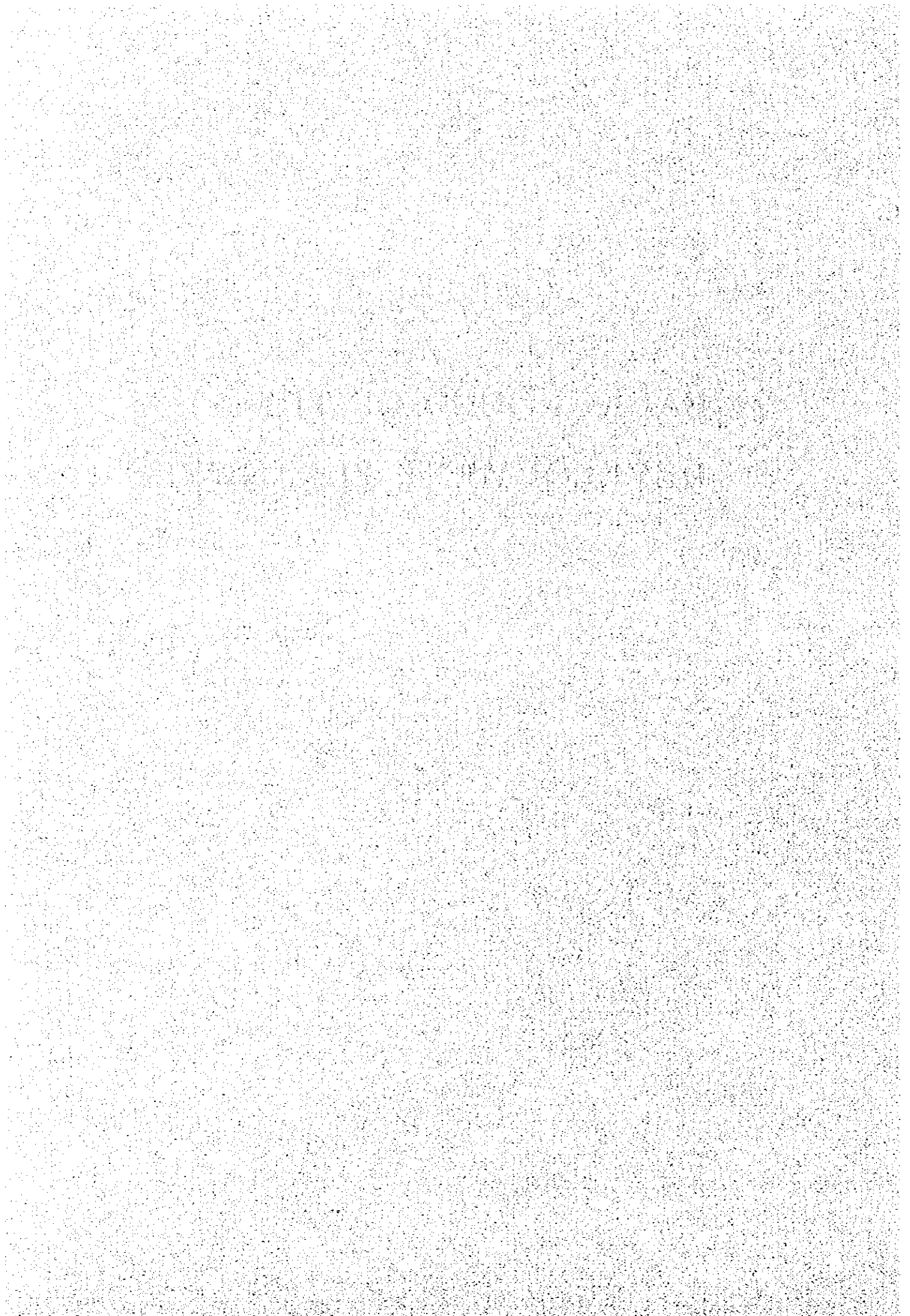


## **2. BACKGROUND OF THE DEVELOPMENT PLANNING**



## **2. BACKGROUND OF THE DEVELOPMENT PLANNING**

### **2.1 Natural Condition**

#### **2.1.1 Land**

Zambia lies on the great Central African plateau having an area of about 753,000 km<sup>2</sup>, twice that of Japan, and it is a land-locked country sharing borders with eight countries, Tanzania and Zaire to north, Malawi and Mozambique to east, Zimbabwe, Botswana and Namibia to south, and Angola to west.

Most parts of the country lie on an altitude ranging between 1,000m and 1,300m, but there are broad depressions along borders or in the middle parts of the plateau, forming lakes and rivers. Lake Mweru (2,500 km<sup>2</sup>) and Lake Bangweulu (2,700 km<sup>2</sup>) are located in the depression of Northern border Luangwa flows in Eastern province, Kafue basin sites in the middle part of Western Province and Zambezi flows through alluvial deposit developed in north-western part of the country toward south, then into Lake Kariba (2,412 km<sup>2</sup>), one of the biggest artificial reservoirs in the world.

There are 73 ethnic groups among its indigenous population in Zambia. Bemba is the largest group, comprising some 18% of the population living in north-east and Copperbelt area. The other major groups are the Tonga of Southern Province, the Nyanja of Eastern Province and some in Lusaka, and the Lozi of Western Province.

#### **2.1.2 Climate**

Although Zambia locates in tropical regions, its climate is relatively comfortable through the year because of its high altitude. There are three distinct seasons in Zambia; a cool dry winter season from May to August, a hot dry season from September to October and a warm wet season from November to April.

##### **(1) Temperature**

In the cool dry season, June and July are the coolest with monthly mean temperatures of about 15°C~17.5°C. The hottest season occurs usually in October with mean temperatures of 22.5°C~25.0°C. There are sometimes frosts in a year in the Southern Province and 1~3 days in a half area of the Western Province.

##### **(2) Rainfall**

Rainy season and dry season in Zambia are clearly distinct. Rain begins its fall during October to November with December to February as its peak precipitation and ends around April. There is almost no rain during May to August and the rainfall patterns are similar in all over the country

but the precipitation differs quite a lot in quantities between northern and southern areas. The former has 1000~1500mm while the latter has 600~800mm in a year.

### **2.1.3 Geology and Soil**

#### **(1) Geology**

The Basement complex of Precambrian age underlies widely in eastern and south-western part of the country outcropping at several places. As it gets westward, Basement complex changes its strata continually to younger geologic time. Most of the Basement complex were formulated in unconformity and consisted of two strata in which the upper one includes sand stone, crystalline schist, conglomerate and the lower one includes gneiss, mica schist, quartzite, etc. It has also been decomposed widely by lava intrusion of granite.

Karoo system is younger than the strata mentioned above and belongs carboniferous period (Paleozoic era) to jurassic period (Mesozoic era) underlying along the rift valley in eastern and southern part of the country. Its lower part of the carboniferous period includes sand stone, and coal. The upper part of the jurassic period includes basalt, mudstone etc. outcropping around Livingstone and Victoria fall area.

Kalahari system consists of weakly conformed sand stratum and accumulated aeolian sand covering most of the Western Province. These sands had been accumulated during late tertiary period to diluvial age when Kalahari desert was developed extensively and the atmosphere was dry.

#### **(2) Soil**

The pedogenesis in Zambia has been influenced mostly by its mother rocks, topography, climate and so on. Especially the amount of rainfall affected the degree of eluviation in soil.

Generally, there are 7 soil types classified in Zambia as following.

##### **1) Fersiallitic soils**

This soil is formed mostly by materials rich in ferro and magnesia with low acidity covered by old alluvium of Kafue basin. The soil is clay loam 50~300cm in depth and the soil colors are red, redbrown or yellow brown when drained well, and gray or gray brown when poorly drained. This soil is most suitable for crop cultivation and is highly productive under irrigation as has been practiced by the commercial farmers in the country.

##### **2) Ferrallitic soils**

The distribution of this soil is the largest in Zambia occupying 50% of the country. The

soil is distributed over high lands with gentle slopes and can be divided in two groups; one is in northern part of the country with much rain and the other in the southern part with less rain. Parent rocks of the soil are granite, gneiss, sandstone, and crystalline schist.

The soil in the southern part is a loam layer with much sand and the color is yellow brown in poorly drained area, and gray brown in well drained areas. The surface layer is 180 cm deep in some cases, but generally shallower. The soil is distributed over the Southern, Western, and Central provinces. It contains a high rate of sand requiring much attention in crop cultivation.

### 3) Barotse sands

The sands are deep and soft layers containing less than 5% of clay. Whole layer is composed of coarse-grained quartz sand with few silt and clay. It looks usually gray white but yellow or red brown when it contains iron oxides. This soil covers extensively Western Province and are utilized for forest and grazing.

### 4) Vertisols of the Kafue flats

This soil consists of fine clay with lime which is black of the surface and gray in the deep layer having PH of 5.7~7.3. The subsoil 120cm from surface has calcium carbonate layers. The flood area of the Kafue flats is almost occupied by this soil utilized mainly for grazing but for cropping where water is available.

### 5) Vertisols of the river valleys

This soil is distributed along the valleys of the Luangwa river in the Eastern province and the Luapula river in Luapula province and has a high concentration of clay.

### 6) Vertisols of the flood plains

This soils are originated from silicic materials, containing silty organics with 25~180cm in depth and distributing over the flood plain of Zambezi river in Western Province and Dambo area. The surface soils are peat with sandy sublayers having strong acidity caused by poor drainage. This soil can be cultivated with upland crops and paddy under drainage system.

### 7) Lithosols

This soil is distributed over narrowly sloped land mixing with rocks on the surface. The subsoil is laterite or gravel or weathered rock and the surface is sand or sandy loam which is originated from weathered granite, gneiss, crystalline schist, and sandstone.

Traditional small farmers are practicing shifting cultivation in this vegetation area by cutting branches and burning them during the dry season and sowing in the coming rainy season. The main crops are millet, maize and cassava.

## 2.2 Policy and Economy

### 2.2.1 Population

The population of Zambia recorded 7.8 million in the 1990 Census and the average annual growth rate during past 20 years was 3.7%. The population at present is estimated at 8.5 million of which 50% is concentrated in urban areas along the railway that makes Zambia one of the urbanized countries in Africa.

The urbanization of the population accelerates migration of men from rural areas causing big gaps of sex ratio between urban and rural areas.

In some districts, less than 80 males per 100 females are found, that influences adverse effect on agriculture in the rural areas.

**Table 2.2.1 Population and Density by Province 1990**

Province	Population (1,000)	Sex ratio Male/Female (%)	Area (1,000 km <sup>2</sup> )	Density per km <sup>2</sup>
Central	726	98.8	94	7.7
Copperbelt	1,580	102.4	31	50.4
Eastern	974	93.4	69	14.1
Luapula	527	93.5	51	10.4
Lusaka	1,208	101.1	22	55.2
Northern	868	94.2	148	5.9
North-Western	383	91.2	126	3.0
Southern	946	96.6	85	11.1
Western	607	87.3	126	4.8
Total	7,818	96.7	753	10.4

### 2.2.2 Politics

Since its independence, Zambia's policy had been trying to make harmony among the ethnic groups and to settle the disputes among political parties, then in 1973 Zambia established one party state under the Government of president Kenneth Kaunda. Zambia also had been positive with regard to diplomatic activities for humanitarianism in Africa opposing to be colonized by White rule.

Under these backgrounds, Zambia had to cope with neighbouring countries on the national interest, and in addition the worldwide recession of copper industries begun in 1975 accelerated an aggravation of Zambian economy.

The economic unstable situation had led to unpopularity of one party state policy so that a general election competed by political multi-parties was held in 1991. In this election, "Movement for Multiparty Democracy" led by Fredrick J.T. Chiluba had won the election appealing the policies of Decentralization, Freemarket-oriented economy and so on.

### 2.2.3 Economy

#### (1) Economic structure

In 1960s Zambia had enjoyed their economy supported by copper industries. Since the middle of 1970s, however, the recession of copper industries had deteriorated Zambian economy seriously. The production of copper declined from 700,000 tons in 1969s to 200,000 tons at present, and the estimated copper ore at 1991 was 384 million tons which was about a half of that estimated in 1980s.

Consequently, the share of copper industries in GDP had fallen from 33% in 1980s to 15% in 1990s, and this trend has been continued until present. In addition to the decline of export earnings, the increase of population and financial debts has worsened Zambia's economy causing high rate of inflation. The GDP per capita of US\$ 500 in 1970s had decreased to US\$ 300 in 1993.

#### (2) Economic policy

With the change of political power, the Government took new economic policies aiming at achieving decentralization, freemarket oriented economy and so on, instead of the centralized policy, controlled economy and price regulation etc. taken by the former Government. The new policies include following components :

- 1) Liberalization of the price of inputs and outputs in agriculture.
- 2) Free transaction of trade and foreign exchange.
- 3) Stabilization of interest rate and inflation by austerity measures of money.
- 4) Efficient use of Government expenditure.
- 5) Improvement of services of Government offices and parastatals.
- 6) Revitalization and privatization of parastatals and companies.

The Government has converted its economic dependence from mining sector to agriculture which has a potential of more than 5 million ha of arable land and holds 50% of population. The share of the government expenditure for agriculture increased from 7.9% in 1984 to 13.0% in 1994. Accordingly the share of agricultural products to GDP has been improved from 11.0% to 21.1% between 1987~1993. But there are some constraints about depending on rain-fed agriculture.

**Table 2.2.2 Gross Domestic Product**

	unit	1988	1989	1990	1991	1992	1993
GDP current price	K million	30,020	55,181	113,340	219,353	569,207	1,643,758
GDP 1977 price	K million	2,247	2,224	2,213	2,213	2,136	2,319
Growth rate	%	6.30	-1.00	-0.50	-	-3.50	8.60
Per capita	K	3,987	7,357	14,045	26,145	65,825	188,526
Per capita	US\$	482	532	427	405	393	378
Foreign exchange rate	K/US\$	8.27	13.84	32.89	64.64	167.63	443.00
Population	1000	7,534	7,676	7,818	8,108	8,408	8,719

Source : GDP, EIU (The Economist Intelligence Unit limited) Country Profile 1994-'95.  
 Foreign exchange rate, IMF International Financial Statistics  
 Population, CSO

**Table 2.2.3 National Budget by Sector (1984 price)**

	1984		1994	
	K million	%	K million	%
Agriculture	117.3	7.9	108.6	13.0
Health	112.9	7.6	110.0	13.2
Education	249.5	16.8	142.0	17.0
Transport/Communication	83.2	5.6	43.8	5.3
Energy	16.3	1.1	5.8	0.7
Others	905.9	61.0	424.8	50.9
Total	1,485.0	100	835.0	100

Source: ASIP of MAFF



**Table 2.2.4 Gross Domestic Product by Sector (1977 price)**

	1989		1990		1991		1992		1993	
	Km	%	Km	%	Km	%	Km	%	Km	%
Agriculture,	424.5	(19.1)	386.7	(17.5)	406.7	(18.4)	272.2	(12.7)	488.8	(21.1)
Forest, Fish, Mining	175.6	(7.9)	162.7	(7.4)	148.0	(6.7)	166.9	(7.8)	151.7	(6.5)
Manufacturing	544.1	(24.5)	586.7	(26.5)	586.6	(26.5)	636.5	(29.8)	601.9	(26.0)
Electricity	49.9	(2.2)	58.8	(2.7)	63.8	(2.9)	60.6	(2.8)	62.7	(2.7)
Construction	63.3	(2.8)	62.6	(2.8)	61.8	(2.8)	58.5	(2.7)	60.4	(2.6)
Market, Service	233.0	(10.5)	234.9	(10.6)	226.4	(10.2)	244.3	(11.5)	252.2	(10.9)
Transport, Communication	110.2	(5.0)	102.1	(4.6)	97.1	(4.4)	84.6	(4.0)	78.2	(3.4)
Finance, Insurance	52.9	(2.4)	53.8	(2.4)	54.7	(2.5)	52.2	(2.4)	47.1	(2.0)
Real estate	192.7	(8.7)	182.7	(8.3)	178.1	(8.0)	185.7	(8.7)	191.5	(8.3)
Others	373.0	(17.0)	382.5	(17.2)	389.5	(17.6)	375.0	(17.5)	384.8	(16.1)
<b>Total</b>	<b>2,224.2</b>	<b>(100)</b>	<b>2,213.5</b>	<b>(100)</b>	<b>2,212.7</b>	<b>(100)</b>	<b>2,136.5</b>	<b>(100)</b>	<b>2,319.4</b>	<b>(100)</b>

Source : Economic Report of National Commission for Development Planning.

## 2.3 Agriculture and its Policy

### 2.3.1 Farmland

Zambia has about 75.3 million ha of land in which approximately 5 million ha are estimated as farmland including arable ones. The farmland is classified into two types, State land and Trust or Reserved land. Most of the State land are being leased to commercial farmers and the Trust or Reserved land, which are not much fertile, to the small scale farmers.

Table 2.3.1 Land Utilization (1988)

			(1,000,000 ha)	
Items		Area	Remark	
Farmland		5.23		
	for Lease	(1.90)	Stateland	
	for Government	(0.60)	do	
	Others	(0.10)	do	
	Trust or Reserved	(2.63)	including Fallow	
Grazing		35.00		
Forest		29.09		
Others		5.94		
Total		75.26		

Source: FAO Year book Vol. 43 1989, ASIP M.A.F.F.

### 2.3.2 Farm Management

There are three categories of farmers in Zambia namely commercial farmers, emerging farmers and small scale farmers. The commercial farmers consist of only about 2000 but managing in a large acreage with modernized techniques so that they produce 40% of total agricultural product in the country and occupy 60% of marketing share. The emerging farmers consist of about 150,000 who manage 3~4 ha of farmland, and engage in raising livestock using extensive grazing area. The small scale farmers consist of about 430,000 who manage practically subsistence farming with 1~2ha of farmland mostly depending on human power.

In contrast to the commercial farmers who earn 22% of their income by maize and 35% by other cash crops, the emerging and small scale farmers get their income with 60% by maize and 21% by other crops. Looking at the farm expenses, the commercial farmers pay some 70% of total income for hiring laborers and purchasing fertilizers, machinery, foodstuffs and so on. On the other hand, emerging and small scale farmers are paying 38% of cash income for hiring laborers, purchasing production materials such as fertilizers and foodstuffs. As cash income is 40% of total income, the factual proportion of farm expenses to the total income is only 15% for emerging and small scale farmers. The farming, except for that of commercial farmers, is so extensive that only just a little input materials are applied and, at the same time, almost 60% of

the harvest are consumed by farmers themselves.

**Table 2.3.2 Farm Management of the Emerging and Small-scale Farmers**

	Emerging Farmers	Small-Scale Farmers
Number of Farms	150,000	430,000
Total Cultivated Area	500,000 hectares	600,000 hectares
Ave. Cultivated Area	3-4 hectares	1-2 hectares
Fallow and Other Land	1 to 2 million hectares	1 to 2 million hectares
Number of Cattle	2.2 million head	none
Number of Cattle//Farm	about 16 head	none
Grazing Land Used	about 9 million hectares	none
Total Land Utilized	about 11 million hectares	about 2 million hectares
Average Area Used/Farm	about 70 hectares	about 5 hectares

Source : Agricultural Sector Investment Programme by MAFF

**Table 2.3.3 Farm Income and Expenditure for Commercial and Non-Commercial Farms**

Items	Commercial		Non-commercial	
	K million	%	K million	%
<b>Sales</b>				
maize	75.6	22.1	126.7	60.1
other field	101.2	29.5	44.7	21.2
hort. crops	20.2	5.9	0	0
cattle	50.8	14.8	26.9	12.8
pigs, goats & sheep	16.8	4.9	2.6	1.2
livestock products	21.8	6.3	4.6	2.2
poultry products	34.5	10.2	3.8	1.8
egg products	21.6	6.3	1.5	0.7
<b>Total sale</b>	<b>342.8</b>	<b>100.0</b>	<b>210.8</b>	<b>100.0</b>
<b>Expenses</b>				
salaries & wages	62.0	18.1	15.9	7.5
fertilizers & manures	21.5	6.3	34.0	16.2
interest paid	21.5	6.3	12.5	5.9
feed purchased	44.2	12.9	0.9	0.4
mach'y & plant maintenance	29.1	8.5	3.0	1.4
fuel, oil & lub	18.3	5.4	3.3	1.6
agri. chemicals	7.0	2.0	2.0	0.9
seeds & seedlings	7.7	2.2	6.4	3.0
vet. & livestock	10.7	3.1	0	0
electricity, water	5.2	1.5	0	0
machinery hire	3.5	1.0	0	0
miscellaneous	11.8	3.4	3.1	1.5
<b>total expenses</b>	<b>242.4</b>	<b>70.7</b>	<b>81.1</b>	<b>38.5</b>
Depreciation	79.4	23.2	9.1	4.3
<b>Total farm expenses</b>	<b>321.9</b>	<b>93.9</b>	<b>90.2</b>	<b>42.8</b>
<b>Net return from sales</b>	<b>20.9</b>	<b>6.1</b>	<b>120.5</b>	<b>57.2</b>
<b>Value of home grown food</b>	<b>-</b>	<b>-</b>	<b>315.2</b>	
<b>Vet farm income</b>	<b>20.9</b>		<b>435.8</b>	

Source: ASIP, M.A.F.F.

### 2.3.3 Agricultural Production

#### (1) Crops

In Zambia, maize is a dominant crop recorded nearly 2 million tons of yields in 1988 but decreased extremely to 0.5 million tons in 1992 because of severe drought.

The productions of other crops are increasing with its cultivating area as a whole, but the increasing rate is relatively small.

**Table 2.3.4 Planted Area (1,000 ha) and Production (1,000 ton) of Main Crops**

Crops	Unit	1986	1987	1988	1989	1990	1991	1992 **
Maize	Area	588.50	609.50	723.10	1,020.60	763.30	639.39	641.84
	Yield	1,230.60	1,063.40	1,943.20	1,845.00	1,092.70	1,096.00	463.80
Sunflower	Area	57.20	31.60	44.60	45.00	44.30	36.49	22.31
	Yield	30.60	17.00	15.80	15.00	20.00	10.65	4.56
Soyabean	Area	13.90	16.90	20.30	21.30	29.80	29.20	26.82
	Yield	15.90	13.50	21.20	20.60	26.80	27.71	19.75
Groundnut	Area	34.40	149.00	81.80	62.90	80.40	80.47	68.71
	Yield	18.20	47.40	33.40	30.10	25.10	28.20	20.78
Rice	Area	10.40	8.70	10.40	12.80	9.50	13.45	14.15
	Yield	11.20	8.20	9.40	11.70	9.20	14.60	8.48
M. Beans	Area	19.70	23.60	17.60	18.70	26.40	28.94	27.62
	Yield	10.20	15.50	10.90	24.30	14.30	14.12	15.02
Sorghum	Area	59.60	47.50	47.40	52.00	48.50	31.79	42.16
	Yield	45.00	26.20	36.10	33.80	19.60	14.12	15.02
Cotton	Area	52.00	28.20	77.90	106.40	64.00	74.02	64.20
	Yield	33.40	20.20	58.50	34.80	30.70	48.72	35.89
Tobacco	Area	3.48	2.46	4.89	5.04	5.07	3.09	5.50
	Yield	3.90	3.55	4.35	3.60	4.65	1.68	5.42
Millet	Area	18.50	43.60	44.10	47.40	58.90	45.27	53.00
	Yield	11.70	30.60	28.60	27.30	31.50	25.57	25.95
Wheat	Area	—	* 7.40	* 6.93	0.20	0.36	12.50	14.90
	Yield	—	27.46	31.55	0.17	0.33	69.26	97.23

Source : Official Crop Production and Sales data 1986-1992

Note : \* Under Irrigation

: \*\* Expected Production

(2) Livestock

Cattle is the dominant animal in this country and has a big potential due to vast grazing land available. The cattle are expected to increase to 3.2 million heads by 2005.

**Table 2.3.5 Livestock Population in Zambia (1984 - 1988)**

Type	1984	1985	1986	1987	1988	
Subsistence sector	Cattle	2,215	2,077	2,107	2,167	2,229
	Sheep & Goats	403	424	454	486	520
	Pigs	166	156	163	170	178
Commercial sector	Cattle	-	393	413	433	455
	Sheep & Goats	-	32	33	40	43
	Pigs	-	22	24	26	29
Total	Cattle	2,215	2,470	2,520	2,600	2,684
	Sheep & Goats	403	456	487	526	563
	Pigs	166	178	187	196	207

Figures : 1,000 heads  
- : Not Available  
Source : Country Profile 1992

(3) Inland Fisheries

The demand for fish in Zambia is strong since most people are accustomed to this food, and an annual consumption of fish would reach 150,000 tons by the year 2005.

