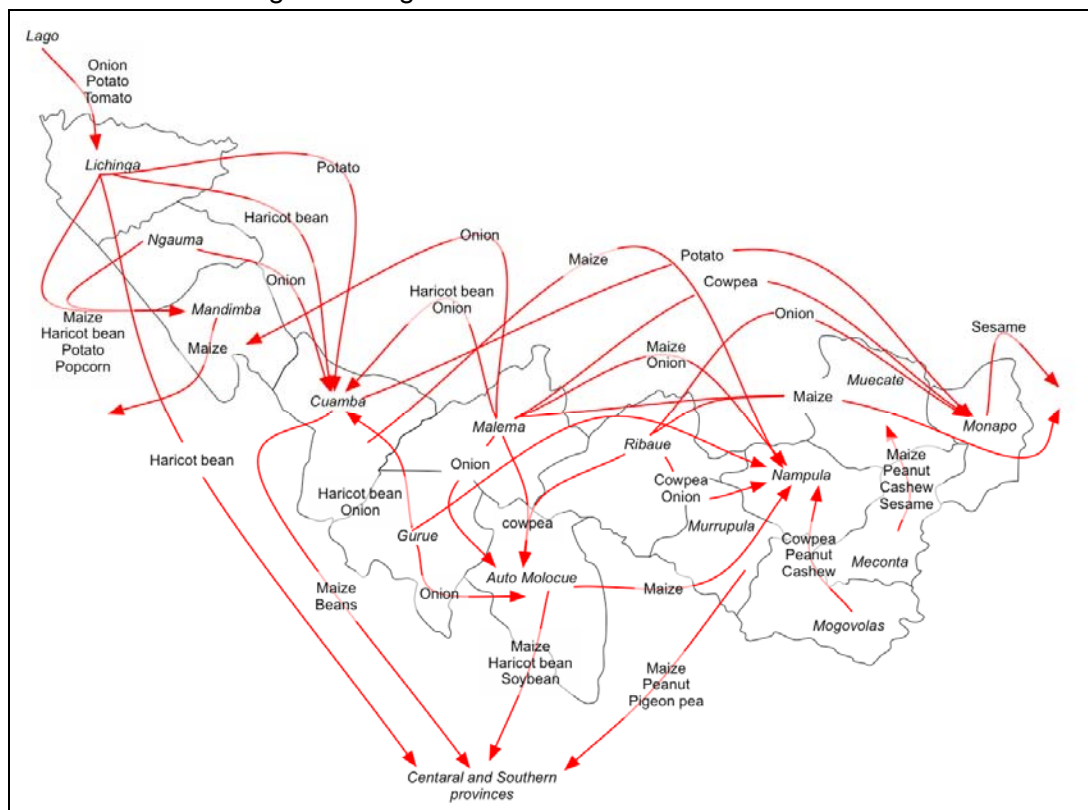
(2) Market Flow

Figure 3.6.1 illustrates movement of agriculture products excluding industrial crops in the Study Area. Agriculture produces are broadly traded inside the Study Area, and to the outside of the area by collector, various size of trader, processor, retailer, and exporter in each product's value chain.

The Study Area rises over 3 provinces, Nampula, Niassa and Zambezia. In Nampula province, other than flows between proximate districts, overall market flow goes towards mainly Nampula city, and flow from districts adjacent to Niassa and Zambezia, such as Malema and Ribaue, goes to districts in these provinces too. Most produces are transported by trucks and pick-up.

In Niassa Province, market flows go to Malawi through Mandimba, to Nampula and Zambezia province through Cuamba, and to central and south region for high value crops. Since, train runs once a month between Cuamba and Lichinga, trucks and pick-up are prevailing for product transportation. For maize in harvest season, railway car is used for transportation from Cuamba to Nampula.

In Zambezia province, which categorized in central region, market flow from Alto Molocue and Gurue goes to Quelimane and other districts in the province, and to central and south region through National road No.1.



Source: Trade inventory survey, JICA study team, 2012

Figure 3.6.1 Production and Movement

(3) Market Flow of Industrial Crops

Industrial crops such as tobacco and cotton are produced in concessional system with contract farming. So, concessionaires' processing factories in general is located in production area.

Primarily processed tobacco in Cuamba and Malema is transported to processing factory in Tete exported to Malawi through traders. Processed cotton is exported to mainly Asian countries.

3.6.2. Infrastructure of Agricultural Logistics

(1) Road Transportation

Most agriculture product is transported by various sizes of trucks. Bigger truck is more used for transportation in latter flow of value chain.

East-west National road No.12 (N12) & N13 and a part of N1 are passed from Nacala to Lichinga. North-south national road N1 from Maputo is passed Alto Molocue and Nampula city to Pemba, and N103 from Mutuali is connected to N1 through Cuamba towards south. These road network is crucial for transportation of agriculture product in Nacala corridor, but road condition of N13 and N103 is not good enough for efficient transportation. Road between Nampula and Cuamba in National road N13 and N103 between Gurue and Namialo are currently under rehabilitation.

Table 3.6.4 shows comparison of transportation cost by road, railway and ship. For road transportation, it cost 5,600 US\$ per a container from Nampula to Maputo, which is equivalent to from Lichinga to Maputo.

According to the

Table 3.6.4 Rail, Road and Ship Transport Cost Comparison

| | Road | | | | Ship |
|-------------------|-----------------|---------|-------------|---------|---------|
| | Road (tons) | | Rail (tons) | | |
| | 22 | 30 | 14 | 22 | |
| Maputo to: | | | | | |
| Johannesburg | \$625 | \$950 | \$393 | \$620 | |
| Harare | \$1,008 | \$1,344 | \$960 | \$1,686 | |
| Blantyre | \$1,260 | \$2,380 | na | na | |
| Lusaka | \$1,064 | \$2,100 | na | na | |
| Lubumbashi | \$2,520 | \$2,940 | na | na | |
| Dares Salam | | | na | na | \$845 |
| Dubai | | | | | \$2,550 |
| Guangzhou | | | | | \$2,550 |
| Tilbury/NWC ports | | | | | \$2,750 |
| Pemba | \$7,000 | | na | na | \$1,350 |
| Nampula | \$5,600 | | na | na | |
| Beira | \$1,800 | | na | na | \$1,800 |
| Kilema | \$3,000 | | na | na | |
| Tete | \$3,500 | | na | na | |
| Nacala | | | na | na | \$2,500 |
| Beira to: | | | | | |
| Harare | \$1,200 | | \$500 | \$1,000 | |
| Blantyre | \$1,700 | | na | na | |
| Lusaka | \$3,700 | | \$1,033 | \$2,021 | |
| Nacala to: | | | | | |
| Lilongwe | | | \$896 | \$1,408 | |
| Blantyre | | | \$840 | \$1,320 | |
| Lichinga to: | | | | | |
| Nampula | \$2,900-\$3,200 | | | | |
| Beira | 3,600 | | | | |
| Maputo | \$5,400-\$7,100 | | | | |

Source: Value Chain Analysis for Strategic Sectors in Mozambique, GDS, 2005
Cost from Lichinga was collected by JICA study team, 2012

transportation association in Lichinga, transportation cost per container costs 150,000 to 200,000 MT (5,357 to 7,143 US\$) from Lichinga to Maputo, 100,000 MT (3,571 US\$) from Lichinga to Beira, and 80,000 to 90,000 MT (2,857 to 3,214 US\$) from Lichinga to Nampula. Lichinga imports commodity goods from Maputo, and trucks load agriculture product in Lichinga on the way back to Maputo. Beans are mainly selected for Maputo, because of high value for resell.

Similarly, given the infrequent service routes and poor quality of shipping service, shipping cargo from Nacala to Maputo costs 2,500 US\$, which is nearly 3 times the cost of shipping a container from Maputo to Dar-es-Salam, Tanzania (845 US\$), and approximately the same cost as shipping a container from Dubai or Guangzhou to Maputo.

Rehabilitation to paved road of National road N13 connecting between Nampula and Cuamba will be completed in February, 2015, and N14 connecting between Pemba and Lichinga will be finished in 2015. It is expected to reduce transportation cost through these corridors. Sections Cuamba to Mandimba and Mandimba to Lichinga, which connects above corridors is also planned to be rehabilitated. It is expected to decrease transportation cost in this area.

Since a bridge across the Zambezi river rehabilitated, link between north, central and south region has been improved. But, it has still remained high transportation cost between north-south corridor.

(2) Railway Transportation

Cargo transportation by railway is run on irregular basis upon readiness of certain cargo. Railway transport is scarcely utilized for transportation of agriculture product in Nacala corridor. Only in harvest season, maize collected in Cuamba is transported to Nampula and Nacala by cargo train.

(3) Storage Facility

Traditional grain storage, which is built by bamboo with thatched roof, is dominant at producer level. Producers fumigate storing produces by smoke of firewood. Nevertheless, postharvest loss is still high in this type of storage, because no insecticide is applied.

Mozambique Cereal Institute (ICM) has a 2,500 ton public storage facility in Cuamba, and they rent out to private company, Export Marketing. This kind of public storage facilities were spread in production areas, and utilized for store food staples, such as maize, cassava, beans, by ICM. Since the mandate of ICM (buying and selling food staples) was lifted, most ICM storage facilities are being rent out to private sector. Storage facility in the Study Area is all-purpose storage in general, and not specialized

for grain or other products. Not only ICM storage facilities, but old storage facility in the Study Area, often causes quality deterioration by insect attack and physical damage. For peanut, inappropriate storage management results losses by aflatoxin as well.

ICM, now has a plan to install a 5,000 ton grain silo, which equips cleaning and drying units in the same property by the end of this year. Similar program is ongoing at Yapara (Ribaué), Nacala, Milange (Zambezia).

Table 3.7.5 shows the result of storage facility in trade inventory survey conducted by the JICA sturdy team. These storage facilities were selected by sampling and not cover all storage facilities in Nacala corridor. These are all private facility, which are owned by producer association, trader, and exporter. Capacity of facility varied from 10 tons to 3,000 tons, and relatively large capacity storages are located at the assemble point of distribution network, such as Nampula, Cuamba, Namialo, Monapo, and large-scale consumers. These storages are generally used for short-term storage as maximum period of storage one week. Destinations from this kind of storage are markets of cities and district capitals, and other larger storage points. Average capacity of these storages is 374 tons, and average annual turnover is 462%. Assuming storage period is one week, they use their storage for only 4.6 weeks in a year. This is quite low level of utilization of the facility. Shortage of storage facility is sometimes pointed out as a constraint of sector development, but appropriate storage capacity and location are more important for efficient storage management. This is reflected to storage cost/fee in value chain as well.

(4) Market Information

Countrywide market information is collected and published in WEB site by SIMA in MINAG. For producers, however, it is difficult to access this information to date. Ttrial service, which provides market information to producers through SMS has been carried out in Zambezia.

(5) Rural Market Facility

All district capitals in the Study Area have a public market, which opens everyday for selling agriculture products as well as other commodities. Temporary or semi permanent market opens mainly weekends in villages along the national road. Products sold these market are supplies by traders or producers near the market. In the provincial development strategy in Nampula and Niassa, market facility is under development for public market in cities, district capitals, and open market in rural area by Rural Market Program -PROMER.

Table 3.6.5 Storage Facility and Storage Fee

| Province | District | Product | Capacity (tons) | Amount handled (tons/yr) | Turnover (%) | Destination of stored goods | Storage Cost | |
|-----------------------------|-----------|--|------------------------------|--------------------------|--------------|--|----------------------------|--|
| NAMPULA | Monapo | maize, cashew nut | 200 | 500 | 250 | Local | 300MT/ton/day | |
| | | maize, peanut | 100 | 80 | 80 | Local | 300MT/ton/day | |
| | | maize, beans, sesame | 50 | 400 | 800 | Nacala | 300MT/ton/day | |
| | Muecate | peanut, cassava, cashew nut | 300 | 500 | 167 | | 150MT/ton/day | |
| | | peanut, castanha, cassava, sesame, cowpea | 50 | 1,500 | 3,000 | | 150MT/ton/day | |
| | Meconta | maize, peanut, sesame, cashew nut | 200 | 90 | 45 | Namialo | | |
| | | maize, peanut | 1,500 | 800 | 53 | Local | | |
| | Mogovolas | peanut, cowpea, cashew nut | 60 | 500 | 833 | Nampula | | |
| | | peanut, cowpea, cashew nut | 45 | 175 | 389 | Nametil, Nampula | 150MT/ton/day | |
| | Nampula | peanut, beans | 30 | 75 | 250 | Nampula | 15MT/ton/day | |
| | | peanut, cashew nut | 80 | 230 | 288 | Nampula | 15MT/ton/day | |
| | | cabbage, peanut, sesame, harikot bean, cassava | 1,000 | 22,000 | 2,200 | Nampula | 25,000MT/ton/day | |
| | | peanut, cashew nut, cowpea, cassava | 50 | 300 | 600 | Nampula | 15MT/ton/day | |
| | Murrupula | maize, peanut, pigeon pea | 80 | 400 | 500 | Nacala, Nampula, Beira, Maxixe, Maputo | 200MT/ton/day | |
| | | peanut, cowpea e castanha | 100 | 160 | 160 | Nampula | 150MT/ton/day | |
| | Ribau | maize, onion, cowpea | 700 | 400 | 57 | Nampula, Nacala | Not estimated | |
| | | maize, cowpea | 50 | 80 | 160 | Nampula | Not estimated | |
| | | maize, peanut, cowpea | 100 | 150 | 150 | Nampula | Not estimated | |
| | Malema | maize, beans, sesame | 500 | 1,500 | 300 | Nampula | 5000MT/month | |
| | | maize, cowpea | 300 | 700 | 233 | Nampula, Nacala | Not estimated | |
| | | maize, Cebola, harikot bean | 700 | 900 | 129 | Nampula, Nacala | Not estimated | |
| | ZAMBEZIA | Alto Molocue | maize, harikot bean | 100 | 130 | 130 | Maputo, Quelimane, Nampula | |
| | | | maize, harikot bean, soybean | 400 | 800 | 200 | Maputo, Quelimane, Nampula | |
| maize, harikot bean, cowpea | | | 500 | 3,000 | 600 | Maputo, Quelimane, Chimoio, Nampula | | |
| Gurue | | maize, pigeon pea, sesame | 3,000 | 2,800 | 93 | Nampula | Not estimated | |
| | | maize, cowpea, sesame | 200 | 150 | 75 | WFP | Not estimated | |
| | | maize, soybean | 750 | 80 | 11 | King Frango | | |
| | | maize, soybean | 250 | 300 | 120 | Novos Horizontes | | |
| NIASA | Cuamba | maize, beans | 100 | 400 | 400 | Cuamba, Gurue, Nampula, Quelimane | 2500MT/month | |
| | | maize, beans | 50 | 250 | 500 | Cuamba, Gurue, Nampula, Quelimane | 1500MT/month | |
| | Mandimba | maize, popcorn, harikot bean | 350 | 7,000 | 2,000 | Malawi | 700 | |
| | | maize | 50 | 400 | 800 | Local | 40 | |
| | | Arroz | 200 | 900 | 450 | Local | 90 | |
| | Ngauma | maize, harikot bean, cowpea, potato | 20 | 60 | 300 | | 6 | |
| | | maize, harikot bean, feijão cute | 10 | 52 | 520 | Massangulo | 2MT/sack | |
| | Lichinga | maiz, harikot bean | 1,500 | 6,000 | 400 | Nampula | 2MT/sack | |
| | | maiz, harikot bean | 500 | 800 | 160 | Local | 2MT/sack | |
| | | harikot bean, potato | 20 | 30 | 150 | Nampula, Beira, Inhambane, Maputo | 2MT/sack | |
| Average | | 374 | 1,437 | 462 | | | | |

Source: Trade inventory survey, JICA study team, 2012

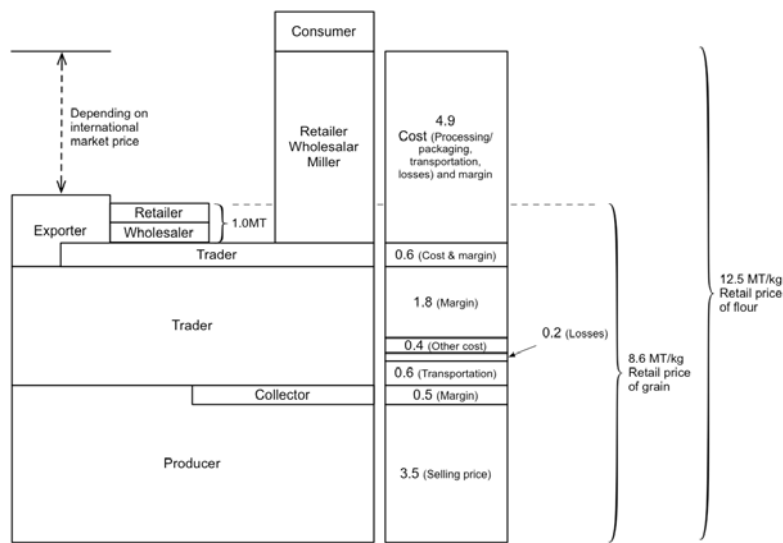
3.6.3. Value Chain of Agriculture Products

Value chain analysis was attempted for some crops. Since data and information from informants are limited, some parts are not clarified yet. Further survey will be carried out to obtain detailed information. These information was collected during April-May in 2012.

