社会開発調査部報告書

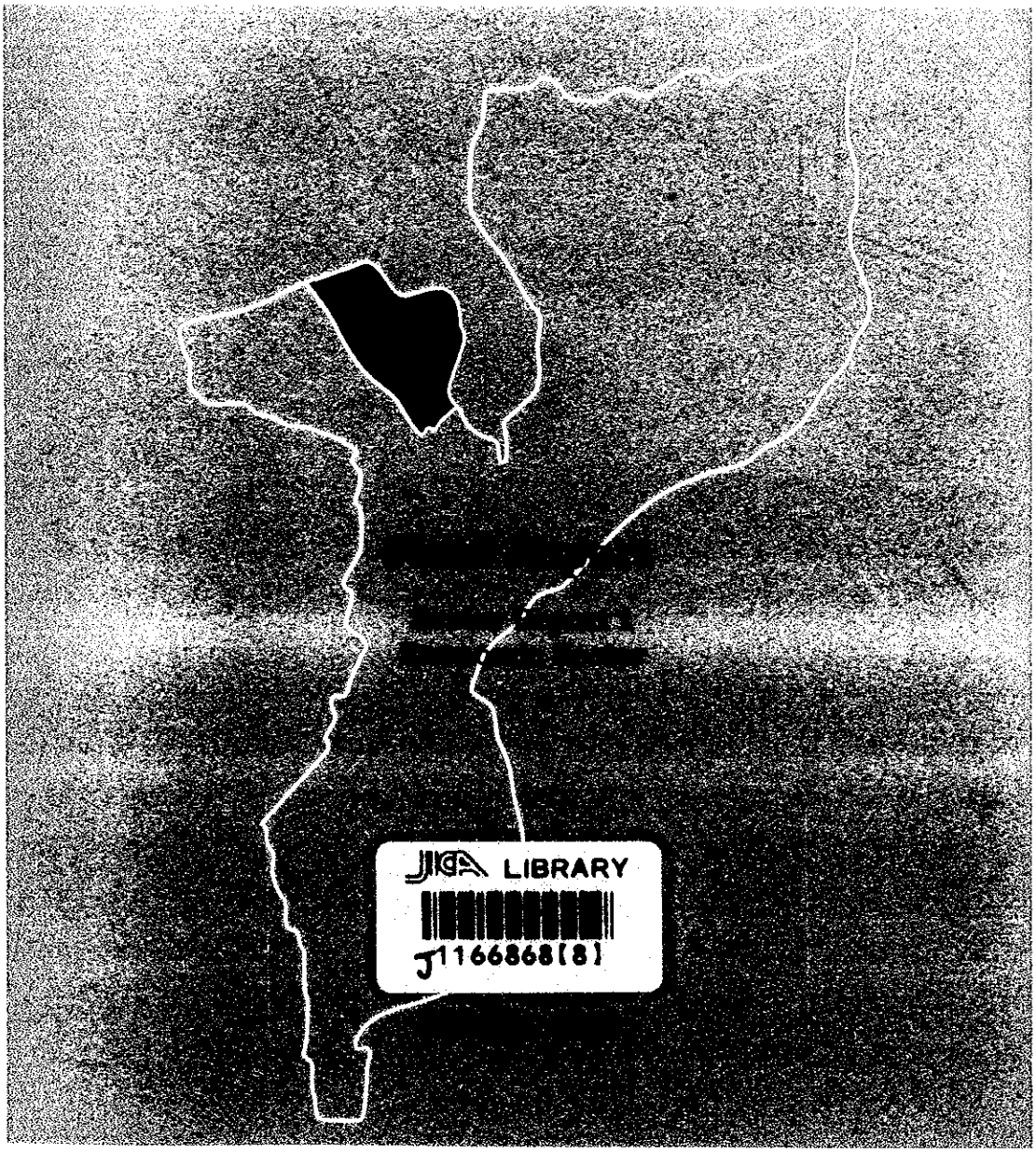
No. 49

Japan International Cooperation Agency (JICA)

Zambezi Valley Development Authority

The Republic of Mozambique

The Study on the Integrated Development Master Plan of the Angonia Region in the Republic of Mozambique



RECS International Inc.
Sanyu Consultants Inc.

The Study on the Integrated Development Master Plan of the Angonia Region in the Republic of Mozambique
Sector Report 1
Economic Sector
October, 2001
Japan International Cooperation Agency

Japan International Cooperation Agency (JICA)

Zambezi Valley Development Authority
The Republic of Mozambique

The Study on the Integrated Development Master Plan of the Angonia Region in the Republic of Mozambique

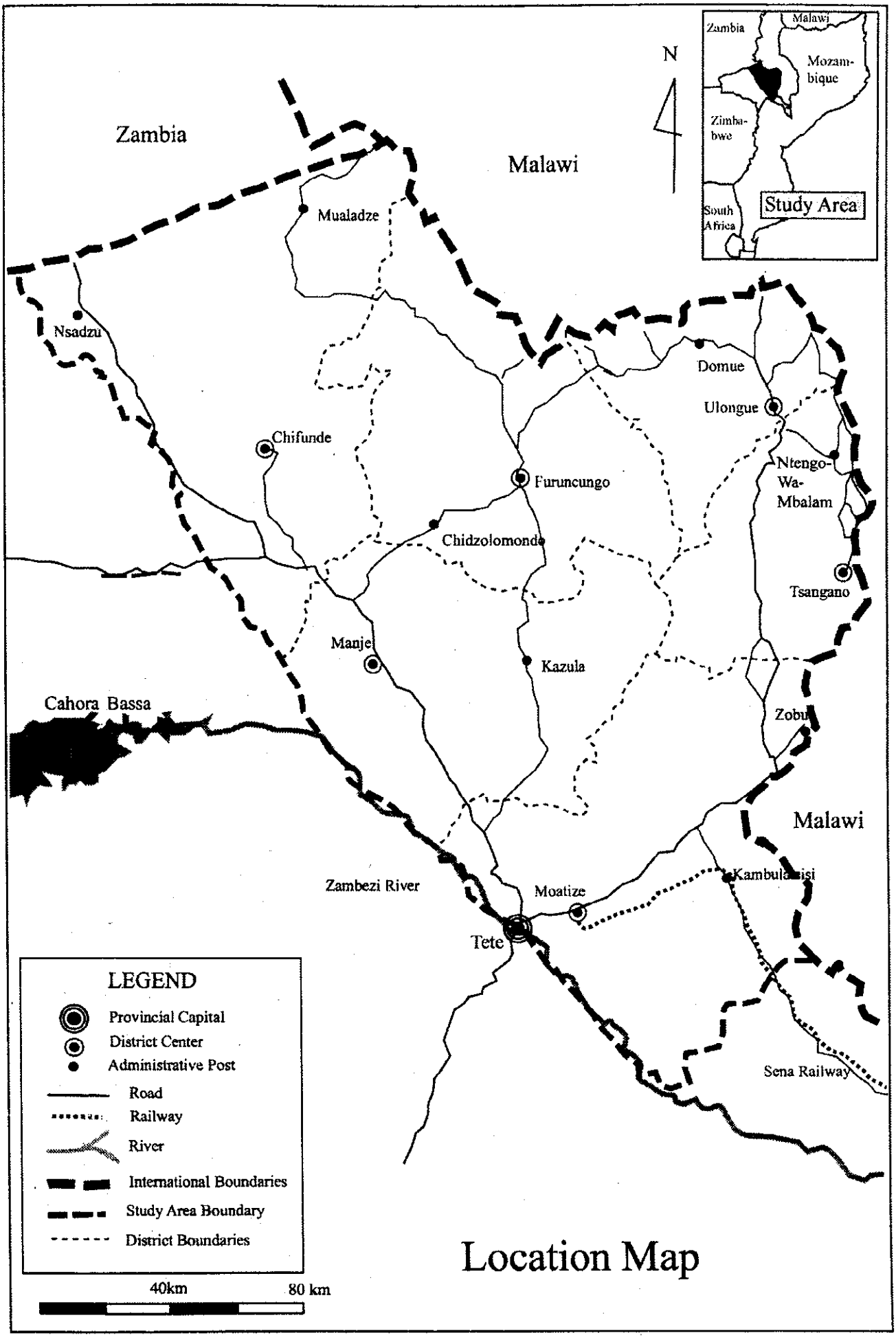
Final Report
Sector Report 1
Economic Sector