**Table 2.3.6 Fish Production in Zambia**

	1985	1986	1987	1988	1989	1990	1991
Rivers	14,500	8,400	10,800	10,395	24,258	19,272	21,242
Lakes	76,200	58,300	51,300	18,602	28,019	30,324	30,038
Swamps	1,000	1,200	1,600	-	1,401	2,613	1,870
Total	91,700	67,900	63,700	28,997	53,678	52,209	53,150

Figures : Tonnes Fresh Weight Equivalent  
Source : Country Profile 1992

### 2.3.4 Agro-policy

#### (1) Constraints in Agricultural development

- 1) The Government of Zambia has been giving its economical priority to the Mining sector and urban area, but rural area considered to be a source of supplying labors to the mining industries. Consequently, fundamental infrastructures in the rural area are in very poor conditions especially concerning to agricultural production and marketing such as rural roads, irrigation and drainage canals, marketing facilities and so on. Farmers are cultivating crops, based on rain-fed condition.
- 2) Although Zambia has more than 5 million ha of arable land, staple food production in the country is not secured because of unstable weather patterns.
- 3) Commercial farmers are cultivating crops along the railway districts on fertile soils, but the non-commercial farmers are living far from urban area with infertile soils so that they suffer from the short of food production even to their own demands.
- 4) Farmers are not much used to cooperate each other with agricultural production and have not adequate supporting system in this respect.

#### (2) Basic objectives for Agricultural development.

The Government of Zambia has given priority to the agricultural sector in order to develop the national economy substituting copper industries.

In 1992, the Government formulated five basic objectives of Agricultural sector, as follows :

- 1) Establishment of national and regional food security through dependable annual production with reasonable prices.
- 2) Establishment of improved and sustainable agricultural system based upon existing resources.
- 3) Increase of income and employment to maximum feasible levels in all regions through full utilization of local resources and realization of domestic and export market potential.
- 4) Development of sustainable related industries.
- 5) Expansion of sector's contribution to the national balance of payments by promoting agricultural exports in line with international comparative advantage.

### **(3) Agricultural Sector Investment Programme (ASIP)**

In 1994, the Government has drawn up a development strategy known as the Agricultural Sector Investment Programme (ASIP) aiming at achieving a sectional growth of 6% per year with a minimum investment of 1.5% of GDP until the year of 2,000.

#### **1) Main components of ASIP**

The ASIP programme consists of three main components :

- a. Policy and institutional reforms
- b. Support for private sector investment
- c. Rehabilitation and strengthening of the public agricultural services

The main purposes are to move from a centralized command economy to liberalized market driven economy, to support private sectors activities and also to rehabilitate and strengthen various agricultural service programmes relating to ASIP.

#### **2) Development strategies of ASIP**

The Government has adopted following complementary strategies for stimulating the sector growth and development according to its priorities.

- Urgent and High priority
  1. Market liberalization
  2. Crop diversification
  3. Emphasis on services to small holders
  
- Medium priority
  4. Development of the livestock sector
  5. Improve opportunities for outlying regions
  6. Better utilization of available land
  7. Emphasis on sustainable farming
  
- Essential for complete success
  8. Improvement of women's the economic conditions
  9. Better utilization of available water
  10. Establishment of countermeasure against natural disasters



## 2.4 The Agriculture in Western Province

### 2.4.1 Location

Western Province is located between 22 ° 00' and 25 ° 30' of east longitude and 13 ° 45' and 17 ° 45' of south latitude. Northern and eastern parts of the Province are mostly demarcated by sizable rivers such as Machili, Dongwe, Kabompo and others. The Province extends to 126,386 sq. km and shares the southern boundary with Namibia by the Zambezi and the western boundary with Angola by the 22° degree line of east longitude and the Kwando.

### 2.4.2 Administrative Jurisdiction and Population

The Province lies on the westernmost part of Zambia and occupies a little less than 17 % of the total land inhabited by 7.8 % of the total population. Although the area is secondly broad following to the Northern Province the population is the third from the bottom among nine Provinces. As the result, the population density is situated at the second from the lowest.

The Province is divided into six Districts. The Capital of the Province is placed in Mongu District which is located a little to the north of central part in the Province. The areas and population of respective District are shown in Table 2.4.1.

**Table 2.4.1 Area and Population in the Respective District**

Name	Area (sq. km)	Population				
		Total	Urban	Rural	Male	Female
Kalabo	17,526	101,410	7,156	94,254	45,854	55,556
Kaoma	23,315	112,747	10,209	102,538	53,969	58,778
Lukulu	16,291	51,016	3,124	47,892	23,704	27,312
Mongu	10,075	142,213	36,762	105,451	66,100	76,113
Senanga	29,907	135,210	7,757	127,453	62,383	72,827
Sesheke	29,272	64,901	5,460	59,441	31,194	33,707
<b>TOTAL</b>	<b>126,386</b>	<b>607,497</b>	<b>70,468</b>	<b>537,029</b>	<b>283,204</b>	<b>324,293</b>

The extent of the District area is smaller in three north and west Districts and larger in three south and east Districts. Almost ninety per cent of population is living in rural area. Only in Mongu District, 26 % of people are living in urban area and the population density is 14.1/km<sup>2</sup>, which is higher than the national average of 10.4/km<sup>2</sup>. More than ninety per cent of population is living in rural area in all other Districts, and population density is especially low in the northernmost District, Lukulu, and the southernmost District, Sesheke. The sex ratio, number of males per 100 females, in the Western Province is 87.3 compared to the national average of 96.7 and this is the lowest among all Provinces.

Although the inhabitants of the Province consist of more than forty tribes, the dominant is the Lozi together with Nkoyas in Kaoma. The Mbunda mainly composed of migrants from Angola

also forms a tribe. Most of the other tribes have been assimilated into the Lozi. Litunga, the paramount chief of the Lozi, is the traditional head of Barotseland where most of the area overlap with the Western Province. Not only Lozi but all tribes in Barotseland pay allegiance to Litunga with his Royal Establishment assisting in administering through representatives in each District.

### **2.4.3 Topography and Climate**

The Province is characteristically flat throughout the whole area in keeping with the features of the massive Zambezi river which cuts the western part of the Province vertically and has a marked influence on the Provincial features and Agro-Ecology.

There are no specific topographical features except for a few ridges in the North along the edge of the flood plain which are some 70 m above the river level, and some hills of up to 140 m where appears the river scarp like in Sesheke District.

The Climate of Zambia ranges from normal temperate in the north to extreme dry in the south. The Province lies between the temperate climate of Mwinilunga in the north and the hot dry climate of Botswana in the south. Average annual rainfall ranges from 1000 mm in the north to 650 mm in the south. The rainfall is less reliable and the period of rainy season is shorter toward the south.

The prevailing wind is easterly in the dry season and north westerly in the rainy season.

### **2.4.4 Land Use and Agricultural Production**

Western Province is covered by a deep mantle of Kalahari sands and more than 95 % of lands are considered not to be suitable for permanent cultivation of staple food crops. According to the 1989/1990 Agricultural Statistical Bulletin, the ratio of the area planted by 12 main crops to the total land area is only 0.52 % in the Western Province compared to that of 1.54 % for the whole country. There are numbers of forest reserves. Most of the non-gazetted forest are, however, being destroyed for planting cassava which is supplementary staple food and charcoal for sale in town.

Some 90 % or more of the population are involved in agriculture. Number of farmers and planted areas in respective districts in the Western Province are shown in Table 2.4.2.

**Table 2.4.2 Number of Farmers and Area Planted ( Farm Type-wise )**

District	Farm Type	Farm-Number	Area Planted(ha)
Kalabo	Large	-	-
	Medium	96	515
	Small	6,896	7,616
	Total	6,992	8,131
Kaoma	Large	22	715
	Medium	272	1,604
	Small	8,406	15,125
	Total	8,700	17,444
Lukulu	Large	-	-
	Medium	128	675
	Small	8,238	7,975
	Total	8,366	8,650
Mongu	Large	-	-
	Medium	430	2,456
	Small	11,794	15,051
	Total	12,224	17,507
Senanga	Large	-	-
	Medium	193	1,298
	Small	8,548	15,969
	Total	8,741	17,267
Sesheke	Large	7	193
	Medium	902	6,485
	Small	7,772	19,651
	Total	8,681	26,329
Grand Total	Large	29	908
	Medium	2,021	13,033
	Small	51,654	81,387
	Total	53,704	95,328

Note : Large Scale Farm : Planting 20 ha and above  
 Medium Scale Farm : Planting 5 ha ~ 19.9 ha  
 Small Scale Farm : Planting 0.5 ha ~ 4.9 ha

Almost all farms are in small scale cultivating about 1.6 ha on the average. The number of large scale farms which are scarcely realized in Kaoma and Sesheke District is nearly negligible. Medium scale farmers who cultivate some 6.5 ha on the average occupy 2 ~ 4 % of the total farmers in the respective Districts except for Sesheke District where a little more than 10 % farmers are planting 7.2 ha on an average.

The most important crop in Zambia is maize and it occupies 66 % of planted area followed by groundnut, cotton, millet, sorghum, sunflower and so on. The situation of maize is just the same in the Western Province and it occupies 60 % of the crop planted area. The notable feature in the Western Province is that raised crops are concentrated on the staple foods. The aggregated ratio of maize, millet, sorghum and rice amounts to 95 % of the total area planted. Major crops in the

Western Province are maize on the plain and upland fields with the best soils, sorghum and millet on the better upland fields and cassava on the poorer upland fields. Rice is the marked crop in the Province grown in the areas of Dambos and the flood plain. The ratios to the figures of whole country are 40 ~ 50 % in area planted and 35 % in amount produced.

Cattle has been endowed significant meaning in the Western Province as a property which express as the owners' status rather than the resource of production. Some portion of them, however, are utilized for the purpose of draughting, milking and Kraaling and the significance of owning cattle is gradually changing towards the practical use as economic animals from mere possession as assets.

The numbers of livestock in respective Districts obtained from the 1992 Livestock Census are shown in Table 2.4.3. The dominant livestock is cattle. Some 75 % of the cattle are grazed on the Barotse flood plain from June to December and on the upland areas in the remaining season.

The population of cattle is exceeding the reasonable capacities in Mongu and Kalabo Districts especially in relation to upland grazing. Sesheke and Senanga West are relatively abundant in grazing land, and Kaoma is virtually understocked. The principal constraint on livestock development is the shortage of adequate grazing land during the rainy season because most herds are mainly dependent on the flood plain. The improvement of cattle raising management is also very important for the management is so extensive that almost no culling, selective breeding and grazing management are observed on the fields.

**Table 2.4.3 Livestock Population (1992)**

District	unit (×1,000)			
	Cattle	Pigs	Goats	Poultry/Ducks
Kalabo	109.4	0.6	0.6	62.0
Kaoma	27.8	1.5	1.6	34.0
Lukulu	79.5	-	0.2	25.0
Mongu	109.1	0.6	0.5	62.0
Senanga	179.3	0.9	4.1	60.0
Sesheke	58.5	1.1	1.9	15.0
Total	563.6	3.8	8.9	258.0

The Province, at present, is not able to sustain itself in food production. Food self-sufficiency rate throughout the Province is 62 % of FAO. norm [200 kg/capita/annum in average (1988-1990)] as shown in Table 2.4.4. Only Kaoma is able to produce more amount of staple foods than that of consumption. In Kaoma a lot of maize is harvested as the granary area of the Province. On the other hand, Kalabo and Senanga, where not only land fertility are poor but population densities are relatively high, barely produce one forth of demand.

**Table 2.4.4 Cereal Self-Sufficiency Levels per District Based on Crop Forecasts and Population Projections (1988 ~ 1990)**

	Kalabo	Kaoma	Lukulu	Mongu	Senanga	Sesheke	Total
<b>Production (m.t.)</b>							
Maize	1,719	24,214	2,233	2,233	2,644	5,730	38,773
Rice *	195	69	67	687	70	4	1,092
Sorghum	507	167	211	145	676	1,040	2,746
Millet	804	403	925	558	992	647	4,329
Cassava **	2,106	4,862	5,168	8,660	1,008	710	22,514
<b>Total</b>	<b>5,331</b>	<b>29,715</b>	<b>8,604</b>	<b>12,283</b>	<b>5,390</b>	<b>8,131</b>	<b>69,454</b>
<b>Population</b>							
	103,324	89,449	51,673	139,391	115,762	64,412	564,001
<b>Total *** consumption (t)</b>							
	20,665	17,890	10,335	27,878	23,152	12,882	112,802
<b>Self sufficiency (%)</b>							
	26	166	83	44	23	63	62

Note : \* Estimate retention for own consumption or 25 % of the production  
 \*\* Dry cassava equivalent  
 \*\*\* Calculated with 200 kg/year/capita

#### 2.4.5 Marketing and Related Industries

The major commodities exported from the Province are principally cattle, dried fish and timber, mainly in form of raw materials. The primary export crop is rice followed by cashewnuts and tobacco. Although rice is a very important export crop, it is facing difficulties in trading because of its low quality. Unification of variety and standardization of quality are inevitable through the improvement of cultivation on the farm field and processing methods at the rice mills.

Private traders are involved in the marketing of commodities both for export and internal marketing. The major food crops such as cassava, maize, sorghum and bulrush millet are mainly consumed and marketed within the province.

There are no heavy industries in the Province and only a few light industries and primary industries listed below are located mainly in Mongu. Most of the business in small towns are related to retail and trading and no manufacturing industries are realized.

- Cashewnut processing factory (1)
- Mango fruit processing plant (1)
- Livestock abattoir owned by a parastatal company (1)
- Rice mills in Mongu and Kaoma owned by Cooperative Societies (2)
- Maize mills in Kaoma and Mongu (2) and numerous hammer mills scattered all over the rural area.

#### **2.4.6 Communications and Transport Facilities**

Communication is very poor, because of poor roads which are technically difficult to manage due to the unstable nature of Kalahari sands covering the whole area.

A good tarred road lies between Mongu and Lusaka via Kaoma District. There is also a tarred road linking Senanga, Mongu and Limulunga. There are gravel roads linking Kaoma and Lukulu, Senanga and Sesheke, and a tarred road linking Sesheke and Livingstone.

There are major sand tracks linking Senanga and Kalabo, Kaoma and Sesheke, Kaoma and Kasempa in North Western Province. Most of these roads, both gravel and sandy tracks, are in poor condition necessitating repairs and maintenance.

- Total tarred road network ..... 400 km
- Total gravel road network ..... 400 km
- Total main sandy roads/tracks ..... 480 km
- Numerous small less passable tracks/foot paths/ sandy tracks

## 2.5 The Agriculture in the Mongu District

### 2.5.1 Area and Population

Mongu District is located in the center of Western Province with Zambezi river on its western border. The population density is highest in the Province and Mongu Township is the administrative and economic center of the Province. It consists of 20 wards with an area of 10,076 km<sup>2</sup> and a population of 142,213. The Study Area is included in the six Wards dotted in Table 2.5.1.

**Table 2.5.1 Ward-basis Population Density and Number of Farmers**

Ward	Area (km <sup>2</sup> )	Population	Population density/km <sup>2</sup>	Farmers / ward
Ushaa	724	4,525	6.3	754
Mabili	668	3,013	4.5	502
* Limulunga	504	9,447	18.8	1,574
Ikwichi	218	3,064	14.0	511
Namboma	238	3,208	13.5	535
* Mabumbu	101	3,287	32.5	548
* Lealui	319	9,714	30.5	1,619
Kaande	90	1,917	21.4	319
* Yeta	168	4,643	27.6	774
* Katongo	254	8,969	35.3	1,495
Lumbo	344	5,567	16.2	928
* Namushakende	85	3,438	40.3	573
Nakato	699	5,326	7.6	888
Nangula	907	8,852	9.8	1,475
Ndanda	668	4,952	7.4	825
Lui	1,091	6,995	6.4	1,166
Imalyo	912	3,845	4.2	641
Mbekise	499	4,446	8.9	741
Nakanya	606	3,752	6.2	625
Mutondo	962	4,013	4.2	669
Total of rural area	10,076	102,973	10.2	17,162
Total	10,076	142,213	14.1	17,162

\* Wards Relevant to the Master plan

Source : Mongu District Council, Department of Agriculture (1990 census)

### 2.5.2 Agriculture in the Mongu District and Master Plan Study Area

#### (1) Farm Size and Cropping Intensity

Since the total number of farmers in the District is 17,162 (1990) and the total crop area is 22,848 ha (1989 crop forecast), the mean farm size of all over the district is 1.33 ha. Generally

speaking, the average size seems to be larger in Wards located in marginal area where less intensive crops are dominating. The type of farming is almost fallen into a category of traditional-subsistence farmers.

In the Wards relevant to the Study Area, the number of farmers is 6,583 and the crop area is 8,978 ha, therefore the average farm size is 1.36 ha which is almost equivalent to the District average. Among those Wards, the average sizes of Limulunga and Yeta are larger and those of the other four Wards are smaller than that of the District.

Crop intensity, the ratio of crop area to the total farm area, tends reverse to the order of farm size, that is, the areas where the farming is extensive are parallel with the areas where crop intensity is low. Both of the size and intensity are, however, exceptionally high in Limulunga and Yeta. Especially in Yeta, both indicators are the highest among all Wards in the District. Yeta is also the only Ward where rice is planted as a predominant crop which is the most intensive one among the staple food crops.

**Table 2.5.2 Ward-basis Farm Size and Cropping Intensity**

Ward	Farm size	Crop area	Cropping intensity	Cropping + fallow intensity
Limulunga	1.80	2,834	0.06	0.34
Mabunbu	0.70	382	0.04	0.23
Lealui	1.12	1,808	0.06	0.34
Katongo	0.78	1,166	0.05	0.28
Yeta	2.73	2,112	0.13	0.75
Namushakende	1.18	676	0.08	0.48
Others	1.58	13,870	0.02	0.13
Mongu District	1.33	22,848	0.02	0.14

Source: Adapted from Department of Agriculture, Crop forecast 1989

## (2) Crop Production

The areas of main staple crops cultivated in Mongu District are shown in Table 2.5.3. Cassava has the largest area among those main crops. Cassava is planted on the upland fields of poorer soils which are mostly located in the other wards from the Target Area.

The area of maize follows cassava. The area proportion of maize in the Province is less than 20 % for larger portion of maize is produced mainly in Kaoma District. However, more than 70 % of maize is produced in the Wards including the Target Area where better fields with rich soil are abundant on the flood plain in the District.

Rice is one of the particular crops in the District together with mango and cashewnuts. Although



40~50 % of rice are planted in the Western Province, more than 90 % of it is occupied by Mongu District and the Target Area covers 55 % of cropping area in the District. Around one fourth of cultivated area of rice in the whole country are, therefore, occupied by only six Wards relevant to the Target Area. The problem is that the export of rice produced in this area to the Lusaka market is almost impossible because of its inferior quality. Standardization of the varieties of rice and Improvement of cultivation methods are important subjects to be solved urgently.

Sorghum and bulrush millet are also important staple crops in the Western Province. These crops, however, are not essential in Mongu District and only some 10 % sorghum and 20 % bulrush millet of the total area in the Province are planted in the District respectively. A large portion of Sorghum, which is relatively intensive between the two, is mostly planted in the 6 Wards, and the situation of more extensive bulrush millet is just reverse.

Except for leafy vegetables, most of the exotic vegetables like onion, potatoes, cabbage and tomatoes are mainly imported from outside the Province with very few production locally.

**Table 2.5.3 Ward-basis Hectarage of Main Crops**

Ward	Maize	Sorghum	B. millet	Cassava	Rice
Limulunga	2,111	277	5	281	864
Mabumbu	188	116	2	97	90
Lealui	1,311	104	0	184	642
Katongo	1,045	23	9	234	157
Yeta	870	32	21	352	1,276
Namushakende	256	128	25	266	183
Others	2,082	382	2,602	9,452	2,721
Total	7,863	1,062	2,664	10,866	5,933

Source : Department of Agriculture

### (3) Livestock production

As mentioned in the preceding paragraph, cattle has been endowed specific meaning in the Lozi society. It has been considered as valuable property which expresses the owner's status rather than as economic animal producing additional values. Although this thought is changing gradually towards the economic way of thinking, the remaining traditional way of thinking is often disturbing the development of cattle production in economically effective way.

In Mongu District, about 20 % of the total cattle in the Western Province is kept in 8 % of land area, and the density of cattle population is the highest among six Districts. Number of heads per sq. km is 10.8 in Mongu compared to 4.5 of the Province average and this is considered

somehow overstocking especially in the wet season because the cattle can be grazed on the flood plain during the dry season but they cannot find enough grassland on upland areas in the wet season.

Cattle is owned by 38 % of the farm households, which amounts to 1,610 kraals with an average of 4 households per kraal. The kraal size (average 65 animals) varies considerably, being high in wards near the flood plain (72) and low in the uplands (45). Only 34 % of the upland farmers own cattle, while 41 % of the farmers in wards near the flood plain own cattle

The numbers of cattle exported from the District and the Province are roughly estimated 1,000 and 10,000 respectively. The ratio of exported number to the total in the District is about half of that in the Province. Farmers' attitude on the cattle trading seems to be more conventional in Mongu District where is the Litunga's royal town. However, cattle is utilized in various ways such as draughting, milking and kraaling on the farming. Among these utilities, kraaling is especially important in order to maintain the soil fertility under the circumstances where the application of chemical fertilizers is almost impossible from economical and social reasons. Noticeable practices are the traditions called "Kukulima" and "Mafisa", the cattle rent system through which even farmers who do not own cattle can keep cattle and share the benefits of kraaling, milking and even breeding as caretakers according to the contract with owners. These traditions are extremely advantageous in order to encourage the farming of small scale farmers and should be, therefore, extended furthermore as possible.

**Table 2.5.4 Livestock Ownership and Number of Cattle per Ward**

Ward	Number of cattle	Number of kraal	Prop. ownership	Kraal size	Number of poultry	Poultry/village
Limulunga	10,652	110	0.28	97	3,376	31
Mabumbu	367	8	0.06	46	59	7
Lealui	13,093	160	0.40	82	3,688	23
Katongo	9,543	121	0.32	79	1,934	16
Yeta	2,839	36	0.19	79	719	20
Namushakende	8,503	109	0.76	78	2,366	22
Others	59,395	1,066	0.40	56	40,495	38
Total	104,392	1,610	0.38	65	52,636	33

Source : Vulnerability Assessment Mongu District

### 2.5.3 Staple Food Self-Sufficiency

The self-sufficiency rate of staple foods in Mongu District, the total produced starch foods excluding sweet potatoes per person divided by the average consumption per person (200 kg staple per year), are shown in Table 2.5.5. The total self sufficiency rate by rice, maize,

sorghum, bulrush millet and cassava is 86 %, and the deficiency is about 4,000 MT per year, and the shortage of staple foods in cereals is supposed to exceed 12,000 MT.

Generally speaking, the staple food is mostly self supplied in the rural area by the starch food stuffs including rice. Rice is considered and treated as a commercial crop. According to the result of our Farm Economic Survey, however, some 60 % of rice are consumed farmers themselves. The smallest farmers of less than 1 ha consume almost 90 % of produced rice and the largest farmers of more than 5 ha consume less than 50 %.

The traditional and representative foodstuffs in the District are maize and cassava, and the former is planted on the fields of good soils and the latter of poor soil. Cassava is usually consumed as the last option after cereals are finished.

There are great differences in the self-sufficient rate and the composition of food stuffs between the Wards. Among 20 Wards in the District, only four of them cannot fulfill the staple self-sufficiency. Mabumbu and Katongo in the Study Area are included among those four Wards. In these two Wards, their average farm sizes are very small because of relative scarcity of land resources. On the other hand, the self-sufficiency rates in Limulunga and Yeta are very high and that of Yeta is the highest among 20 Wards because of its abundant land resource.

In general, the proportion of cereal crops is higher in the Wards of the Study Area compared to the other Wards and it exceeds 70 % even in the least case in Namushakende. In the Study Area, the farm land is utilized more intensively because of its relatively high land fertility.