(1) Maize

Figure 3.6.2 shows a sample of value chain of maize produced in Cuamba. Buying price a collector, in general, is varied from 3 to 3.5 MT/kg. The collector's margin is 0.5MT/kg including transportation cost to Cuamba city. Once buying price of a trader is

raised to 4MT/kg, some producers, who have transportation method, prefer to sell directly to the trader. The trader weighs and repacks produce into sack, then sells to a trader in Nampula or an exporter in Nacala. In harvest season, the trader in Cuamba uses railway to transport to Nampula. The exporter decides export price depending on international market price. In Nampula, maize received by the trader sells to a maize milling company, which has 50 to 90 tons/day processing capacity. Maize flour is graded and packed after milling, then sold to consumers through wholesalers and retailers. Retail price was 12.5MT/kg in April 2012. Cost and margin of processor, wholesaler and retailer is 4.9 MT/kg, but detailed cost and margin for each are not clarified in this study period.

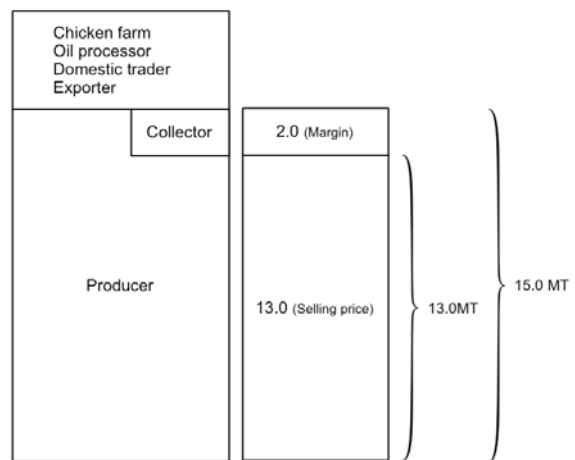


Source: Trade inventory survey, SIMA, interview by JICA survey team

Figure 3.6.3 Value Chain of Maize Grain and Maize Flour in Nampula

(2) Soybean

In Mozambique, people do not cook and eat soybean. All soybeans are consumed by chicken farms, oil processors or exporters. These final consumers purchase soybean directly from producers or through traders. A chicken farm in Nampula buy soybean from producer by contract farming. Farm gate price is high as 15-16 MT/kg. Collectors' cost and margin is 2 MT/kg. Once international market price hike



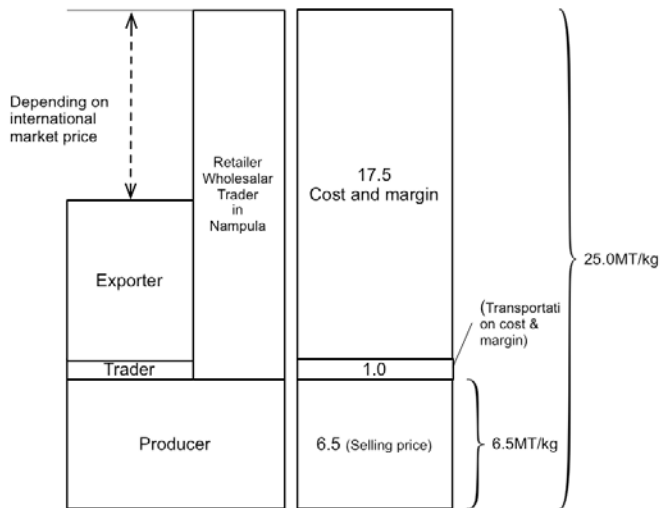
Source: Trade inventory survey, SIMA,

Figure 3.6.2 Value Chain of Soybean in Nampula

appears, demand of domestic soybean become high. Consequently, domestic product is rather consumed in domestic market.

(3) Cowpea

Cowpea is produced for both domestic consumption and export. Farm gate price is 6.5 MT/kg, but retail price is about 4 times of farm gate price. Since cowpea is produced in east area from Malema, it is not considered that transportation cost is very high. Cost and margin for trader, wholesaler, and retailer in Nampula is quite high as 17.5 MT/kg, but



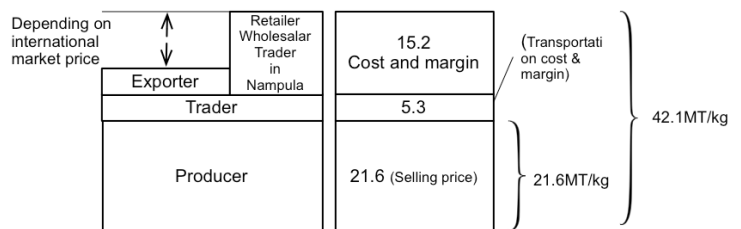
Source: Trade inventory survey, SIMA

Figure 3.6.4 Value Chain of Cowpea in Nampula

but detailed cost and margin in each stakeholder are not clarified. Presumably, retail price is leaded by export price or international market price.

(4) Peanut

Peanut is export product as well as domestic production. Farm gate price is very high as 21.6 MT/kg. Retail price is 42.1 MT/kg in Nampula. Retailer, wholesaler and trader in Nampula earn 15.2 MT/kg including transaction cost. This is high level as cowpea. It is also considered that retail price is affected by export price.

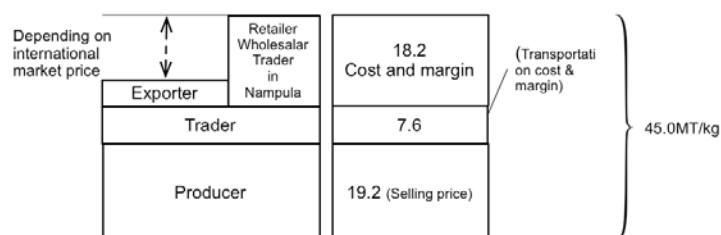


Source: Trade inventory survey, SIMA

Figure 3.6.5 Value Chain of Peanut in Nampula

(5) Haricot Bean

Haricot bean has a similar value structure with peanut, but cost and margin in Nampula is more than its of peanut as 18.2 MT/kg. This crop has strong demand in Maputo market as well as export market. It is also presumed that high price market leads the retail price in Nampula.



Source: Trade inventory survey, SIMA

Figure 3.6.6 Value Chain of Haricot Bean in Nampula

It is also presumed that high price market leads the retail price in Nampula.

(6) Profit of Intermediate Traders

Gross profit was calculated from buying and selling price of trader. These traders are all deal with producers. So, the buying price is farm gate price. Products are arranged by order of gross profit of trader. Haricot bean earns the highest gross profit for traders followed by peanut and sesame. Vegetables, such as tomato and onion, make also good profit. As mentioned above, beans and peanut are distributed to central and southern provinces, because of high demand and price in the market.

Table 3.6.6 Buying and Selling Price of Trader

| Produce | Buying price MT/ton | Selling price (MT/ton) | Gross profit (MT/ton) | Gross profit ratio (%) | No. interviewee |
|---------------|------------------------|---------------------------|--------------------------|---------------------------|-----------------|
| Haricot beans | 19,154 | 26,808 | 7,654 | 28.55 | 13 |
| Peanuts | 21,567 | 26,867 | 5,300 | 19.73 | 15 |
| Sesame | 22,556 | 26,889 | 4,333 | 16.12 | 9 |
| Tomato | 8,750 | 13,000 | 4,250 | 32.69 | 2 |
| Onion | 11,000 | 15,000 | 4,000 | 26.67 | 1 |
| Cashew nut | 17,625 | 21,583 | 3,958 | 18.34 | 12 |
| Pigeon pea | 16,167 | 19,333 | 3,167 | 16.38 | 3 |
| Potato | 4,800 | 7,500 | 2,700 | 36.00 | 1 |
| Soybean | 13,000 | 15,000 | 2,000 | 13.33 | 1 |
| Cabbage | 8,250 | 10,000 | 1,750 | 17.50 | 2 |
| Mung bean | 8,750 | 10,125 | 1,375 | 13.58 | 4 |
| Maize | 3,752 | 5,104 | 1,351 | 26.48 | 22 |
| Popcorn | 7,200 | 8,300 | 1,100 | 13.25 | 1 |
| Cowpea | 6,429 | 7,452 | 1,024 | 13.74 | 21 |
| Feijao cute | 7,000 | 8,000 | 1,000 | 12.50 | 1 |
| Cassava | 2,391 | 3,382 | 991 | 29.30 | 11 |
| Dry cassava | 3,000 | 3,500 | 500 | 14.29 | 1 |
| Sweet potato | 2,500 | 3,000 | 500 | 16.67 | 1 |

Source: Trade inventory survey, JICA study team, 2012

3.7. Processing Agriculture Products

3.7.1. Agro-processing

The Study Area is major agriculture production area in the country, and there are about 200 processing companies varying from small to large scale operate in Nampula province. Mills for maize and cassava prevails small to medium scale processing factories. Cashew and cotton factories have large scale processing capacity.

(1) Small and Medium Scale Agro-processing

Table 3.7.1 shows a part of small-scale processor in the Study Area. In district capitals and relatively large communities, small-scale mills, processing capacity less than 1 tons/hr, are operated. In the areas, where electricity network is not available, a diesel generator is used for power source. Maize and cassava are milled to flour in these small-scale mills for self-consumption of producers and retail purpose at local market. In rural area, where mechanical flourmills are not available, flour is processed traditional way in pounding by women's hand. In Nampula province, there are rice mills, which mill and packing imported rice as well as rice from outside the province.

Table 3.7.1 Small and Medium Scale Agriculture Processing Factory in the Study Area

| Province | District | Locality | Main product | Processing capacity (tons/yr) | Annual processed (tons) | Operating ratio (%) | Legal status | |
|----------|--------------|-------------------------|-------------------------|-------------------------------|-------------------------|---------------------|----------------|----------------|
| Nampula | Ribaué | Pecuaría | Maize, cassava | 800 | 450 | 56% | Registered | |
| | | Ribaué Sede | Maize, cassava | 1,200 | 740 | 62% | Registered | |
| | Malema | Mutuali | Maize, cassava | 2,340 | 1,250 | 53% | Registered | |
| | | Malema Sede | Maize, cassava | 800 | 750 | 94% | Registered | |
| | | Malema Sede | Maize, cassava | 800 | 800 | 100% | Registered | |
| | Murrupula | Rovuma 1 | Cashew nut | 1,500 | 150 | 10% | Registered | |
| | | Nihessie | Cashew nut | 350 | 20 | 6% | Registered | |
| | | Murrupula sede | Maize, cassava, sorghum | 3,590 | 350 | 10% | Registered | |
| | Nampula | Murrupula sede | Maize, cassava, beans | 3,500 | 300 | 9% | Registered | |
| | | Anchilo | Maize, cassava, beans | 750 | 480 | 64% | Registered | |
| | | Anchilo | Maize, cassava, beans | 3,500 | 600 | 17% | Registered | |
| | Mogovolas | Naphome | Naphome | Maize, cassava, beans | 6,500 | 1,290 | 20% | Registered |
| | | | Km 20 | Maize, cassava, sorghum | 4,000 | 2,000 | 50% | Not registered |
| | | Namatil sede | Namatil sede | Maize, cassava, beans | 5,000 | 4,000 | 80% | Not registered |
| | | | Iulute | Maize, cassava, beans | 3,500 | 3,000 | 86% | Not registered |
| | | Muecate | Imala | Maize, cassava, sorghum | 4,500 | 1,500 | 33% | Not registered |
| | Muecate sede | | Maize, cassava, beans | 4,000 | 2,000 | 50% | Not registered | |
| Zambezia | Gurue | Muecate sede | Maize, cassava, beans | 5,500 | 4,500 | 82% | Not registered | |
| | | Gurue-Sede | Beans | | | | Registered | |
| | | Gurue-Sede | Maize, cassava | 3,600 | 2,500 | 69% | Registered | |
| Niassa | Cuamba | Lioma | Maize, cassava | 3,600 | 2,500 | 69% | Registered | |
| | | Cuamba Sede | Maize, cassava, sorghum | 6,000 | 4,500 | 75% | Not registered | |
| | | Cuamba Sede | Maize, cassava, sorghum | 3,500 | 2,000 | 57% | Not registered | |
| | Ngauma | Lurio | Maize, cassava, sorghum | 1,250 | 800 | 64% | Not registered | |
| | | Massangulo | Maize | 3,000 | 1,450 | 48% | Not registered | |
| | | Massangulo | Maize, cassava | 2,700 | 900 | 33% | Not registered | |
| | | Bairro de trabalhadores | Maize, cassava | 4,600 | 1,010 | 22% | Not registered | |
| | Lichinga | Chiuaula | Maize, sorghum | 7,900 | 5,200 | 66% | Not registered | |
| | | Chiuaula-cerâmica | Maize, cassava | 4,500 | 2,300 | 51% | Not registered | |
| | | Sanjala | Maize, cassava, sorghum | 3,600 | 1,900 | 53% | Not registered | |

Source: Trade inventory survey, JICA study team, 2012

In Mandimba, small-scale rice milling plant was provided to one association in 2004. This plant was abandoned, and is no longer operating. Direct reason is the association

could not pay electric bills, but reality was lack of operation and management skills and experience of the association on operation and maintenance of equipment, management of buying and selling of materials and product, and cost and benefit management.

(2) Large Scale Agro-processing

Tobacco, cotton and cashew are mainly processed for exportation. Maize and cassava flours are supplied for domestic market in north region. 50-90 tons/day capacity mills are located in Nampula city.

Tobacco is produced in concessionary system. In the Study Area, two tobacco processing factories, Sonil and Mozambique Leaf Tobacco (MLT) are located in Malema and Cuamba respectively. Selection and packing are main processes in the tobacco factory.

For cotton, ginning, selection and packing are main processes in the factory. Most cotton factories are located in Nampula province (Figure 3.7.2). District name followed by (F), in which cotton factory is located. After ginning, cottonseed is produced as by-product after ginning process, and utilized for cottonseed oil, as well as seed cotton for next season. SANAM has cottonseed oil extraction plant in their cotton factory. Another cottonseed extraction company in Cuamba, "Cotton Oil Factory from Cuamba", is a Mozambique-Malawi joint company. They established a cotton oil factory closed to cotton ginning factory of S.A.M., by which cottonseeds are supplied. Cottonseed oil from this oil factory is exported to Malawi for refining and selling. Seed cakes, as animal feed, are exported to South Africa, Zambia, and Zimbabwe. Operation rate of this factory is still low as less than 50%, due to lack of materials.

Nampula province is major producer of cashew nut in Mozambique. Many cashew processing factories are allocated in the eastern districts of the province as shown in Figure 3.7.3. Processing of cashew nut in Mozambique is the primary processing only, sometimes referred to as 'shelling' (roasting, cutting, drying and peeling); the international buyer is responsible for the second stage of processing (e.g. roasting and adding flavor and consumer packaging). Based on the interviews with a few of the processing companies, it appears that cashew processing is a fairly profitable (but not excessively profitable) activity, with margins between 15-20%¹¹. Cashew processing is labor intensive, and factories contribute job creation in surrounding areas.