October, 2001

RECS International Inc.
Sanyu Consultants Inc.

List of Reports

Volume I	Executive Summary Report
Volume II	Master Plan Report
Volume III	Sector Report 1: Economic Sector
	(1) Agriculture
	(2) Mining
	(3) Industry and Small and Medium Business
	(4) Trade and Services
Volume IV	Sector Report 2: Social Sector
	(1) Education and Training
	(2) Public Health Development
	(3) Community Development and Participatory Approach
Volume V	Sector Report 3: Environment
Volume VI	Sector Report 4: Infrastructure
	(1) Transportation
	(2) Telecommunication
	(3) Energy
	(4) Water Resources
Volume VII	Sector Report 5: Administration, Finance and Institutions
Volume VIII	Project Report
	(1) Project Profiles
	(2) In-Depth Studies


Zambia
Malawi
N
Zambia
Malawi
Mozam-
bique
Zimba-
bwe
South
Africa
Study Area
Mualadze
Nsadzu
Domue
Ulongue
Chifunde
Furuncungo
Ntengo-
Wa-
Mbalam
Chidzolomondo
Tsangano
Manje
Kazula
Cahora Bassa
Zobue
Malawi
Zambezi River
Moatize
Kambulamisi
Tete
Sena Railway
LEGEND
Provincial Capital
District Center
Administrative Post
Road
Railway
River
International Boundaries
Study Area Boundary
District Boundaries
40km
80 km
Location Map

Abbreviations

ADM	Airport Authority of Mozambique
ADP	Accelerated Demining Program
ADPP/DAPP	Development Aid from People to People
AIDS	Acquired immune deficiency syndrome
ANE	Road Authority
ARA	Regional Administration of Water
ARC	Action for the Rights of Children
ASPS	Agricultural sector program support
BAD	African Development Bank
BADEA	Arab Bank for African Development
CAIA	Agro-Industrial Complex of Angonia
CCAP	Church of Central African Presbyterian
CCF	Cease-fire Commission
CFM	Port and Railway Authority
CIDA	Canadian International Development Agency
CIDAC	Centro de Informação e Documentação Amílcar Cabral (Amílcar Cabral Center of Information and Documentation)
CIDC	Canadian International Demining Center
CPI	Investment Promotion Center
DANIDA	Danish International Development Assistance
DAs	District Administrators
DNA	National Directorate of Water
EDM	Electricity of Mozambique
EIA	Environmental impact assessment
FRELIMO	Mozambique Liberation Front
GDP	Gross domestic product
GNP	Gross national product
GPZ	Gabinete do Plano de Desenvolvimento da Região do Zambezi (Zambezi Valley Development Authority)
GRDP	Gross regional domestic product
HALO Trust	Hazardous Area Life-Support Organisation Trust
HCB	Cahora Bassa Hydropower Corporation
HI	Handicap International
HIV	Human immuno-deficiency virus
IDB	Inter-American Development Bank
IDPs	Internally displaced persons
IMF	International Monetary Fund
INE	Institute of National Statistics
IRC	International Rescue Committee

ISCOS	Istituto Sindacale per la Cooperazione allo Sviluppo
IVA	Value added tax
JCI	Japan Consulting Institute
JICA	Japan International Cooperation Agency
LAM	Mozambique Air Lines
LWF	Lutheran World Federation
MARD	Ministry of Agriculture and Rural Development
mCel	Mozambique Cellular
MEDDS	Mechem Explosives and Drug Detection System
MIAF	Mozambique National Household Survey on Living Conditions
MICOA	Ministry of Environmental Action Coordination
MINED	Ministry of Education
MIPF	Ministry of Planning and Finance
MLTC	Mozambique Leaf Tobacco Company
MMRE	Ministry of Mineral Resources and Energy
MOH	Ministry of Health
MOTC	Ministry of Transport and Communications
MPF	Ministry of Planning and Finance
MPWH	Ministry of Public Works and Housing
MTLC	Mozambique Tobacco Leaf Company
NACP	National AIDS Control Program
NDI	National Demining Institute
NGO	Non-government organization
NHS	National Health System
NMCC	National Mine Clearance Commission
NORAD	Norwegian Agency for International Development
NPA	Norwegian People's Aid
NRC	Norwegian Refugee Council
OD	Origin-destination
ODA	British Overseas Development Administration
ONG	National Directorate of Geology
ONUMOZ	United Nations Operation in Mozambique
OPEC	Organization of Petroleum Exporting Countries
PAR	Participatory action research
PARPA	Action Plan for Reduction of Absolute Poverty
PHC	Primary health care
PLA	Participatory learning and action
PRA	Participatory rural appraisal
PROAGRI	National Program of Agrarian Development
RA	Rural appraisal

RENAMO	Mozambique National Resistance
RRA	Rapid rural appraisal
S/W	Scope of work
SAC	Survey Action Center
SCS	Special Clearance Services
SIDA	Swedish International Development Agency
SLP	Sena line program
TDM	Telecommunications of Mozambique
UNDAF	United Nations Common Development Assistance Framework
UNDP	United Nations Development Program
UNHCR	United Nations High Commission for Refugees
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UNOHAC	United Nations Office for Humanitarian Assistance Coordination
WVI	World Vision International
ZMM-GT	Zambezi-Malawi-Mozambique Growth Triangle

The Study on the Integrated Development Master Plan of the Angonia Region

Sector Report 1: Economic Sector

Part 1: Agriculture

Contents

List of Tables

List of Figures

Sector Report 1: Economic Sector

Part 1: Agriculture

Chapter 1. Agricultural Policies, Programs and Institutions

The agricultural sector in Mozambique was devastated by the civil war, but started to recover quickly as refugees returned and restoration progressed, supported by international aid organizations and NGOs. National production of the staple maize, for instance, dropped only to 13,000 tons with the average yield of 0.5 ton/ha in 1991-92, but recovered to 764,000 tons with the 1.3 ton/ha yield on an average already in 1995-96 (Table 1.1). This was supported by the previous administration (1994-99), which adopted market-oriented, open economy policy under the structural adjustment program supported by IMF and the World Bank.