The ratio of malnutrition for children is indicated in Table 2.5.6 for reference. The highest ratio of monthly malnutrition throughout the year, was recorded in the season before harvesting (Nov. ~ Feb.).

**Table 2.5.5 Self-Sufficiency Rate on Staple Foods per Ward**

Ward	Rice	Maize	Sorghum	Millet	Cassava	Total
Ushaa	0.74	0.90	0.04	0.00	0.54	2.23
Mabili	0.21	0.94	0.05	0.00	0.02	1.22
* Limulunga	0.55	1.12	0.07	0.00	0.12	1.86
Ikwichi	0.14	0.57	0.06	0.00	0.75	1.53
Namboma	0.16	0.36	0.02	0.12	0.25	1.00
* Mabumbu	0.16	0.29	0.09	0.00	0.12	0.66
* Lealui	0.40	0.67	0.03	0.00	0.08	1.17
Kaande	0.55	0.11	0.01	0.01	0.54	1.22
* Yeta	1.65	0.94	0.02	0.01	0.30	2.91
* Katongo	0.11	0.58	0.01	0.00	0.10	0.80
Lumbo	0.00	0.21	0.00	0.02	0.14	0.38
* Namushakende	0.32	0.37	0.09	0.01	0.31	1.11
Nakato	0.20	0.66	0.00	0.18	0.60	1.63
Nangula	0.25	0.45	0.07	0.05	0.74	1.56
Ndanda	0.66	0.49	0.05	0.06	0.93	2.18
Lui	0.11	0.03	0.00	0.06	0.39	0.59
Imalyo	0.34	0.31	0.01	0.06	1.05	1.75
Mbekise	0.08	0.47	0.02	0.03	0.40	1.00
Nakanya	0.53	0.51	0.03	0.08	0.77	1.92
Mutondo	1.17	0.10	0.01	0.04	0.41	1.72
Total Of Rural Area	0.34	0.38	0.03	0.04	0.42	1.18
Total	0.25	0.28	0.02	0.03	0.31	0.86

Source : Vulnerability Assessment, Mongu District : July 1993.  
Farm Economic Survey : February 1994.

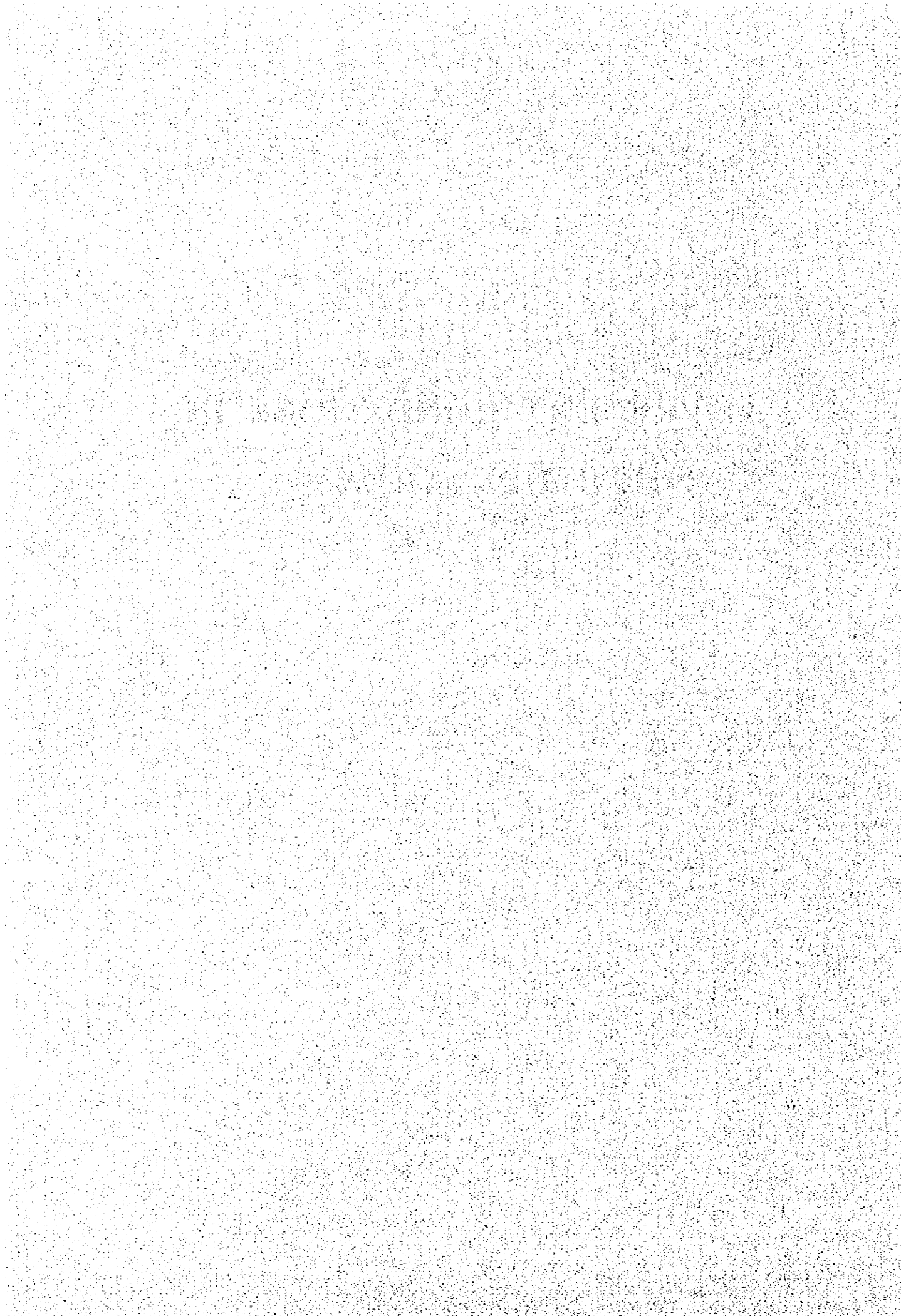
Note : \* Wards the Study Area included

**Table 2.5.6 Malnutrition of Children under Five Years Old**

Ward in the Study Area	Malnutrition (%)	
	1991	1992
Limulunga	19	34
Mabumbu	21	30
Lealui	21	24
Yeta	11	15
Katongo	14	18
Namushakende	26	29
Average in Mongu district	25	29

Source : Department of Agriculture, WP

### **3 . PRESENT CONDITIONS IN THE STUDY AREA**



### **3. PRESENT CONDITIONS IN THE STUDY AREA**

#### **3.1 Natural Conditions**

##### **3.1.1 Location**

Mongu, the capital city of Western Province, is located on 15° 16' south latitude and 23° 9' east longitude. The Study Area is located between Limulunga, 13 km north of Mongu town-ship, and Namushakende, 25 km south of Mongu town-ship, with approximately 3 km width. The road Limulunga - Mongu - Senanga Road is caught in the Study Area .

##### **3.1.2 Geology and Topography**

###### **(1) Geology**

The Study Area belongs to Tertiary and comprises recent Kalahari group with fossil seif dunes on the plateau and alluvium and laterite in the floodplain. (Thiem et al 1974-1975.)

The Kalahari group is in deep deposits. The sands are locally called Barotse sands. They are well sorted and consist of almost entirely quarts (Spaargaren, 1969). Heavy minerals were found almost absent in the sand fraction. The sands are underlain by karroo classics.

The floodplain sediments comprise loams and clays in the flood channels overlying Barotse sands. The raised parts of the floodplain comprise Barotse sands overlain in some places by loams. In the seepage trough the Barotse sands are overlain by peat soils.

###### **(2) Topography**

The Study Area is part of the aggraded Central African Plateau. The aggraded plateau can be divided into two categories, 1) Floodplain and 2) Plateau or Upland.

###### **1) The Floodplain**

In the Floodplain two sub-units can be identified as follows :

###### **a. Seepage trough**

This unit covers a narrow zone up to 500 m width along the floodplain edge towards the plateau. It is locally called the Sishanjo. Perennial subsurface seepage from the plateau keeps this unit wet throughout the year. Further into the floodplain the Sishanjo gives way to slightly raised river sand terraces.

###### **b. River sand terrace**

The sand terraces are locally known as the Saana. They comprise relatively high level sand terraces that are partly unflooded (Ft) and, in lower parts, made of an

intricate complex of eroded sand terraces including raised mounds called Mazulu, flood ridges and flood gullies (fc). The Saana is intersected by often wide, flat flood channels (fc) through which annual floods advance and recede.

The flood channels are locally known as Liwatata.

## 2) Plateau (Upland)

In the plateau 4 sub-units were identified as follows :

### a. Flood plain escarpment

This is the part where the plateau suddenly slopes towards the floodplain. It is narrow rarely 1km wide. The slope varies from 5 to 12 %. At the place where the escarpment joins the Sishanjo the slope is 2-3 %. Villages are concentrated on this soil-unit.

### b. Plateau crest

This is the most dominant physiographic unit of the plateau. It is separated from the floodplain by the escarpment. It is approximately 50 - 80 m above the plain (Hennemann, 1986).

Its level is nearly flat in the northern part but becomes more undulating in the southern part where deflation pockets are common. Predominant slopes are 0 - 3 %.

### c. Dry deflation pans

These are circular to elliptical depressions within the plateau. They are common on the western edge of the Study Area.

### d. Deflation pan - dune complex

In this unit the deflation pans are associated with sand dunes. They are common in the southern part of the Study Area in the Sefula-Namushakende area. The deflation pans in this area may be influenced by ground water.

## 3.1.3 Meteorology, Hydrology and Water Quality

### (1) Meteorology

#### 1) General Climate

As anywhere in Zambia the general climate in the Study Area is strongly seasonal and typical subtropical with a long dry season (May-October) and a relatively shorter wet



season (November-March). April is transitional. The mean annual rainfall is 916 mm. Annual pan evaporation is 2292 mm. Mean annual temperature is 21.5°C and mean annual relative humidity is 58%.

#### 2) Rainfall

The mean annual total rainfall is 916 mm. More than 90 % of this rainfall are found during November to March. However , the wettest months are December, January and February with an average monthly rainfall of 190 mm.

#### 3) Relative Humidity and Evaporation

Monthly mean relative humidity is highest during the rain season ranging from 65 to 79 % and lowest in September at the end of the dry season with 32 %. The annual mean relative humidity is 58 %.

Monthly mean Pan evaporation varies from 147 mm in February to 291mm in October. It is lower in the wet season than in the dry season. During the months of December to February rainfall is higher than evaporation.

#### 4) Temperature

Mean annual temperature is 21.5°C. Mean monthly temperature varies from 16.7°C in June/July to 25.3°C in October. The mean annual maximum and minimum temperature is 29.4°C and 15.2°C respectively. The absolute maximum temperature is 38.0°C in October and the absolute minimum is -2.2°C in July. Frost is possible but only few days of June and July in some years.

#### 5) Wind Velocity

Wind velocity is generally low. Mean monthly wind velocity range from 1.7 m/sec in December to 3.8 m/sec in September. Mean annual wind velocity is 2.6 m/sec. It is generally lower during the wet season than during the dry season. Easterly winds prevail during the dry season while in the wet season winds are usually from the north-west through variable during rain showers and storms.

#### 6) Agro-Ecological Zones

The Study Area falls in the medium rainfall (800-1000 mm/year) agro-ecological Region II and zones 13F and 13C. Zone 13F falls in the floodplain while zone 13C applies to the plateau. Both zones have a growing period ranging from 120-130 days at 70% probability and 150-166 days at 50% probability. Within the growing season 2-3 ten-day periods with less 30 mm rainfall may occur. Frost in the floodplain may occur in the months of June and July (Annex-Figure III.1.11).

## (2) Hydrology

### 1) Natural Stream Discharge

Discharges of two natural streams, Sefula river and Namitome canal, were observed in the Study Area during March and June.

The Sefula river passing through the Sefula mission originates from an upland dambo about 5km east of the area. The discharge amount observed from September 1991 to April 1992 by The Agricultural Verification Study Team fluctuated between 0.29 m<sup>3</sup>/sec and 0.86 m<sup>3</sup>/sec. It seems that the base flow of this river is approximately 0.3 m<sup>3</sup>/sec. The observed discharge during March and June was 0.37 m<sup>3</sup>/sec each.

The Namitome canal passing along the Limulunga plain edge originates from upland dambo about 20 km east. Discharge amount observed from September 1991 to April 1992 fluctuated between 0.22 m<sup>3</sup>/sec and 0.79 m<sup>3</sup>/sec. The base flow of this river is approximately 0.2 m<sup>3</sup>/sec. The observed discharge in March was 0.47 m<sup>3</sup>/sec, however, the discharge in June reduced to 0.37 m<sup>3</sup>/sec.

### 2) Flood Condition in the Study Area

The annual maximum water level at Matongo platform and Senanga gauging station between 1981 and 1990 is shown in Table 3.1.1. In these 10 years, return period probability of exceedance of the maximum water level is below 33%, and the maximum water level was observed at the end of April in 1989. JICA AVS measured the field groundwater level and water level of Musiamo canal since 1989. However, the AVS farm has never been experienced any severe floods above the field surface.

LWMP published a report, entitled "The Zambezi Flood Plain Edge and Flood Plain". This was for the purpose of studying the relationship between topographic conditions in the flood plain edge and the annual maximum water level in the small Zambezi river. This report also estimated flood levels at several sites in the Study Area, that can not simulate with actual flood levels but it is enough to predict the average flood level. If flood levels are estimated to follow the reported method, 69 % of the Plain in the Study Area will be flooded at least once in 3 years (Annex-Table III.1.1 & Figure III.1.1).

**Table 3.1.1 The Annual Maximum Water Level at Matongo and Senanga**

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Matongo	1013.95	1013.95	1013.07	1012.70	1013.28	1013.71	1013.50	1013.69	1014.03	1012.78
Senanga	1001.92	1000.53	999.99	1000.84	1000.96	1001.63	1001.21	1001.52	1001.93	999.63

### (3) Underground Water and Water Quality

#### 1) Underground Water

There are abundant underground water resources in the Study Area, especially in the flood plain edge area which is supplied by rich underground water flows through the plateau from the east. The plateau is composed of porous sand, having a function to store underground water as a subsurface dam with a steep ground water table gradient towards the flood plain and no evaporation loss.

Mongu District Council Water Supply is using ground water for domestic consumption which is fed to Mongu township by 9 boreholes in Mongu wellfield with a length of 1.6 km. The maximum yield of those boreholes is around 65 l/sec each. Therefore, maximum wellfield yield is approximately 585 l/sec or 0.365 liter per second per unit meter .

#### 2) Water Quality

The 12 water-samples collected in the Study Area on 8th March, 1994 have the following characteristics :

All samples were very acidic. The low electric conductivity of most of them indicates a low mineralization or low level of total dissolved solids (TDS). The concentration of calcium and magnesium is also very low in all samples. Therefore, the water classification of all these samples belongs to the very soft category. Fluoride, chloride, and nitrate concentrations were in low level too.

The values of dissolved oxygen (DO) vary considerably from sample to sample. DO of less than 3-4 mg/l indicates pollution, most likely by organic matters. No samples had any measurable amounts of total suspended solids (TSS) and the visual appearance of all of them with one exception was clear and colorless. Only sample at Kasikasika well was slightly turbid and colored. This sample had also the lowest DO concentration.

All these samples (with one exception) are analyzed in conformity with the ranges of WHO Guidelines for Drinking - Water Quality (1984). The pH values of all samples, however, are found outside the recommended range of 6.5 ~ 8.5. Whether the water represented by these samples can be considered to fit for human consumption will depend on the parameters those were not analyzed, and in particular on the results of bacteriological examinations.

Apart from the health consideration it can be predicted that all of the water samples analyzed will behave corrosive. This is due to their low pH values and very low hardness (calcium and magnesium concentrations).

In order to avoid the damage of pipes and concrete structures, a treatment process for de

acidification is recommended by which also a slight increase of the water hardness is simultaneously brought about.

### 3.1.4 Soils

Based on the FAO/UNESCO soil classification system, major soils in the project are Gleysol, Arenosol, and Podzol. Soils had been derived from alluvial, colluvial and lateritic materials, and Kalahari sands belonging to period of Tertiary to recent.

Description for a representative profile and results of chemical analysis of collected soil samples are presented in Annex-Figure III.3.1.2~III.3.1.9 Soil Profile Description No.1. The cross section of the Zambezi flood plain and diagram of the seepage zone are shown in Figure 3.1.1 and 3.1.2.

The soils of land facets occurring in the Study Area are described below :

#### (1) Upland

##### 1) Plateau

In plateau the soils are sandy, very deep, structureless, highly porous, highly permeable, and excessively drained. Erosion and salinity/alkalinity hazards are very limited. Low natural fertility, low water holding capacity and strong acidity are the major constraints.

##### 2) Escarpment

On escarpment soils are composed of dark brown sand with a clear humus enriched sub horizon. Low water holding capacity and steep slope are the major constraints. These soils are subjected to water erosion, particularly where rills and gullies exist.

#### (2) Seepage Zone

##### 1) Upper part (dry Litongo)

In this part the soils are sandy, deep, highly porous and well to moderately well drained. Groundwater occurs at 1~3 meters depth with limited fluctuation. Electrical conductivity and pH of soils are low. Available phosphorous is more than 20 ppm, which is considered sufficient for most crops.

##### 2) Middle part (wet Litongo)

The soils are sandy, deep, moderately to imperfectly drained, rich in humus and under strong influence of groundwater. These soils are occasionally flooded and permanently moist. Considering the soil fertility and soil moisture regime, these are the most important soils in the Study Area. They do not have severe limitation and are used for growing mango, cashew, maize, sorghum and vegetables.

### 3) Lowest part (Sishanjo)

The soils are deep, very poorly drained, annually flooded and permanently waterlogged. They consist of well decomposed mucks and partially decomposed muck peat underlain by sand.

The soils are fertile and used mainly for rice cultivation. Strong acidity and water logging are the major constraints.

### (3) Flood plain

#### 1) Flat part (Grazing Saana)

In Saana the soils are deep, highly porous and moderately well to imperfectly drained grayish brown sands overlain by bleached sand. Topsoil has medium crumb structure, while the subsoil is structureless. These soils receive brief and shallow flood. They are occupied by flood plain grasses and grazed in dry season.

#### 2) Mounds (Mazulu)

On Mazulu the soils are deep, well structured and moderately well to imperfectly drained very dark gray clay loam to pale brown sands and loamy sands. These soils have good natural fertility and moderate acidity (pH 4.5). Most cropping that occurs in the flood plain is concentrated on these soils. The major crops are maize, sorghum, sweet potatoes and pumpkin.

#### 3) Depression in flood plain (Sitapa)

In Sitapa the soils are moderately shallow in depth and poorly drained pale brown sands underlain by compact yellowish brown sandy clay loam and sandy clays. These soils receive deep and long annual flood, and are used for rice cultivation.

### 3.1.5 Soil Erosion and Land Degradation

#### (1) Present Status of Soil Erosion and Land Degradation

Soil erosion is uncontrolled removal of soil from one place and its undesirable accumulation in another place. This is caused by water, wind or both. In undisturbed areas where natural vegetation is vigor and provides sufficient protection to soil, erosion takes place at a slow rate. But where the vegetation is removed and soil is left bare, the rate of erosion increases and erosion problem becomes serious.

In order to clarify the status of soil erosion and identify the localities with erosion problem, on-foot field investigation was carried out in the entire Study Area. During the field investigation the following criteria were considered :

- Rills, their number, and size (rill erosion)

- Gullies, their number, width and depth (gully erosion)
- Removal of soil materials from land surface (sheet erosion)
- Accumulation of transported materials downslope.

Findings of the investigation are summarized below :

- 1) Rill erosion is significant in plateau on sides of the Tarmac road, particularly in places where footpaths join the main road. Apparently some foot paths have been modified to rills.
- 2) Gully erosion was found in localized areas on escarpment from Limulunga to Namushakende. The gullies are of big, medium and small sizes.
- 3) Sheet erosion does not threaten the Study Area. It occurs locally in some cultivated fields, but is not wide spread.
- 4) Huge amount of water transported sands was observed on escarpment foot. Movement of these sands threatens the residential areas, pens and orchards existing in the seepage zone.

The localities with major erosion problem and their respective erosion status are shown in Annex-Figure III.1.10.

## (2) Causes of Soil Erosion

- Animal** : Overgrazing and trampling by livestock cause destruction of natural vegetation, leaving the soil bare and susceptible to erosion. Trails created due to animal movement with time are expanded and converted to rills and gullies. This hazard threatens the plateau, escarpment and flood plain.
- Man** : Removal of natural vegetation by man leaves the soil unprotected. Woody plants are cut for energy and grasses for making house roof. Woodland and shrub land are cleared for cultivation purposes. Incomplete and improper engineering designs in town and rural development activities accelerate the erosion (particularly water erosion) process. Improper farming activities accelerate the erosion rate. Tracks made due to movements of animals, men and vehicles reduce the soil vegetation cover.
- Termite** : Termites attack most plants, thereby, causing removal of soil vegetative cover.

**Rain Water** : Surface runoff which on bare land has high velocity finds its way to rills, gullies and foot paths, and deepens and widens them. On the escarpment where the amount and velocity of water are greater this problem is more serious.

Wind erosion is not considered to be a big problem in the Study Area.

### (3) Land Degradation

Occurrence of soil erosion, reduction in biological, chemical and physical quality (property) of soil are signs of land degradation. In addition to erosion hazard, reduction in soil fertility also threatens the land resources in the Study Area.

Continuous farming on the same field, no chemical fertilizer application and no proper crop rotation are some of the factors leading to land degradation. However, in some cases, a small quantity of farm manure is applied, but it is non decomposed. In these cases it is necessary to make at the amount of nutrients to be removed from root zone by plants, or to be moved to the lower layer by water movement.

It should be noted that under present situation the loss of nutrients from surface soil is continuous and significant, and land degradation is getting serious(severe).

### (4) Constraints Affecting the Land Use and Land Productivity in the Study Area

Major constraints affecting the land use and land productivity in the Study Area are briefly mentioned herein :

#### 1) Sandy Nature of the Area

The Study Area is a sandy area in which depth of sands could be up to 80 meters. The sands belong geologically to Kalahari group and are locally called Barotse sands.

The following problems are associated with the sandy soils :

- a. **Erodibility** : Due to poor physical properties the soils are susceptible to erosion. Water erosion is a threat particularly on slope.
- b. **Poor natural fertility** : The soils have no or little nutrients to produce satisfactory crop yields.
- c. **Low water holding capacity** : The soils have rapid and excessive natural drainage, so no sufficient moisture is available in root zone.

- d. Low microbial population : Due to lack of soil organic matter, population and activity of micro/macro organisms are limited. Soil organisms and their product largely contribute to soil fertility.

## 2) Soil Acidity

In Study Area, the pH of soils varies from very strongly acid (pH less than 4.0) to slightly acid (pH about 6.0). In fertile land of seepage zone soil is strongly acid.

Acidity causes physiological disorder in plant and consequently reduces the crop yield. It also suppresses the soil microbial activities.

## 3) Land Configuration

- a. A long and high escarpment occurs in the Study Area. Steep slope, susceptibility to erosion and presence of gullies are its major constraints.
- b. Litapa(plural of Sitapa), low lying areas in flood plain, are productive areas, but their cultivation is very risky because changes in groundwater level, which depend on timing of rain and flood, govern the crop yield.

### 3.1.6 Vegetation

The common natural vegetation on land facets in the Project Area are :

#### (1) Plateau

The plateau is occupied by Kalahari woodland which comprises of semi-evergreen and evergreen trees with 10-30 meters height. The woodland is derived from destruction of Baikiaea forest. At present the woodland is strongly degraded and the rate of re growth is influenced by human activity. Prolonged shifting cultivation and repeated cutting of firewood are the major causes of degradation.

Dominant Trees in plateau :

- *Brachystegia spiciformis* (Lozi - Mutuya)  
A large semi-evergreen tree growing up to 30 m high, with a rough bark and rounded crown. Bark contains a high percentage of tannin and is used for dyeing cloth and tanning hides.
- *Guibourtia coleosperma* (Muzauli)  
A semi-evergreen tree up to 24 m tall, with a smooth bark, twisted branching and conical crown. The foliage is eaten by animals, and an edible oil is extracted from its seed coat.



- *Erythrophleum africanum* (Mubako)  
A semi-deciduous tree up to 18 m tall, with spreading branch and open crown. Gum from the roots is used for water proofing and fixing agricultural tools, and trunk for making furniture.
- *Burkea africana* (Musheshe)
- *Parinari curatellifolia* (Mubula)
- *Pterocarpus angolensis* (Mulombe).