¹¹ Source: Value chain finance assessment of the cashew nuts sector in Nampula, GIZ, 2011

Table 3.7.2 Production Area of Cotton by Concessionaire (ha)

| Province | District | Company | | | | | | | | | Total |
|--------------|------------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|------------|---------------|----------------|
| | | OLAM | SANAM | SAM | PLEXUS | NOVOS | PALOPIQUE | NOVA | MOCOTEX | SAN/JFS | |
| Nampula | Monapo (F) | | 18,200 | | | | | | | | 18,200 |
| | Muecate | | 9,100 | | | | | | | | 9,100 |
| | Meconta (F) | | 1,100 | | | 2,500 | | | | | 3,600 |
| | Mogovolas (F) | | 2,500 | | | | | | | | 2,500 |
| | Nampula Dist (F) | | 150 | | | | | | | | 150 |
| | Murrupula | 610 | | | | | | | | | 610 |
| | Ribaue (F) | 4,600 | | | | | | | | | 4,600 |
| | Malema (F) | | | 11,925 | | | | | | | 11,925 |
| | Lalaua | 18,500 | | | | | | | | | 18,500 |
| | Moma | | 4,570 | | | | | | | | 4,570 |
| | Nacaroa | | 1,260 | | | | | | | | 1,260 |
| | Mecuburi | | 10,000 | | | | | | | | 10,000 |
| Erati (F) | | | | | 7,900 | | | | | 7,900 | |
| Zambezia | Alto Molocue | | | | | | | 500 | | | 500 |
| | Lugela | | | | | | 400 | | | | 400 |
| | Mocuba | | | | | | 1,700 | | 550 | | 2,250 |
| | Gile | | | | | | | 1,000 | | | 1,000 |
| | Ile | | | | | | | 300 | | | 300 |
| Niasa | Cuamba (F) | | | | | | | | | 19,900 | 19,900 |
| | Mandinba | | | | | | | | | 200 | 200 |
| | Maua | | | | | | | | | 1,200 | 1,200 |
| | Marrupa | | | | | | | | | 900 | 900 |
| | Metarica | | | | | | | | | 3,800 | 3,800 |
| | Mecanhelas | | | | | | | | | 3,850 | 3,850 |
| | Mecula | | | | | | | | | 20 | 20 |
| | Majune | | | | | | | | | 80 | 80 |
| | Nipepe | | | | | | | | | 2,800 | 2,800 |
| Millange | | | | | | | | | 40 | 40 | |
| Total | | 23,710 | 46,880 | 11,925 | 7,900 | 2,500 | 2,100 | 1,800 | 550 | 32,790 | 130,155 |

Note: (F) Factory

Source: Institute of cotton (IAM), 2012

Constraints of processing companies are; 1) low operation rate of facility due to lac of materials, 2) insufficient volume and quality of materials due to low awareness level of producers, 3) high cost of imported packing and packaging material, 4) unstable or undeveloped infrastructure, such as electricity, water, and road.

In the meantime, in order to attain cost reduction and strong bargaining power ,nine cashew processing companies established a private company, *Agro Industrias Associadas Lda. (A.I.A.)*, under the brand name “Zambique” with a guaranteed quality standard. The main activities of AIA are:

- Support for bulked imports for factory production (packing and packaging materials),
- Manage price negotiations with customers
- Complete paperwork and logistics for exporting processed nuts
- Remit sales, net of costs, to member processors
- Promote and manage Zambique™ brand (Technoserve, 2009).

Table 3.7.3 Cashew Processing Factory in Nampula in 2009

| Name | Location | Year established | Processing capacity (tons/yr) | Processed capacity (tons/yr) | Operating ratio (%) |
|-----------------------------|--------------------|------------------|-------------------------------|------------------------------|---------------------|
| Miranda Industrial | Namige | 2002 | 1,500 | 1,400 | 93% |
| | Angoche | 2004 | 3,500 | 3,000 | 86% |
| | Meconta | 2004 | n.s. | 1,000 | – |
| | Napaco | 2005 | 1,000 | 600 | 60% |
| Ilha Caju (GANI Commercial) | Ilha de Mozambique | 2004 | 5,000 | 1,000 | 20% |
| Condor Caju | Nametil | 2005 | *5,000 | 4,500 | 90% |
| Condor Nuts | Anchilo | 2008 | 7,000 | 2,500 | 36% |
| IPCCM | Murruapula | 2003 | *1,000 | *450 | 45% |
| Olam | Monapo | 2004 | 5,000 | 3,500 | 70% |
| Koroxo | Chehure | 2006 | 2,500 | 1,700 | 68% |
| Total | | | 27,000 | 19,650 | 73% |

* Estimation

Source: Value chain finance assessment of the cashew nuts sector in Nampula, GIZ, 2011

3.7.2. Agro-processing Investment

(1) Agro-processing Investment in Nampula Province

Thirteen investment projects in the agro-processing industry have been approved in Nampula province since 2007,¹² of which 6 are in the Nacala port and the surrounding area, 5 are in Nampula district and 2 are in Meconta district, in aggregate also including 3 large investment projects for which the investment volume exceed 20 million US\$. The crop processing industry is the dominant industry, including small to medium scale processing factories for the cleaning and sorting of crops. Cashew nut processing is also a growing industry since 3 new factories have started operations since 2007. Including the fact that 6 cashew nut processing factories have been built in the time period from 2002 to 2006¹³, 10 cashew nut factories in Nampula province have begun operation over the past 10 years.

Table 3.7.4 Summary of the Agro-Processing Investment in Nampula Province (2007 – 2011)

| Year | Enterprises | Products | District | Investment Value (000 \$) | No. of Employment |
|------|-------------------|-------------------------------|----------------|---------------------------|-------------------|
| 2007 | Caju Ilha | Cashew nut processing | I Mozambique | 956 | 700 |
| | Cister Mozambique | Crop processing (maize, bean) | Nampula | 50 | 24 |
| | Nova Texmoqued | Cotton | Nampula | 24,000 | 450 |
| 2008 | Proalimantar | Crop processing (soybean) | Cidade Nacala | 130 | 20 |
| | Aviam | Jatropha oil processing | Nacala-a-Velha | 20,191 | 2,500 |

¹² CPI Nampula office does not have a list of the approved investment projects in Niassa province.

¹³ Source: CPI investment data 2002-2006, and "Preparatory Study on Triangular Cooperation Programme for Agricultural Development of the African Tropical Savannah among Japan, Brazil and Mozambique (ProSAVANA-JBM)" 2010, JICA

| Year | Enterprises | Products | District | Investment Value (000 \$) | No. of Employment |
|------|-----------------------------|-------------------------------|---------------|---------------------------|-------------------|
| 2009 | Soc. Aglgodoeria | Cotton | Cidade Nacala | 4,500 | |
| | Apel Agro Processing | Crop processing (sesame) | Nacala Port | 2,781 | 115 |
| | Industria de Process Ricino | Castor oil processing | Meconta | 4,000 | 28 |
| | Cervejas de Moc | Beer production (with cassava | Cidade Nacala | 55,010 | 129 |
| | Fabrica de Nampula | starch) | | | |
| 2010 | Afro Moagen | Crop processing (maize) | Nampula | 1,000 | 24 |
| | Sunway | Crop processing (maize, bean) | Meconta | 500 | 50 |
| | Condor Nuts | Cashew nuts processing | Nampula | 1,789 | 500 |
| 2011 | Global View | Cashew nuts processing | Nampula | 154 | 24 |

Source: CPI

(2) Major Agro-processing Sectors in the Nacala Corridor

The three major agro-processing industry products in the Nacala Corridor are cashew nuts, cotton and tobacco. While the cotton¹⁴ and tobacco production and processing industries have been administered by a large-scale commercial agribusiness in a coordinated manner, the cashew nut industry has been growing diversely, especially in Nampula province¹⁵ where new investment in the cashew processing industry has been concentrated as noted above.¹⁶ The Table 3.7.5 below sets out the location and number of processing factories of the 3 major products in the Nacala Corridor. In addition, Figure 3.7.1 compares the export values of cashew nuts between those “with shells” and “shelled”. This shows that the export value of the shelled cashew nuts overtook that of unshelled nuts in 2008, which would imply growth in the cashew nut processing industries. Other agro-processing industries operating in the Nacala Corridor are of a rather small-scale, ranging from the primary to secondary processing level, which includes factories for sesame pre-hulling, rice processing, grain milling, and oil pressing.

Table 3.7.5 Major Agro-Processing Industries in the Nacala Corridor

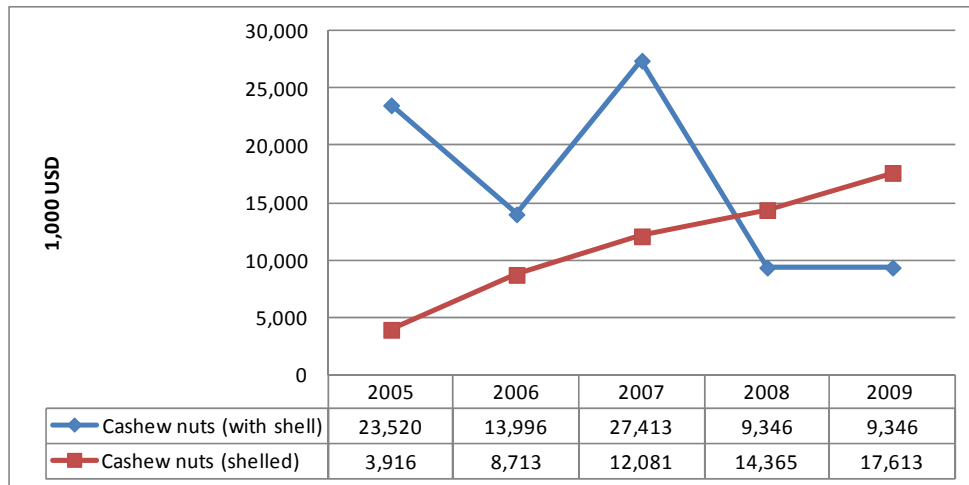
| Sector | Location (no. of factories) | Operators |
|-------------|--|--|
| Cashew nuts | Monapo (4), Meconta (1), Mogovolas (2), Murrupula (1) | ADPP, Atija Nuts, Caju-Liha, CC Association, Condor Nuts, IPCCN, Maziotela, OLAM |
| Cotton | Monapo (1), Mogovolas (1), Ribaue (1), Malema (1), Alto Molocue (1), | OLAM, SANAM, S.A.M, NOVA, SAN (Niassa) |
| Tobacco | Lichinga | Sonil |

(Source: CEPAGRI, and Instituto do Algodao de Mocambique)

¹⁴ Mozambique Cotton Institute (Instituto do Algodao de Mocambique) oversees /manages the cotton production in coordination with the processing industries.

¹⁵ According to INCAJU, around 40% of cashew nut production occurs in Nampula province.

¹⁶ Source “Review of Horticultural Outgrower Schemes in Mozambique”, World Bank



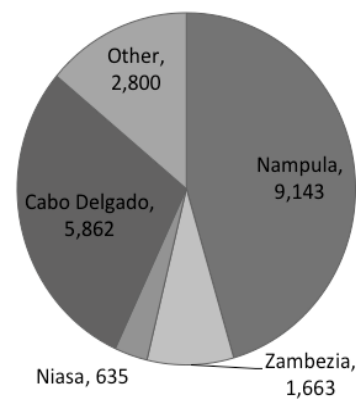
(Source: FAOSTAT)

Figure 3.7.1 Export Value of Cashew Nuts (shelled and unshelled)

3.7.3. Exporting Processed Agriculture Products

(1) Cotton

In Mozambique, all cotton lint are exported. Figure 3.7.2 illustrates Cotton lint production in Nampula, Zambezia and Niassa in 2009 are 9,143 tons, 1,663 tons, and 635 tons respectively, and total production of these three provinces accounts for 56.9% of total production of the country.



Source: Institute of Cotton Mozambique (IAM)

Figure 3.7.2 Production of Cotton Lint by Provinces

(2) Cashew

The market for cashew nuts is growing internationally and there is still an opportunity for Mozambican producers to capture a larger or higher-value share of this market. As mentioned above, in the Study Area, 20,000 tons of cashew nut were processed, and most of them were exported in 2009 as shown in Table 3.7.2

3.8. Agricultural Investment in the Nacala Corridor

3.8.1. Existing and Proposed Large Scale Agricultural Investments

(1) Trends in Agriculture/Agro-industry Investments in the Nacala Corridor

The investment environment for the agriculture/agro-industry sector in the Nacala Corridor has not matured fully as of yet due to the area's geographical isolation and limited trunk road networks, and its poor road conditions, which result in difficulties in the acquiring the necessary agriculture inputs and increased prices, as compared to major towns in the central and southern part of Mozambique. The proceeding table illustrates the transitions in agriculture investments in the Nacala Corridor over the past 5 years as seen through investment proposals reviewed by CEPAGRI. It indicates fluctuations in levels of investment volume as well as project areas, which resulted from large-scale investment plans for forest plantations in 2009 and 2010.

Table 3.8.1 Agriculture/Agro-Industry Investments in the Nacala Corridor (2008-2012)

| | 2008 | 2009 | 2010 | 2011 | 2012 | Total |
|----------------|--------|-----------|---------|--------|--------|-----------|
| No. of Project | 2 | 5 | 4 | 6 | 3 | 20 |
| Amount (000\$) | 17,839 | 2,434,449 | 92,744 | 60,086 | 11,546 | 2,616,665 |
| Area (Ha) | 31,789 | 387,400 | 275,500 | 29,964 | 16,014 | 740,667 |

Source: CEPAGRI investment data

The following table sets out the investment volumes and project areas from 2008 to 2012 categorized by sub-sector. It clearly indicates that the forestry sub-sector contributes greatly to investment volume because of the nature of the investment, which requires large areas and associated costs, though the number of such proposed projects is only 4 out of a total of 20 projects proposed during the time period.

Table 3.8.2 Agriculture/Agri-Industry Investments in the Nacala Corridor by Activity (2008 - 2012)

| | Area (Ha) | Amount (000 \$) | No. of Projects |
|---------------------------|-----------|-----------------|-----------------|
| Agriculture/Agri-industry | 63,978 | 89,572 | 9 |
| Livestock | 100,000 | 3,600 | 1 |
| Biofuel | 33,789 | 10,545 | 3 |
| Forestry | 466,000 | 2,511,948 | 4 |
| Others | 76,900 | 1,000 | 3 |
| Total | 740,667 | 2,616,665 | 20 |

Source: CEPAGRI investment data

(2) Large-scale Agriculture Investments in the Nacala Corridor

Though the number is limited, compared to the central zone including Sofala, Manica and Tete provinces where several large-scale biofuel projects have been approved,¹⁷ foreign investors have submitted proposals for large-scale agriculture investments to be carried out in the Nacala Corridor. Most of investors are forest plantations and the development of commercial farms for the production of cereals and legumes, especially maize, soybeans and oilseeds. Their projects are mostly planned in Niassa Province where an investor could relatively easily find a large vacant area suitable for plantation or commercial farming since most districts in Niassa Province have a low population density due to their remoteness. The following table summarizes the proposed large-scale agriculture investment projects¹⁸ in the Nacala Corridor since 2008.