Particularly for the agricultural sector, the main policy thrust was to give incentives to small farmers through improvement of access to agricultural input and support services, while pursuing slow and moderate liberalization of market and prices for agricultural commodities. Specifically, the following were aimed at:

(1) to expand food crop production,
(2) to reduce food aid by donors,
(3) to attain stable supply of food and increased income in both rural and urban areas,
(4) to restore the export of agricultural commodities to the 1980 level,
(5) to supply raw materials for domestic agro-processing industries, and
(6) to prevent environmental degradation induced by population pressure.

The Government introduced in 1998 the five year agricultural development plan (PROAGRI 1998-2003), supported by the World Bank. It is a public sector investment plan to support sustainable and equitable development in rural areas through infrastructure development, resources management, support services strengthening, and institutional development. This plan represents the basic policy for the agricultural sector in Mozambique.

PROAGRI adopts the development of various agricultural activities by the family sector as the main thrust to attain the four objectives: (1) poverty alleviation, (2) food security, (3) employment generation, and (4) balance of payment improvement. PROAGRI represents the application of the sector approach to the Mozambique agriculture through donor coordination. Accordingly, the DANIDA assistance for agricultural development in Tete province, implemented since 1985, has been transformed into a provincial program of the agricultural sector program support (ASPS).

Table 1.1. Maize Production and Havested Area in Mozambique

Provincial		1990 - 1991	1991 - 1992	1992 - 1993	1993 - 1994	1994 - 1995	1995 - 1996	1996 - 1997	1997 - 1998	1998 - 1999	*1999 - 2000 (Plano)*
Cabo D.	**Havested Area**	388	499	1,730	2,597	2,744	2,682	-	148,045	111,980	119,922
	Production	200	150	3,884	7,214	2,977	3,362	1,533	65,034	111,654	83,245
	Yield	515	301	2,245	2,778	1,085	1,254	-	439	997	694
	Share in Mozam.	0.95%	1.17%	10.85%	7.72%	3.74%	0.44%	0.17%	7.00%	10.09%	11.17%
Niassa	**Havested Area**	1,057	567	448	809	1,241	83,549	102,152	104,094	101,561	-
	Production	1,533	633	538	951	1,729	72,630	97,077	98,877	96,917	-
	Yield	1,450	1,116	1,201	1,176	1,393	869	950	950	954	-
	Share in Mozam.	7.32%	4.93%	1.50%	1.02%	2.17%	9.51%	10.50%	10.64%	8.76%	-
Nampula	**Havested Area**	3,627	3,823	2,691	3,301	1,758	2,039	-	-	205,407	-
	Production	2,780	2,712	2,451	3,109	1,833	89,700	85,902	57,608	-	196,383
	Yield	766	709	911	942	1,043	43,992	-	-	-	-
	Share in Mozam.	13.27%	21.12%	6.85%	3.33%	2.30%	11.75%	9.29%	6.20%	-	0
Zambez.	**Havested Area**	1,246	1,336	1,081	6,936	7,993	323,301	325,487	308,701	308,701	308,701
	Production	851	1,985	1,825	6,936	8,352	334,376	325,073	313,720	313,720	313,720
	Yield	683	1,486	1,688	1,000	1,045	1,034	999	1,016	1,016	1,016
	Share in Mozam.	4.06%	15.46%	5.10%	7.42%	10.50%	43.78%	35.17%	33.75%	28.35%	0
Tete	**Havested Area**	2,524	1,861	1,598	1,328	1,042	1,780	293,440	-	-	-
	Production	3,907	2,230	2,274	1,619	2,926	3,702	2,828	-	-	-
	Yield	1,548	1,198	1,423	1,219	2,808	2,080	10	-	-	-
	Share in Mozam.	18.65%	17.37%	6.35%	1.73%	3.68%	0.48%	0.31%	-	-	-
Manica	**Havested Area**	7,352	5,529	4,077	4,524	4,544	4,544	190,875	192,288	201,302	-
	Production	3,324	252	7,396	9,487	5,997	5,997	174,300	77,440	88,250	21,000
	Yield	452	46	1,814	2,097	1,320	1,320	913	403	438	-
	Share in Mozam.	15.87%	1.96%	20.67%	10.15%	7.54%	0.79%	18.86%	8.33%	7.97%	0
Sofala	**Havested Area**	3,215	2,836	1,305	1,040	354	5,099	89,838	-	-	-
	Production	591	553	1,571	55,071	46,482	179,242	83,584	108,197	114,113	115,500
	Yield	184	195	1,204	52,953	131,305	35,152	930	-		
	Share in Mozam.	2.82%	4.31%	4.39%	58.94%	58.41%	23.47%	9.04%	11.64%	10.31%	0
Inhamb.	**Havested Area**	368	262	77	194	104	143,125	157,362	158,340	163,413	179,760
	Production	299	247	162	159	55	54,098	47,215	77,590	86,609	90,356
	Yield	813	943	2,104	820	529	378	300	490	530	503
	Share in Mozam.	1.43%	1.92%	0.45%	0.17%	0.07%	7.08%	5.11%	8.35%	7.83%	0
Gaza	**Havested Area**	3,427	2,848	3,389	2,923	4,787	11,397	168,749	118,904	193,716	201,300
	Production	2,988	984	8,406	4,108	4,587	16,628	106,892	104,703	164,662	186,200
	Yield	872	346	2,480	1,405	958	1,459	633	881	850	925
	Share in Mozam.	14.26%	7.66%	23.49%	4.40%	5.76%	2.18%	11.56%	11.26%	14.88%	0
Maputo	**Havested Area**	5,527	6,086	2,281	4,073	12,589	6,019	-	72,576	66,913	69,949
	Production	4,475	3,095	7,278	4,774	4,641	3,977	-	26,404	50,170	52,762
	Yield	810	509	3,191	1,172	369	661	-	364	750	754
	Share in Mozam.	21.36%	24.10%	20.34%	5.11%	5.83%	0.52%	-	2.84%	4.53%	7.08%
Nacional	**Havested Area**	28,731	25,647	18,677	27 725	37,156	583,535	1,327,331	1,102,948	1,386,329	570,931
	Production	20,948	12,841	35,785	93,428	79,579	763,712	924,404	929,573	1,106,629	745,446
	Yield	729	501	1,916	3,370	2,142	547,160	1,310,240	996,650	1,268,599	547,777
	Associa.	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: Nas campanhas 90-91, 91-92, 94-95, 95-96 as áreas são semeadas.