Dominant Grasses in plateau :

- *Digitaria ciliaris* (Lozi- Busambo)
- *Hyparrhenia species* (Matenganya).

(2) Escarpment

Most parts of escarpment are under shrubs which are highly adopted to adverse environmental condition. New shrubs are developed on old fallow lands which were cleaned in shifting cultivation practice.

Dominant Shurubs on escarpment :

- *Baphia massaiensis* (Lozi- Isunde)  
An evergreen shrub up to 9 m tall, with a twisted trunk, spreading branches, and thin leathery leaves. Trunk is used for hut building and firewood. Leaves and roots are used as medicine.
- *Bauhinia petersiana* (Mupondoondo)  
An evergreen shrub up to 15 m tall, with spreading branches and open crown. Leaves are thin, leathery, blue-green with a diameter of 3 to 9 cm. Seeds are edible, and leaves and roots have medicinal uses.

Dominant Grasses on escarpment :

- *Aristida species* (Nanganya)
- *Loudetin superba* (Lukolokoko)
- *Digitaria ciliaris* (Busambo)

(3) Dry and wet Litongo

- *Xylopia odoratissima* (Lozi- Situndubwanga)  
A semi-deciduous Shurub growing up to 12 m high, with a short trunk, spreading branches and round crown. Leaves are simple, alternate, thin and leathery. Leaves and roots are used in the preparation of local medicines.

Dominant Grasses are -

- *Imperata cylindrica* (Silenge)
- *Cyperus rotundus* (Ndaundau)
- *Sctatia pumila* (Malamatwa).

(4) Sishanjo

- *Syzygium cordatum* (common name - Water tree. Lozi- Mutoya)

A medium sized evergreen tree growing up to 22 m high, with a red brown bark, and simple, leathery and sessile leaves. The bark, leaves and roots are used in the preparation of various traditional medicines.

The main grasses are :

- *Vetiveria nigriflora* (Maamba)
- *Cyperus ferax* (Matutu).

(5) Grazing Saana

This part is under grasses such as :

- *Loudetia simplex* (common name-Russet grass. Lozi- Mwange)

A short, perennial grass, with 20-90 cm height. Leaves are narrow, hairless and sour and not readily taken by cattle.

- *Heteropogon contortus* (common name- Spear grass)

Perennial, tufted grass of variable height, with sharp seeds and compressed leaf sheaths.

- *Hyparrhenia bracteata*

- *Echinochloa stagnina*

(6) Sitapa

In Sitapa the common grasses are :

- *Andropogon eucomus* (Lozi- Katondo)

A grass with medium height, and narrow leaf blades.

- *Vossia cuspidata*

- *Oryza barthii*

- *Leersia hexandra*

- *Miscanthidium teretifolium*

- *Loudetia simplex*.

**(7) Mazulu**

- **Ficus sycomorus (Mukuyu)**

A large semi-deciduous tree up to 20 m tall, with a heavy and round crown. Leaves are alternate, simple and rough. Bark, leaf and fruit are used in the preparation of local medicine.

- **Acacia albida (common name- Winter thorn. Lozi- Mukaicani)**

A large attractive, deciduous tree growing up to 30m high, with round crown and drooping branches. Bark and root are used for making various local medicines.

Common grasses in Mazulu are :

- **Rottboellia exaltata (Singungu)**
- **Imperata cylindrica (Silenge)**
- **Andropogon species**

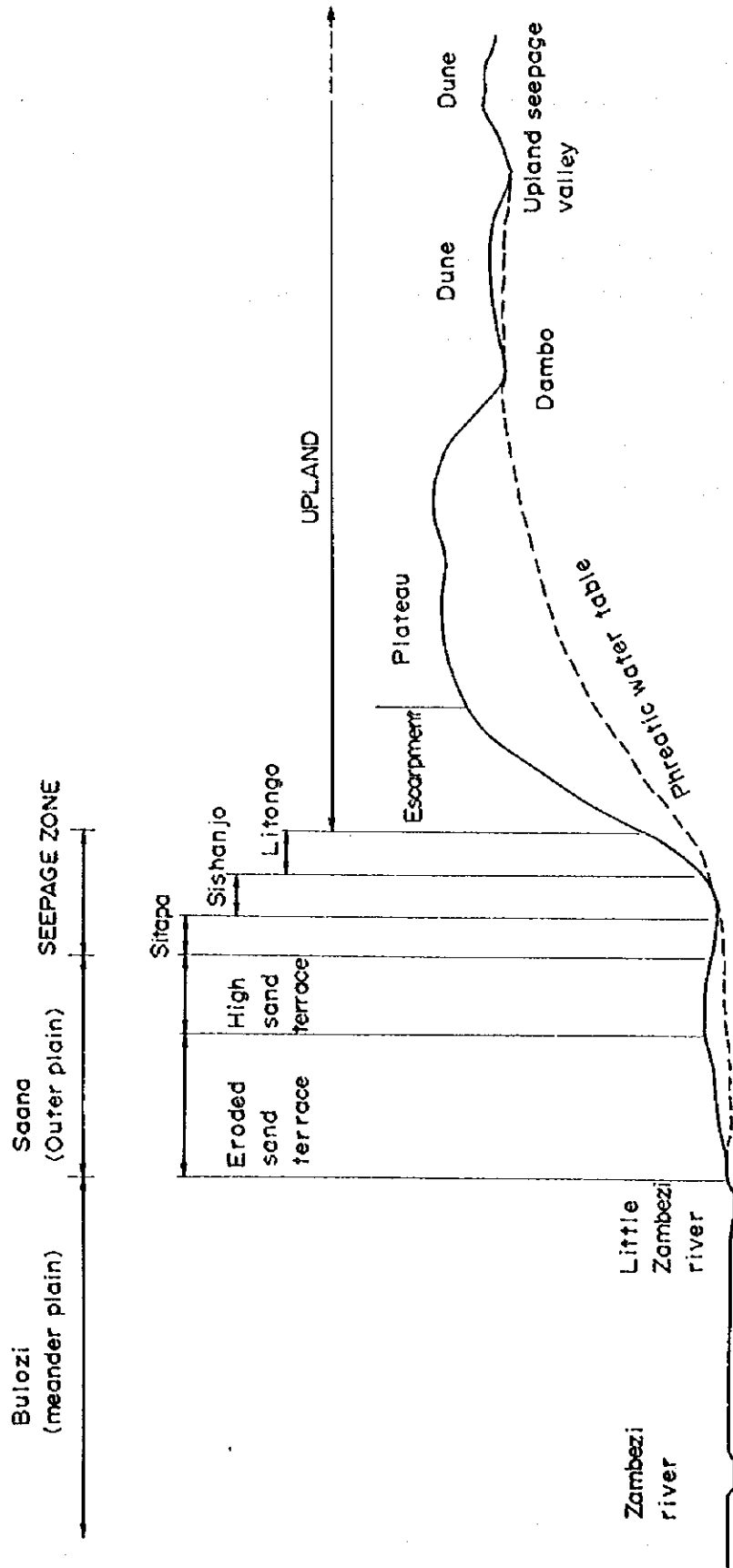
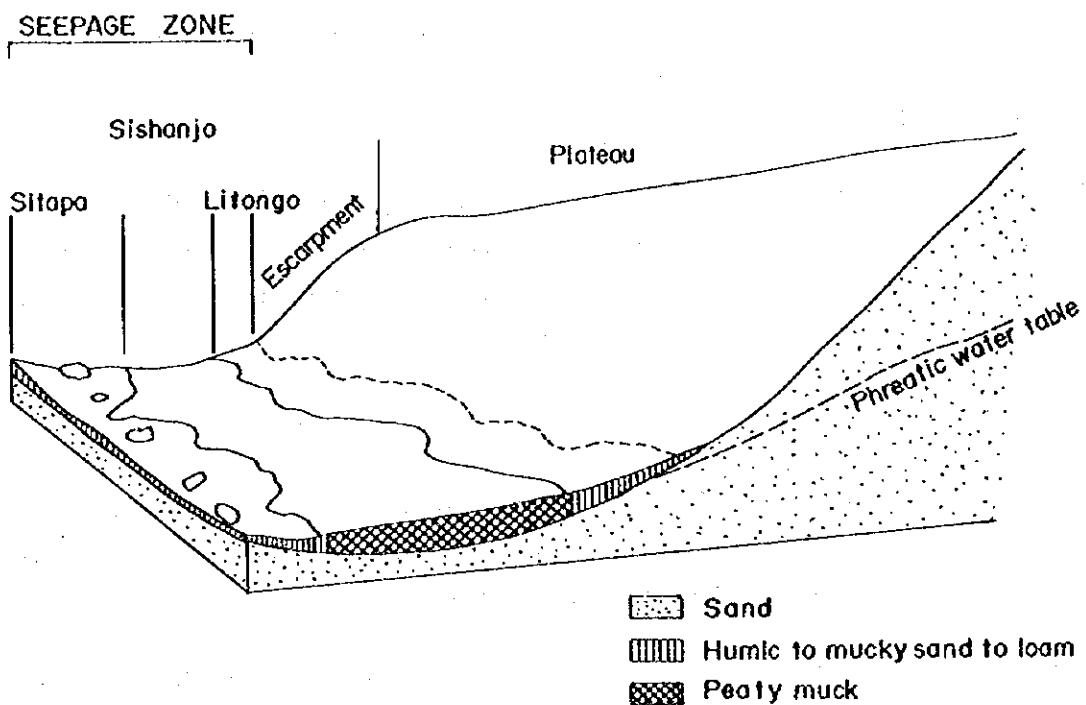


Figure 3.1.1 Schematic Cross Section of the Zambezi Flood plain



**Figure 3.1.2 Schematic Diagram of the Matapa Seepage Zone**

## **3.2 Socio-Economic Condition**

### **3.2.1 Economic Situation**

The six wards relevant to the Study Area are located in the west end of Mongu District. The Study Area occupies the east end of the relevant wards' area along the Zambezi flood plain edge for some 40 km from north to south. Mongu, the Provincial Capital, is situated at the center of the Study Area.

A fine paved road runs from the south end Namushakende through the north end Limulunga via Mongu on the ridge which is the edge of plateau paralleled with the plain edge. Once a person gets on the plateau from the plain edge, therefore, the condition of traffic and transport is pretty good. However, feeder roads which join the plateau and the plain and farm roads linking the villages mainly located on the plain edge are very poor and those are disturbing the economic development in this area.

Although the notable industry in the Study Area is only agriculture as already mentioned in the preceding chapter, the agriculture in the Area can be said to be favourably situated compared to the other wards located on the plateau area where poor Kalahari sand soil is predominant. Main agricultural products are maize, rice, mango and cattle.

The outline of agriculture and the comparison between the wards in the Study Area and the others were also discussed in the preceding chapter. The average population density of the relevant six wards is 27.6 and this is almost fourfold of the other 14 wards' average. As the large part of the population is concentrated on the plain edge in the relevant wards, the population density is extremely high in the Study Area.

There are fairly large differences of the average farm size among the six wards. Limulunga and Yeta are larger and the other four are smaller than the District average size. The crops raised in the Study Area are, however, weighed on more intensive ones such as maize and rice. The agriculture in the Study Area, therefore, can be said that it has higher potentiality compared to the other area in the same District.

No heavy industries are allocated in the Study Area. Although Mongu township is the economic center of the area together with the economic and political center of the Province, only some processing factories of agricultural products such as rice, maize, mango and cashewnuts are allocated in the township area. In the rural area, scattered tiny hammer mills and small blacksmith's shops are barely realized.

On the aspect of commerce, a relatively large center market is in Mongu township and always crowded, but commodities dealt are mostly consumer's goods such as food stuffs and clothes. There are three local markets in the Study Area. They are in Limulunga, Yeta and Namushakende. The one in Limulunga is somewhat larger than the other two and deals with not

only foods but clothes. Primary Cooperative Society in Limulunga is also carrying on active business in the market. The other two are small size local markets and handle foods for the most part. Two registered Primary Cooperative Societies in these areas are both unfortunately inactive.

### 3.2.2 Rural Society

#### (1) The Village

A number of villages are located along the tarred road connecting Limulunga to Namushakende (Limulunga to Senanga road). Most of the villages are located in the western part of the tarred road. The village sizes range from small villages with less than 10 households to large villages with more than 30 households (Table 3.2.1). Most of the villagers live in traditional houses with grass roofs and mud walls. However, most of village headmen and some villagers live in brick houses. Although the transmission line is running along the tarred road, almost all the villages are not electrified, except some households in sub-urban areas of Limulunga, Sefula and Namushakende. Almost all the households use firewood for cooking and some households use charcoal in addition to firewood. The result of interview survey in 31 villages of the Study Area indicates that the percentage of the houses having latrines are very low which will lead to bad sanitary conditions.

These villages usually consist of a group of very closely related families under a headman normally chosen from the various family heads. The village headman is responsible for allocating the land to the head of each family. The head of the family has the responsibility of re-allocating gardens to his offsprings and close relatives. Male and female offspring of the same male parent will have equal access to land belonging to their father.

#### (2) Ethnic Groups

Ethnic groups in the Study Area can be roughly divided into Luyana group (Lozi, Kwandi, Kwanga, Mbowe, etc.) and Luba group (Mbunda, Luvale, Luchazi, Chokwe, etc. who originated from Angola). The former is the dominant tribes and the latter is considered to be ethnical minority. The 1990 Population Census classified the population into several local language groups, of which Barotse language group (Lozi, Nyengo, Subiya, Nkoya, etc.) accounted for 65.7% and North-Western group (Luvale, Lunda, Kaonde, etc.) accounted for 26%. Other language groups including Bemba, Nyanja, Tonga, and others altogether accounted for less than 10%. Although definite data are not available, it is estimated that Barotse language group in the Study Area accounts for more than 80%.

According to the interview survey made in the Study Area, Luba group inhabits in 14 villages out of 31 villages surveyed (Table 3.2.1). In some villages, some of Luba group borrow the land from Luyana group people to work on it. It is observed that most of the Mbunda and the

Luvale tend to live along the tarred road. Traditionally these minority groups tended to prefer cassava and other forest crops against the traditional Lozi crops like local maize and sorghum which are grown in the plain edge. With the increasing benefits from the rice sector, even these groups have become interested in the rice land which is no longer available to them (M. Kaluba, 1992).

### (3) Out-Migration

Labor migration has been a dominant factor in the Lozi's life. Most of the adult male population have been absent for several years. Interview survey in 31 villages indicated that out of 514 households in the surveyed villages, 161 household heads or 31% were working outside the villages. Although definite data are not available, some are reportedly working at the estate in Southern Province and some are working in urban areas such as Mongu township, Lusaka and Kitwe.

Due mainly to out-migration of adult male population and other reasons (e.g. divorce), the Study Area is socially characterized by its higher percentage of FHHs (Female Headed Households). The average percentage of FHHs in Mongu District was 21 % based on the 1990 Population Census. However, the Interview Survey in 31 villages showed that the percentage of FHHs in the sample villages were as high as 40 % in 1994 (Table 3.2.1).



**Table 3.2.1 Interview Survey in 31 Villages, June 1994**

Ward	Village	House hold (HH)	Female Headed HH	Absent HH head	Average Farm Land Holding (ha)	Non Lozi HH	Source of Potable Water	Main Fuel	Toilet Facility
Limulunga	Kanambo	8	4	6	2.0	3	Dug Well	Firewood	Open
	Mushuwa	18	9	6	3.0	18	Hand Pump	Firewood	Open
	Kakunka	6	3	2	2.0	3	Dug Well	Firewood	Open
	Lubachi	20	8	0	4.0	0	Dug Well	Firewood	Pit
	Liilu	21	14	12	0.7	0	Dug Well	Firewood	Open
	Likomde	21	7	12	0.4	0	Dug Well	Firewood	Open
	(Sub-Total)	94	45	38	2.6	24			
Mabumbu	Liomboko	7	3	0	1.0	0	Dug Well	Firewood	Open
	Namangu	15	4	8	1.5	0	Dug Well	Firewood	Open
	Nambanda	8	7	7	3.0	0	Dug Well	Firewood	Open
	Kalangu	8	2	5	3.0	0	Dug Well	Firewood	Open
	Jeke	22	1	15	1.7	5	Dug Well	Firewood	Open
	(Sub-Total)	60	17	35	2.0	5			
Malengwa	Nasitoko Pit/Open	30	22	5	1.0	8	Hand/Dug	Firewood	
	Namibonda	28	14	6	0.4	6	Dug Well	Firewood	Open
	Naende	7	2	2	1.3	0	Dug/Stream	Firewood	Open
	Katoya	12	6	5	1.3	0	Dug Well	Firewood	Open
	Imbowa	26	3	5	0.3	0	Dug Well	Firewood	Pit
	(Sub-Total)	103	47	23	0.8	14			
Katongo	Kanangelelo	35	n.a.	n.a.	1.0	22	Dug Well	Firewood	Pit
	Nomai	20	n.a.	10	0.3	5	Dug Well	Firewood	Pit
	Kandiana	9	4	2	1.0	4	Dug Well	Firewood	Open
	Ndandanda	7	2	1	0.5	0	Dug Well	Firewood	Open
	Katongo	9	n.a.	7	0.3	n.a.	Dug Well	Firewood	Open
	(Sub-Total)	80	6	20	0.6	31			
Yeta	Mule	7	5	0	1.5	0	Dug Well	Firewood	Open
	Natuyanga	3	0	3	1.0	0	Dug Well	Firewood	Pit
	Liyoo	14	7	10	1.0	4	Dug Well	Firewood	Pit
	Litapuya	5	2	0	3.0	0	Hand Pump	Firewood	Pit
	Nakonga	22	11	4	1.5	1	Dug Well	Firewood	Pit
	(Sub-Total)	51	25	17	1.6	5			
Namushakende	Situnda	36	11	1	2.0	8	Dug Well	Firewood	Pit
	Siwela	42	29	10	3.0	25	Dug Well	Firewood	Pit
	Kanokela	8	4	3	2.3	3	Tap	Firewood	Pit
	Sikandina	10	6	0	1.5	0	Dug Well	Firewood	Open
	Moonga	30	18	14	1.0	0	Dug Well	Firewood	Pit
	(Sub-Total)	126	68	28	2.0	36			
<b>Total</b>		<b>514</b>	<b>208</b>	<b>161</b>	<b>1.6</b>	<b>115</b>			

Note : Open = Open field Pit = Pit latrine Tap = Communal tap n.a. = not available  
 Source: Interview Survey by the Study Team, June 1994

### 3.2.3 Rural Women

#### (1) The Role of Rural Women

Rural women in Zambia have been playing a very significant role in agricultural production, and they provide most of the labour required for agricultural production. Men are responsible for cleaning, ploughing and harrowing of fields, provided that ploughing and harrowing are done by draught power. On the other hand, cleaning of fields, planting, weeding, bird scaring and harvesting are almost completely the tasks of women (Table 3.2.2). And women have major responsibility in the cultivation of cassava, millet, sorghum, groundnuts, legumes, sweet potatoes etc. which are called "women's crops".

**Table 3.2.2 Women's Agricultural Activities**

Month	Main Activity
January to March	1. Planting of sweet potatoes 2. Transplanting of rice 3. Weeding Mazuru fields of maize, sorghum, rice and b/millet
April to June	1. Planting of sweet potatoes continues 2. Vegetable gardening 3. Scaring of birds from sorghum and rice fields 4. Harvesting sorghum, rice, maize and b/millet
July to September	1. Vegetable gardening continues 2. Preparation of fields for maize and rice 3. Planting of legumes (beans) in Litapa, Matongo and Sishanjo soils.
October to December	1. Planting of legumes continues 2. Planting of maize, rice, sorghum, b/millet and cassava

Women's work is not limited only in these agricultural activities. In order to get cash income, they are working on jobs such as brewing of beer which is one of the major income-generating sources, and handicraft, knitting, sewing etc. Women are also responsible for all household tasks, i.e. fetching water, collecting firewood and all activities connected with food preparation, washing clothes, house cleaning, child care and so on. In time-use for a day between men and women, it seems that women are too busy compared with men, and their daily works are influenced by agricultural activities very much although there are some differences according to seasons.

#### (2) Female Headed Households (FHHs) in the Study Area

The Western Province has a very high percentage of FHHs which are headed by women who are either widowed, divorced or unmarried (now making up 25 ~ 30% of all households). In the Study Area, 37 % of all households are FHHs. They are the poorest and the smallest scale farmers and belong to the lowest income group in rural society. The number of MHHs (Male

Headed Households) and FHHs are revealed in the following Table 3.2.3.

**Table 3.2.3 Number of MHHs and FHHs**

Head of household	Namusha-kende	Yeta	Katongo	Lealui	Mabumbu	Limulunga	Total
Male	256 (63%)	244 (59%)	126 (54%)	320 (60%)	87 (74%)	202 (77%)	1,235 (63%)
Female	153 (37%)	170 (41%)	106 (46%)	212 (40%)	30 (26%)	62 (23%)	733 (37%)
Total	409	414	232	532	117	264	1,968

Source : Farm Survey, Mar. 94'

Besides, FHHs have less ready access to factors and means of production, such as labour, land, animal draft power (ADP), capital, agricultural services etc. The comparisons for farming stage between MHHs(76) and FHHs(24) are shown on Table 3.2.4 Table 3.2.5 and Figure 3.2.1~Figure 3.2.4 which are based on the results of Farm Economic Survey(March 1994) in the Study Area.

**Table 3.2.4 Family Size and Labour Force and Land-holding Size**

Head of Household	No. of family member	No. of labour	Supplement labour	Total labour day	Off-farm labour day
Male	8.67	3.82	1.68	532	9.9
Female	5.33	2.13	0.75	245	0.5

Head of Household	Paddy Field (ha)	Upland Field (ha)	Orchard (ha)	Forest (ha)	Total (ha)
Male	5.77	1.15	0.08	3.21	10.21
Female	2.51	0.47	0.00	1.26	4.24

Source : Farm Economic Survey, March 1994

As shown on the table above, the number of FHH's family members is about 40 % less compared to MHH's family members, and FHH's total land is cultivated about half of MHH's. In general, access to land is not a major problem for women because they acquire land through inheritance, marriage or the right to use land from their male relatives. However, FHHs tend to have less fertile soils than MHHs, less access to manure and more difficulties in clearing a new piece of land. On the other hand, lack of labour in FHHs is a serious problem because there are only 2 workers and occasionally both of them are women. They need to hire external labour for specific purposes such as land clearing and ploughing. However it is very difficult to hire external labour because of the lack of cash income.

**Table 3.2.5 Cropping Area (ha)**

Head of Household	Rice	Maize	Cassava	Millet	Sorghum	Vegetables	Total
Male	1.39	1.00	0.50	0.08	0.11	0.22	3.28
Female	0.77	0.55	0.16	0.05	0.07	0.13	1.74

As shown in the table above, FHH's cropping areas of rice, maize and cassava are 30 % to 50 % and millet, sorghum and vegetable are about 60 % of the MHHs' level.

Figure 3.2.1 ~ Figure 3.2.4 show the economic situation of MHH and FHH. Although the results of farming are not good for both of them, FHHs are especially in serious deficiencies of proper living conditions.