Table 3.8.3 Major Large-Scale Agriculture Investments in the Nacala Corridor

| Investor/Company | Activity | Project Site | Area (ha) | Remarks |
|---|--|-------------------------------------|-----------|--|
| Matanuska (Zimbabwean capital) | Banana Plantation | Monapo district, Nampula | 3,800 | - Plantation started operation in 2007 |
| Luambala Jatropha (Finnish capital) | Jatropha plantation (biofuel) | Majune District, Niassa | 8,700 | - Organic soybeans have also been produced |
| Niassa Green Resource (Norwegian capital) | Forestry plantations (eucalyptus/pine trees) | Sanga and Lichinga district, Niassa | 60,000 | - 46,000 Ha in Sanga - Started planting in 2007 |
| Lurio Green Resource (Norwegian capital) | Forestry plantations (eucalyptus/pine trees) | Nampula and Cabo Delgado provinces, | 126.000 | - Approved in 2009 as a 15-year plantation project |
| Companhia Florestal de Massangulo | Forestry plantations | Lichinga district, Niassa | 80,000 | - An investment proposal was submitted in 2009 |
| Quifel (Portuguese capital) | Commercial farming (soybeans, sunflower) | Gurue district, Zambezia | 10,000 | - Approved in 2009 - Land conflicts with local people have occurred |
| Brasperson (Brazilian capital) | Commercial farming (soybeans, maize) | Mandimba district, Niassa | 16,000 | - An investment proposal was submitted in 2012 |

Source: CEPAGRI investment data

3.8.2. Agricultural Investments and Land Issues

(1) Conflict between Investments and Community

The Government of Mozambique has emphasized on encouraging foreign investments in the agriculture sector since the mid 2000's in order to promote commercial agriculture and agro-industry development by the private sector. As a result of the promotion, the Government granted concessions to foreign companies of

¹⁷ They are mostly the Jatropha or sugar cane plantation with a processing factory.

¹⁸ Some projects are still in the planning stage, waiting to acquire the DUAT and environmental license.

close to 1 million hectares in the period from 2004 to 2010, 73% of the area of which is for forestry and 13% for biofuel projects.¹⁹ Some projects have come into conflict with local communities due to a lack of mutual understanding and consensus over the arrangement of compensation and relocation, which resulted from incomplete community consultation.²⁰

Though large-scale agriculture investments in the Nacala Corridor are limited in number, conflict cases between investors and communities have been reported, most of which occurred during the delimitation of the concession area. The table below summarizes the land conflicts with communities resulting from agriculture investments in the Nacala Corridor and surrounding areas.

Table 3.8.4 Land Conflicts in the Nacala Corridor

| Investment Project | Location (Province) | Area (Ha) | Details of Conflicts | Measures |
|--------------------|---------------------|-----------|---|--|
| Commercial Farm | Zambezia | 10,000 | <ul style="list-style-type: none"> - 240 farmers who have lived in the concession area have not been re-located. - Only 500 Ha out of 10,000 Ha of the concession area, has been cultivated due to land conflict with communities. | <ul style="list-style-type: none"> - Local district offices have tried to mediate the case with local traditional leaders. |
| Fruit Plantation | Nampula | 3,500 | <ul style="list-style-type: none"> - Local communities claimed that the agreed compensation payment for the land has not been paid by the investor. | <ul style="list-style-type: none"> - The community brought the case to the district attorney's office. |
| Forestry | Zambezia | 150,000 | <ul style="list-style-type: none"> - The planned area was densely populated, and most lands were being utilized for cultivation of food crops by local communities. - Communities questioned risks of impacts on food security and environment. | <ul style="list-style-type: none"> - The investor decided to withdraw from the plantation project. |
| Forestry | Niassa | 30,000 | <ul style="list-style-type: none"> - The community claimed that the investor planted trees in farmlands (out of the delimited area) of local farmers. - The investor has run into a serious conflict with communities. | <ul style="list-style-type: none"> - A continuous dialogue involving concerned stakeholders has been carried out to mediate the conflict. |
| Commercial Farm | Niassa | 16.000 | <ul style="list-style-type: none"> - Though a conflict case has not been reported yet as it is still in the preparatory stage of the project, the investor is anxious about the procedures for accruing the DUTA. | |

(Source: 1) JICA Study Team, 2) "Confrontation between peasant producers and investors in Northern Zambezia, Mozambique, in the context of Profit Pressures of European Investors", Simon Norfolk and Joseph Hanlon, and 3) "Study on Community Land Rights in Niassa Province", Gunilla Akesson, A Calengo, C Tanner)

¹⁹ "Confrontation between peasant producers and investors in Northern Zambezia, Mozambique, in the context of Profit Pressures of European Investors", Simon Norfolk and Joseph Hanlon, Annual Conference on Land and Poverty 2012, World Bank

²⁰ Application and community consultation procedures for acquiring a land-use right (DUAT) will be discussed in the following Section 9.2.

Though in-depth discussion on the procedures for acquiring the land-use right (DUAT) will be addressed in other sections of this report, some of the findings are summarized below in order to help to avoid conflicts with local communities as a result of large-scale agriculture investment.

1) Insufficient public consultation

Though the Land Law Legislation stipulates the holding of public consultation at least two times involving concerned stakeholders (representatives for the investor, local government offices and community representatives), the consultation process is sometimes dominated by local political/religious leaders. Even though the majority of local people who will be affected by an investment project may be present, they often hesitate to voice their opinion in front of a large audience, and as a result the genuine community's perspective might not be reflected in the agreement with the investor on the demarcation of the land.

2) Vagueness in contents of the minutes of public consultation meeting

The investor is obligated to attach the minutes of the public consultation meeting, signed by the three parties (the government, investor and community), to the application form for the DUAT. Though the minutes are required to describe the details of the agreement, including compensation, social benefits, resettlement plan, project schedule, etc., descriptions are usually vague, containing general statements on welcoming the project and indistinct references to social benefits and compensation schemes.

3) Indistinct roles of local authorities in conflict resolution

It is unclear what the jurisdiction of local authorities is in relation to conflict resolution concerning land issues of agriculture investment. Though the SDAE could take a leading role in mediating such conflicts, its capacity is limited in terms of staff and workload. A continuous dialogue with communities is necessary for solving any conflicts, and thus a proper facilitation by a third party, such as a local government office, would be critical to finding a better solution.

(2) Issues concerning with DUAT

The steps to obtain the DUAT require dedication of time and financial resources, making the legalization of land a constraint to the majority of the population. Although SPGC is available to offer guidance, interviews with companies and individuals who obtained the DUAT, or are in process of obtaining it, informs that the process is slow and complex, and that the same situation occurs in obtaining licenses and rights transferences.

The lack of interest, capacity and/or need for most local occupants to obtain the DUAT makes the National Land Register Office an instrument of low accuracy in terms of existence of available and unoccupied areas and areas that, although occupied without DUAT, can be used in other production process.

The map shown as Figure 3.8.1 below shows the land occupied by DUAT holders, by category, as indicated on the legend: agriculture, forestry, mining, other (industries, commercial sites, etc), communities, reserved (conservation area and hunting ground) and unknown (need to be clarified by DNTF). The map covers the districts of Nacala Corridor, in the Provinces of Niassa, Nampula and part of Zambézia.

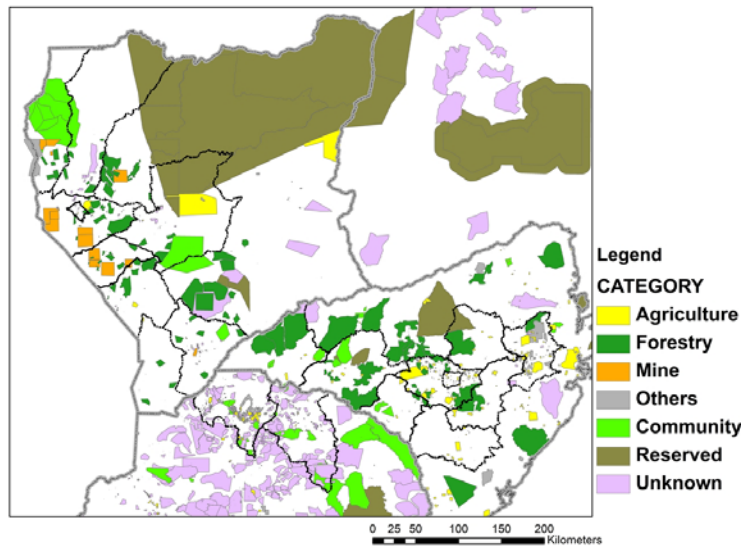


Figure 3.8.1 Land Occupied by DUAT Holder

A simple analysis indicates that there is available area on the white part. However, as mentioned before, some types of occupancy are not obliged to hold a DUAT (individuals and local communities, according to traditional practices, and national individuals who in good faith, have been using the land for at least ten years), so some of the white areas might have certain occupation.

Considering that, the map shown as Figure 3.8.2 below was elaborated using information from the National Agency of Roads (ANE), according the methodology presented on chapter 4.9, and shows, preliminarily, areas occupied by DUAT holders and location of local farmers.

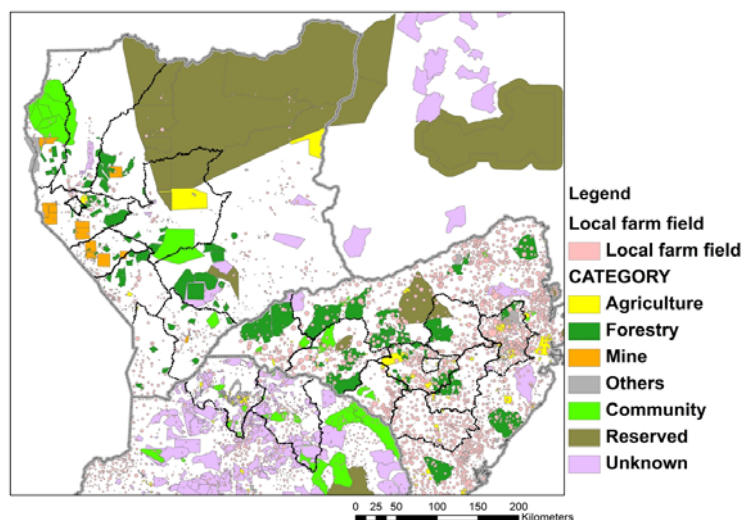


Figure 3.8.2 Land Occupied by DUAT Holder and Local Farm

From that image one can understand the

importance of a mechanism that can bring more accuracy to land occupation, for the white area available is diminished after the rose spots were added.

By ensuring the legitimate occupation of the land by its citizens, based on norms, practices and good faith, the Government of Mozambique valorizes correctly its population and its tradition. However, the lack of a mechanism to provide concrete data on this reality becomes a constraint for the definition of policies that can bring these populations, which in general is in a less favored position, into the production process, ensuring a better income and quality of life.

One must think on ways to make the obtainment of DUAT, licenses and transfers, a faster process, with reduced costs, so that more Mozambican citizens feel attracted to legalize their land (we are not here meaning legitimacy because it is already guaranteed by the constitution). By doing so, the Government may have a more realistic picture of the occupations and citizens can have access to other types of incentives such as credit lines, among others. For larger scale national and international investors, the faster and more transparent the process is, the faster they can achieve the expected results, contributing, thus, more effectively to the development of the country.

The suggestion is to make a Project, following the Quick Impact Project model, that can support rural population and local producers to obtain their DUAT, bringing more accuracy to the work performed by the National Land Registry Office. The result will support potential investor on the elaboration of their Operating Plans and on the identification of available areas; at the same time that will help Government's decisions making and policy elaboration.

It is also important to create a Working Group with stakeholders in order to address major issues, such as:

- possibility to simplify the procedures for obtaining DUATs, licenses and transferring of land, focusing reduction of processing length (time) and costs;
- to evaluate initiatives such as leasing of land in order to provide areas for larger scale productions; and
- re- evaluate criteria and deadlines of the Operating Plans inspections, 2 years for foreigners and 5 years for nationals, and address the percentage to be achieved x dimension of the Plan.

(3) Agricultural Investments and Land Issues

In addressing the subject Investment in Agriculture and Land Issues it is important to have in mind two constitutional principles of Mozambique, here often cited: "1). Land is a state property. 2). Land cannot be sold or by any other means alienated or mortgaged or confiscated. 3). As a universal means to create wealth and social welfare, the use of land is entitled to all Mozambican people (Article 109)", and "the

Republic of Mozambique agriculture is the basis of national development (Article 103)".

Therefore, it is important that investors, specially foreigners, understands how to invest without expecting land valuation, unlike the paradigm of many countries with intensive agricultural production, such as Brazil, where land tenure is a property, whose value increases, with the use of technology that leads to soil fertility improvement.

The following Table 3.8.5 illustrates the meaning of adding value to land, presenting prices in two types of areas in Brazil (Bahia Juazeiro and West), located in Bahia State (Province), which resemble different Savannah regions in Nampula Province, Nacala Corridor in Mozambique.

The table 3.8.5 indicates an increase in land value in the period 2005 to 2010, caused directly by the demand for production area, and shows that prices increases in both regions, with low precipitation (semiarid / Juazeiro BA) and where rainfall rates are more suitable for grain production (1,300 to + 1,500 mm per year).

Other factor that adds value to land is the incorporation of irrigation infrastructure, which may represent an increase up to 10 times the initial value of the land (Irrigated Agricultural land / Agricultural land of high productivity). It is observed that in the case of native vegetation, with an average rainfall of 1,400 mm per year, the increase is three times (300%) the initial value of the land, after four years of work (Agricultural land with 1,400 mm / Savannah 1400 mm annually).

Table 3.8.5 Meaning of Adding Value of Land in Brazil – Bahia State

| Land Value R\$ / HA | | | | |
|--|---------------|--------------|--------------|---------|
| Type of Land / Province | 2005 | 2009 | 2010 | % 10/05 |
| Juazeiro / Bahia State (400 to 700 mm annual rainfall) | | | | |
| Caatinga – 400 mm annual | 87 | 117 | 103 | 19% |
| Pasture formed (Jacobina – District) | 783 | 867 | 800 | 2.1% |
| Pasture formed (Juazeiro – District) | 184 | 315 | 210 | 14% |
| Agricultural land of high productivity | 826 | 2,167 | 1,233 | 49.2% |
| Agricultural land of low productivity | 147 | 508 | 500 | 240% |
| Irrigated agricultural land | 8,767 | 7,025 | 3,600 | -58.9% |
| Irrigable agricultural land | 3,004 | 4,000 | 1,733 | -42.3% |
| West Baiano / Bahia State (1100 a +1500 mm annual rainfall) | | | | |
| Savannah with 1,100 mm annual | 150 | 675 | 567 | 278.6% |
| Savannah with 1,300 mm annual | 531 | 1,917 | 1,600 | 201.4% |
| Savannah with 1,400 mm annual | 1,062 | 1,500 | 1,267 | 19.3% |
| Savannah with 1,500 mm annual | 1,566 | 3,933 | 3,167 | 102.2% |
| Agricultural land with 1,500 mm | 4,016 | 9,417 | 9,167 | 128.3% |
| Agricultural land with 1,400 mm | 3,239 | 5,208 | 5,233 | 61.6% |
| Agricultural land with + 1,500 mm | 4,793 | 10,500 | 10,033 | 109.3% |
| Ratio Savannah/Agricultural land 1400 mm | 300.5% | 347% | 413% | |

Source: Publication AGRUANUAL – Brasil, 2011, AgraFNP.

This concept of working the land, leading to the increase of its value, is one of the main reasons of the promotion of the expansion of investments in unexplored areas in Brazil.

Therefore, in the case of Mozambique, investors especially foreigners should be aware that adding value to land is not applicable. Instead, a concession of 50 years, renewable for another 50 years, is provided by the government, as long as it has the consent of local communities where the venture will be implemented.

3.8.3. Collaboration between the Commercial Farms and Small-Scale Farmers

(1) Experience of the Beira Agriculture Growth Corridor (BAGC) initiative

The Beira Agriculture Growth Corridor (BAGC) initiative, launched at the World Economic Forum in 2010, is a partnership between the Government of Mozambique, the private sector, local farmers and donors with the aim of stimulating an increase in agriculture productivity and the income of small-scale farmers by facilitating responsible private investment. BAGC has proposed two commercial agriculture models: 1) the outgrower model; and 2) the serviced farm block model with direct links between commercial farm investments and small-scale farmers. The outgrower model is a familiar model where the commercial farm provides services, such as agriculture inputs and technical extension services, to small-scale farmers, while the serviced farm block model aims to lease irrigated farm blocks to commercial and small-scale farmers.