Source: Depto. Estatística, *MAP/DE/Depto. Estatística/Sector Plano Elaboração: MAP/DE.*

Chapter 2. Existing Conditions of Agriculture

2.1. Agricultural Sector in Mozambique

2.1.1. GDP and employment

Agriculture has been the mainstay of the Mozambican socio-economy. After he civil war ended in 1992, the agricultural sector recovered more rapidly than other sectors, and the contribution of the sector to the GDP reached 35% in 1996. It started to decline as other sectors recovered and started to develop, and the agricultural sector accounted for 32% of the GDP in 1999. The contribution of the sector to the Mozambican socio-economy is much larger than it appears from the GDP share. The agricultural sector employed 78% of the total national labor force in 1997. In rural areas, over 90% of all employed engaged in agriculture and even in urban areas, some 30% are employed in agriculture.

The agricultural sector in Mozambique is dominated by crop production. Production value of crop cultivation has been estimated by major crop as shown in Table 1.2.

Table 1.2. Estimation of Production Value by Crop in Mozambique, 1998

Crop	Production (ton)	Price (Mt. thousand/ton)	Production value (Mt. billion)
Maize	1,106,629	1,500	1,660
Beans	234,253	3,300	773
Rice	236,130	2,500	590
Cotton	77,846	3,200	249
Sugarcane	114,156	147	7
Vegetables	66,134	2,095	139
Cassava	3,543,532	1,446	5,124
Peanut	272,702	4,500	1,227
Mapira	212,627	2,140	455
		Total	10,224

Source: *Statistical Yearbook*, 1999.

Other crops include tobacco, sunflower, tea, cashew nut, and various fruits. Including these crops, the total production value of crops may be more or less Mt. 15,000 billion in 1998.

Livestock production value has been estimated based on livestock population and price data as shown in Table 1.3.

Table 1.3. Livestock Production Value in Mozambique, 1998

Crop	Population	Production (ton)	Price (Mt. million/ton)	Production value (Mt. billion)
Cattle	440,569	24,672	35.0	864
Goat & sheep	722,661	7,227	35.0	253
Pig	265,219	11,896	27.5	327
Poultry	4,000,000*	18,003	38.0	684
	(*rough estimate)		Total	2,128

Source: ibid. for population and prices.

Including other livestock products such as hides and skins, milk and eggs, the total livestock production value may be more or less Mt. 2,500 billion in 1998.

The total production value of crops and livestock is estimated to be Mt. 17,500 million in 1998. Considering relatively labor-intensive practices dominant in Mozambique, this may be converted to the total value-added of Mt. 14,000 million. Including fishery and forestry activities, the total value-added of the agricultural sector in Mozambique is estimated to be Mt. 15,000 million, which correspond to 32% of the GDP in 1998, Mt. 46,427 million in current 1998 prices.

2.1.2. Production performance

Crop production in Mozambique increased generally at high rates in recent years. Maize production recovered rapidly after the civil war as seen already, and increased further by 45% between 1995-96 and 1998-99, representing an annual average increase at 13%. Production performance of several crops is summarized in Table 1.4.

As seen from Table 1.4, following the recovery period from the civil war, both harvested area and production increased at very high rates for all the crops shown between 1995-96 and 1998-99. During this recent period, yields generally declined except for vegetables, presumably because the cultivated area expanded into less productive land. Recent yield levels are generally much lower, except again for vegetables, than yields during the restoration period. This is because the enterprise sector recovered first and reported their production performance while the family sector was slow to recover and also evaded the statistics.

2.1.3. Food production and consumption

Maize is the staple crop for most Mozambique people. The per capita consumption of maize in Mozambique, however, is only slightly over 50kg/year, much lower than consumption levels in neighboring countries of South Africa, Zimbabwe, Malawi, and Zambia, where the per capita consumption is 100kg/year or larger (Table 1.5.). On the other hand, the per capita consumption of cassava in Mozambique is over 200kg/year while that in the neighboring countries is much smaller.

Table 1.4. Harvested Area, Production and Yield of Selected Crops in Mozambique

Crop	Indices	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	Average annual increase 1995-96~1998-99 (%)
Maize	Harvested area (ha)	18,677	27,725	37,156	583,535	1,327.903	1,102,948	1,386,329	33.4
	Production (ton)	35,785	93,428	79,579	763,712	924,404	929,573	1,106,629	13.2
	Yield (ton/ha)	1.92	3.37	2.14	1.31	0.0	0.84	0.80	–
Beans	Harvested area (ha)	2,913	3,235	5,361	226,438	347,586	335,035	487,615	13.229.1
	Production (ton)	2,925	2,665	3,393	139,280	133,433	199,327	234,253	18.9
	Yield (ton/ha)	1.00	0.82	0.62	0.62	0.38	0.59	0.49	–
Rice	Harvested area (ha)	4,281	4,833	8,407	106,853	142,530	148,977	243,931	31.7
	Production (ton)	8,297	27,641	14,929	199,577	236,814	225,579	236,130	5.8
	Yield (ton/ha)	1.94	(5.72)	1.78	1.87	1.66	1.51	0.97	–
Cotton	Harvested area (ha)	18,672	15,039	17,067	41,332	51,395	82,156	152,825	54.6
	Production (ton)	31,270	17,787	16,793	40,253	28,963	116,384	77,846	24.6
	Yield (ton/ha)	1.67	1.18	0.98	0.97	1.54	1.42	0.51	–
Sugarcane	Harvested area (ha)	4,709	4,760	3,375	6,090	–	–	–	–
	Production (ton)	243,661	234,004	379,856	239,187	179,748	270,930	114,156	–
	Yield (ton/ha)	51.7	49.2	(112.5)	39.3	–	–	–	–
Vegetables	Harvested area (ha)	2,317	3,115	1,575	3,838	5,471	6,699	5,612	13.5
	Production (ton)	21,217	21,713	7,285	25,261	33,275	52,422	66,134	37.8
	Yield (ton/ha)	9.2	7.0	4.6	6.6	6.1	7.8	11.8	–
Cassava	Harvested area (ha)	687	3,852	2,254	445,680	525,268	641,430	1,363,356	45.2
	Production (ton)	3,817	10,724	12,744	2,040,800	2,170,578	2,799,351	3,543,532	26.2
	Yield (ton/ha)	5.56	2.78	5.65	4.58	4.13	4.36	2.60	–
Peanut	Harvested area (ha)	830	1,675	1,740	150,001	306,573	270,627	439,077	43.0
	Production (ton)	544	1,586	905	101,840	131,522	128,099	272,702	38.9
	Yield (ton/ha)	0.66	0.95	0.53	0.68	0.43	0.66	0.62	–
Mapira	Harvested area (ha)	507	866	473	69,293	354,245	279,902	352,604	72.0
	Production (ton)	967	26,751	26,231	113,091	159,019	157,228	212,627	23.4
	Yield (ton/ha)	1.91	(30.9)	(55.5)	1.63	0.45	0.56	0.60	–

Source: *Statistical Yearbook*, 1999.