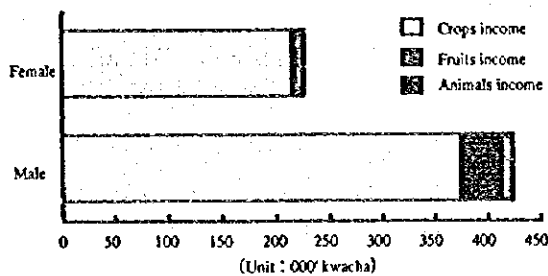


Figure 3.2.1 Items of Agricultural Total Income

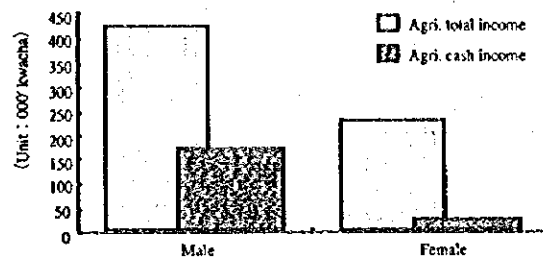


Figure 3.2.2 The ratio of Agricultural Cash Income in Agricultural Total Income

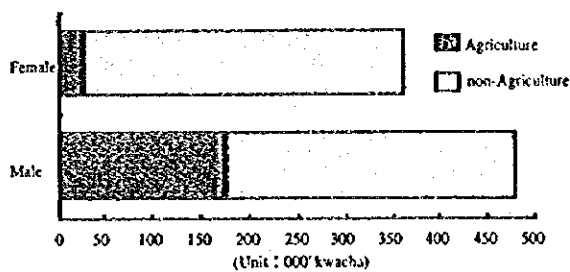


Figure 3.2.3 The ratio of Agricultural Cash Income and non-Agricultural Cash Income in Household Expenses

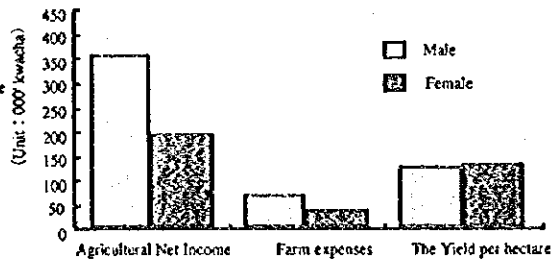


Figure 3.2.4 Agricultural Net Income, Farm Expenses and The Yield per hectare

- 1) Agricultural total income of FHH is half of MHH, and FHH's income from animals is very low because most of them do not own animals. (Fig. 3.2.1)
- 2) FHH's ratio of agricultural cash income in agricultural total income is about 10%. This is because most of the cereal produced are consumed by themselves. (Fig. 3.2.2)
- 3) FHH covers only 10% of their household expense by the agricultural cash income. This situation shows unstable living condition of FHHs who gain their household expenses by brewing beer, handicraft and selling of fish etc. (Fig. 3.2.3)
- 4) FHH don't have money to spend on farming expenses such as production materials (like fertilizer) and farming implements. (Fig. 3.2.4)

As mentioned above, FHHs are the poorest and the smallest scale farmers in the rural society. However they are getting a slightly higher yield per hectare more than MHHs (cf. Figure 3.2.4).

FHHs are trying to do better farming in spite of various limitations of labour, land and production materials etc. These facts suggest that FHHs' participation in development schedule will result in an improvement of agricultural productivity in the whole rural society.

### (3) Activity of Women's group

In the Study Area, many women's groups are already organized and their principal activities are hiring animals, farming and handicrafts in cooperation. These cooperative activities on farming will be essential and advantageous for women in order to improve their agricultural productivity and reduce women's heavy labour.

The situation of women's groups is shown on Table 3.2.6. Almost 50 % of the groups' members is occupied by FHHs.

**Table 3.2.6 The Situation of Women's Groups**

	Namushakende	Yeta	Katongo	Learui	Mabumbu	Limulunga	Total	
No. of women's groups	11 groups	21 groups	3 groups	9 groups	5 groups	6 groups	55 groups	
No. of member								
Men	12 (12%)	30 (11%)	8 (25%)	9 (8%)	11 (18%)	11 (13%)	81 (12%)	
Female	86 (88%)	240 (89%)	27 (77%)	101 (92%)	51 (82%)	74 (87%)	579 (88%)	
Total	98	270	35	110	62	85	660	
No. of FHHs in groups	47	176	21	33	25	38	340	
% in groups	(43%)	(65%)	(60%)	(30%)	(40%)	(45%)	(52%)	
Attached	1) P.P.P.	9 groups		9	5	6	29	
2) W and Y Extension			3				3	
3) Village Extension		13					13	
4) Depart. of Commu. Development	2	8					10	
	There is a case that a person may belong to 2 groups.							
Cropping grown area	65 ha	95.5 ha	18 ha	96 ha	71 ha	51 ha	396.5 ha	
Main activity (groups)	Farming knitting - 1 Handicrafts - 3 Fish farming - 1 Sewing - 1	Farming - 13 Handicrafts - 8	Farming Handicrafts	Farming Handicrafts	Farming Handicrafts	Farming Handicrafts		
Condition	active	7 groups	21	1	5	3	4	41
	not active	4		2	4	2	2	14

As shown on the table above, most of the women's groups are attached to the following organization (programmes).

- 1) People's Participation Project (PPP) implemented by FAO and attached to the Department of Agriculture.

Most activities are staff training, provision of information and assistance in organization and running of women's groups. There are 30 groups in the Study Area, and about 300 people (90% is women) belong to these groups. A Group Promoter who is a young rural woman has charge of leadership of some groups positively under the guidance of training officers. PPP has its own loan system which is in form of input materials such as fertilizer and seeds, and the amount depends on the type of crop. Some groups are getting loans, and utilizing it in good ways. However, the capital is not enough for all of

the PPP's groups and the target of PPP's activities does not cover all the Study Area.

2) **Animal Draught Power Programme (ADPP) by the Department of Agriculture financed by Holland**

The aim is to promote and develop the use of animal draught power (ADP). Although ADPP does not have its own groups, the ADPP is a mobile ox-ploughing course for women. It has a beneficial effect on agricultural activities by teaching women how to plough.

3) **Women and Youth Extension Programme & Village Extension Programme by the Department of Agriculture**

The main activities are training and motivation and limited financial support to women farmer groups and promotion of credit facilities for women farmers.

4) **Department of Community Development**

5) **NGO: World Vision, Nutrition Group, Hunger Project, Red Cross, etc.**

In spite of the endeavors of these organizations, they are not successful in establishing prosperous group. This due to the following reasons:

1) **Financial**

- lack of seed, fertilizer, agricultural equipment, draught cattle etc.
- inaccessibility to loans (small scale loan)

2) **Supporting**

- disintegration of supporting system in the department of Agriculture for women's group activities
- lack of supporting system for women who have a baby
- lack of understanding to works in cooperation (Many groups can not gain profit from their activities.)

3) **Training**

- lack of will and ability of the training staff and group leader (A group activity is influenced by their agricultural skill and technical know-how.)

4) **Facilities**

- lack of a facility for training, meeting and cooperative works
- lack of transportation

### 3.3 Agriculture

#### 3.3.1 Land Use

##### The Land Facets in the Project Area and their Present Usage

(1) Upland, locally called Mushitu, includes two land facets-

1) Plateau, nearly flat land on sides of the main road

Area of plateau is about 3,000 ha(23.0% of the project area). It is occupied by degraded Kalahari woodland, fallow shrub land, grassland, fruit trees, upland fields and residential areas. In woodland the Mutuya(*Brachystegia speciformis*) and in fallow shrub land Isunde(*Baphia massaiensis*) are the dominant natural plants. The woody materials are used by public as firewood and leaves and grasses are utilized by animals, particularly in flood period. The main fruit tree is cashewnut, and the main crops are cassava and millet. These are produced mainly for family consumption. Residential areas include the township, villages, institutions, roads and pens.

2) Escarpment, steep land facing the flood plain

Its area is about 3,440 ha(26.8%) and occupied by degraded woodland, fallow shrub land, grassland, fields(cassava, millet) and pens. These are utilized in the same way mentioned for plateau. In some localities the escarpment is subjected to gully erosion.

(2) Seepage Zone is composed of three parts :

1) Dry Litongo, upper part of the seepage zone, bordering the escarpment.

Area of dry Litongo is 280 ha(2.2%) and is under residential areas, fields (cassava, millet), cashewnuts trees, and natural vegetation such as *Hyparrhenia* species. The crops are utilized by families and natural vegetation by animals. This part is never flooded and never waterlogged.

2) Wet Litongo, mid part of the seepage zone

The area is 230 ha(1.8%) and is under fruit trees(mango, cashewnuts), crops(maize, sorghum), vegetables, natural vegetation(*Scleria* species) and residential areas. Crops are for family consumption, and natural vegetation for feeding the animals. This part is occasionally flooded, and permanently moist.

3) Sishanjo, the lowest part of seepage zone, bordering the flood plain

Its area is 1,300 ha(10.1%) and is used for growing rice, maize, sweet potatoes and vegetables. Natural vegetation such as Mutoya(*Syzgium cordatum*) grow in this part.

Sishanjo is annually flooded and permanently waterlogged.

(3) Flood plain

1) Saana, the flat parts in flood plain, usually covered with natural grasses

Area of Saana is about 1,364 ha(10.6%) and is mainly used for cattle grazing. Some grass species such as Mwange(Loudetia simplex) are used for making house roof. Occasionally small part of it is cultivated with maize and cassava under cattle manure. Saana is subjected to brief and shallow floods.

2) Sitapa, depressions in flood plain

The total area is about 1,916 ha (14.9%) and is used for growing rice, maize and vegetables. Natural grasses are utilized by animals. Sitapa receive long and deep annual floods.

3) Mazulu, mounds in flood plain

With total area of 1,360 ha (10.6% of the project area), Mazulu is occupied by field(maize, sorghum), natural vegetation(Ficus sycomorus), residential areas and pens. Crops are for self consumption, and vegetation for feeding the animals. Mazulu are very rarely completely flooded.

Present land use types are shown in Figure 3.3.1.

**Table 3.3.1 Distribution of Land Types in each Block**

Land Facets	Blocks						Unit : ha
	Namushakende	Yeta	Katongo	Lealui	Mabumbu	Limulunga	Total
Woodland	397.0	247.0	21.0	110.0	68.0	44.0	869.0
Shrub land	306.0	148.0	193.0	31.0	370.0	32.0	1,080.0
Grass Land	91.0	189.0	87.0	482.0	202.0	51.0	1,102.0
Deep Flood Area	668.0	209.0	820.0	294.0	354.0	537.0	2,882.0
Farm Land	976.0	771.0	624.0	435.0	479.0	195.0	3,480.0
Residential	548.0	539.0	439.0	1,414.0	214.0	273.0	3,427.0
<b>Total</b>	<b>2,968.0</b>	<b>2,103.0</b>	<b>2,184.0</b>	<b>2,766.0</b>	<b>1,687.0</b>	<b>1,132.0</b>	<b>12,840.0</b>



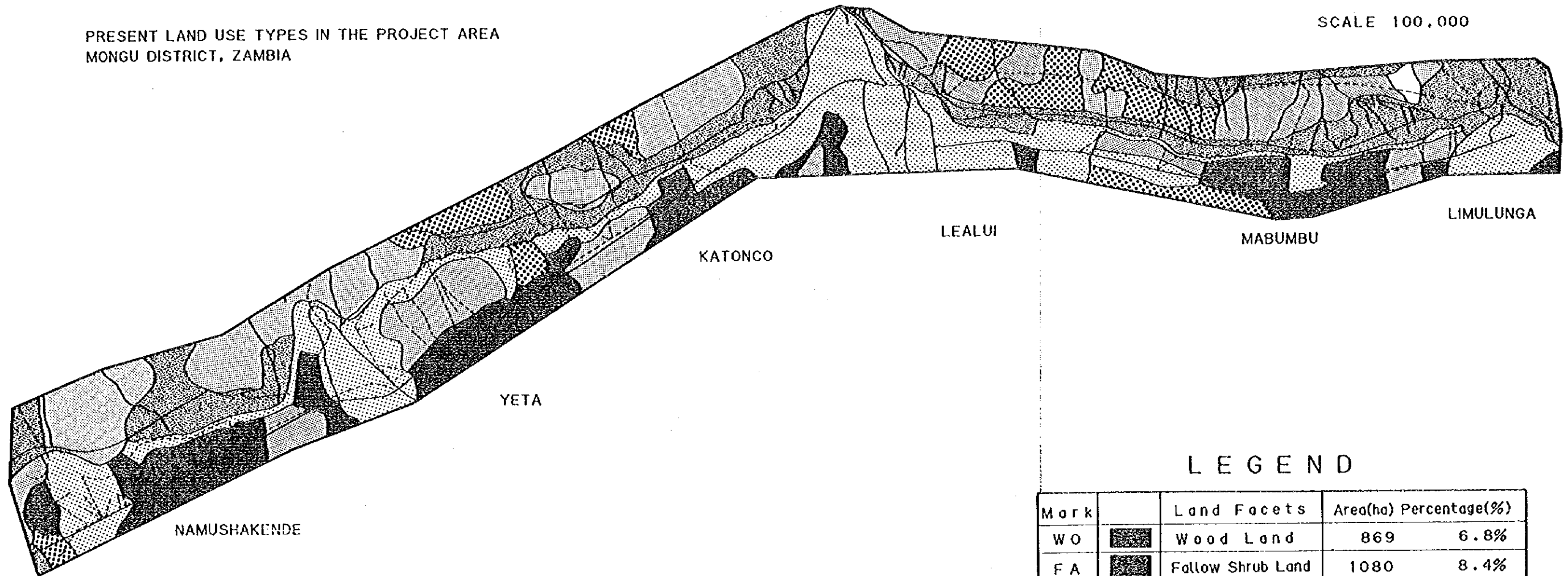
**Table 3.3.2 Distribution of Land Facets in each Block**

Land Facets	Blocks						Unit : ha
							Total
	Namushakende	Yeta	Katongo	Lealui	Mabumbu	Limulunga	
<b>I. UPLAND</b>							
(1) Plateau	584.0	472.0	369.4	845.7	378.4	305.1	2,954.6
(2) Escarpment	960.0	553.0	787.1	695.9	286.0	162.6	3,444.6
<b>II. SEEPAGE ZONE</b>							
(1) Dry Litongo (Upper part)	61.2	49.7	40.5	52.6	41.5	32.9	278.5
(2) Wet Litongo (Mid part)	50.6	40.8	33.5	43.2	38.1	23.8	229.9
(3) Sishanjo (Lower part)	363.2	276.9	169.5	168.2	212.1	103.6	1,293.5
<b>III. FLOOD PLAIN</b>							
(1) Saana (Flat part)	97.0	270.5	177.8	585.4	161.7	71.3	1,363.7
(2) Sitapa (Depressions)	396.0	202.0	423.0	212.1	312.2	370.9	1,916.1
(3) Mazulu (Mounds)	456.0	238.1	183.3	163.1	257.0	61.8	1,359.1
<b>Total</b>	<b>2,968.0</b>	<b>2,103.0</b>	<b>2,184.0</b>	<b>2,766.0</b>	<b>1,687.0</b>	<b>1,132.0</b>	<b>12,840.0</b>

Note : Total Study Area is 12,840 ha (In case of excluding the Mongu township, the area is 11,450 ha)

PRESENT LAND USE TYPES IN THE PROJECT AREA  
MONGU DISTRICT, ZAMBIA

SCALE 100,000



LEGEND

Mark		Land Facets	Area(ha)	Percentage(%)
WO		Wood Land	869	6.8%
FA		Fallow Shrub Land	1080	8.4%
GR		Grassland	1102	8.6%
DE		Deep Flood Area	2882	22.4%
CU		Cultivated Land	3480	27.1%
RE		Residential Area	3427	26.7%
		Total	12840	100.0%

Figure 3.3.1 Land Use Types



### 3.3.2 Type of Farming System

#### (1) Traditional Type of the Farming in the Study Area

Rural society of the Study Area is an agropastoral society with a mixed farming system by a family unit, more or less involving crop cultivation, livestock and fishery. The type of farming is dominantly fallen in a category of traditional-subsistence farmers to produce food for their own consumption and cattle for cash with non-farm activity, and no commercial farmers in the area.

The type of livestock raising is a transhumant system of cattle herd in a communal grazing system cared by an entrusted caretaker, who is called as "herd owner" or "kraal owner" and is usually an elderly man, often the village headman. Thus one herd consists of the animals of several different owners, ranging from 5 to 25 or more. In reward for his catering, he may obtain the free use of the manure, milk and draught power but depending on a contract made between the cattle owners and the caretaker.

Concerning the fishery, according to a hearing survey of the small scale farmers in the Study Area, most of them have the habit of fishing in their surrounding area, i.e., small canal to get tilapia, cat fish or small fishes for their own consumption unless a large amount; surplus might be sold for income generation. Meanwhile, a fisherman is a person who gets license from the Fishery Dept. and makes a living by fishing in the Zambezi river and its tributaries, but no full-time fishermen in the Study Area.

#### (2) Crop-Livestock Interaction

Cattle brings a lots of benefits for agricultural uses in terms of animal traction power to plow or transport, manure, milk, and security functions. The people who can access to these benefits is distinguished into two categories, i.e., those who own cattle themselves, and those who use cattle or cattle products or services through borrowing or hiring without owning animals at all. The farming in the Study Area relies heavily on cattle for provision of manure and draught power. In fact, on the sandy soils of the Study Area, cultivation of crops would be all but impossible without cattle manure. Cattle manure is applied to the fields by tethering cattle or by enclosing a kraal at night till morning and shifting after a number of days to cover the next patch of the field. Different garden types mentioned later are manured in different periods of a year. Some garden types like Sitapa (bulozhi sitapa), Sishanjo and wet Litongo are hardly manured due to too wet for kraaling. Manuring is usually done for Mazulu garden from July to November, some upper plain up to Dec/Jan., while in the flooding period of Feb/March to May, Matema and Matongo (dry Litongo) gardens are manured.

### (3) Benefits from Cattle

#### 1) Manure

Non-cattle owning farmers have some way to get manure by arranging short-term herding contracts(Kukalima) or asking a relative to kraal his cattle on their field. According to the survey result in 1984 by Sutherland, about 50 % of the farm households had access to manure their fields. Our interview survey found that about 60 % of the maize growers applied kraal manure in their fields.

#### 2) Draught power

There have always been more people using a plough than there were people owing a plough and oxen. Only the way to get draught power for non-oxen owing farmers is through lending or hiring. Generally one ploughing team(composed of 4 oxen) covers 8 to 22 farm household fields in a ploughing season. The priority to plough fields is always given to the owner's field, then his son, relatives and paying customers fields in turn.

#### 3) Transport

Oxen-drawn transport (a majority is sledge) is mainly used for collection of firewood, for hauling agricultural produce from the fields to the homestead and eventually to the marketing depot, and for transport of building materials like poles and grass.

The way to access is same as the above mentioned methods to borrow or hire from other people like relatives.

### 3.3.3 Crops and Production

#### (1) Traditional Cropping Pattern

##### 1) Upland Crop

Figure 3.3.2 shows the traditional cropping pattern of crops observed which are closely related to each garden type in the Study Area. Major crops widely cultivated are maize, cassava, sorghum, bulrush millet and rice. Main vegetables are confined to the leafy vegetables like rape (Brassicoleracea nanus), Chinese cabbage, spring onion and endemic vegetables,i.e., Simdambi (Hibiscus sabdariffa), Sishungwa (Cleome gynandra) and Libowa (Amaranthus species). Exotic vegetables like bulb onion, Irish potato, cabbage, and tomato are mainly imported from outside the Province and very few are produced locally.

Traditional cropping pattern in the Area is well elaborated based on natural topography,

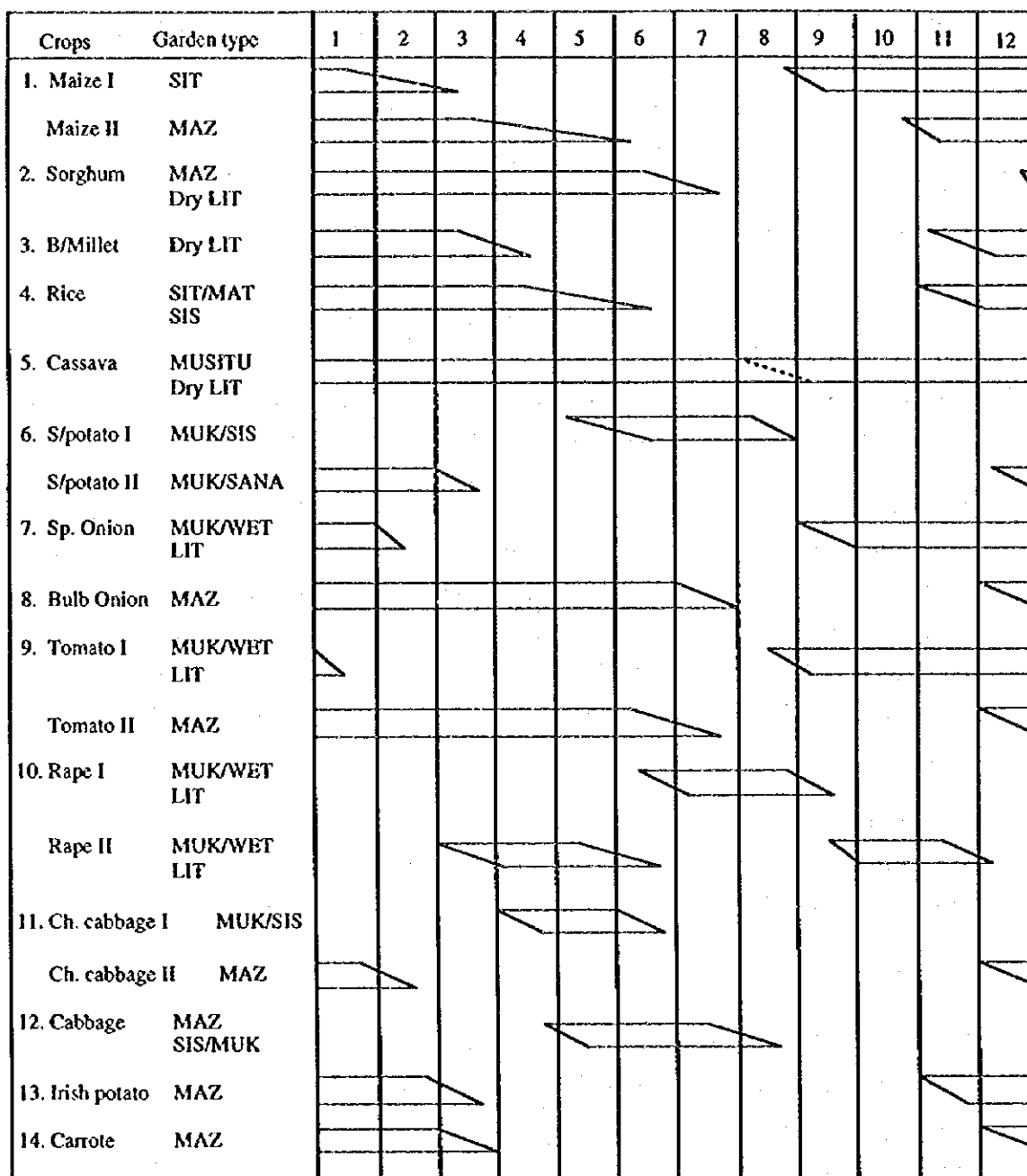
soil type and hydrological regime. Drought tolerant crops like cassava and bulrush millet are mainly distributed in the bush and dry Litongo gardens near the plain edge. Wet Litongo garden where receives seepage moisture through the year is a fertile soil with humus and cultivated with tree crops, cassava and vegetables. In the plain edge towards the outer plain, garden type is stretched with Sishanjo garden where seepage water can be obtained through the year, and further depressed garden called Sitapa-matapa seepage zone, then Saana outer-plain, orderly. Rice is the chief crop cultivated in Sishanjo and Sitapa-matapa seepage zone. However, maize is also planted in Sitapa-matapa garden in the late August of the hot dry season by using soil residue moisture and harvested before flooding. However, this cropping is always risky and there are high loss almost annually because the period between floods is too short or because of early rainfall.

In Mazulu(singular: Lizulu) garden made on ant-hill of old river bed levees in Saana outer-plain, maize is the main crop followed by sorghum and vegetable, which are usually planted in the rainy season. Vegetable cultivation in the late rainy season are usually irrigated using bucket from near drainage canal. This practice is prevailing in the outer-plain of Malengwa and Mabumbu areas. Sweet potato is also widely observed on raised mound (Mukomena) in wet Litongo, Sishanjo, Sitapa-matapa and Mazulu gardens in the both rainy and dry seasons according to water regime.

Cassava is the chief crop planted in Matema garden (bush) after clearing bush and shifted at a certain interval in order to recover soil nutrients, and also it is more or less cultivated in Litongo, Sishanjo, and Saana gardens by making Mukomena (raised bed).

## 2) Tree crop

Figure 3.3.3 shows fruit bearing seasons of the major tree crops in the Study Area. Most of the tree crops is confined to wet Litongo garden along the plain edge. However, some fruit trees like cashew, mango which are relatively tolerant to dry condition are distributed in the forest area where is widely extended with Karahari sand soils. Major fruit trees observed are mango, citrus, and cashew followed by banana, guava, pineapple and so forth. Few avocado trees (local name: Kotapela) are also observed in the plain edge. Fruiting habitat is mostly centered upon in the rainy season, but in the cashew nut tree, newly introduced genotype, Brazilian dwarf is observed to bear nut mainly in the dry season which is rather opposite to the ordinary genotype but not concluded as yet.