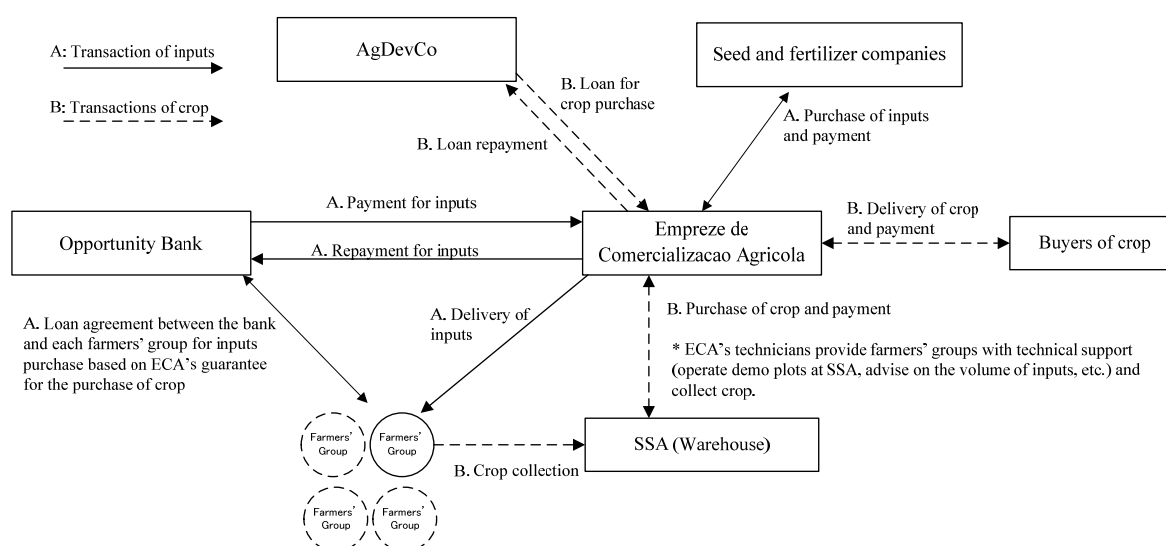
AgDevCo, a not-for-profit agriculture distribution development company operating in sub-Saharan Africa, manages a 22 million US\$ Catalytic Fund,²¹ a social venture capital fund targeting start-up SME agriculture businesses in BAGC, applying the outgrower model. Through the Catalytic Fund, AgDevCo offers different types of loans including a short-term bridge loan for working capital and a mid-term loan for the procurement of machinery as well as equity finance, with a low interest rate ranging from 5 % to 10 % per annum. Since it launched in 2011, twelve projects have received funding from the Catalytic Fund for which the portfolio includes horticulture, livestock, seeds multiplication, and grain and honey production.

In conducting frequent visits to loan recipients for monitoring purposes, AgDevCo also provides business advisory services, such as introducing potential markets for products and creating clusters for mutually supporting SME agricultural businesses in the BAGC area. AgDevCo has tried to find potential partners/recipients for the Catalytic Fund in order to more widely expand the BAGC initiative in the region.

²¹ Major donors of the Catalytic Fund are DFID, Dutch, and Norwegian Governments.

1) An Example of an Agribusiness Model for a Service Provider (seed, fertilizer and marketing)

One of the successful businesses financed by the Catalytic Fund is ECA, which is acting as a service provider by linking a group of small-scale farmers to profitable markets. As illustrated in Figure 3.8.3 below, utilizing financing from the AgDevCo (the Catalytic Fund), ECA provides seeds and fertilizer to farmer groups,²² while AgDevCo facilitates the acquiring of loans from local banks for farmers to purchase inputs. It should be noted that ECA provides extensive extension services to the farmer groups by establishing demo-plots for the demonstrating effective farming techniques through which mutual trust between ECA and farmer groups has been fostered. ECA achieved a nearly 100 % recovery rate on input finance for seeds and fertilizer in its first season, while the farmer groups supplied the largest harvest to ECA without selling to other traders.



Source: JICA Study Team

Figure 3.8.3 Agribusiness Model with Small-scale Farmers: ECA's Case (service provider)

2) An Example of the Agribusiness Model by a Small/Medium Scale Commercial Farm

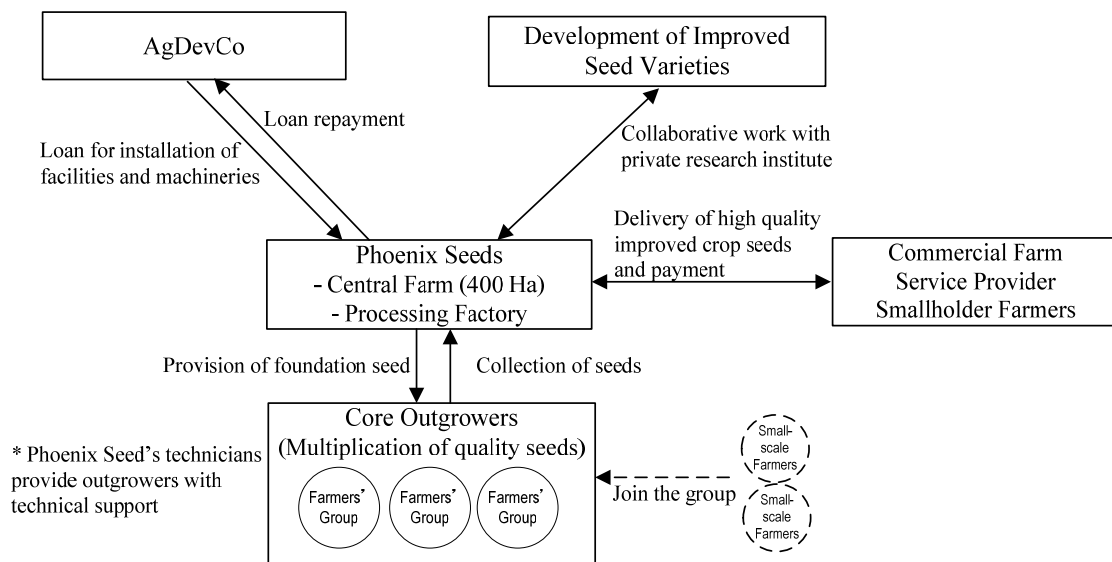
Though commercial agriculture in the Beira Corridor has not been well developed as of yet,²³ AgDevCo has worked with small/medium scale commercial farms with the aim of structuring equitable relationships with small-scale farmers so that they may benefit

²² Twenty SSGs (similar to a forum) composed of 56 groups with total 850 small-scale farmers was formed to conduct the contact farming with ECA.

²³ The report indicated that of the 10 million Ha of arable land in the Beira Corridor, less than 0.3 % is farmed commercially. (source: Beira Agriculture Growth Corridor)

from the growth of commercial agriculture. Financed by the Catalytic Fund, a variety of commercial farms²⁴ have adopted the outgrower model providing small-scale farmers with access to farm inputs, extension services, value-adding facilities and reliable markets.

One of the pioneers in developing a commercially viable outgrower model is Phoenix Seeds, a seed development and multiplication farm. Phoenix Seeds has its own commercial farm with an irrigation facility where the improved foundation seeds of different crops (maize, soya bean, cow peas, etc.) have been produced. Phoenix Seeds works with a group of farmers, as outgrowers, for the multiplication of improved seeds while providing extensive technical support and agriculture inputs. The strategy of Phoenix Seeds is to build the capacity of the core outgrowers so they may be leaders/facilitators in farmer-to-farmer technology extensions involving more small-scale farmers in the production of seeds.



Source: JICA Study Team

Figure 3.8.4 Agribusiness Model with Small-scale Farmers : Phoenix Seed's Case (Commercial Farm)

Apart from medium-scale commercial farms like Phoenix Seeds, AgDevCo also provides loans to small-scale commercial farm owners who operate farms with an area of 20 to 50 ha since supporting the entrepreneur, who is eager to depart from an individual producer to a commercial farmer, is crucial to achieving scale and impacts on commercializing small-scale farmers.

²⁴ It includes commercial farms for horticulture, livestock, fruits, seed multiplication, and honey production.

3) Lessons Learned from the BAGC Initiative

The strategy for the BAGC initiative is to create a collaborative mechanism by which small-scale farmers benefit from the growth of commercial agriculture while working with large agribusiness companies in Mozambique for the development of a joint irrigation project that would contribute to the modernizing of the agriculture sector in the region. As explained earlier, small/medium scale commercial farms take a leading role in the expanding of agribusiness initiatives by involving groups of small-scale farmers in commercial production, which would be regarded as an effective agriculture development model applicable to the Nacala Corridor. The lessons learned from the BAGC initiative are summarized below.

- Medium-scale commercial farms or service providers operating in the areas should be an important partner for agribusiness development, involving small-scale farmers through the outgrower/contract farming model. It is essential that commercial farm operators should have access to soft loans²⁵ in order to cover the initial investment costs as well as the short-term working capital for the purchase of crops from outgrowers, since the loan interest rates of commercial banks in Mozambique are quite high.²⁶
- Building mutual trust with a group of outgrowers is a prerequisite for the success of this model. A commercial business partner should develop a proper extension method that allows for close interaction with outgrowers through frequent farm visits.
- Commercial farms, with support from a government office such as CEPAGRI, needs to make proper arrangements with local banks to provide loans to outgrowers since farm inputs such as seed and fertilizer should be provided at a price under the outgrower model. With a loan contract, a commercial farm operator could easily control the input and harvest transactions with outgrowers.

(2) Current Status of Collaboration between Private Business and Small-Scale Farmers in the Nacala Corridor

Except for the cotton and tobacco sectors, which operate the largest outgrower scheme in Mozambique, working with small-scale farmers, only a few private businesses work with small-scale farmers for commercial agriculture through the outgrower/contract farming arrangement in the Nacala Corridor, while several projects, supported by NGOs, donors, or the government, have tried to link with the private sector in order to establish product value chains. Though it is still in the early stages of developing a collaborative mechanism between commercial farms/service providers

²⁵ Its interest rate ranges from 5 to 10 % per annum.

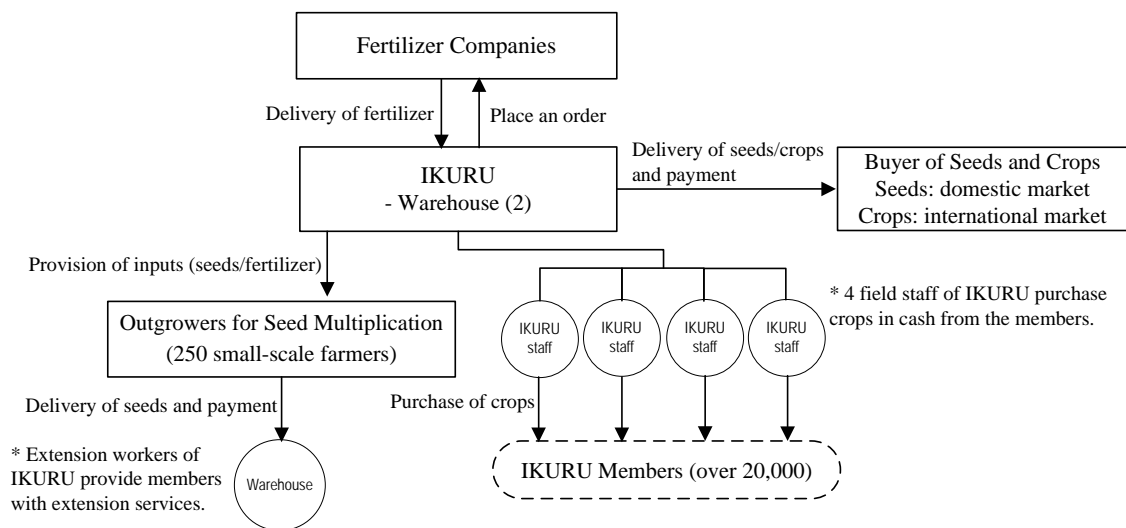
²⁶ This ranges from 20% to 25% per annum.

and a group of small-scale farmers, the current agribusiness initiative observed in the Nacala Corridor is producing food/cash crops with farmer's groups.

1) Agribusiness Initiatives by Private Businesses

<IKURU>

As a producer-owned marketing company, IKURU was established in 2003 in Nampula with the support of various external organizations, and to which shares are held by GAPI²⁷ (44.15%), Oxfam NOVIB²⁸ (44.15%) and producers (11.7%). At present IKURU has 26 farmer forums, including over 500 associations, with a total of around 20,000 farmers. Since 2010 IKURU has concentrated its trading activities on organic certified crops (sesame and ground nuts) in addition to seed multiplication. The main production area is in the Monapo and Meconta districts for sesame, and in the Mogovolas and Murrupula districts for ground nuts. IKURU has carried out contract farming for seed multiplication with 250 farmers, while other members do not have any agreements with IKURU on the marketing of crops so that they may sell their harvests to other traders. IKURU has faced an enormous challenge in purchasing organic products, especially sesame, from members due to a severe price competition with other traders. In the last season IKURU only purchased 60 tons of sesame out of the over 2,000 tons harvested by IKURU members. In terms of property, IKURU owns 2 warehouses in Nampula and Monapo; the former is currently under construction and the later is equipped with sesame processing machinery.



Source: JICA Study Team

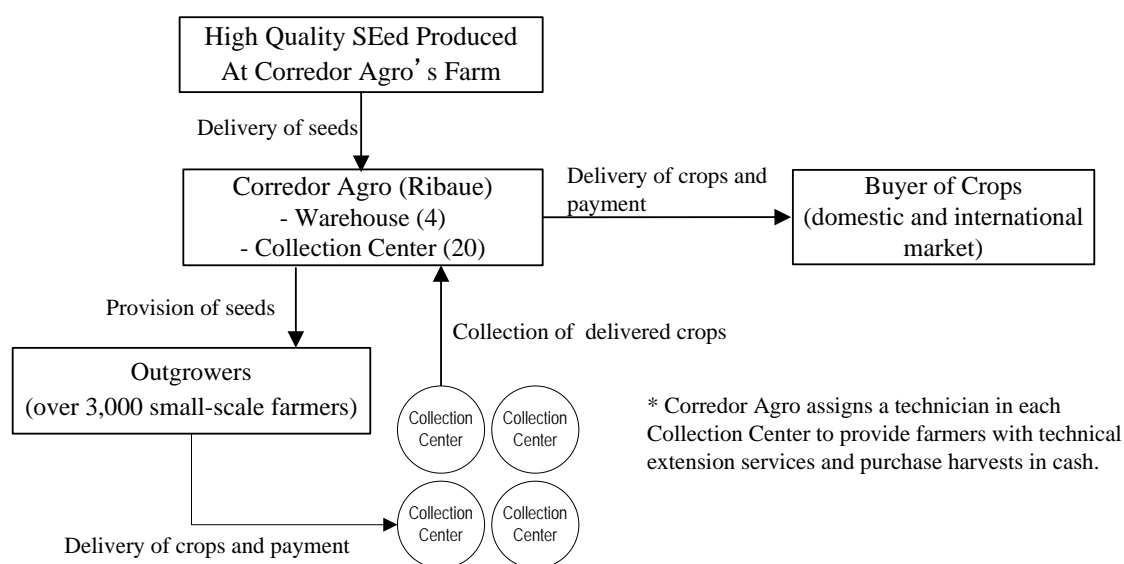
Figure 3.8.5 Agribusiness Model with Small-scale Farmers : IKURU's Case

<Corredor Agro>

²⁷ GAPI is a Mozambican development financing institution based in Maputo, providing credit to business support services.

²⁸ Oxfam NOVIB is a Norwegian organization for international aid, an affiliate of Oxfam International.