Table 1.5. Food Consumption per Capita per Year

(Unit: kg per person per Year)

Year	Wheat					Rice					Maize					Millet				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	11.3	64.8	29.5	6.3	12.7	7.1	11.1	2.3	2.5	1.2	49.4	102.4	122.4	141.6	138.5	1.6	0.2	8.2	0.9	2.5
1995	13.8	66.4	20.4	4.3	12.0	7.1	12.1	2.6	3.1	1.3	50.1	98.6	120.9	149.4	139.1	1.8	0.2	8.5	1.7	2.6
1996	13.0	68.1	30.8	7.7	12.6	7.9	12.5	1.5	4.4	2.6	54.8	101.7	122.1	144.8	141.8	2.2	0.2	7.3	1.9	2.6
1997	10.8	65.5	30.3	9.9	14.7	7.1	14.8	2.8	4.0	1.7	54.2	102.1	121.8	133.9	139.4	2.2	0.2	7.0	1.5	2.6
1998	13.1	71.5	29.9	7.1	14.7	7.8	13.2	2.8	3.9	0.7	53.9	95.9	122.0	136.5	136.2	2.6	0.2	4.6	1.7	2.6
Growth rate/yr (%)	3.00	1.99	0.27	2.42	2.97	1.90	3.53	4.01	9.30	-10.22	1.76	-1.30	-0.07	-0.73	-0.33	10.20	0.00	-10.92	13.56	0.79
Year	Sorghum					Cassava					Potatoes					Sweet Potatoes				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	9.0	3.8	5.0	0.9	2.9	187.2	0.0	11.5	23.0	71.5	4.3	26.6	2.4	26.1	1.3	3.2	1.5	0.1	0.0	6.0
1995	12.4	4.3	3.3	2.3	4.2	205.3	0.1	13.1	31.0	68.4	3.9	28.9	2.3	27.5	1.1	2.8	1.2	0.1	0.0	5.6
1996	12.3	4.2	4.8	2.7	2.8	217.1	0.1	12.9	48.9	70.2	4.1	31.5	2.4	50.4	1.3	2.9	1.0	0.1	0.0	5.8
1997	12.6	2.6	4.9	2.0	2.3	231.5	0.0	13.6	63.9	77.7	4.1	30.4	2.3	67.5	1.1	2.9	1.3	0.1	0.0	5.3
1998	15.0	2.5	5.2	2.0	2.3	233.4	0.0	13.8	72.9	88.4	4.2	28.8	2.2	113.4	1.3	2.9	1.1	0.1	0.0	5.1
Growth rate/yr (%)	10.76	-8.03	0.79	17.32	-4.53	4.51	-	3.71	25.95	4.34	-0.47	1.60	-1.73	34.15	0.00	-1.95	-6.02	0.00	-	-3.20
Year	Sugarcrops					Sweeteners					Pulses					Oilcrops				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	0.1	-	0.0	-	-	4.4	37.5	23.5	16.7	16.0	5.6	3.6	3.5	13.0	2.4	2.3	0.7	6.0	1.1	1.7
1995	0.1	-	0.0	-	-	4.2	36.6	24.3	17.0	14.4	7.4	4.0	3.7	12.0	2.1	3.9	1.2	5.1	1.1	1.8
1996	0.1	-	0.0	-	-	4.1	36.4	22.2	16.9	13.7	6.9	3.5	3.7	13.1	2.2	2.5	1.2	5.7	0.8	1.6
1997	0.1	-	0.0	-	-	4.0	37.1	22.7	16.3	13.7	7.3	3.5	3.5	12.8	1.6	3.1	1.1	7.6	1.1	1.7
1998	0.1	-	0.0	-	-	4.4	36.7	23.9	16.8	12.7	8.9	2.5	3.6	12.9	1.3	3.2	1.0	7.1	1.5	2.5
Growth rate/yr (%)	0.00	-	-	-	-	0.00	-0.43	0.34	0.12	-4.52	9.71	-7.03	0.57	-0.15	-11.54	6.83	7.39	3.42	6.40	8.02
Year	Vegetable oils					Vegetables					Fruit					Stimulants (Coffee, Cocoa, Tea)				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	6.8	12.1	6.9	2.1	2.5	7.8	47.5	11.6	24.4	30.2	16.9	35.3	14.5	46.1	11.7	0.2	1.2	0.5	0.1	0.1
1995	6.6	12.4	7.3	3.0	2.5	8.1	50.2	11.7	23.5	28.6	17.6	35.5	12.5	47.0	11.2	0.1	1.3	0.7	0.1	0.1
1996	7.1	12.2	7.6	3.9	2.6	8.5	48.3	11.7	24.1	29.4	18.3	41.6	15.8	47.1	11.5	0.2	1.2	0.6	0.1	0.1
1997	7.0	13.4	8.0	3.4	2.7	8.6	49.4	11.5	22.0	27.3	18.3	43.4	13.1	45.2	11.4	0.2	1.1	0.5	0.1	0.1
1998	6.6	13.1	8.2	3.6	2.5	8.7	47.8	10.8	22.1	25.6	18.3	37.3	10.9	44.6	10.7	0.1	1.1	0.7	0.1	0.1
Growth rate/yr (%)	-0.60	1.60	3.51	11.38	0.00	2.21	0.13	-1.42	-1.96	-3.25	1.60	1.11	-5.55	-0.66	-1.77	-12.95	-1.73	6.96	0.00	0.00
Year	Beef and Veal					Mutton and Goat					Pork					Poultry				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	2.2	16.7	4.4	1.5	5.4	0.2	4.4	1.0	0.4	0.3	0.7	3.5	0.9	1.2	1.3	1.9	12.5	1.5	1.4	3.0
1995	2.2	15.1	4.5	1.4	4.6	0.1	4.2	1.0	0.4	0.3	0.7	3.7	1.0	1.3	1.2	1.8	13.8	1.7	1.4	3.1
1996	2.1	13.6	4.5	1.7	4.7	0.1	4.3	1.1	0.5	0.3	0.7	3.5	0.9	1.1	1.2	1.8	13.4	1.9	1.5	3.3
1997	2.1	13.7	4.7	1.8	3.3	0.1	4.2	1.1	0.5	0.3	0.7	3.2	1.0	1.2	1.2	1.9	13.6	1.9	1.5	3.5
1998	2.1	13.4	4.6	1.7	3.2	0.1	4.1	1.1	0.5	0.4	0.7	3.3	1.0	1.1	1.2	1.9	12.7	2.0	1.6	3.7
Growth rate/yr (%)	-0.93	-4.31	0.89	2.54	-9.94	-12.95	-1.40	1.92	4.56	5.92	0.00	-1.17	2.13	-1.73	-1.59	0.00	0.32	5.92	2.71	4.28
Year	Milk					Eggs					Fish, Seafood					Calories (per day)				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	7.0	60.0	23.8	5.0	11.3	0.5	5.0	1.3	1.6	3.6	1.9	6.5	3.7	6.2	9.1	1,616	2,908	2,106	1,970	1,962
1995	6.3	71.8	24.7	3.9	10.1	0.6	5.3	1.6	1.6	3.6	2.1	8.8	3.8	5.6	9.0	1,752	2,930	2,027	2,061	1,941
1996	6.8	66.6	32.9	4.2	9.3	0.6	6.0	1.4	1.6	3.9	2.1	6.6	3.9	6.5	8.3	1,822	2,946	2,110	2,172	1,969
1997	6.2	71.2	41.9	4.3	7.2	0.6	5.7	1.2	1.6	4.1	2.1	8.0	3.5	6.7	8.3	1,847	2,971	2,164	2,114	1,962
1998	5.7	68.2	37.0	4.2	7.1	0.6	6.3	1.3	1.6	4.3	2.0	7.9	3.5	5.5	8.1	1,911	2,909	2,153	2,226	1,950
Growth rate/yr (%)	-4.03	2.60	9.23	-3.43	-8.88	3.71	4.73	0.00	0.00	3.62	1.03	3.98	-1.11	-2.37	-2.30	3.41	0.01	0.44	2.47	-0.12