Notes:  
 SIT/MAT: Sitapa-matapa  
 MAZ: Mazulu  
 Dry Lit: Dry Litongo  
 MUK/SIS: Mukomena in Sishanjo  
 MUK/SANA: Mukomena in Saana  
 MUK/WET LIT: Mukomena in Wet Litongo  
 SIS: Sishanjo

Figure 3.3.2 Traditional Cropping Pattern of Food Crops and Vegetables

Tree crop	Garden	1	2	3	4	5	6	7	8	9	10	11	12	
1. Mango	Wet LIT	/										/		
2. Orange	Wet LIT		/											
3. Guava	Wet LIT	/										/		
4. Cashew	Dry LIT MUSITU		/											
	Dry LIT MUSITU		/									/		
5. Lemon	Wet LIT		/									/		

Note:1) Abbreviation of "Garden" is referred to note of fig. 3.3.2.

2) { — } : This period produces small amounts of nuts.

**Figure 3.3.3 Fruit Bearing Season of Major Tree Crops**

**(2) Current Farming Practice in the Study Area**

The farming practice in the Study Area is summarized in Tables 3.3.3 and 3.3.4.

Generally the traditional farming practice among the self-subsistent farmers is primarily oriented to an extensive way with low inputs, thus the yield is also manifested in low level, and which is less than the national level. Each farm operation prevailing in the Study Area is described as follows :

**1) Crop Seeds and Seedlings of the Tree Crops**

Among the inputs used in the Study Area, majority of the maize raising farmers procures the certified maize seeds every year because they use hybrid seeds. While, the rice growers keep some produce of the seeds for the next season, and no institutional organs to supply certified seeds in a commercial basis. The vegetable seeds are supplied through Western Province Cooperative Union (WPCU), Primary Health Care (PHC) workshop, Mongu Nutrition Group (NGO) and so forth. Other cereal crop seeds and cassava cuttings are mainly supported by themselves. Mango seedlings are generally self supplied but citrus seedling is distributed through the Western Province nursery center at Namushakende. Cashew seedling is shouldered by Zambia Cashew Company Limited (ZCCL).



**Table 3.3.3 Conventional Farming Practice of Major Crops**

Crop	Major variety	Seed Rate/Lima	Fertilizer Application/Farming practice	Major disease & pest
Maize	MMV400, R215 MM603, MM604 Pool 16, Munali	8 - 10 kg Spot sowing	Majority of farmers manure their fields every 2-3 years and minor applies D'mix 50kg/lima as basal dressing only. Weeding practice is usually done two times at 20cm high and knee high stages after sowing. No chemical spray is practiced.	Aphid, Stemborer, Black maize beetles, Army worm, Streak virus
Sorghum	Red framida Rzelepu, Kuyuma, Makonga Munanana, Sisyndicate	10 - 15 kg Spot sowing Broad casting	Almost same practice as maize field	Smut, Downy mildew, Ergot, Birds
B/Millet	Kaufela, Lubasi, Local var.	12 - 20 kg Spot sowing Broadcasting	Manuring if kraal manure is available. Weeding is practiced 2 times like maize field.	Birds
Rice	Supa, Burma, Angola crystal Malawi faya, ITA var., P1369 Xiang Zhou 5	20 - 30 kg Broadcasting, Line sowing	Majority of farmers do not apply fertilizer, even manure as well.  Only handful farmer apply D mix (10-20-10) 50 kg/lima as basal.	Black maize beetles, Blast, Birds
Cassava	Nakamoya, Nalumino, Kapumba	About 3000 plants Random planting	Manuring practice is hardly done and shifting cultivation is primary method in bush garden by clearing bush and tree	Mealy bug, Rate, Termite
S/Potato	Local Var. (Sesheke, Kando, Teresa)	About 10000 - 12500 plants Random planting	No manuring practice is employed except for applying organic matter like weed incorporation.	Sweet potato weevils, Virus, Nematodes,
Shallot	Spring onion	Line planting	Chicken manure or kraal manure is applied at planting time.	Threes
Onion	Texas Grano	Random planting about 28000 - 30000 plants	Kraal manure is usually applied at planting time.	Thrips, White leaf sport
Tomato	Rome VF, Heinze, Money maker, Red curkey, Mannande	About 6000 - 70000 plants	Kraal manure is usually applied at planting time.	Red spider mite Early blight, Ball worm, Ill worm
Rape	Kale rape, Giant rape	About 10000 - 15000 plants	Kraal manure is usually applied at planting time.	Aphid, Cut worm
Chinese cabbage	Chinese cabbage	same as rape	same as rape	Aphid, cut worm

**Table 3.3.4 Conventional Farming Practice of Major Fruit Crops**

Fruit Crop	Major variety	Plant Density	Fertilizer Application/Farming Practice	Major disease & pest
Mango	Nolea	No specific intention	No practice except for planting time to apply kraal manure or chicken manure.	Scale
Citrus	Valencia late Washington navel Tangerines Rough lemon	- do -	Same as Mango	Orange dog, Scale, Aphid
Cashew	Senegalese, Brazilian dwarf	Recommendation is 10 x 10m, but no specific intention	Same as Mango	Stem borer, T-mosquito, Powdery mildew
Banana	Local banana Dwarf cavendish	No specific intention	Same as Mango	Nematodes
Pineapple	Queens, Smooth cyan	No specific intention	Same as Mango	Nematodes, Scales

## 2) Fertilizers and Agro-chemicals

Only a few farmers apply chemical fertilizer because of its high price under poor transport conditions, thus the majority uses kraal manure for maize and vegetable crops. The source of these inputs is available through WPCU or a barter credit system by the loan organizations or some NGO groups. Chemicals for pest and disease are quite limited to supply in terms of bulk and optimal descriptions and quite expensive for the self subsistent farmers, thus only a handful farmers spray chemicals to their vegetable garden. Shortage of hand sprayers leads the farmers to spray chemicals by splashing with a dipped broom or branch.

## 3) Plowing Operation

Table 3.3.5 shows the present condition of animal draught power in the Study Area. Generally, animal draught power is practiced to Mazulu, Sitapa-matapa gardens but not usual in Sishanjo due to insufficient bearing capacity, thus hoe-oriented cultivation is a primary method there. Vegetable gardens are mostly in small scale and hoe is the chief tool to cultivate. From the above-mentioned table, an extent of animal draught power in the Study Area is quite limited and ranges only from 3 to 23 percent and 4 ox-spans are very common in the Area.

**Table 3.3.5 Summary of the Animal Traction Power in the Study Area**

	Namshakende	Yeta	Katongo	Lealui	Mabumbu	Limulunga	Total
No. of F/Households	409	414	232	532	117	264	1968
<b>Farming Implements</b>							
1. No. of Ox span	23	28	8	32	27	17	135
2. No. of Ox-cart	4	0	2	2	0	7	15
3. No. of Plow	24	20	10	15	28	25	122
4. No. of Sledge	19	13	2	14	14	2	64
5. No. of Harrow	3	1	1	0	0	12	17
<b>Total</b>	<b>73</b>	<b>62</b>	<b>23</b>	<b>63</b>	<b>69</b>	<b>63</b>	<b>353</b>

Note : The data is based on the hearing survey done in June 1994 through each agriculture camp officer in the Study Area.

#### 4) Sowing Operation

Sowing operation exclusively depends on manual works. In some cases, the sowing operation of maize or rice is combined with ox-plowing operation and done after plow like line sowing or spot sowing. But the majority of sowing method for rice is broadcasting followed by harrowing or plowing or hoeing to cover seeds with soils. Other crops like sorghum and bulrush millet are also primarily broadcasted. Spot sowing practice is found minor.

#### 5) Inter-Cropping and Relay Cropping

Pumpkin is widely inter-cropped on Mazulu maize field. Sitapa maize planted in mid-August is usually relayed with rice and harvested before flooding. Another common practice is bulrush millet and cassava inter-cropping in Litongo or Matema gardens.

#### 6) Agro-Forestry

In a broad sense, the current production system in the upland (Matongo and Matema gardens) is a sort of extensive agro-forestry system to involve tree crops, perennial crop, annual crops and animals. In the wet Litongo garden, it is very common that fruit crops like mango, guava, pineapple, bush crops like cassava, and vegetables are planted in a fashion of inter-cropping or under planting of the trees. When the wetland plain is flooded from Feb/March, most of the herds start shifting from the flood plain to the upland to seek for grasses in the bush area(local name: Mushitu). This is called "agro-sylvo-pastoral system".

#### 7) Weeding Practice

Most of the food crops like cereals, cassava and sweet potato are weeded once or twice

through the season.

## 8) Harvesting Operation

Rice is harvested in two ways, i.e. 1) panicle cutting by knife and 2) bottom cutting by sickle. The former is the most common practice prevailed in the Study Area. Sorghum and millet are firstly cut at bottom by hoe, then breaking its head by knife. Field residues are grazed for animal, and the leftover, mostly stovers are burnt. Maize is harvested by removing cob. Its field residue is fed for animals. Maize stovers are taken out of the field by stamping with hoe.

## (3) Post-Harvest Practice

### 1) Maize

Cob picked from stovers at matured stage is dried for a few days in the sunlight and kept in the storage bin. Shelling is done by beating a sacked cobs with stick, or shelled by hand when necessary for their consumption. Pounding by mortar is shouldered by women and children, and its process is as follows :

- a. Pouring maize grains into mortar with splashing small quantity of water
- b. Pounding them gently so as to remove maize bran
- c. Soaking them 3 to 4 days in water after winnowing
- d. Pounding them into mill again

On the other hand, maize is also utilized as green maize by boiling or roasting unmaturred cob. For this purpose, the harvest is practiced in December for Sitapa maize and in February for Mazulu maize.

### 2) Rice

Panicle cutting by knife is a popular method instead of bottom cutting by sickle, which appears to be due to unaffordable price of sickle among the small-scale farmers. Threshing is practiced by beating a heaped panicles with stick, and winnowed out, then sacked and kept in the storage bin. Mortar is widely used for dehuling and polishing rice in the area.

### 3) Sorghum

Collected heads are dried in the sunlight for 4-5 days and threshed by beating heaped ears by stick, then bagged and kept in their houses. Grain is processed into mealy mill by pounding them with mortar, and used for material of brewing the local beer.

#### 4) Bulrush Millet

Collected heads are dried for few days, then pounded gently with mortar for threshing purpose and winnowed followed by sacked. Grain is mainly used for the material of brewing the local beer in the Area.

#### 5) Cassava

Usually two types of cassava, i.e., sweet and bitter varieties (contain cyanic acid) are mixedly planted in a field. Therefore, tubers are soaked for a week to decompose hydrocyanic acid by fermentation. Then, peeling off the skin and drying for a few days under the sunlight and cutting them are carried out. The dried cassava is pounded to mill and mixed with maize mealy mill for cooking Nsima.

#### 6) Sweet Potato

There are several local ways to process sweet potato

- a. To store in the ridge for several months after vines are removed.
- b. To make dried slice chips after being boiled or unboiled, which could be preserved for long period.
- c. To cure by digging pit and spreading grass at bottom of the pit and wood ash sprinkled on top of the tubers placed on the grass. Very common way of cooking is to boil or to roast tuber, or to fry sliced tuber.

#### 7) Vegetables

Leafy vegetables are splashed with water to keep freshness for marketing. Local vegetables like pumpkin and Simdambi leaves are dried for preservation purpose. Another method is to dry leafy vegetables or fruit vegetables under the sunlight for a few hours, then drying in the shade after boiling few minutes with salt.

#### (4) Crop Production and Cultivated Area

Table 3.3.6 shows the number of the farmhouses, major crop production and its cultivated area for the '93-'94 cropping season in the Study Area. The production as per each crop was estimated by multiplying acreage collected by the Camp Extension Officers (CEO) and yield/unit area quoted from the results of the Farm Economic Survey of the 100 farm households. From this result, an area devoted to cassava is the highest followed by rice and maize, but the production of rice is outstanding among them. Thus, the farming of the Study Area is characterized to the rice-oriented farming system.

The production of mango was estimated by an average number of trees/farm household times yield/tree quoted from the result of the above mentioned survey. Total output is annually

estimated at around 2400 t in the Study Area. On the other hand, Table 3.3.7 shows the cashew production as per each block in the Study Area, which indicates that the northern part of the Study Area produces almost 80 % of rawnuts. Meanwhile, citrus production is quite small and estimated at around 16 tons based on the results of the hearing survey and the aforementioned Farm Economic Survey.

**Table 3.3.6 Farmland, Area Cultivated per Crop and Crop Production in the Study Area**

Parameter	Block						Total
	Namusha -kende	Yeta	Kato	Lealui	Mabumbu	Limulunga	
1) Farm HHS Male	256	244	126	320	87	202	1,235
Female	153	170	106	212	30	62	733
Total	409	414	232	532	117.0	264	1,968
2) Farmland (ha)	1,230	881	360	250	150	205	3,076
3) Area (ha) / crop							
Maize	126.0	145.0	65.0	50.0	53.0	34.2	473.2
Rice	135.0	230.0	64.0	39.0	40.0	55.5	563.5
Cassava	166.0	300.0	93.0	40.0	12.0	36.0	647.0
Millet & Sorghum	52.5	51.5	27.3	38.0	21.0	31.5	221.8
(Total : ha)	479.5	726.5	249.3	167.0	126.0	157.2	1,905.5
4) Production (t) / crop							
Maize	142.1	97.9	46.1	36.3	74.3	29.4	426.1
Rice	184.3	249.6	78.1	40.8	60.0	65.2	678.1
Cassava	124.8	108.0	62.6	38.9	10.8	32.4	377.5
Millet & Sorghum	53.7	29.1	14.9	24.5	14.3	15.3	151.8
(Total : ton)	504.9	484.5	201.7	140.6	159.4	142.4	1633.5
5) Produce / fruit							
Mango (t)	953.8	508.2	138.9	543.1	189.2	51.6	2,384.8

- Note: (1) The year for crop production is based on the 93/94 crop forecast data.  
 (2) Cashew production per each ward is based on a mean value of 4 years produce from '90 to '94 harvest season.  
 (3) HHS and M or F refer to household, Male headed HHS and Female headed HHS.

**Table 3.3.7 Cashew Production of the Study Area**

Year	(Unit: kg)							Total
	Limulunga	Mabumb	Malengwa	Mongu	Katongo	Yeta	Namushakende	
90-91	950	8,531	976	2,491	378	1,097	947	15,370
91-92	9,289	14,235	1,620	3,724	1,859	4,480	2,062	37,270
92-93	15,584	13,247	1,872	4,698	1,122	3,241	2,649	42,413
93-94	2,841	6,351	1,001	5,324	106	907	959	17,487
Total	28,664	42,363	5,469	16,237	3,465	9,724	6,618	112,540

## **(5) Production Constraints**

Production constraints perceived by the interviewed farmers in the Study Area are summarized as follows :

### **1) Unstable productivity due to erratic rainfall pattern**

The Study Area is always exposed to erratic rainfall pattern with fluctuation of precipitation. Crop stand, therefore, is directly affected under this condition. Existing irrigation facility is negligible, thus the effect on farming due to abnormal flooding or drought weather is tremendous.

### **2) Shortage of animal draught power and farming implements**

According to the survey result by ADPP, a mean of the plowed farmland by oxen was around 67 % in the Study Area. However, a hearing survey via each CEOs found that the number of the farm households who own the trained oxen with plow ranged only 3 to 23 % among the blocks. Thus the majority of the farmers in the Area seem to plow by borrowing or hiring of oxen. This common practice generally leads to late ploughing and planting.

### **3) Limited access to loan**

Most of farmers complained a limited access for loans, especially the medium term loan which is applicable to procure farming implements such as oxen and plow. Thus the small scale farmers who have no mortgage are completely shut out from a chance to get loan.

### **4) Sharp rise and shortage of farming inputs**

Due to a jump in seeds, fertilizers, agro-chemicals, farming tools being associated with their shortage, the small scale farmers can not manage their farming practice intensively and can not get out of the current extensive farming.

### **5) Influence on the farming due to defunct catch-drain**

Wetland agriculture in the Study Area is directly subjected to the function of seepage water catch-drain canal to the Zambezi river. At present, several sites of the catch-drain are blocked by weeds due to poor maintenance and causing flood over the farmlands here and there, which is severely interrupting the surrounding farming.

### **6) Shortage of depot to collect produce related to poorly developed road network**

Most of the small scale farmers in the Study Area are facing with the lack of

transportation means to carry their produce from field to farmyard or market, while the poor road network severely hampers the traders to access the rural area in the sandy terrain. Thus some of agricultural produce such as mango fruit is practically wasted in huge amount.

- 7) Extensive farming practice related to ineffective extension service coupled with poor institutional support to the farmers

The majority of small scale farmers are put on limited access to the resources in terms of updated technological information combined with limited institutional supporting services. Existing extension service system is facing with physical difficulties to communicate with farmers, and to brush up updated expertise for Camp Extension Officer (CEOs) without effective mobile means.

#### **3.3.4 Agriculture Research and Extension**

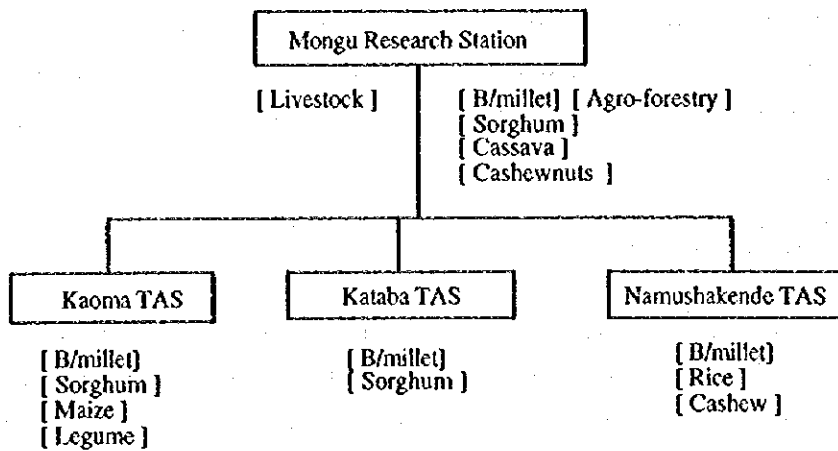
Agriculture research work in the Western Province is carried out by the following organizations mentioned in Figure 3.3.4 and 3.3.5. The research subject and the target crop are mentioned in each station as well.

Mongu Research Station(MRS) under the Region II Research Station is currently under transitional process to shift from Mongu to Simulumbe about 50 km eastward from Mongu township. Dissemination of the updated technological information through the CEOs is carried out based on the two following processes.

The grassroot problems among the farmers encountered in their farming are brought to the District Crop Husbandry Officer (DCHO) via CEO. DCHO feed back to CEO after making the solution. If the problem is difficult, then this matter is transferred to Provincial Subject Matter Specialist (PSMS) or Research Sector (Commodity Research Team: CRT, Farming System Research Team: FSRT) to find out a solution and to transfer it to the farmers through the same channel. In this channel, the subject matter dealt is mainly confined to the technical matter encountered by the small scale farmers.

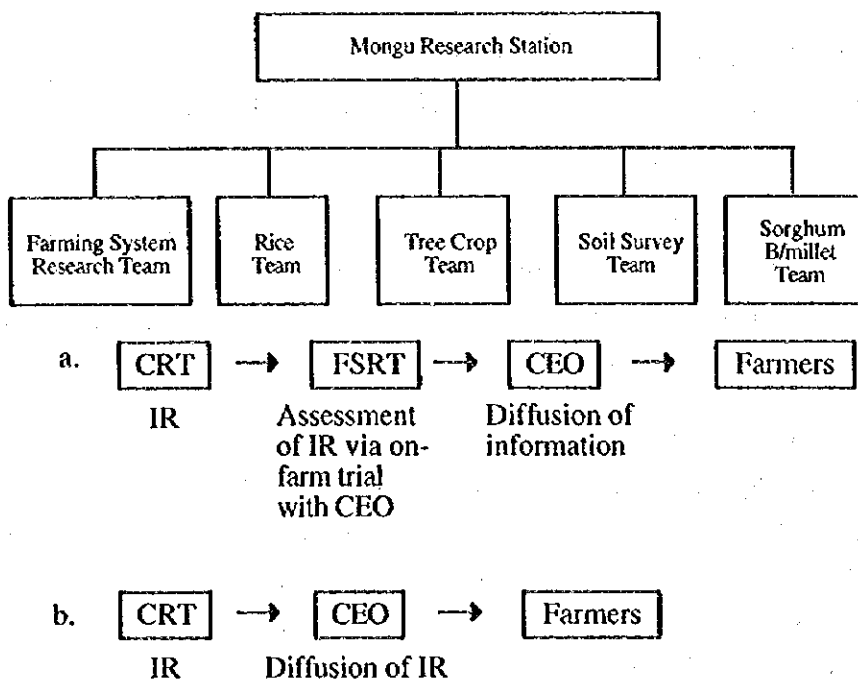
Updated technological information is based on the findings through CRT and disseminated to the farmers through the camp extension officers.





Note: TAS = TRIAL ASSESSMENT SITE

Figure 3.3.4 Agricultural Research Organization in Western Province



Note: IR refers to "Initial Recommendation".

Figure 3.3.5 Organization of the Commodity Research Teams

### **3.3.5 Animal Husbandry and Inland Fisheries**

#### **(1) The Population of Livestock**

##### **1) Cattle Population**

In the Western Province, main livestock is cattle. According to the livestock census figures for 1992, total cattle population was 563,603 heads with an increase of 1.6 % from 1991 to 1992. In 1990/1991 season there was an increase of 2 %. The registered population in the Mongu District was 109, 138 heads in 1992 with an increment of 4.6 %. The Study Area lies over the six wards, and about 7,000 heads are estimated in the Area scattering over 88 kraals with an average of 76 heads/ kraal at present.

##### **2) Pig Population**

In the Western Province, the total population of pig in 1992 was 6,203 heads with an increase of 12.6% from 1991 to 1992. Registered total in the Mongu District was 2,091 heads in 1992 at an increase of 164.3%.

##### **3) Chicken Population**

In the Western Province, the total number of chickens in 1992 recorded 245,370 and increased 2.6 % from 1991. While in Mongu District, 60,041 chickens were registered with an increment of 14% in the same period.

#### **(2) Chicken and Pig Production**

It is very difficult to venture on these enterprises at the moment because of high stockfeed price for chicken and pig, and not feasible in Mongu. Zambia Cold Storage Cooperation Ltd.(ZCSC), the market of concentrates (meat, bone meal and blood) stopped its production in 1989 due to its high running cost.

Vaccination with treatment system for these livestock is very poor. The local chickens are not usually affected by diseases but production and growth rate are very low, so it is not worthy to consider a large scale. There is also no hatchery in Mongu, thus the chicks have to be purchased from Lusaka. At present chicken feeds (concentrates) are sold for K14,000/50kg in Mongu by INDECO milling company, but the stockfeeds for pig are not available in Mongu area.

#### **(3) Cattle Grazing System**

The dominant grazing system is a transhumant system which graze cattle in the Zambezi flood plain during the dry season and move to the upland during the wet season when the plain is

flooded. Full time grazing is practiced, and cattle are kept in the kraal at night and released every morning between 8 to 9 hours every day and brought back to the Kraal at around 18:00 hours after grazing. A natural grazing system for feeding is cheap but during the wet season herds have to move over long distances searching for good grass in the upland. Thus they lose energy and have slow growth.

Most kraals are managed by one caretaker but several owners are involved. This makes it difficult to control diseases. That is, when any disease breaks out, the caretaker has to make contact with cattle owners who usually live in different places to ask for money to buy drugs for cattle, but if there is a failure to contact due to long distance, the infected cattle will die or the infection will spread over a whole herd in a kraal.

#### (4) Cattle Disease Control

Disease control is very important but has to be sustainable and economical for both Government and the farmers. Disease control measures in a national level specific the following disease such as Anthrax, Foot and Mouth disease(FMD), Contagious Bovine Pleural Pneumonia (CBPP) as legal communicable disease to be strictly controlled in the country. At present these diseases are controlled by blocking the movement of herds getting into and/or out of the Western Province.