Corredor Agro, established in 2009, conducts both large scale farming operations at its own farm located in Namialo²⁹ and contract farming for the production of maize, soybean and sesame with small-scale farmers at 2 locations; the Namialo and Ribaue districts in Nampula province. The operation in Ribaue, begun in 2011, is engaged with over 3,000 small-scale farmers through “seed-for-crop” contracts under which seed, planting instruments and guaranteed crop purchases are provided by Corredor Agro.³⁰ Corredor Agro built 4 warehouses and 20 collection centers in Ribaue district where an extension worker hired by Corredor Agro was dispatched with the task of providing extension services and purchasing crops from the members. Though the contract farming operation in Ribaue has gone fairly well, Corredor Agro has faced difficulty in acquiring crops, especially soybeans and sesame, from farmers due to dissatisfaction with the purchase price. Corredor Agro plans to widely expand the contract farming in the neighboring districts, Malema and Cuamba, in the near future.



(Source: JICA Study Team)

Figure 3.8.6 Agribusiness Model with Small-scale Farmers : Corredor Agro's Case

2) Agribusiness Initiatives by NGOs/Donors and Government

<NGOs/Donors>

CLUSA, the Cooperative League of the USA, has implemented the Agri FUTURO project, sponsored by USAID, in the Nacala and Beira Corridors for 4 years since 2009 with the aim of improving the competitiveness of Mozambican commercial agriculture by identifying the constraints which prevent alignments with market demand, and finding solutions to overcome those barriers. The Agri FUTURO project works with

²⁹ Namialo is located in Meconta District, Nampula Province.

³⁰ Source: Corredor Agro Company Profile. Under the “seed-for-crop” contract, farmers do not pay for seed.

selected private agribusiness companies/farms to strengthen their capacity in marketing and business management skills by providing advisory support and a series of trainings. In addition, the project provides a matching grant of up to 75,000 US\$ to facilitate access to commercial loans for agribusiness investors³¹.

In Nampula province the Agri FUTURO project has tried to promote the contract farming model with interested commercial agribusiness partners³² through technical support in extension services and the provision of necessary machinery.³³

OLIPA, a local NGO established in 1999, has carried out 2 projects in the Nacala Corridor since 2011 focusing on creating a value-chain for cash crops involving potential buyers, as summarized in Table 3.8.6 below. Despite the fact that last year the projects facilitated connections with major local traders with Nampula or Nacale as a project partners in the marketing and purchasing of products, the results were suboptimal due to limited access to the project site, especially the Malema and Ribaue districts, where vegetables were produced. Traders were reluctant to come to those sites for collecting harvests since production volumes were minimal with the costs for direct purchases, including the transport expenses, not being able to be covered.

Table 3.8.6 Project Information (OLIPA)

| | Project Area | Components | Remarks |
|---|--|---|---|
| 1 | Malema, Ribaue (Nampula province) Gurue, Alto Molocue (Zambezia province) | <ul style="list-style-type: none"> - Capacity building of farmers associations - Provision of farm inputs (seed and fertilizer) - Extension services for farm management - Market promotion (finding a potential buyers) | <ul style="list-style-type: none"> - Target crops: Nampula: vegetables (onion) Zambezia: soybeans, maize - Funded by the Ministry of Agriculture |
| 2 | Mogovolas, Mecuburi (Nampula province) | <ul style="list-style-type: none"> - Promotion and marketing support of sesame and ground nuts - Provision of farm inputs (seed and fertilizer) - Extension service (2 extension workers hired by OLIPA are assigned in each district) | <ul style="list-style-type: none"> - Target number: 40 associations from each district - A candidate farmer facilitator is selected from each association - Supported by the Germany NGO |

<Government>

According to the Nampula Provincial Strategic Plan 2010-2020, CEPAGRI, in collaboration with a private sector partner, has planned a public-private-people

³¹ Economic and Sector Work: Agribusiness Indicator : Mozambique, World Bank 2012

³² Agri FUTURO has identified 4 private businesses, IKURU, Corredor Agro, ORINOTO, and CISTER, in Nampula province as a partner for implementing contract farming.

³³ Agri FUTURO provided 3 tractors to Corredor Agro and built a field office for IKURU.

partnership project in the Ribaue district of Nampula province to develop and test a full-package contract farming model, involving a service provider and local finance institution. The private service provider³⁴ provides agriculture inputs such as quality seed, fertilizer and instruments at a price, extensive technical extension services and a purchase guarantee for crops, while a finance institution provides loans to farmers with reasonable conditions.³⁵ The project will commence in the autumn of this year with the participation of over 300 farmers.

The Government of Mozambique has launched a cross-sectoral program in rural market promotion called PROMER, which covers 15 districts in 4 northern provinces (Nampula, Niassa, Zambezia and Cabo Delgado) with the aim of transforming the local agriculture system from subsistence to market-oriented through the implementing of several activities including: 1) agriculture extension services; 2) capacity building of farmer's associations and small/ medium local entrepreneurs; 3) support the establishing of local trader and small-scale village vendor networks to strengthen value chains; and 4) rural road rehabilitation. Private agribusiness partners are involved in the implementation of activities to improve market linkages for products. The following table summarizes the government projects for the promotion of agribusiness.

Table 3.8.7 Projects Information Implemented by the Government

| | Project Area | Components | Remarks |
|-------------|--|---|--|
| PPP Project | Ribaue (Nampula province) | <ul style="list-style-type: none"> - Full-package of contract farming for maize, soybean and sesame production with 300 farmers. - A private service provider takes the leading role in implementing a series of activities (input provision, extension service and crop purchase). | <ul style="list-style-type: none"> - A loan to farmers for the input purchase is provided from a local microfinance institution. - Corredor Agro is nominated as a private partner in the project. |
| PROMER | Malema, Ribaue (Nampula province) Cuamba, Mandimba (Niassa province) Gurue, Alto Molocue (Zambezia province) | <ul style="list-style-type: none"> - 7-year project that covers 15 districts in the northern provinces in Mozambique. - With financial incentives from the government, private sector partners are widely involved in implementing pilot activities with small-scale farmers. | <ul style="list-style-type: none"> - Corredor Agro will implement a sesame and cassava promotion project under PROMER. - PROMER will provide the financial support for the procurement of machinery. |

³⁴ Corredor Agro has been selected as a partner in the project.

³⁵ Modelo Microbanco, a microfinance institute operated in Ribaue district, provides a loan to farmers at 4% interest rate per month with a 6-month grace period.

3) Lessons Learned from the Agribusiness Initiatives with Small-scale Farmers in the Nacala Corridor

Compared to the Beira Corridor, commercial agriculture³⁶ has not fully matured due to several limitations in the agribusiness environment, such as accessibility to the large markets, the availability of inputs at an affordable price and the lack of infrastructure, particularly limited rural road networks and their condition. In addition to such limitations, private businesses, like IKURU and Corredor Agro, have faced other challenges from the business environment in creating new business models that involve small-scale farmers in the whole value chain, such as the availability of affordable loans, which are not conducive to local agribusinesses. The government and donors/NGOs are active in implementing projects supporting small-scale farmers through free input distribution and marketing support. These are definitely important for farmers who suffer emergency conditions, but some critics say that free of charge input distribution might crowd out private business, distort input markets and create moral hazard.

Taking into consideration the efforts made by the different sectors in the Nacala Corridor, it is recommended that collaborative work be initiated to develop a sustainable mechanism involving small-scale farmers as a partner, not a recipient, in the support/grant aid as well as the commercial agribusiness so as to improve productivity and strengthen the entire product value chain.

3.8.4. Japan, Brazil and Mozambique Public Private Joint Mission - ProSAVANA

The Private and Public Mission of ProSAVANA (hereinafter called PPP mission) was organized from 16th to 20th April, 2012. The mission visited fields in Nampula and Niassa Provinces and had discussion in Maputo. The number of participant in the mission was 55 in total, 19 from Japan, 16 from Brazil and 20 from Mozambique respectively. The mission consisted of 8 large-scale trade companies

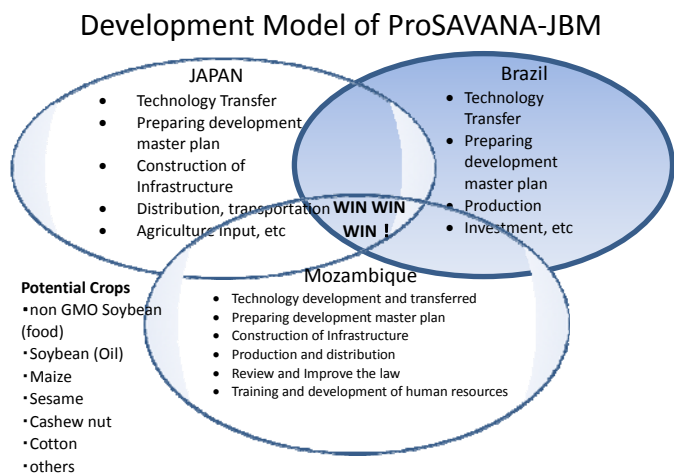


Figure 3.8.7 Development Model of ProSAVANA-JBM

³⁶ Though large cotton and tobacco commercial industries have been established in the Nacala Corridor, the number of medium-scale commercial farms in crop production is minimal.

and an engineering company in Japan, manufactures in Brazil, public sector and farm owners in Brazil.

Through the mission, the potential and constraints below Table 3.8.8 were confirmed and framework of cooperation among three countries shown in Figure 3.8.7 was proposed.

Table 3.8.8 Potential and Constraints Found in the Mission

| Potential | Constraints |
|---|--|
| <ul style="list-style-type: none"> • Huge potential for Agricultural development (Soil, Climate, Water resource, vegetation etc.) • Strong motivation and commitment of the government and farmer • Possibility to apply experience and techniques in Japan and Brazil (especially one in Cerardo) • Existing of basic infrastructure (road, port, telecommunication and power supply) • Existing of system meet for Invetment (Special Economic Zone and DUAT) • Good access to Asia and Europe market • Rich available manpower • Identification of role of parties among Mozambique, Japan and Brazil in ProSAVANA. • Existence of domestic and international market. • Have similarities to Brazil in social and culture • Stable political, social and economic environment in Mozambique | <ul style="list-style-type: none"> • ProSAVANA Master Plan is under preparing • Necessity of establish Agribusiness model including export (value chain) • Need increasing of production value (not stable supply) • Undeveloped agricultural techniques • Low productivity • Weak extension system • Weak farmer's cooperation • Land Issues (expropriation, relocation) • Difficulty of access to agricultural input (machines, fertilizer) • Need to establish finance system (high interest, undeveloped guarantee system) • Need to strengthen coordination and implementation structure of ProSAVANA • Undeveloped governmental policy for agri-business • Need to improve infrastructure (construction, operation and maintenance) • Public Security • Need to consider social and natural environmental |

3.9. Donors Interventions in Agricultural and Rural Development

A number of international agencies and NGOs have conducted activities related to agricultural development in the Study Area. They have large influence in area like extension services, provision of inputs and direct technical support, trading or facilitation of access to markets for new cash crops, provision of micro finance, introduction of new methods of conservation of agro products, etc. With respect the international organizations, such as World Bank and Asian Development Bank (ADB), and JICA, USAID, Sweden (SIDA), Switzerland (SDC), Finland (FINNIDA), etc. are supporting. As NGOs, there are many organizations that mainly carry out activities to create farmers' organizations for co-cultivation and sales of small-scale farmers. In addition, the NGOs act that compensate farmers for the shortage of the government extension workers as assistants in the agricultural extension sector (approximately half of extensionists).

3.9.1. International Institutions

The ongoing projects of the agricultural sector by the international agencies in the Surveyed Area are as follows:

Table 3.9.1 Ongoing Projects of the Agricultural Sector by the International Agencies

| Province | District | Donor | Project / Programme Title | Total Commitments | Actual Start Date | Actual End Date |
|----------|-----------------------|-------------------------------------|---|-------------------|-------------------|-----------------|
| Nampula | Province-level | ADB | Multi-Ncala Road Corridor | 95,940,480 EUR | 2011/6/20 | 2015/6/15 |
| | | JAPAN | The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development | 737,124 EUR | 2011/5/6 | 2016/5/5 |
| | | USA | Land Tenure Project | 0 EUR | 2008/9/22 | 2013/9/22 |
| | | SWITZERLAND | Rural income increase & diversification through micro irrigation in Northern Mozambique | 189,420 EUR | 2011/11/1 | 2012/6/1 |
| | Monapo | UNDP | Millenium Villages Alto Molocue | 112,310,025 EUR | 2009/1/1 | 2012/12/31 |
| | | MCC | Water Supply and Sanitation Project | 18,894,150 EUR | 2008/9/22 | 2013/9/22 |
| | Muecate | ADB | Rural Electrif. Project (ELECT. III) | 1,142,469 EUR | 2002/10/1 | 2012/12/31 |
| | Meconta | WORLDBANK | Competitiveness and Private Sector Development | 9,000,000 EUR | 2009/10/28 | 2014/11/30 |
| | Mogovolas | | Non | | | |
| | Nampula City | MCC | Water Supply and Sanitation Project | 18,894,150 EUR | 2008/9/22 | 2013/9/22 |
| | Nampula Dist (Rapale) | | Non | | | |
| | Murrupula | ADB | Rural Electrif. Project (ELECT. III) | 1,142,469 EUR | 2002/10/1 | 2012/12/31 |
| | Ribaue | | Non | | | |
| | Malema | | Non | | | |
| Zambezia | Province-level | FINLAND | Project for rural development | 1,000,000 EUR | 2010/10/1 | 2014/12/31 |
| | | JAPAN | The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development | 737,124 EUR | 2011/5/6 | 2016/5/5 |
| | | WORLDBANK | Sustainable Irrigation Development | 50,400,000 EUR | 2011/12/10 | 2017/6/30 |
| | Alto Molocue | UNDP | Millenium Villages Alto Molocue | 112,310,025 EUR | 2009/1/1 | 2012/12/31 |
| Grue | MCC | Water Supply and Sanitation Project | 18,894,150 EUR | 2008/9/22 | 2013/9/22 | |
| Niassa | Province-level | ADB | Multi-Ncala Road Corridor | 95,940,480 EUR | 2011/6/20 | 2015/6/15 |
| | | JAPAN | The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development | 737,124 EUR | 2011/5/6 | 2016/5/5 |
| | | USA | Land Tenure Project | 0 EUR | 2008/9/22 | 2013/9/22 |
| | Cuamba | SWEDEN | Rural Electrification in Niassa | 1,875,720 EUR | 2005/12/1 | 2013/9/30 |
| | | SWEDEN | Rural Electrification in Cuamba | 4,704,000 EUR | 2012/3/1 | 2016/12/31 |
| | | IFAD | Rural Markets Promotion Programme (PROMER) | 2,876,405 EUR | 2009/4/26 | 2015/12/31 |
| | Mandinba | IFAD | Rural Markets Promotion Programme (PROMER) | 2,876,405 EUR | 2009/4/26 | 2015/12/31 |
| | Nguama | | Non | | | |
| | Lichinga | | Non | | | |

source: Official Development Assistance to Mozambique Database, 2012.

The projects by the international agencies are by ADB, UNDP, IFAD and World Bank. As projects by bilateral aid, there are by Japan, USA, Sweden, Finland and Switzerland. As the other, it is due to Millennium Challenge Corporation (MCC).

3.9.2. NGOs

According to the governments of the three provinces, non-governmental organizations (NGOs) implementing the activities of agricultural sector in the Study Area are as shown in Table 3.9.2.

A number of NGOs articulate their interventions by supporting different levels of activity in the value chain, commercialization and transformation of rural product by adopting the form of a consortium with other NGOs. The main NGOs involved in this type of arrangement are: CARE (providing extension services, diversification of production, financial services), OLIPA (promoting associations and commercialization, and rural socio-economic development), CLUSA (promoting associations, marketing and certification) and Technoserve (providing assistance for identification of agro-industry projects, identification of technology, plant design, formulation and implementation of business plans, mobilization of finance), OIKOS, (promoting

associations and distribution of agricultural products), ORAM (promoting community development, land rights and decentralization), KULIMA (promoting associations and commercialization of cashews), Save the Children, (promoting strengthen food security and to fight child malnutrition), and etc.