Source: Food balance sheet FAO statistical databases (http://apps.fao.org/default.htm).

Per capita consumption of meat, milk and eggs is generally lower in Mozambique than in the neighboring countries. In 1998, the per capita consumption in Mozambique was smallest among the five countries for mutton and goat, pork and eggs, and the second smallest for meat and veal, poultry meat and milk. Consequently, the per capita calorie intake by Mozambique people averaged 1,911 cal/day in 1998, compared with 2,909 cal/day in South Africa, 2,226 cal/day in Malawi, 2,153 cal/day in Zimbabwe, and 1,950 cal/day in Zambia in the same year (Table 1.5).

2.1.4. Agricultural exports and imports

Export of agricultural products generally increased steadily in recent years. In terms of export value, however, a peak was reached in 1997 at US$172 million, and since then the export value of agricultural value has declined (Table 1.6). This is due to decrease in export volume of specialized export products such as fish and crustaceans, cereals and their products, sugar products, and tobacco. Only exception is edible fruits and nuts, including cashew nut, showing steady export performance in recent years.

Import of agricultural products is also generally increasing in recent years. It is dominated by cereals, which account for 43% of the total import value during 1995-99. Two other basic food products also have relatively large shares: sugar products for 12.0%, and animal fat and vegetable oils for 10.7%.

2.2. Existing Conditions of Agriculture in the Study Area

2.2.1. Natural conditions for agriculture

The Study Area has generally favorable natural conditions for agriculture. Rainfalls are comparatively large, ranging mostly in 600-1,000mm (Table 1.7 and Figure 1.1), soil conditions are reasonably good except susceptibility to soil erosion, and land is plentiful, mostly flat to gentry rolling. The pronounced dry season, however, prevents cultivation of most crops from June through October, and constrains livestock activities due to reduced availability of roughages.

Temperature is consistently high throughout the year in most part of the Study Area, which is considered a favorable factor for high productivity (Table 1.8). The monthly maximum ranges in 29-37°C and the monthly minimum is in the range of 16-24°C in Tete city. Another favorable natural condition for agriculture is the variance in altitude, which allows a wide variety of agricultural activities (Figure 1.2). In the Angonia plateau at an elevation ranging in 1,200-1,600 m, the climate is suitable for temperate agriculture such as vegetables and wheat cultivation and more productive livestock without tsetse flies.