Cattle infected with FMD and CBPP are immediately slaughtered and the number of these infected cattle is less incidence in the Province. According to the 1992 data of the cattle diseases, three diseases of Hemorrhagic Septicaemia (HS), Black Quarter (BQ) and Trypanosomiasis were very important diseases to be controlled in order to support cattle farmers.

According to the 1994 vaccination plan in Mongu district, anthrax vaccine is given free of charge during June to October but in the control off season it is charged 150 k/head. The charges for other vaccines are 150 k/head for BQ, and 200 k/head for FMD, and 150 k/head for HS and 350 k/head for trypanosomiasis. However CBPP is free of charge throughout the year.

#### (5) General Conditions of Grass Land

According to the analysis data in 1993 by the University of Zambia, the quality of grasses on pasture is very high but quantity per unit area is very small in May. The grass in May is composed of 48% of dry matter, 2.5% of crude protein and 527 kcal of metabolizable energy. In the early rainy season of November, Digest Protein(DP) was 9.8% while metabolizable energy was 978 kcal. Quality and quantity of grasses on the pasture varied with its growth stage. Three factors affect on the growth of grass, which are precipitation, grass species and soil types but the most influential factor is the precipitation.

According to the report of "Photocopies of Grass Species in Mongu District 1991" issued by RDP, there are 126 grass species of 44 grass families in the Area. The Area has lots of grass species which are utilized for cattle at juvenile growth stage. Andropogon species are used for

roofing materials, and the most useful grass species for cattle are the Panicum and Digitaria families.

#### (6) Seasonal Cattle Grazing Density and Grazing Capacity

According to Veterinary Dept., a cattle density was difficult to be identified in the Study Area because of the uncontrolled movement of cattle from one place to another. Generally cattle density in the flood plain during the dry season is about 44 cattle/km<sup>2</sup>, while in the wet season (upland area) it is about 27 cattle /square km.

The detailed data for a grazing capacity in the Study Area is not available, but according to the report of "The Vegetation Ecology and Rangeland Resources in the Western Province 1991", the grazing capacity in the flood plain ranged from about 0.4 to 10 ha/LSU (Livestock 260 kg live weight/head unit), while in the river valleys and dambo area ranged from about 1.1 to 7 ha/LSU, with a similar range of the grazing capacity in the flood plain, in Bush area and Saana area from 2.0 to 14 ha/LSU, from open wood land to tree savanna area ranged from about 10 to 37 ha/LSU and in the most mixed wood land, it ranged from 20 to 60 ha/LSU.

#### (7) Meat Processing

A slaughtering capacity of ZCSC in 1993 was 60 heads/day and this is supposed to be an average of 1,500 heads/month, but the actual slaughtered number in ZCSC abattoir resulted in only 227 heads/month. This implies that the abattoir worked only 6 % of the full capacity.

An average live weight of the cattle dealt by ZCSC was 328 kg/head. The data of local butcheries were not available in terms of the number of slaughtered cattle in the Study Area. Concerning meat processing sector, there are two local butcheries together with ZCSC, and processes small amount of beef sausage and mincemeat.

As the meat of livestock injected with drugs and vaccines is dangerous for human body, the livestock treated with vaccine or drug must be kept alive for about 7 days before slaughtering. Price of meat in Mongu is often different from one butcher to another. The prices of the meat generally include bone. The prices of dressed meats in Mongu in 1994 are K800/kg/beef, K1,000/kg/fillet, K1,000/kg/minced beef, K1,500/kg/beef sausage, K3,000/broiler chicken, K150/egg, and pork of K600/kg, respectively.

#### (8) Milk Production

The ZADL is the only one large scale milk production farm in the Western Province. ZADL is a major supplier of fresh milk to Mongu township. The ZADL has 62 milking cows, and a storage capacity of treating fresh milk of 1,200 liter/day, but currently exerted only its 10% of the full capacity.

According to the ZADL manager, selling price for fresh milk is K300/liter in 1994, and an average of milking day/cow/year was 120 days and 6 liters/day/head. However, because of poor stockfeed available except for maize and rice brans, milking days/year are less than 100 days at present. On the other hand, local cows produce an average of 2-3 liters/day with 90 milking days/cow.

According to the report of "Milk Marketing Report 1992 by ARPT", there is good grasses available for cows during the rainy season which bring a peak in milk production but the price becomes low. While in the dry season, pasture condition becomes poor and herds have to look for grasses over a long distance. This leads a milk price higher associated with low output. Milk processing method prevailing in the Study Area is to make sour milk by keeping fresh milk in a bottle for 2-3 days or week for fermentation, and it is sold for K400/liter.

#### (9) Hide and Skin Production

There is no large scale industries for hide and skin processing in Mongu district. ZCSC is currently processing hides and skins by cleaning and salting and selling them to the processing plant in Kafue. Hide and skin processing industries are difficult to be established in this area because of difficulty of getting enough raw materials and necessity of quite a lot of water with toxic chemicals for its process. There are no processing facilities in the Study Area as well.

#### (10) Tax on Livestock Trade

There is no systematized livestock market in the Study Area. Livestock traders visit and buy in cash in the Study Area with negotiation. Usually the price in the dry season goes down because of decreasing live weight. There are two types of livestock tax. The first one is the income tax (managed by the tax office) imposed to buyer at rate of 10% of the sale price.

The second one is the livestock trading tax (Council levy) with a rate of K500/head within the Province, and off-take from the Western Province to another province is K1,000/head.

#### (11) Supporting System for Livestock

There are two support systems for the livestock farmers; the first is DVTCS which deal with animal health and disease control, and has 3 veterinary camps which are located in Limulunga, Mongu central and Namushakende. The second is DOA dealing with livestock production and management and agricultural camps of Limulunga, Mabumbu, Malengwa, Katongo, Sefula, and Namushakende involved in the Study Area. These two departments have a good relation to coordinate each other.

## (12) Life Cycle of Fish

General life cycle of fish in the Upper Zambezi river is as follows :

When water level raises in the flood plain area from January to April, fish can easily search for food and grow.

From May to August, water level goes down and adult fish pairs for matching. From September to October, the fish egg hatches into fry.

From November to December, water level raise again and the fry spread all over the flood plain looking for food and become adult for the next 2-3 years.

However, natural growth rate is slow because the fries compete with big fishes for food, thus mortality of fry is very high.

## (13) Store Dams and Fish Species

According to the 1993 annual report by Dept. of Fisheries, there are 5 fishery basins (store dams) in the Upper Zambezi river of which 3rd store dam is involved in the Study Area. Fish species in the upper Zambezi river are 24 species of 8 families. The dominant species for production are mainly tilapia and cat fish, but the grunter species are scarce.

## (14) Number of Fishermen and Taxation

The definition of fisherman refers to a fish trader who is either temporary or permanent. The Fisheries Department issues a license for fisherman with K3,000/year. Fish levy by the Mongu council is imposed K 500 /10 kg dry fish from Mongu to Lusaka and K 600 /10 kg fresh fish from Mongu to Kaoma and Lusaka. The number of fishermen in the Study Area in 1994 is as follows :

Fishery camp	No of fishermen
Limulunga	231
Mongu	335
Sefula	169
Namushakende	137
Total	872

## (15) Inland Fisheries Production

There are two types of fish production, i.e, fresh and dry in the Study Area. A method of dry fish in each fishery camp is to smoke and dry and pack in a basket and directly sent to market places. On the other hand, fresh fishes are sent to the market place without cooling. The Study Area is involved in the third store dam and total fresh fish production was 301,877 kg in 1992

and dry fish was 145,473 kg in the same year. About 80 % of dry fish and 40 % of fresh fish produced in Mongu area are sold to Lusaka.

#### **(16) Supporting System for Fishermen**

The survey on the seasonal fish yield and seasonal prices controlled by the Fisheries Dept. is very important for the conservation of fish resources. If fishing with a large scale without a licence is found, subjected nets and boat will be confiscated.

Major supporting activities by the Authorities are as follows :

- 1) Fishery office in the Western Province supports for fish culture development to run a hatchery in Kaoma, but it needs repairs. Besides, data analysis and Provincial development plan are also shouldered.
- 2) Mongu District Office has 5 fish guard offices in the Study Area which are located at Limulunga, Mongu, Muramda, Sefula, and Namushakende and are responsible for fish guard patrol and marketing research for the development plan.

#### **(17) Protection of Fish Resources**

Control of fishery is very important from the viewpoint of preserving fish resources. Currently existing rules for the fishery control are as follows :

- 1) Using of the seine net is restricted in the Zambezi river, its tributaries and main canals.
- 2) Gillnet less than 3 inch mesh is prohibited for use in the whole Zambezi river basin, including its tributaries.
- 3) Mono filament net less than 120 mm mesh is prohibited for use in the said basin.

### 3.4 Agricultural Economics

#### 3.4.1 Farm Economics

##### (1) The Outlook of Farming

The number of farm household, average size of cultivating area and main crop raising areas per farm in the six wards which include the Study Area are shown in Table 3.4.1. In the three Wards, Katongo, Lealui and Mabumbu, which are located in the central part of the Study Area close to Mongu, the average sizes of cultivating area are smaller for farmers are residing densely in the small areas and farm lands are relatively scarce. On the other hand, in the Wards Yeta and Limulunga which are located of the both end sides of the Study Area, the average cultivating areas are much greater than the average of the whole area.

Almost all crops raised are staple food. Maize, the traditional most important staple food, is raised on the broadest area followed by rice and those two crops occupy 80% of the main crop cultivated area. Although farmers raising vegetables such as tomatoes and rape are increasing in Mabumbu and Lealui recently, the raising area is very small except for little number of specialized farmers.

The aggregated average sizes of cropping area are proportional to the cultivating areas, and those of the both end Wards are larger and those of the central Wards are smaller. However, land utilizing rates are between 120% and 130% throughout the Wards. The reason why the rates exceed 100% seems mainly because of relay cropping of rice after harvesting maize.

Although the Table 3.4.1 shows brief outline of agriculture in the Study Area, there are almost no materials and data through which we can able to know the real status quo of farmers' economies. In order to get information on farmers' economic situation, a Farm Economic Survey was carried out choosing 100 representative farms from the six relevant Wards in the Study Area in proportionately to the number of farms in respective Wards.

**Table 3.4.1 Number of Farms, Cultivated Areas and Main Crop Raising Areas**

	No. of Farms	Cultivated Area	Cultivated per Farm	Raising Area per Farm					Total
				Rice	Maize	Cassava	B. Millet	Sorghum	
Namushakende	573	676	1.18	0.32	0.45	0.46	0.04	0.22	1.50
Yeta	774	2,112	2.73	1.65	1.12	0.45	0.03	0.04	3.30
Katongo	1,495	1,166	0.78	0.11	0.70	0.16	0.01	0.02	0.98
Lealui	1,619	1,808	1.12	0.40	0.81	0.11	0.00	0.06	1.38
Mabumbu	548	382	0.70	0.16	0.34	0.18	0.00	0.21	0.90
Limulunga	1,574	2,834	1.80	0.55	1.34	0.18	0.00	0.18	2.25
Total/Average	6,583	8,978	1.36	0.49	0.88	0.21	0.01	0.10	1.69



## (2) Farm Economics

The summary of the Farm Economic Survey is shown in Table 3.4.2 and Table 3.4.3. The overall means of holding land and number of family members are 8.8 ha and 7.9 respectively. Both of those in Namushakende are largest and land holding areas in Lealui and Limulunga exceed the average. More than half of total land is occupied by paddy fields and one third by forest. The average size of crop raising area is 2.9 ha and some 43 % and 31 % are occupied by rice and maize respectively. As paddy field and rice are most predominant in land utilization and crop raising, the relationship of areas between land holding and paddy field and paddy field and rice growing area were statistically tested.

Between land holding area and paddy field area, a regression equation through the origin such as  $Y=0.16X$  was calculated where Y is paddy field area and X is holding area. Between paddy field area and rice growing area, a formula  $Y=0.17 X$  was obtained where Y is rice growing area and X is paddy field area. Both regression coefficients were highly significant. Therefore, it seems that more land is necessary in order to raise more rice. However, only a quarter of paddy fields is used for rice crop raising, although some of them are utilized for raising maize. If those idle land are utilized more effectively by implementation of improved facilities and irrigation system, deficit of land will be solved and cultivable land will be utilized more intensively.

Farmers' economic situation is shown as agricultural total income, farm expenses and net income. Almost 90 % of agricultural income is occupied by crop products and those of Namushakende, Yeta and Limulunga exceed the average. The ratio of farm expenses against total income is very low because few materials such as fertilizers and chemicals are applied and farming implements are very poor. As the results, the ratio of net income in the total income is extremely high. The agricultural net income in Namushakende, Yeta and Limulunga also exceed the average net income and those of Katongo, Lealui and Mabumbu are below the average.

Here the relationship between cash income and household expenses has to be contemplated because the latter exceed the former in a great deal. The proportion of cash income in the total income is only 37 % because a large part of cereal produces are consumed by farmers themselves. On the other hand, household expenses exceed cash income by more than three times for they have to buy quite a lot of food stuffs which are mainly supposed to be staple foods. These unfavorable situations have to be solved by means of achieving higher productivity and fulfilling self sufficiency of principal food stuffs through the introduction of various higher production technologies.

**Table 3.4.2 Summary of Farm Survey**

**1. Family Members, Labour Forces and Land Holding**

Ward (No. of Farms)	No. of F.M.	Main Laborer	Suppl. Labor	Til. Labor Day	Off Farm L.D.	Paddy Field	Upland Field	Orchard	Forest	Total
Namushakende (9)	10.00	4.00	3.00	627	12.3	4.64	1.78	0.22	5.06	11.69
Yeta (12)	7.08	2.58	2.33	375	3.1	4.42	1.13	0.00	2.22	7.76
Katongo (23)	7.48	2.83	1.00	324	15.5	2.67	0.62	0.05	1.97	5.32
Lealui (24)	7.46	2.96	0.96	332	3.5	3.94	1.07	0.05	5.40	10.45
Mabumbu (8)	8.75	4.13	1.50	503	7.5	5.63	0.25	0.00	0.38	6.25
Limulunga (24)	7.96	4.38	1.38	677	4.8	8.45	1.14	0.07	1.02	10.67
Average	7.87	3.41	1.46	458	7.6	4.98	0.98	0.06	2.74	8.77

**2. Crop Raising Area**

Ward (No. of Farms)	Rice	Maize	Cassava	Millet	Sorghum	Vegetables	Crops Total
Namushakende (9)	2.00	2.06	1.72	0.14	0.15	0.22	6.29
Yeta (12)	1.70	0.87	0.59	0.15	0.00	0.09	3.41
Katongo (23)	0.94	0.52	0.40	0.12	0.02	0.17	2.17
Lealui (24)	0.44	0.73	0.23	0.05	0.10	0.14	1.69
Mabumbu (8)	1.16	0.69	0.00	0.00	0.38	0.31	2.53
Limulunga (24)	1.83	1.05	0.18	0.00	0.10	0.28	3.45
Average	1.24	0.89	0.42	0.07	0.09	0.20	2.91

**3. Agricultural Income and Farm Expenses**

Ward (No. of Farms)	Total Income	Crops	Animals	Fruits	Cash Income	Total Input	Variable	Net Ag. Income	House- hold Ex
Namushakende (9)	817,956	703,633	85,133	29,189	326,411	68,968	58,943	748,988	436,213
Yeta (12)	444,279	434,625	4,867	4,788	106,296	38,767	37,608	405,513	344,842
Katongo (23)	233,626	212,978	7,696	12,952	67,804	71,469	69,870	162,157	389,404
Lealui (24)	206,008	158,750	32,346	14,913	102,988	40,577	39,581	165,431	493,881
Mabumbu (8)	298,650	269,763	10,200	18,688	115,400	34,803	33,531	263,848	392,313
Limulunga (24)	519,279	475,079	35,838	8,363	203,296	87,010	83,483	432,270	551,884
Average	378,625	338,167	27,196	13,262	140,468	60,702	58,106	317,923	452,571

**Table 3.4.3 Number of Growers, Raising Hectarage and Yield for each Crop in respective Ward**

**The proportion of Growers against the Farmers Surveyed**

	Rice	Maize	Cassava	Millet	Sorghum	Sweet-potatoes	Pumpkin	Tomatoes	Mango	Cashew
Namushakende	100	100	89	22	33	11	11	-	78	11
Sefula	100	92	50	25	-	-	8	-	67	8
Katongo	100	91	26	17	9	26	17	4	57	9
Lealui	67	100	13	13	13	17	4	13	58	4
Mabumbu	88	88	-	-	50	25	13	13	88	13
Limulunga	100	100	-	-	25	21	13	4	38	8
Total	91	96	23	12	18	18	11	6	56	8

**Raising Hectarage Per Farm (ha)**

Namushakende	2.00	2.06	1.94	0.63	0.46	1.00	1.00	-	13	10
Sefula	1.70	0.95	1.19	0.58	-	-	1.00	-	8	25
Katongo	0.96	0.57	1.53	0.67	0.19	0.24	0.69	0.25	7	80
Lealui	0.66	0.73	1.83	0.42	0.83	0.63	0.25	0.25	10	45
Mabumbu	1.32	0.79	-	-	0.75	0.38	0.25	0.65	7	6
Limulunga	1.83	1.05	-	-	0.40	0.43	1.11	0.25	9	33
Total	1.37	0.93	1.81	0.58	0.54	0.44	0.78	0.31	9	39

**Yield of respective Crop per Hectare (kg)**

Namushakende	1,365	1,128	752	1,140	880	1,00	200	-	230	2.20
Sefula	1,085	675	360	368	-	-	2,700	-	229	1.00
Katongo	1,221	709	673	670	0	1,346	998	9,600	150	2.23
Lealui	1,047	726	973	440	750	1,450	800	1,467	176	0.33
Mabumbu	1,501	1,401	-	-	720	990	1,600	1,800	231	4.20
Limulunga	1,175	861	-	-	623	834	933	120,00	63	2.45
Total	1,196	838	779	615	639	1,000	1,099	6	173	2.11

Note : The figures for Mango and Cashew are Yields per Tree.

**(3) Farm Income and Expenses according to the Farm Size Classification**

Table 3.4.4 shows the cultivated area-wise income and expenses of crop production which rearranged the data of the Farm Economic Survey. Surveyed farms are divided into four classes, 26 farms less than 1 ha, 29 farms between 1 ha and 2 ha, 30 farms between 2 ha and 5 ha, and 15 farms more than 5 ha. The number of so called small scale farmers is 85.

The average cultivating area of whole surveyed farms is 2.91 ha, average total income from

crops produced is K 338,167 per farm, average total expenses is K 58,412 and the net income ratio is a little less than 83%.

Gross income from rice is the largest among staple crops followed by maize. Those two crops are raised by more than 90 farms. Cassava, which is situated as the last option among staple foods, is not raised so much broadly, but it is rather concentrated to large scale farmers. Among these food crops, only rice could be said as commercialized one. The sold ratio of rice in the total amount produced is 43% and maize and cassava are 20%. The smaller the cultivating area, the higher the self-sufficient rate of staple foods. In the case of rice, the self-sufficiency rate of farmers less than 1 ha is 89% and that of ones more than 5 ha is 46%. Farmers less than 2 ha in the case of maize and less than 5 ha in the case of cassava consume whole amount of them produced.

Concerning the farm expenditure, the input levels of production materials are very low in general, and principal items of input are payment for custom works and repair. The payment for custom work is mainly the one for hiring draft animals and implements such as plough and harrow by small farmers who do not own them, and expenses for repair are those of mending buildings and small implements. Both of them are rather paid more by small farmers. Although seeds expenditure follows them, some part of farmers are purchasing grain for food in order to use them as seeds because there are no way to be supplied the seeds for renewal. This is also paid more by smaller farmers in terms of payment per unit area under cultivation.

In regard to the income and expenditure of crop production with relation to the classified cultivating size, total yields of respective crops increase according to the increase of average cultivating size classified. The larger the cultivating size, therefore, the larger the gross income of respective crops. Although similar tendency is observed on expenditure, the relationship between the cultivation size and total expenditure is not so clear as the case of income because various input items are not necessarily proportional to the cultivating size.

After looking over these relations with income and expenditure per unit cultivating area, distinct differences of gross income per ha are not recognized between strata classified by cultivating size, but the gross income per ha is the largest in the stratum less than 1 ha which has the greatest average gross income of vegetables. On the items of expenditure, the monetary amount of fertilizers, chemicals, miscellaneous expenses and so on are largest in the smallest stratum, and the total input per ha of the strata less than 2 ha are larger than that of upper strata in general. As the result, the gross expenditure per ha of smaller farmers is greater than that of larger farmers.

As mentioned above, it is realized that smaller farmers are intending to utilize their petty land more intensively. Looking at the net income ratio as the indicator of production efficiency, however, that of the upper-most stratum which is carrying on extensive production is the highest and, therefore, is getting the highest net income.

As the level of the farming in the Study Area is considered to be in the range of increasing yield, it is quite important to promote introducing pertinent technologies which can increase both of the amount of net income and net income ratio through intensification in order to improve the farming of small farmers.

**Table 3.4.4 Cultivated Area-wise Income and Expenses of Crop Production**

**1. Output (unit : K)**

Class.	Culti. Area (ha)	Seeds	Maize	Cassava	B/millet	Sorghum	Vegetables	Total	Net Income Ratio
.25-1.0	0.66	33,577	20,154	3,538	885	0	37,000	95,231	82.2%
1.0-2.0	1.57	138,414	36,966	2,828	1,276	2,552	37,366	219,400	73.4%
2.0-5.0	3.37	178,600	49,133	7,300	4,950	6,133	29,310	275,427	81.8%
5.0-	8.48	464,980	250,303	59,367	15,667	10,933	313,100	1,114,353	86.8%
Ave.	2.91	127,197	68,246	12,835	4,435	4,220	76,234	338,167	82.7%
.25-1.0	1.00	51,112	30,697	5,386	1,347	0	56,400	144,963	
1.0-2.0	1.00	88,104	23,529	1,800	812	1,624	23,784	139,653	
2.0-5.0	1.00	53,055	14,569	2,169	1,470	1,822	8,707	81,818	
5.0-	1.00	54,858	29,531	7,004	1,848	1,290	36,940	131,427	
Ave.	1.00	59,221	23,471	4,414	1,524	1,451	26,218	116,301	

**2. Input (unit : K)**

Class.	Culti. Area (ha)	Seeds	Fertilizer	Chemicals	Miscell.	Custom
.25-1.0	0.66	2,962	3,077	885	1,115	5,673
1.0-2.0	1.57	9,978	3,448	52	690	15,862
2.0-5.0	3.37	9,107	5,417	187	3,500	18,600
5.0-	8.48	25,633	22,633	267	987	20,000
Ave.	2.91	10,241	6,820	671	1,688	14,655
.25-1.0	1.00	4,508	4,684	1,347	1,698	8,636
1.0-2.0	1.00	6,351	2,195	33	439	10,097
2.0-5.0	1.00	2,705	1,609	55	1,040	5,525
5.0-	1.00	3,024	2,670	291	116	2,360
Ave.	1.00	3,522	2,345	231	581	5,040

Class.	Wears	Repair	Wages	Build. Deprec.	Machi. Deprec.	Total
.25-1.0	462	2,387	404	0	7	16,971
1.0-2.0	1,983	24,821	1,552	0	17	58,401
2.0-5.0	1,000	11,920	300	0	47	50,076
5.0-	9,533	20,947	44,000	120	610	146,930
Ave.	2,425	14,535	7,245	18	112	58,412
.25-1.0	703	3,633	615	6	11	25,833
1.0-2.0	1,262	15,799	988	0	11	37,174
2.0-5.0	297	3,541	89	0	14	14,87
5.0-	1,125	2,471	5,191	0	72	17,335
Ave.	834	4,999	2,492	14	39	20,089

#### (4) Some Analyses on Agricultural Production

Rice and maize are produced by more than ninety per cent of farmers and those role on crop raising and farm economy is extremely important. For this reason, the characteristics of those two crops were analyzed statistically in some degree utilizing the data collected from surveyed farmers.

Rice is raised by 91 farmers among a hundred surveyed ones and occupies the largest portion in the raising area and farm income. The yield per unit area, however, varies very much among farms and even the field on the same farms. The overall mean of rice yield per hectare is 1,196 kg and this is fairly high yield compared to those in the subject area and national level. But it varies from farm to farm in a great deal and the coefficient of variability is 62.6 %. Yields per hectare fluctuate from the lowest of less than 400 kg up to the highest of more than 3,000 kg. This has to be stabilized at first by establishing the way to supply necessary water in time through the improvement of irrigation system.