Table 3.9.2 List of NGO in the Study Area (2012)

| Province | Non-Governmental Organizations |
|----------|--|
| Nampula | <ul style="list-style-type: none"> - Save the children: Agriculture. - Action Aid: Agriculture. - ADAP-SF: Agriculture. - Africare: Agriculture. - ADPP: Agriculture. - ADIPSA: Agriculture, Marketing, Finance. - ORAM: Agriculture, Land. - CARE-International: Agriculture, Water, Environment. - Heif- International: Agriculture, Environment, Gender. - Kulima: Agriculture. - CLUSA: Agriculture. - OLIPA-ODES: Agriculture. - SCIP: Agriculture. - Technoserve: Agriculture. - Trocaire: Social Welfare, Agriculture, Health. - World Vision (WV): Agriculture, Education, Environment and Health. |
| Zambezia | <ul style="list-style-type: none"> - World Vision (WV): Health, Agriculture, Food Security, Social Action and Emergência, in all districts. - CLUSA: Agriculture, in Gurúe - CCM (Conselho Cristão de Moçambique): Agriculture and Education, in Gurúe |
| Niassa | <ul style="list-style-type: none"> - OIKOS: Promoter of Associations, in Lichinga and Mandimba - ACORD: Promoter of Associations, in Lichinga - Concern Universal: Promoter of Associations, in Lichinga. - CCS (Concelho Cooperativo Sueco): Promoter of Associations, PASC (Programa de Apoio a Sociedade Civil) in Cuamba. |

Source: Provincial Governments of Nampula, Zambezia and Niassa, 2012.

3.10. Environmental and Social Consideration

3.10.1. Natural Conservation and Protection in the Study Area

Table 3.10.1 shows a comparison between JICA Guidelines for Environmental and Social Considerations and Mozambique's EIA regulation, regarding the sensitive areas which require protection or particularly careful consideration on natural and social environment.

Table 3.10.1 Sensitive Areas by JICA Guidelines and Mozambique's EIA Regulation

| Aspect | JICA Guidelines | Mozambique's EIA Regulation (Category A) |
|---------------|--|---|
| Natural | <ul style="list-style-type: none"> ● National parks, nationally-designated protected areas (coastal areas, wetlands, areas for ethnic minorities or indigenous peoples and cultural heritage, etc. designated by national governments) ● Primary forests or natural forests in tropical areas; ● Habitats with important ecological value; ● Habitats of rare species that require protection under domestic legislation, international treaties, etc; ● Areas in danger of large-scale salt accumulation or soil erosion; ● Areas with a remarkable tendency towards desertification. | <ul style="list-style-type: none"> ● Areas and ecosystems recognized as having special statute under the national and international legislation such as: <ul style="list-style-type: none"> - Coral reefs; - Mangroves; - Indigenous forests; - Small islands; - Zones of imminent erosion including coastal dunes; - Zones exposed to desertification; - Zones or areas of conservation or protection; - Marshes; - Zones containing endangered species of animal or vegetation, habitats and ecosystems; - Zones of unique scenery; - Zones of archaeological, historical and cultural value to be preserved; - Protection areas around water supply springs and fountains; |
| Social | <ul style="list-style-type: none"> ● Areas with unique archaeological, historical or cultural value; ● Areas inhabited by ethnic minorities, indigenous peoples, or nomadic peoples with traditional ways of life, and other areas with special social value. | <ul style="list-style-type: none"> ● Populated areas that imply the need for resettlement; ● Densely populated areas where the activity involves unacceptable levels of pollution or other type of disturbance significantly affecting the resident communities; ● Regions subject to high levels of development or regions where there are conflicts in the distribution and use of natural resources; ● Areas along rivers or areas used by local communities as a source of domestic water supply; ● Zones containing valuable resources such as aquatic resource, mineral, medicinal plants, etc. |

Source: Adapted from "JICA guidelines for environmental and social considerations (2010)" and "Decree no.45/2004 Regulation on the process of environmental impact assessment"

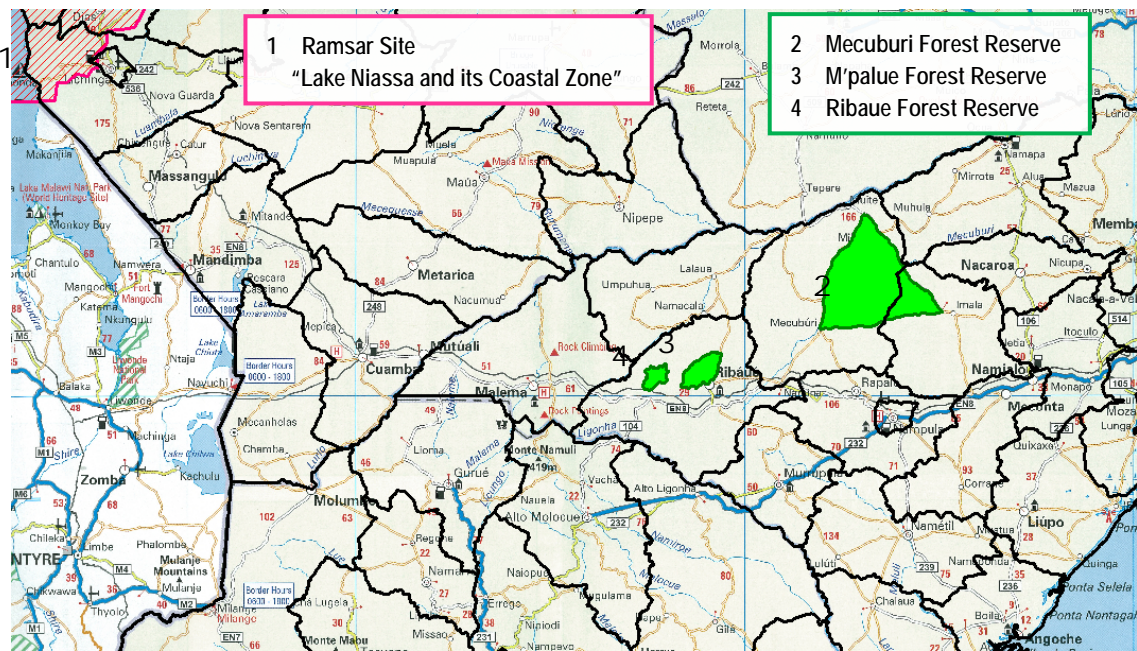
Activities situated in above-mentioned sensitive areas are most likely to be classified as category A. In principle, it is desirable to avoid implementation of any project inside or in the vicinity of national parks and nationally-designated protected areas, except for those projects whose main objective is to contribute to the promotion of conservation. Nationally-designated protected areas in the Study Area are listed in Table 3.10.2 and shown in Figure 3.10.1. It should be noted that all these areas have been, and actually are, inhabited by a number of communities.

Table 3.10.2 Nationally-designated Protected Areas in the Study Area

| Name | Location and Area* | Legal background |
|---|--|---|
| Lake Niassa Partial Reserve Ramsar Site "Lake Niassa and its Coastal Zone" | Niassa Province; Districts of Lago, Sanga and Lichinga; Bordering with Malawi and Tanzania; <i>As national reserve</i> it has 47,800ha plus 89,300ha of buffer zone. <i>As Ramsar site</i> it has 1,363,700ha including water body (of which 129,600ha belong to the land of Lichinga District). | <ul style="list-style-type: none"> ● Decree no.59 of November 2011 'to create Lake Niassa Partial Reserve' by Council of Ministers, aiming at preservation and increment of reproduction of species, increase in family income, promotion of ecotourism, conservation of biodiversity and protection of available resources. ● Resolution no.67 of December 2011 'to designate Lake Niassa as Ramsar Site to be included in the list of internationally important wetland' by Council of Ministers, in recognition of its ecological diversity. ● Resolution no.45 of November 2003 'Adhesion of Mozambique to Ramsar Convention' by Council of Ministers. |
| Mecuburi Forest Reserve | Nampula Province; Districts of Mecuburi and Muecate; 230,600ha originally and 195,400ha currently (41,800ha of which belong to Muecate District). | <ul style="list-style-type: none"> ● Government Gazette no. 29/8459 Series 1 of July 1950, with the main objective of supplying construction timber for the two cities of Nampula and Nacala Port, and also for the railway, as well as protecting the ecosystem of the catchment of Mecuburi River. |
| M'palue Forest Reserve | Nampula Province; District of Ribauae; 5,100ha originally and 4,250ha currently. | <ul style="list-style-type: none"> ● Government Gazette (number unknown) of 1950, with the main objective of conservation of water catchments that feed the River Mepuipui and protecting the flora and fauna in the area. |
| Ribauae Forest Reserve | Nampula Province; District of Ribauae; 5,200ha originally and 3,750ha currently. | |

*Areas are cited from different publications though some figures are known to be inconsistent with reality. The partial areas of Ramsar site belonging to Lichinga District and of Mecuburi Forest Reserve belonging to Muecate District are calculated geometrically by JICA Study Team.

Source: JICA Study Team



Source: JICA Study Team

Figure 3.10.1 Nationally-designated Protected Areas in the Study Area

Outside the Study Area, however in its vicinity, are located other nationally-designated protected areas such as Quirimbas National Park (Cabo Delgado Province), Niassa Reserve (Niassa Province), Gile Reserve (Zambézia Province), Baixo Pinda Forest Reserve and Matibane Forest Reserve (Nampula Province). The world heritage Mozambique Island is also located nearby.

Additionally, several other sensitive areas may exist which require careful consideration on natural and social environment. More detailed information shall be gathered and analyzed during the formulation of master plan and priority projects under ProSAVANA-PD. General features of these sensitive areas are described below:

Forests, Habitats, Areas with soil degradation risk

Sacred forests including cemetery for local communities (“zones of historical cultural value and use” defined by Forestry and Wildlife Law) may exist throughout the Study Area. At province level, 42 threatened plant species are reported (including 35 endemic and 3 near-endemic species) in Nampula, Niassa and Zambezia, though specific location is unknown.

According to IUCN Red List and other sources, there are at least 11 threatened (3 mammals and 8 birds) and 7 near threatened (4 mammals, 2 birds and 1 fish) animal species in the Study Area. Among them, black rhinoceros (critically endangered), white rhinoceros (near threatened), brown hyenas (near threatened), hooded vulture

(endangered), white-headed vulture (vulnerable), Madagascar pond-heron (endangered), secretary bird (vulnerable) and African skimmer (near threatened) are legally protected by Regulation on Forestry and Wildlife Law. Mount Namuli in Gurue District is especially known to be home to several endemic species. Lake Niassa, recently declared as Ramsar site, is home to more than 600 fish species, 90% of which are endemic. Also the lake lies within flyways of migratory birds between Africa and Europe. It should be noted that, in general terms, scientific survey and description of flora and fauna around the Study Area still remain at incipient level.

Dangers of desertification or large-scale salt accumulation are not prominent in the Study Area: however, several districts such as Monapo, Mogovolas, Gurue and Alto Molocue are reported to have soil erosion problems (see Table 3.1.5).

Historical and cultural sites, Issues of social concern

Mozambican legislation gives a fairly broad meaning for 'cultural heritage', classifying them into material/immaterial, movable/immovable ones or such categories as monument, complex, site and natural element, at national/local/universal level. A complete inventory of historical and cultural heritages of the Study Area is not yet available, and chances of new discovery are still left. Sites of historical importance such as mountain, lake, cave, tomb, monument, church, ritual place and rock paintings are reported in Malema, Meconta, Muecate, Nampula and Ngauma Districts.

The population of Mozambique is generally considered as relatively well-balanced mixture of different ethnic groups, and the Government of Mozambique (GOM) does not apply any legal definition or protection for ethnic minorities or indigenous peoples. The Study Area does not include any special area inhabited by such groups: however, linguistic issues are worth careful consideration where three dominant languages are spoken (*Emakuwa* in Nampula, *Elomwe* in Zambézia and *Cyao* in Niassa Province's part of the Study Area) and in average 72% of the population over 5 years old do not understand Portuguese and 79% are illiterate (both figures according to 1997 census). Therefore, special attention should be paid in the public consultations as well as information disclosure under ProSAVANA, so that all the local stakeholders could have access to and understanding of the information. Problems related to religion are hardly probable in the Study Area where Islamic majority keeps peaceful relation with Christian society: however, when involuntary resettlement is inevitable, an attention will be needed so that resettling people and host communities might not suffer from religious conflict.

Landmine clearance is another sensitive topic: it is reported that 2 "dangerous areas" still exist (1 in Meconta and 1 in Lichinga Districts) in the Study Area.

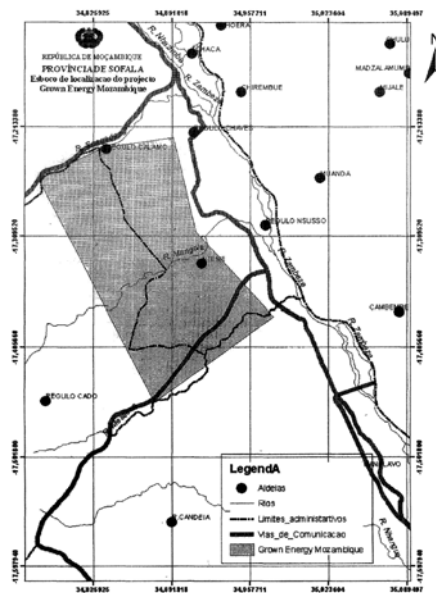
Delimited community land

Several communities carried out the delimitation of land as a means to proclaim and visualize their DUATs obtained through customary (traditional) occupation (see Figure 3.10.2 and Table 3.10.3 below). The rights of these communities as well as great many other communities should be respected especially when private investors are looking for large-scale “available land”, because actually in Mozambique DUATs are being awarded to investors even for a territory which contain villages inside, as shown in the case of Sofala Province (Figure 3.10.2), based on the “partnership agreement” between investor and community.

Table 3.10.3 Community Land Delimitation at Province Level, as of 2009

| | Nampula | Niassa | Zambezia | Total Mozambique |
|----------------------------------|---------|---------|-----------|------------------|
| Number of Certified Communities | 93 | 9 | 73 | 229 |
| Number of Communities in Process | 2 | 0 | 18 | 74 |
| Certified Area (ha) | 743,418 | 357,231 | 3,637,001 | 6,734,287 |
| Area in Process (ha) | 4,518 | 0 | 568,011 | 5,924,235 |
| Number of Case < 1,000ha | 10 | 0 | 0 | 14 |
| Number of Case 1,000 to 10,000ha | 67 | 0 | 45 | 145 |
| Number of Case > 10,000ha | 18 | 8 | 46 | 143 |

Source: Adapted from “Recognizing Rights to Natural Resources in Mozambique, De Wit and Norfolk, 2010”



Source: Bulletin of the Republic, Series I no.37, 21st September 2009

Figure 3.10.2 Example of DUAT awarded over Existing Villages

3.10.2. Case Studies in Agricultural Sector

Table 3.10.4 shows 4 case studies in agriculture/agro-industry sector which may provide lessons regarding EIA and subsequent implementation of environmental management plan as well as resettlement action plan.

Table 3.10.4 Case Studies of Environmental and Social Considerations

| | Case 1 Matanuska | Case 2 New Horizons | Case 3 PROIRRI | Case 4 PROAGRI-II |
|--------------------------|---|--|---|--|
| Title | Matanuska Banana Plantation Project | New Horizons Chicken Slaughterhouse Project | Sustainable Irrigation Development Project | National Agricultural Development Program-II |
| Type | Private investment | Private investment | Sector investment loan | Sector program |
| Executing body | Matanuska Mozambique Lda | New Horizons Mozambique Lda | MINAG | MINAG |
| Budget | 50 million US\$ | 0.5 million US\$ | 92 million US\$ | 200 million US\$ |
| Finance | Own capital and fund | Own capital and fund | World Bank (IDA and PHRD) | Common fund by 8 donors (6 bilateral and 2 multilateral) |
| Province | Nampula | Nampula | Sofala and Manica | All provinces |
| Main Components | 3,000ha of irrigated banana; 12 packaging facilities; 1 dam with 600ha of inundated area; 1 weir, 1 pumping station and 25km of canal system. | Construction of 1 slaughterhouse of 1,250m ² with capacity of 250,000 chickens per month. | In total 5,000ha of irrigated land (rice, sugarcane, upland crops, etc.) with dams, weirs, canals, access roads, pumps, etc. and processing facilities. | Family agriculture; Commercial agriculture; Natural resources management (infrastructure, input supply, marketing, extension, finance, organization, etc.) |
| Applied EIA tools | EIA procedure by Decree 45/2004 | EIA procedure by Decree 45/2004 | EIA procedure by Decree 45/2004; WB-OPs 4.01/04/09/11/12/37, 7.50 | Strategic Environmental Assessment (SEACAM method) |
| Category | A | B | B | not categorized |
| Products of EIA | Full EIA Report (Summary, Main report*, Environmental management plan, RAP, Public participation report*) | Simplified Environmental Report | Environmental and Social Management Framework; Resettlement Policy Framework | Environmental Strategy for Program Implementation; Environmental Criteria for Selection of Proposals. |
| Clearance | After January 2009 | January 2007 | March 2011 | July 2005 |

*Main report and public participation report were not available.