Table 1.6. Value of Agricultural, Fishery and Forestry Trade

	1995 (US$'000)	1996 (US$'000)	1997 (US$'000)	1998 (US$'000)	1999 (US$'000)	Average ('95-'99 Ave.)	Distribution ('95-'99Ave.)	1995-99 Annual increase
(1) Import								
TOTAL MERCHANDISE TRADE	726,986	782,646	760,203	817,275	656,502	748,722		-2.02%
AGRIC.PRODUCTS TOTAL	168,545	178,118	185,128	222,572	141,224	179,117	100.0	-3.48%
FOOD AND ANIMALS	165,902	174,994	182,093	214,686	138,179	175,171	97.8	-3.59%
Live animals and products	7,498	7,689	13,580	25,289	12,269	13,265	7.4	10.35%
Live animals	796	708	2,326	4,738	1,544	2,022	1.1	14.17%
Meat and edible meat offal	1,394	1,058	1,664	3,004	1,446	1,713	1.0	0.74%
Fish and crustacean, mollusks and other aquatic invertebrate	1,627	1,376	3,271	10,414	6,549	4,647	2.6	32.12%
Milk and dairy products, eggs, natural honey	3,662	4,547	6,319	7,130	2,670	4,866	2.7	-6.12%
Products of animal origin	19	0	0	3	60	16	0.0	25.86%
Vegetable products	101,956	101,812	96,219	114,901	74,925	97,963	54.7	-5.98%
Edible vegetable and certain roots and tubers	8,687	3,219	3,953	5,087	2,594	4,708	2.6	-21.47%
Edible fruit and nuts, peel of citrus fruit or melons	346	352	991	1,025	314	606	0.3	-1.92%
Coffee, tea ,mate and spices	167	951	589	516	237	492	0.3	7.25%
Cereals	66,438	74,409	84,433	94,268	65,282	76,966	43.0	-0.35%
Products of milling industry	20,856	20,397	4,223	8,054	4,213	11,549	6.4	-27.38%
Oil seed and oleaginous fruit, miscellaneous grain seed and fr	3,938	1,675	1,674	5,455	2,157	2,980	1.7	-11.34%
Others	1,524	737	356	496	128	648	0.4	-39.07%
Animal and vegetables products	22,265	20,792	14,508	14,295	20,540	18,480	10.3	-1.60%
Animal and vegetables fat and oil	22,265	20,792	14,508	14,295	20,540	18,480	10.3	-1.60%
Food products, beverages and tobacco	34,183	44,701	57,786	60,201	30,445	45,463	25.4	-2.29%
Preparation of meat ,fish or crustaceans, mollusk or their aqu	2,132	513	1,071	1,625	872	1,243	0.7	-16.37%
Sugar and sugar confectionery	15,672	20,143	31,060	26,497	13,831	21,441	12.0	-2.47%
Preparation of cereals, flour, starch or milk, pastry cooks proc	1,832	1,358	3,618	5,757	3,410	3,195	1.8	13.23%
Preparations of vegetables, fruit, nuts or other part of plants	762	632	2,016	2,633	1,416	1,492	0.8	13.19%
Miscellaneous edible preparations	3,318	3,697	2,791	4,495	1,639	3,188	1.8	-13.16%
Beverages, sprits and vinegar	6,015	6,647	11,108	11,123	5,155	8,010	4.5	-3.04%
Residues and waste from the food industries	3,395	3,872	3,262	4,529	1,901	3,392	1.9	-10.95%
Tobacco and manufactures tobacco substitutes	929	7,768	2,588	3,168	2,141	3,319	1.9	18.17%
Others	128	71	272	347	80	180	0.1	-8.97%
Leather and products	770	390	1,000	1,057	496	743	0.4	-8.42%
Wood and Products	1,873	2,734	2,036	6,829	2,549	3,204	1.8	6.36%
(2) Export								
TOTAL MERCHANDISE TRADE	174,303	226,084	225,552	244,599	262,838	226,675		8.56%
AGRIC PRODUCTS TOTAL	123,859	163,553	171,881	149,262	143,097	150,330	100.0	2.93%
FOOD AND ANIMALS	114,378	155,570	162,399	144,054	133,944	142,069	94.5	3.21%
Live animals and products	81,460	87,033	82,552	66,531	73,908	78,297	52.1	-1.93%
Live animals	-	88	-	-	12	50	0.0	-
Meat and edible meat offal	-	529	-	-	3	266	0.2	-
Fish and crustacean, mollusks and other aquatic invertebrate	81,305	86,210	82,358	66,358	73,540	77,954	51.9	-1.99%
Milk and dairy products, eggs, natural honey	-	-	-	-	43	43	0.0	-
Products of animal origin	155	206	194	173	310	208	0.1	14.87%
Vegetable products	21445	50,305	55010	61144	48,716	47,324	31.5	17.83%
Edible vegetable and certain roots and tubers	59	1,171	448	338	2,349	873	0.6	108.93%
Edible fruit and nuts, peel of citrus fruit or melons	13995	44,444	29473	49473	40,185	35,514	23.6	23.49%
Coffee, tea ,mate and spices	64	-	265	468	273	268	0.2	33.66%
Cereals	639	2,138	12523	6265	1,359	4,585	3.0	16.29%
Products of milling industry	-	-	8790	238	31	3,020	2.0	-
Oil seed and oleaginous fruit, miscellaneous grain seed and fr	6688	2,552	3511	4362	4,519	4,326	2.9	-7.54%
Animal and vegetables products	148	1071	2102	5006	5,492	2,764	1.8	106.01%
Animal and vegetables fat and oils	148	1,071	2102	5006	5,492	2,764	1.8	106.01%
Food products, beverages and tobacco	11325	17161	22735	11373	5,828	13,684	9.1	-12.44%
Sugar and sugar confectionery	7371	12,868	12815	2898	158	7,222	4.8	-53.63%
Beverages, sprits and vinegar	79	-	204	252	235	193	0.1	24.36%
Residues and waste from the food industries	2113	2,243	2904	3175	2,789	2,645	1.8	5.71%
Tobacco and manufactures tobacco substitutes	1212	1685	6530	5042	2,567	3,407	2.3	16.19%
Others	550	365	282	-	79	319	0.2	-32.17%
Leather and products	112	-	-	-	58	85	0.1	-12.33%
Wood and Products	9369	7,983	9482	5208	9,095	8,227	5.5	-0.59%

Source: INE, *Statistical Year Book. 1996, 1997, 1998, 1999*.

Table 1.7. Rainfall in the Study Area

(Unit: mm)

Month	Study Area			
	Chiuta	Moatize	Tete	Ulongue
January	255.7	189.6	166.9	197.6
February	169.4	130.4	139.0	213.7
March	156.9	40.6	75.8	169.2
April	38.7	12.8	12.5	49.9
May	10.9	15.2	5.1	6.8
June	10.1	8.0	3.1	1.5
July	10.1	2.2	3.6	2.9
August	4.5	1.9	0.7	0.8
September	3.4	0.1	0.9	3.6
October	12.3	8.7	15.5	13.4
November	74.9	61.0	39.2	65.1
December	221.2	166.1	39.2	228.6
Total	968.1	636.6	501.5	953.1

Source: Meteorological services of Tete.

Table 1.8. Climate in Tete City

Month	Max. temp. (°C)	Min. temp. (°C)	Rainfall (mm)
January	33.9	23.7	166.9
February	33.3	23.7	139.0
March	34.0	23.2	75.8
April	33.0	21.8	12.5
May	31.5	18.9	5.1
June	29.3	16.4	3.1
July	29.2	16.3	3.6
August	30.7	17.7	0.7
September	33.7	20.4	0.9
October	35.6	22.5	15.5
November	36.9	24.0	39.2
December	35.1	23.6	39.2
		Total	501.5

Source: ibid.