The relationship between the size of raising area and yield per unit area was also examined. The regression equation for the size of area and yield per hector is calculated as  $Y = 1,241 - 32.6 X$ . where Y refers to the yield and X to area. This means that increasing of raising area will lead to decreasing of yield per unit area. In fact, there were small farmers especially some women headed small farmers who are getting higher yield. Unfortunately, I would rather stress, the regression coefficient is statistically insignificant. That is, the yield of rice fluctuates from place to place and in general has nothing to do with the size of raising area statistically. Good examples which are acquiring higher yield by vulnerable small farmers pouring their poor labor and implements intensively, however, should not be ignored and the principle that more intensive and effective utilization of scarce resources will lead to more prosperous results.

Maize is cultivated by 96 farmers among 100 surveyed farmers. This is most important traditional staple food stuff and almost all farms raise it for the sake of getting their own meal and for sale. Maize is raised on Mazulu (high land in the flood plain) and some part of paddy fields where water supply is not sufficient for rice growing.

The yields of maize fluctuate much more than rice. Its overall mean of raising farmers is 838 kg and this is not so good yield compared to those of the Province and the whole Nation. Besides, the coefficient of variability reaches to 92 %. This figure is tremendously high, and actual yields per hectare fluctuate from the lowest less than 100 kg to the highest more than 3,000 kg. A regression equation was also calculated for the relationship between the yield of maize per hectare and the size of growing area by respective farmer. The result is  $Y = 816 + 22.8 X$ . This means that the yield per hectare increases by 22.8 kg if the raising area is increased by one hectare. The more the area to raise, the more the yield per hectare. The regression coefficient,

however, insignificant here too because of too high variability of the yield per hectare. It is urgent to stabilize the production of maize in the Study Area in order to secure the staple food stuff for the farmer themselves and for the people living in surrounding areas.

### **3.4.2 Farmers' Groups and Supporting System**

Generally speaking, cooperative activities do not seem to be so much familiar in the rural area of Zambia and ,therefore, farmers are not acquainted with cooperative production activities. Although the authorities are promoting cooperation among farmers in various ways, those are not always successful.

Among numerous groups including those organized by NGOs, the authorized principal groups are People's Participation Project groups (PPP groups), Women's Extension Groups, Young Farmers' Clubs and Village Extension Groups (VEG). They often overlap each other because they are occasionally organized based on the same existing groups. Many of them, however, have nothing to do with production activities except for some of the PPP groups.

PPP groups are organized under the aegis of the World Bank getting assistance of MAFF and principal participants are women. A Group Promoter in each group sets up plans and leads the group activities under the direction and guidance of District Agricultural Supervisor in charge and Camp Extension Officer (CEO). Although their main activities are handicrafts, sewing, tailoring and so on in general, some of groups are challenging to production oriented activities such as custom working of ploughing and harrowing on paddy fields in cooperation with less expenses in order to supplement their unpossession of oxen and ploughs.

VEGs are formed in every contact village by the hands of CEO at least one in each zone as the interface between the extension programme and farming community. CEO visits contact villages periodically to give farming information timely and to get farmers' requests through VEG. VEGs are situated, therefore, the focal points for interaction between farmers and extension activities. Though VEGs are functioning very important role in extension, they have almost nothing to do with group activities on production at present. Scarce cases related to the group action are those which are used for application of getting credit according to the request of the financing organization.

The organization and activities of extension service are as follows:

The allocation of Extension staffs all over the country and Camp Extension Officers in the Mongu Central Block are shown in Table 3.4.5 and Table 3.4.6 respectively.

**Table 3.4.5 The Allocation of Extension Staffs**

Position	Number of Staff Officers		
	Whole Country	West. Prov.	Mongu Distr.
Assistant Director	1	-	-
Principal Ag. Officer	9	1	-
District Ag. Officer	61	6	-
Block Supervisor	360	48	6
Camp Extension Officer	2,263	165	41

Foot Note: The Number of Camp Officers exclude the Number of Land Use Officers.

**Table 3.4.6 The Allocation of Camp Extension Officers in the Mongu Central Block**

Name of Camps	Subjet Ward	No. of Camp Officer	No. of Zones
South Namushakende	Southern Namushakende	1	6
North Namushakende	Northern Namushakende	1	6
Namaenya	Sefla & a part of Katongo	1	6
Katongo	Most part of Katongo	1	6
Lealui	Flood Plain of Lealui	1	6
Malengwa	Plainedge of Lealui Mongu Township	1	8
Mabumbu	Mabumbu	1	8
South Limulunga	Southern Limulunga	1	6
North Limulunga	Northern Limulunga	1	6

Foot Note: Only the boundary between Namaenya Camp and Katongo Camp is slightly different from the boundary between Sefla Ward and Katongo Ward.

The National Extension Action Plan activated in 1991 is carried in effect now, but this plan is under the revising procedure in the studies of new Agricultural Sector Investment Programme (ASIP) in the Central Government. The subject areas in the Western Province in the present Action Plan are two Districts of Kaoma and Lukulu, and Mongu District is not included. In the new Programme, however, Mongu and Kalabo are supposed to be included and the circumstances of extension works will be improved in some degree.

In the Western Province, DAO is allocated in each of six Districts under PAO. Each District is divided into six Blocks in average and a Block Supervisor (BS) is allocated in each Block. Each Block is divided into six to eight Camps and a CEO is allocated in each Camp.

In Mongu District, the whole area is divided into six blocks and each Block is consisted of some



seven Camps in average. Among 41 positions of CEO in Mongu District, three are unfilled with CEO of which two are in the Mongu Central District where the Study Area of the Master Plan is included.

The Mongu Central Block is divided into nine Camps and a CEO is allocated in each Camp except for Malengwa and Mabumbu Camps where the BS is in charge of CEO's Duties. Each Camp is divided into six to eight Zones and CEO visits one Zone per day in turn from Monday through Thursday and records the results of visiting on Friday. The reports are submitted to the BS once a month.

In spite of Extension Workers' endeavour under the T & V system mentioned above, farmers are not able to get sufficient impact from extension because of lack of farming materials and facilities. Besides, the territory where each CEO responsible is too broad and roads are too bad to go around on foot on visiting farmers. A mountain bicycle or a motor bike is indispensable for each CEO in order to promote more effective extension activities.

### **3.4.3 Marketing of Agricultural Products**

#### **(1) Cooperative organizations and their activities**

Before the liberalization of marketing in Zambia, the Food Security Act forced that all agricultural products had to be dealt with through cooperatives. Zambia Cooperatives Federation (ZCF) and its subsidiaries, therefore, had been monopolized the handling of agricultural products. After the day of liberalization, however, anyone is able to get into the dealings of agricultural produces. As the result of the policy change, the marketing share of the Cooperative Unions is declining rapidly and respective union and their affiliates, at the same time, are competing each other in some degree. Such a circumstance will not be favorable for the development of agriculture and some type of countermeasure seem to be inevitable. Although the institutional circumstances for marketing of agricultural products have been changed, the fundamental role of cooperative does not change and activities of cooperatives should be encouraged through the consciousness of related persons such as government officials, cooperative staffs and especially farmers themselves.

The cooperative system in Zambia is arranged in very good order. ZCF is organized as the national federation throughout the country. Lima Bank, Credit Union and Saving Association of Zambia (CUSA), Zambia Agricultural and Trading Cooperative Society (ZATCO), Provincial Cooperative Unions (PCUs) and other several cooperatives are the affiliate of ZCF. A CPU is organized in each Province and District Cooperative Unions (DCUs) are affiliates of PCU. DCU is affiliated by Primary Cooperative Societies (PCSSs) but is not organized in all Districts.

In the Western Province, Western PCU (WPCU) and three DCUs (Mongu, Kaoma and Senanga) are organized. Lukulu, Kalabo and Sesheke do not have their own DCU and WPCU is

in charge of cooperative business some how in these Districts.

WPCU was established in 1980 with K 5,500 thousand share capital and 13 affiliate PCSs. In 1989, WPCU reorganized its set up in order to adapt to the change of policy, and established three new Company, West Coop Agribusiness, West Coop Trading and West Coop Haulage, with its full capital share. The intention was to achieve more active and effective business under the liberalized economic circumstances. However, this intention was disturbed by the restriction of different legislation on which the Head Office and those three Companies based upon respectively. For the purpose of solving this problem, WPCU reconsolidated the establishment in April 1994, and three Companies were replaced as the Departments under the General Management.

WPCU is facing many difficulties in various phases, but is making effort to solve them. For example, WPCU collected more than 21,000 bags of rice in the last season getting K 200 million of loan from the Government. Because of low quality of rice produced in the Western Province, however, it seemed very difficult to find buyers. The staffs starved for securing new customers such as breweries and new target areas where rice is not produced. As the results, they are getting gradually some hopeful prospect. Another example is that they are going to start the operation of a mango juice factory which were idle for several years. This factory was transferred to WPCU from ZAMHORT in 1990, and WPCU has been continued rehabilitating the factory and getting the operating fund. The factory is supposed to start its operation this coming fall. If it is actually carried out, that will be a big present to the farmers residing the plain edge for they are wasting quite a lot of high quality mango fruits because of lack of marketing measures.

Mongu District Cooperative Union (MDCU) has 29 PCSs as its affiliates. MDCU is facing to serious deficit of operation capital and stopped its business on crops and cattle dealings since 1993. The activities of MDCU are restricted to supplying consumer's goods and some of agricultural materials such as seeds, fertilizers and spare parts and so on and served to only 12 PCs among 29 affiliates. DCUs have to be encouraged and strengthened because they are situated very close to farmers and they are also acquainted with farmers' real states.

PCSs are also facing various difficulties caused by limited operational capital, lack of own transport, absence of own infrastructure and so on. Among 29 PCSs, the number of having turnover is 14, and those which turnover exceed K 100,000 are only three. Eight of them have already "Eaten Up" their share capital and their businesses are completely stopped. In the Study Area, six PCSs are located including three which are in Mongu township. Three in the Wards are KUUSO in Limulunga, Namushakende and Sefula PCSs. The Sefula already stopped its activities. The Namushakende is not so active and turnover is not reported. Under such circumstances, the activities of KUUSO can be said distinguished. KUUSO was established in 1991 by 39 members with share capital of K 14,200. Now members increased to 62 and the

share capital grew up to K 92,600. KUUSO has its own shop in the Limulunga Market and is dealing with mainly consumer's goods and some of agricultural materials. The turnover in 1992 was about K 4.5 million and in 1993 it exceeded K 12 millions. The members have strong desire to expand the business and they are, at the same time, intending to organize agricultural production activities getting oxen and ploughs when enough share capital were accumulated. KUUSO's activities should be disseminated broadly as an excellent example.

## (2) Marketing of agricultural products

In the Study Area, there are some marketing facilities owned by District Council in the township. Regional marketing are carried out based on these marketing facilities. The largest market located in Mongu, the capital of western Province, is always crowded with many people. Other markets are in Limulunga, Namushakende and Sefula, which are also owned by District Council.

The Study Area is far from Lusaka, Capital of Zambia, and does not have enough roads connecting to other regions. Marketing agricultural commodities are mostly raw materials for there are few notable processing industries in the Area.

Main marketing goods are maize, mealie meal and rice as cereal, catfish, tiger fish and tilapia as aquatic products, tomato, Chinese cabbage etc. as vegetables, live chicken and eggs as animal products. As vegetables for marketing are produced little, various kind of vegetables such as onion, cabbage, okra, green pepper and so on are imported mainly from Mumbwa and at times from Lusaka. Beeves are processed at the large slaughter and cold storage plant in the Mongu township which are mainly sent to Copperbelt and Lusaka, but a part of them are retailed to the local people. In townships, beeves are produced by small slaughter houses located in the area to be sold at meat shops to the residents.

Marketing places in the Study Area are limited in the townships because of poor road condition and insufficient infrastructure.

In the Mongu District where the Study Area is included, 1,485 MT of rice and 17 MT of maize were dealt in 1993 according to the data of Department of Marketing and Cooperatives. These data were calculated from the amounts dealt by 4 large firms, WPCU, ZCF, CUSA and Lima Bank. But these data do not include the amounts treated by the private dealers, although marketing volume by the private dealers is increasing after introduction of the free market system from 1993 by the Government. The mealie meal volumes of 1,528 MT in 1990 and 941 MT in 1991 sent from Mulambwa Harbour to the other District on the opposite side of Zambezi River by Ministry of Communication and Transport are also not included in those data.

Since the amount of maize produced in the Mongu District as staple food is not sufficient to feed the total population, and at the same time, as there is a large maize milling plant in Mongu township, a great deal of maize is imported from neighboring Kaoma District, where maize

production (27,743 MT in 1992/93) is the largest in the Western Province and from where the road to Mongu is good enough to transport the commodities. Incidentally, the marketed amount in Kaoma District in 1993 was 13,684 MT.

The amount of rice produced in the Mongu District (2,987 MT in 1992/93) is the largest among the districts in the Western Province, and a great deal of which is delivered to other Districts and Provinces. However, the quality of the polished rice is very low at present and WPCU, the largest processor and dealer of polished rice, is facing difficulties for selling the polished rice and a large quantity of them is kept in the warehouse of the Union. (Annex-Table III.4.1, Table III.4.2)

There is a large cashewnut processing plant in the Study Area. Cashewnut production is one of the important industries promoted by the Government in the Area. Harvested raw materials are processed by this large plant, which has a processing capacity of 1.5 MT/day. A large quantity of processed cashewnut (12.6 MT in 1993) are delivered to Lusaka and exported to other countries especially to Europe. (Annex-Table III.4.3)

Mango fruits are produced and marketed in the Study Area. However, those are consumed in the residents near the places produced and are not treated as commercial products in order to sell at the market. Mango juice processed by juice plant was transported to sell to Lusaka till a few years ago. Operation of this plant is suspended for the shortage of operating hours and low productivity mainly caused by short harvesting period.

In the Study Area, cattle grazing is flourishing. Approximately 70 percent of the meat processed by the large scale slaughter and cold storage plant in Mongu is sold to Copperbelt Province and Lusaka, the Capital. Some private dealers and graziers are becoming sellers of live cattle directly to the Lusaka Market under favor of introducing the free market by the Government. As a result, Zambia Cold Storage Corporation Ltd., who owns the large scale cold storage plant, is confronted with difficulties to collect sufficient cattle in order to continue regular business.

On the inland fishery, fishes caught in Zambezi River are mostly sold at the harbour and/or markets in the townships in the Study Area. Some K 80 million of fresh fish and K117 million of dried fish are transacted in Mongu according to the 1993 data issued by Department of Fishery, Mongu. (Annex-Table III.4.1)

#### **3.4.4 Agricultural Financing**

The principal agricultural financing organization in Zambia are Zambian Cooperative Federation Financing Service (ZCFFS), Lima Bank, Zambian National Commercial Bank and Credit Union and Saving Association of Zambia (CUSA). The branches of all of those organizations are located in Mongu township, but the areas under their charge are different respectively. ZCFFS is responsible to Mongu, Kaoma, Lukulu and Kalabo, Lima Bank to Mongu, Senanga and Kalabo

and CUSA to Mongu, Kaoma, Lukulu and Kaoma. Commercial Bank is mainly operating in Mongu.

They prepare three types of loan for farmers. Those are classified into short term credit, medium term loan and long term loan. Short term credit is disbursed for getting agricultural materials such as seeds, fertilizers, insecticides and so on which are used seasonally. Medium term loan is lent for the purpose of procuring stock feeds, spare parts and poultry etc. within the period of 18 months. Long term loan is given for purchasing assets which are depreciable for the period exceeding 18 months. In cases of borrowing medium term and long term, as the borrowers are required tangible mortgage, small farmers who can't prepare appropriate assets are impossible to get those loans.

ZCFFS disburses to the farmers through the affiliated PCSs, CUSA through the affiliated Credit Unions. Although Lima Bank disburses credits and loans directly to the farmers, it's not to the individual but to the farmers' group in the cases of small farmers who do not own tangible mortgage. The Bank requires farmers to set up an organization consisted of an Executive Committee and two subcommittees, the Disciplinary and Crop Inspection, getting assistance of Camp Extension Officer. The Bank lends to the group up to K500,000 as short loan on mortgage of harvest under the guarantee of CEO. Even in these ways, to get the loans for middle term and long term is almost impossible for small farmers.

Among the credit and loans mentioned above, the short term loan (seasonal credit) is most important, at this moment, because it is almost only way to get loan in order to improve the farming of small scale farmers. The brief of disbursement and recovery by three financing organization is shown in Table 3.4.7.

**Table 3.4.7 Seasonal Loans Disbursement & Recovery by Principal Financing Institute**

	ZCF Finance		Lima Bank		CUSA
	West.Prov.	Mongu Dist.	Branch Total	Mongu Dist.	West.Prov.
'91 Disbursement	16,803,821	488,298	5,126,413	1,675,088	30,870,180
'91 Recovery	3,226,334	495,073	5,376,306	2,240,344	2,968,190
Recov. Rate	15%	101%	105%	138%	10%
Interest Rate	19%	79%	39%	39%	20%
'92 Disbursement	5,433,824	259,705	7,156,358	2,372,497	20,130,293
'92 Recovery	3,695,000	72,336	6,279,265	2,583,306	4,225,606
Recov. Rate	68%	28%	87%	109%	21%
Interest Rate	50%	20%	43%	43%	40%
'93 Disbursement	70,170,535	82,321,800	41,466,457	24,363,169	302,551,170
'93 Recovery	42,542,627	9,100,000	26,319,770	13,159,885	54,333,802
Recov. Rate	60%	111%	63%	54%	18%
Interest Rate	36%	75%	47%	47%	47%

Note: The Amounts of Recovery include the Repayment of Preceding Year.

Through years, the total amounts of disbursement seem to be in expanding trend. The recovery rates are, however, very low in general, though the amounts of recovery exceed those of disbursement in some cases for repayments of preceding year are included and inseparable in those cases.

Because of poor recovery, the financing organizations are also facing shortage of lending funds and interest rates are fluctuating day after day in a great deal. The circumstances are getting worse and getting loan by small farmers is becoming difficult much more. This is also one of the serious problems to be solved urgently.

### **3.5 Land Tenure**

#### **3.5.1 Land Tenure in Zambia**

##### **(1) Land Laws and Customary Law**

During the colonial time, the land in Zambia was classified into Crown Land (the land reserved for white settlement) and Reserves (the land for natives). After the independence in 1964, the Crown Land has been changed to the State Land which has been put under the control of the Government. In addition the land holding under freehold and leasehold has been recognized. After the Land (Conversion of Titles) Act in 1975, the land holding under freehold has been abolished.

Although there are several land laws in Zambia such as the Zambia (State Lands and Reserves) Orders, 1928 to 1964; the Zambia (Trust Land) Orders, 1940 to 1964; and the Land (Conversion of Titles) Act in 1975, the land holding based on the African Customary Law has been widely recognized by the Government due to existence of customary land tenure system in the country.

The basic principle of land holding in Zambia is that no person can own land. What a person can own is an interest in land such as growing crops, house or other developments which are on the land. A person can occupy land either according to the customary law or by obtaining leasehold title deed.

##### **(2) Planned Land Tenure Reforms**

The ASIP (Agricultural Sector Investment Programme) includes the sub-program for land tenure reform to address the current inadequacies in the delivery of land titles. All land laws are being reviewed, the artificial distinction of Reserve and Trust Land is being abolished and more rural areas will be opened up with a view to further expanding the commercial farming frontier by incorporating traditional farmers into the commercial farmers.

#### **3.5.2 Traditional Land Tenure in Western Province**

Western Province has a long history of Lozi Kingdom which ruled the Barotseland. Even during the colonial time, the Western Province (formerly called Barotseland) was not affected by the policy of Colonial Administration due to the agreement signed between the British Government and the Litunga (the king of Barotseland) in 1924. Western Province remained under traditional tenure even after independence in 1964. The Land (Conversion of Titles) Act in 1975 placed all land in Zambia under the President. However, little has been changed concerning ownership and distribution of land in Western Province.

In Lozi tradition, the king (nowadays the king is called the Paramount Chief) has been regarded as the owner and distributor of the land. The Lozi king is called the "Litunga" which means land

or earth. Land is allocated by the Litunga, who is the head of 5 Royal Establishments, to Area Chiefs or Silalo Indunas who allocate the land to the village headmen. Each village headman portions the land to the household heads who re-allocate the land to their household members. Once the land is allocated by the king to a man, that man owns the right to be protected against all encroachment on this land, by anyone, including the king, and he passes this right to his heir.

According to the Lozi tradition, the land tenure can be classified into (i) Ngwesi or king's own land; (ii) Mubu wa Luu or land of title; (iii) Mubu wa Lusika or family land; and (iv) Mulala Mbuwa or unused land under the control of the king. The land of title can be utilized by the incumbent of a title as if the land is his own while he holds the title. If he is promoted, discharged or dies, they pass to the person next appointed to the title. The family land is attached to a homestead and in general it can only be worked by residents of the homestead. (M. Gluckman, 1968).

### **3.5.3 Land Tenure in the Study Area**

#### **(1) Land Tenure System**

The land in the Study Area can be classified, in terms of land tenure, into family land, public land, church land and leasehold title land. The greater part of the Study Area fall on the category of the family land.

The public land is the land for government institutions such as government offices, public markets, rural health centres, schools, farm institutes, etc.

The church land is the land in Sefula covering approximately 60 ha which was given by the Litunga (Lewanika) when the Paris Evangelic Missionary Society came to the Barotseland in 1885.

The estate owned by Zambia Cashew Company Ltd. can be classified as the leasehold title land. The estate is located at Mabumbu Ward covering 1,900 ha, a large part of which is located outside the Study Area and only a small portion (less than 10%) is located within the Study Area.

The family land is usually owned by each family in strips parallel to one another and at right angles to the plain edge. The ownership of these family land is secured under the traditional custom as far as one remains in the village. The tenant farmer is virtually non-existent in the sense that although some non-Lozi people borrow the land from Lozi people, they do not share their cropping nor pay any amount of money for the land.

A woman is given land by her father when she grows up and she can retain rights to this land when she leaves the village on marriage. After she goes to settle at her husbands home, her



husband has to give her land. She may work her old land if it is sufficiently close and the produce from her own land is absolutely hers. If her land is quite far from her husband's village, she will ask her father, brothers or other relatives to retain the land for her. If she is divorced or widowed, she may return to her village and claim either her old land or other land in lieu of it. If a widow stays with her children at her former husband's village, the land she works is not hers but that of her children, granted to them directly by their father. (David U. Peters, 1960)

## (2) Administration of Family Land

The village has been the basic territorial administrative unit among Lozi. These villages usually consist of related families under a headman normally chosen from the various family heads. The land has been usually allocated to the village through the village headman who allocates the land to each family head.

It can be observed in the Lozi land tenure system that there are two different kinds of rights on the land, i.e. rights to administer the land and rights to work it (M. Gluckman, 1968). Every member of a family has a right to work on the land, while the family head has a right to administer the land and passes the right to his heir. When the family head dies, one main heir inherits the most part of the wealth.

The Lozi are considered to be patrilineal in the sense that the man has the legal right to children and that it is preferred that succession goes to a man's son. However, succession to a daughter is also taken place when sons are younger than their sister. Although the land is administered by the household head, all the household members including relatives who are living together have the right to work on their land.

## (3) Issues on Land Tenure System in the Study Area

The following are the issues identified on the land tenure system in the Study Area.

### 1) Unclear land boundaries

Boundaries of family land are not clearly recorded. It is reported that the land disputes often occur among land holders due to unclear land boundaries. It will be necessary, therefore, to improve the land registry system.

### 2) Land titling

Land titling is not practiced in the Study Area, except small town areas in Limulunga and Namushakende, and the estate of Zambia Cashew Company Ltd in Mabumbu. Therefore, the land can not be utilized as the collateral for the credit. Improvement in land registration and titling will lead to easier access to the institutional credit. Application for land titling can be applied through Mongu District Council to Royal Court at Lealui. After

obtaining the Litunga's approval, the land survey will be made by the Land Department.

### 3) Land classification

Land classification survey is not carried out in the Study Area. Land survey and classification for determination of alienable and disposable lands will greatly be useful for the development planning in the Study Area.