Source: JICA Study Team

In each case, likely adverse impacts on natural and social environment were identified and mitigation measures were proposed. A comparative summary is shown in Table 3.10.5.

Table 3.10.5 Likely Adverse Impacts and Mitigation Measures in Case Studies

| Adverse impacts | Case Study | | | | Mitigation measures (case study number) |
|--|------------|---|---|---|--|
| | 1 | 2 | 3 | 4 | |
| Water pollution | x | x | x | x | (1) Adoption of international GAP guidelines on use of agrochemicals; Monitoring of water level, quality and salinity. (2) Effluent treatment (filtration, flocculation, deposit); Reuse for pasture irrigation; Monitoring every 3 months. (3)(4) Good management of agrochemicals; Removal of organic matter from reservoirs. |
| Waste | | x | | | (2) Solid waste disposal (landfill or incineration); Reuse as animal feed; Monitoring every 3 months. |
| Protected areas | | | x | | (3) Assistance for ongoing rehabilitation efforts. |
| Ecosystem | x | | x | x | (1) Enlarged buffer zone along watercourses; Minimized disturbance. (3) Special study of biota; Creation of compensation areas. (4) Agroforestry; Alternative energy sources; Strict criteria of project selection; Awareness creation; Incentive for good practices; Zoning. |
| Hydrology | x | | x | | (1) Keeping compensation flow by dam operation; (3) Survey of hydrologic flux; Not funding large dams; Keeping minimum flow by dam operation; Periodical flush of reservoirs; Protection of floodplains; Control of ground and surface water abstractions; Adequate layout and management of irrigation system. |
| Erosion, siltation, salt accumulation | x | | x | x | (1) Adoption of international GAP guidelines on use of agrochemicals. (3) Use of appropriate agriculture techniques and good irrigation management at watershed level. (4) Zoning for grazing area and other areas. |
| Resettlement | x | | x | | (1) Provision of new house, farmland, monetary compensation, hand tools, fuel wood and farm inputs; Consensus building with host communities; Mechanism of grievance redress. (3) Land acquisition assessment at screening; Census of all affected people; Avoidance of resettlement wherever possible; RAP approval. |
| Living and livelihood | x | | x | x | (1) Employment of local people as labor-force; Reconstruction of existing school and rehabilitation of existing health post. (3) User participation at planning and design stages; Consultation with local communities; Provision of employment opportunities. (4) Zoning; Land cadastre; Partnership between communities and private sector; Incentive for alienation or effective use of land. |
| Vulnerable groups | | | x | x | (3)(4) Inclusion of disadvantaged groups; Keeping gender balance in resettlement committees; Awareness creation. |
| Heritage | x | | x | | (1) Relocation of tombs based on consensus and local tradition. (3) Protection of heritages by chance-finds-approach. |
| Working conditions including occupational safety | x | x | | x | (1) Training of workers on first aid; Limitation of vehicles' speed. (2) Provision of protection equipments, sanitary toilets and trainings for workers. (4) Training of farmers on correct and safe use of agrochemicals. |
| Infectious disease, HIV/AIDS | x | | x | x | (1) Awareness creation and installation of a medical post for workers. (3) Keeping distance between reservoirs and settlement sites; Good reservoir management. (4) Awareness creation; Assistance for affected people. |
| Transboundary or global effect | | | x | | (3) Prior notification to upstream states of international rivers. |

Source: JICA Study Team

We can see that water, soil, ecosystem, livelihood of affected people, workers' safety and health issue are regarded as principal concern. Mitigation measures proposed in these case studies may be valuable reference for ProSAVANA-PD. Like PROIRRI and PROAGRI-II, use of environmental check list as a requirement for any proposal shall be encouraged. Also, all information related to EIA shall be disclosed at a place easily accessible to local people.

It should be pointed out that proper environmental monitoring and audit are still rather weak in Mozambique compared to its well-structured EIA procedure. According to an officer of DPCA Nampula, environmental monitoring and audit in this region are generally well conducted with few violations. However, as shown in Table 3.10.6, numerous reports have documented the problems that affect the implementation of environmental management plan and resettlement action plan. It is evident that the root of the troubles lies principally in the following points:

- (i) Poor consensus building in community consultations;
- (ii) Weak legal status of community-investor partnership agreement;
- (iii) Inaccessibility to investors' project proposals; and,
- (iv) Lack of coordination among government institutions.

Problems of community consultation include lack of announcement in advance, insufficient number of meetings (in some cases the meeting was not repeated but performed in a single day), not fully impartial representation, inadequate or contradictory recording, vague expression of investor's commitments, lack of consideration for future land needs and community expansion, etc. As for the partnership agreement between community and investor, it is not a legally binding contract and no sanctions are in place in the event that investor or community or both of them do not respect the promises made. As far as agricultural investment project and related DUAT are concerned, project proposals are officially secret which makes it hard for civil society or media to know if they are being carried out properly or not. Also, it is worth mentioning that the coordination required among government institutions to prevent conflicts in land uses is apparently missing in some cases.

As an alternative to address these problems, active participation of neutral players, such as NGOs and consultants uninvolved in the project, shall be encouraged in the periodical review and audit of environmental/social management. Contracting outside experts will also be a recommendable option, especially for delicate issues such as resettlement and grievance redress, as well as for the capacity development of involved officers of government institutions.

Table 3.10.6 Some Reported Troubles in Agriculture Sector with Foreign Investment

| |
|---|
| Example1: Fruit Plantation Project (Nampula Province) |
| <p>Around 2,000 project-affected people of 4 villages accused the company of delaying the payment of compensation for land acquisition, in April 2012, at Monapo District Prosecutors Office. Judgment was given in favor of the villagers: the Prosecutors Office ordered the company immediate payment or otherwise ban on its operation.</p> <p><i>Source: Interview made on 15th June with Monapo District Prosecutor (Documented evidence was not available.) (courtesy by JICA Study Team for Nacala Corridor Economic Development)</i></p> |
| Example 2: Agribusiness Project (Zambezia Province) |
| <p>The 10,000ha DUAT awarded to the company in 2009 by Council of Ministers included 490ha occupied by 244 farmers for more than 10 years. For 2010/2011 soy season the company ploughed 500ha which, according to the local people, had already been cleared by them, including land which had already been planted and which was outside the allocated area. The company had not completed the procedure of land demarcation or implementation of a substantial part of its approved project within the time frame set by law. None of the company's commitments for the construction of a school, a health post, wells, extension of the electricity grid and job creation have been met. No terms of partnership between the company and the existing holders of land use rights were submitted; the formal opinion from MICOA was not attached to project proposal, either. Significant problems of consultation process were found, such as the question of representation, no signs of presence of local soy-producers at the meetings, the lack of rigor involved in capturing agreements, etc. Local farmers lost access to land without any suitable alternatives (resettlement, provision of nearby alternative land, technical assistance, seed, fertilizer and out-grower scheme as committed by the company) having been made.</p> <p><i>Source: Confrontation between peasant producers and investors in northern Zambézia, Mozambique, in the context of profit pressures on European investors (Norfolk and Hanlon, April 2012)</i></p> <p>Counterargument by Agribusiness Company</p> <p>(Realized) Assignment of a social responsibility manager by the company; Creation of social committee with the local authorities; Donation of a fully equipped ambulance to Ruace village; Growing potato for the regional market; Employment of 150 people; etc.</p> <p>(Planned) Recuperation of the bridges of the road from Ruace to Lioma; Preparation of 2,600ha for the exclusive use of local farmers, provision of inputs and transfer of know-how; Provision of training for employees (all from Gurue District) on state-of-the-art farming equipment in South Africa and Brazil; etc.</p> <p><i>Source: http://www.landandpoverty.com/agenda/pdfs/paper/norfolk_hanlon_mozambique_response.pdf</i></p> |
| Example 3: Biofuel Project (Gaza Province) |
| <p>The 30,000ha identified by the company to develop an ethanol production plant was being used by the communities as grazing land, and it also included land reserved by the Limpopo National Park to relocate communities from within the park according to its already approved land use plan. Villagers felt that ProCana had been encroaching on their land with no respect for the agreed boundaries. Only after conducting aerial survey the company approached the communities, but local opinions and concerns were ignored by the company and misrepresented in consultation minutes. Promise of the delimitation of community lands by District Cadastre Service was not completed. the project was approved in 2007 and operations initiated without obtaining environmental license. Today, the DUAT was revoked by the government due to the company's non-compliance with the investment plan.</p> <p><i>Source: Biofuels, land access and rural livelihoods in Mozambique (Nhantumbo and Salomão, IIED, 2010)</i></p> |

Source: JICA Study Team (adapted from different sources shown in the table.)

Readers are recommended to see also Chapter 4.8 on the “Responsible Agricultural Investment (RAI)” which is closely related to these issues.

3.10.3. Implications of Cerrado agriculture development for Mozambique

The nature of ProSAVANA as triangular cooperation among Japan, Brazil and Mozambique, as well as the similarity of natural environment between Nacala Corridor and Brazilian Cerrado, make it reasonable to draw lessons from the experiences of Cerrado agriculture development to be applied in Nacala Corridor with regard to environmental and social considerations.

Population density in Cerrado increased from 2.5 in 1970 to 8.8 persons/km² in 2000 after long and active migration mainly from northeastern and southern states. By contrast, among the 14 districts of the Nacala Corridor, population density in 2011 ranged from 20.4 (Lichinga District) to 97.2 persons/km² (Monapo District) which means quite different initial condition in terms of land availability and pressure on natural resources. Dependency on forest resources such as firewood, charcoal, timber, fiber, medical plants, bush meats, etc. is also considered higher in today Nacala Corridor than it was in Cerrado some forty years ago, implying the relative difficulty of clearing forests for agricultural purpose unless alternative sources of energy, protein and medicine are rapidly widespread. Forests' cultural importance for Mozambican traditional communities and its function as fallow land in slash-and-burn farming system should be taken into consideration as well. As for indigenous peoples and ethnic minorities, detailed reports are hardly available about the interaction supposedly occurred during Cerrado agriculture development, which makes it difficult to seek meaningful lessons for Mozambique.

Rapid deforestation is the greatest concern in Cerrado: according to an estimate, if the loss keeps current rate of 2.2 million ha/year the remaining forest in Cerrado could disappear in 2030. Depletion of surface water as well as groundwater resources due to excessive irrigation is also a serious problem in Cerrado. Increasing awareness of these issues led the federal government of Brazil to adopt a series of conservation measures as shown in Table 3.10.7. Also, important environmental parameters such as soil erosion, river discharge, water quality, vegetation, insect fauna and land use have been monitored by EMBRAPA, CAMPO and JICA experts, which is one of the following technical cooperation projects implemented in response to increasing need of environmental conservation in Cerrado:

- Project of research for the agro-environmental conservation in the Cerrado (1994 – 1999, CPAC)
- Study of environmental monitoring in the Cerrado (1992 – 2000, CAMPO/EMBRAPA)
- Cerrado ecological corridor conservation project (2003 – 2006, IBAMA)
- Jalapão region ecological corridor project (2010 – 2013, ICMBio)

Table 3.10.7 Natural Environment of Cerrado biome and Nacala Corridor

| | Cerrado biome | Nacala Corridor | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|---------|----------|-------|--------|-----|--------|-----|----|------|-----|----|---------|-----|-----|-----------|-----|-----|------|-----|-----|--|
| Biodiversity | <table border="1"> <thead> <tr> <th></th> <th>Species</th> <th>Endemism</th> </tr> </thead> <tbody> <tr> <td>Plant</td> <td>12,356</td> <td>44%</td> </tr> <tr> <td>Mammal</td> <td>195</td> <td>7%</td> </tr> <tr> <td>Bird</td> <td>607</td> <td>3%</td> </tr> <tr> <td>Reptile</td> <td>225</td> <td>15%</td> </tr> <tr> <td>Amphibian</td> <td>186</td> <td>15%</td> </tr> <tr> <td>Fish</td> <td>800</td> <td>25%</td> </tr> </tbody> </table> | | Species | Endemism | Plant | 12,356 | 44% | Mammal | 195 | 7% | Bird | 607 | 3% | Reptile | 225 | 15% | Amphibian | 186 | 15% | Fish | 800 | 25% | <p>Detailed scientific survey is not fully carried out. Reported species at least include:</p> <ul style="list-style-type: none"> - 3 threatened mammals; - 8 threatened birds; - 4 near threatened mammals; - 2 near threatened birds; - 1 near threatened fish; - 42 threatened plants (in 3 provinces). |
| | Species | Endemism | | | | | | | | | | | | | | | | | | | | | |
| Plant | 12,356 | 44% | | | | | | | | | | | | | | | | | | | | | |
| Mammal | 195 | 7% | | | | | | | | | | | | | | | | | | | | | |
| Bird | 607 | 3% | | | | | | | | | | | | | | | | | | | | | |
| Reptile | 225 | 15% | | | | | | | | | | | | | | | | | | | | | |
| Amphibian | 186 | 15% | | | | | | | | | | | | | | | | | | | | | |
| Fish | 800 | 25% | | | | | | | | | | | | | | | | | | | | | |
| River Systems | Upper catchment of 3 major rivers: Amazon, Paraná (tributary of La Plata), São Francisco. | Upper to middle catchment of several rivers: Rovuma, Lugenda, Lurio, Mecuburi, Monapo, Meculi, Ligonha, Molocue, Licungo. | | | | | | | | | | | | | | | | | | | | | |
| Protected Areas | 108 strictly protected areas and 288 sustainable use areas covering 167,777 km ² (8.23% of total area) | 4 national reserves covering 1,869 km ² (2.82% of total area) | | | | | | | | | | | | | | | | | | | | | |
| Conservation Measures (not including nationally-designated protected areas) | <ul style="list-style-type: none"> ● Legal reserve (20 to 50% of each farmland, individually or jointly as “condominium”) by Forest Law, thus forming macro- and micro-corridors which unite gallery forests; ● Rural environmental registry GIS; ● Conservation farming technology such as rotation, contour terracing and non-tillage direct planting; ● Farm reforestation programs such as “produtor de água”. | <ul style="list-style-type: none"> ● “Zones of historical cultural value and use” by Forest and Wildlife Law, to protect communities’ right to access to forest resources in traditional way. <p>Conservation measures other than basic legal provisions are not fully devised.</p> | | | | | | | | | | | | | | | | | | | | | |

Source: Adapted from “Cerrado Agriculture (JICA Research Institute, 2012)” and “Conservation International (www.conservation.org/where/priority_areas/hotspots/south_america/Cerrado)”

An in-depth baseline survey and monitoring of environmental parameters should be started urgently in Nacala Corridor once the agricultural master plan is drafted under ProSAVANA-PD, paying special attention to disturbance in upper catchment areas of important rivers. In this regard, EMBRAPA’s professional contribution is greatly expected as one of the components of ProSAVANA-PI. Transfer of conservation farming technology from Brazil shall be encouraged too, with adequate adaptation for Mozambican farmers. In parallel, efforts by the GOM to devise and enforce legal instruments or incentive schemes for environmental conservation at farm level should be supported by Brazilian and Japanese experts.

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