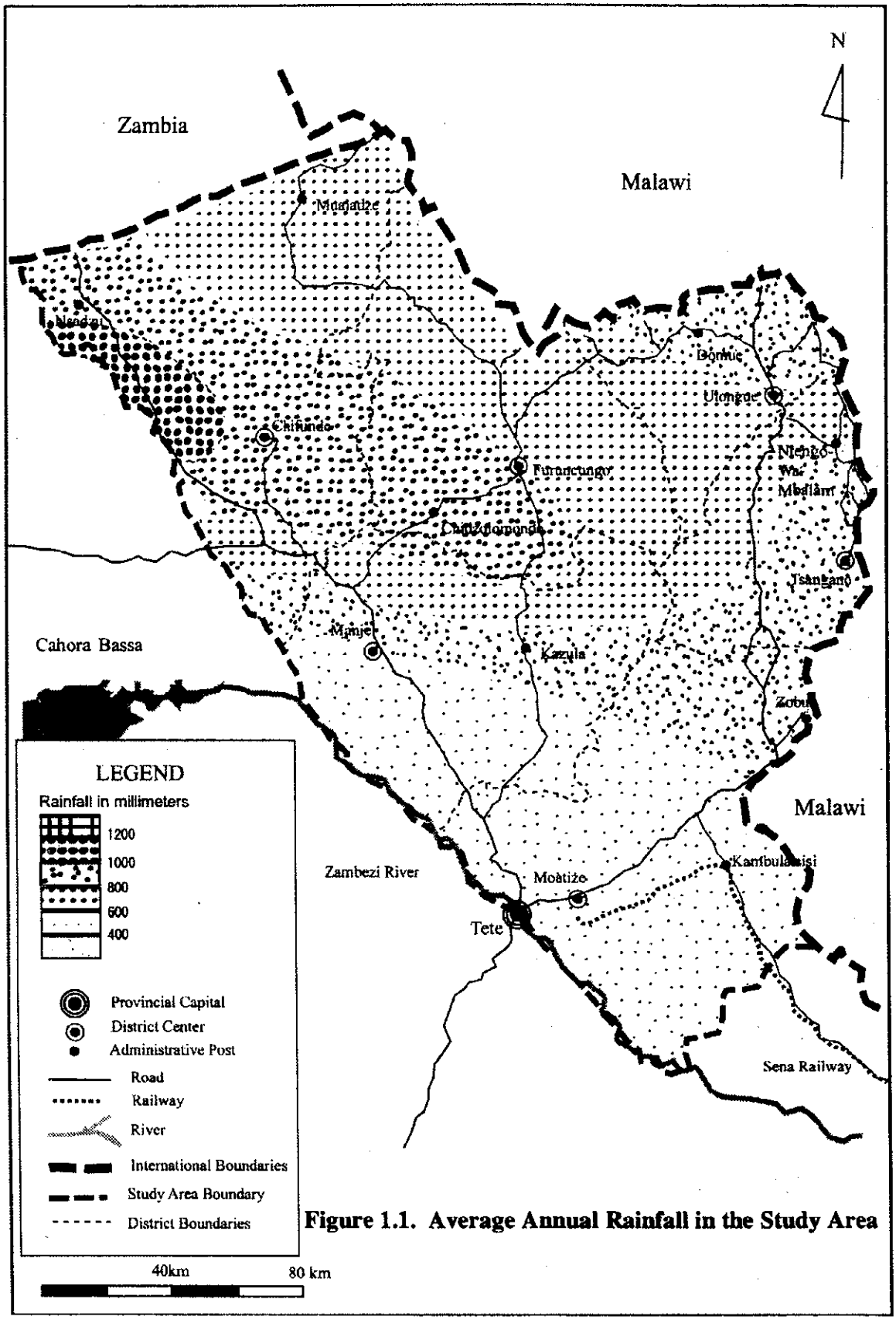


Figure 1.1. Average Annual Rainfall in the Study Area

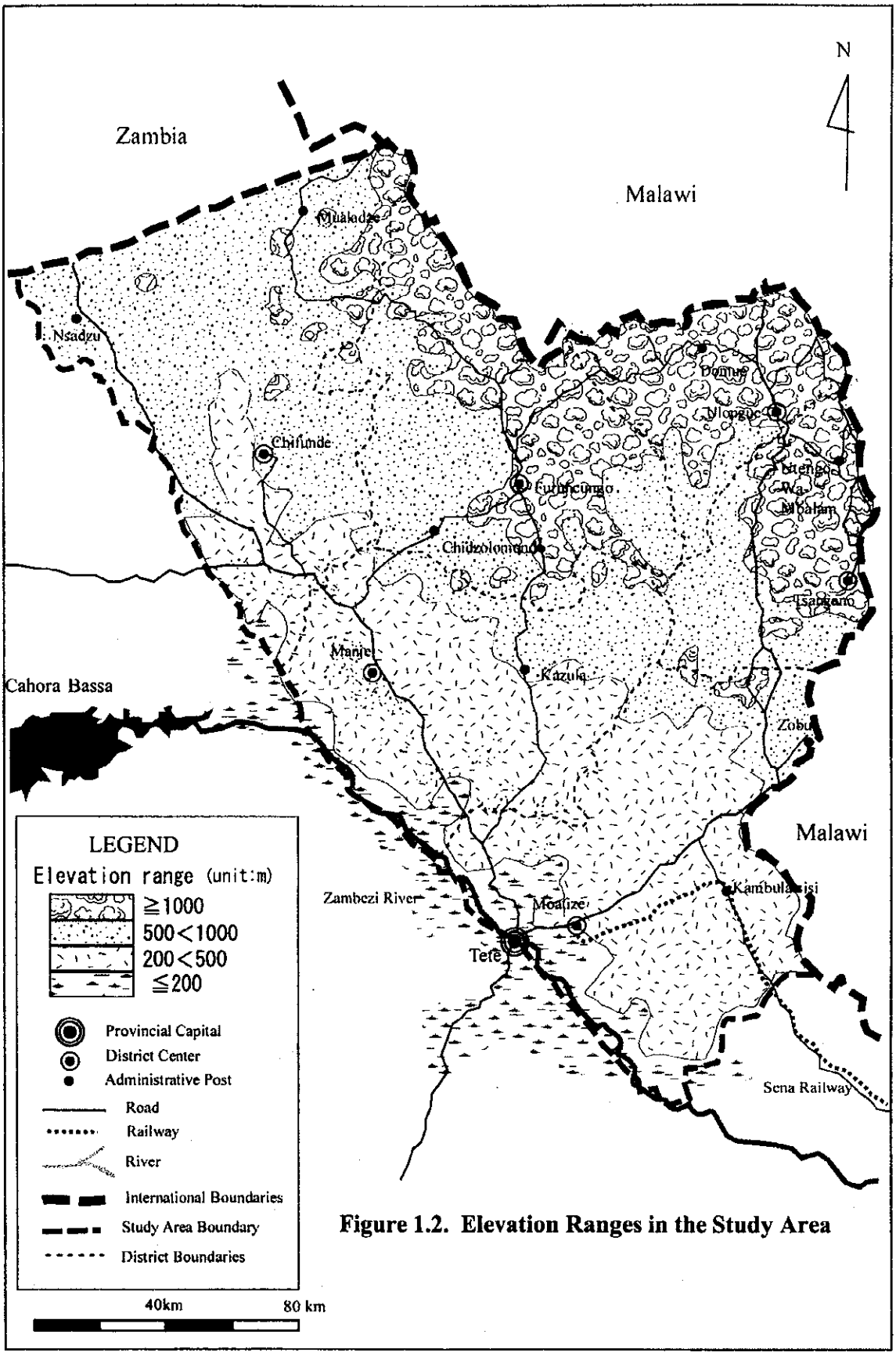


Figure 1.2. Elevation Ranges in the Study Area

2.2.2. Land resources and use

(1) Existing land use

Existing land use is analyzed by using a GIS for digitized land cover maps available for the Study Area. Simplifying land use classification of the maps for the planning purpose, the existing land use in the Study Area is classified into eight categories as shown in Table 1.9.

Table 1.9. Present Land Use in the Study Area

(Unit: km^2)

	Angonia	Chifunde	Chiuta	Macanga	Moatize	Tsangano	Tete city	Study Area
1. Cultivated land	1,670	293	72	255	124	592	65	3,071
2. Developed areas	2	0	0	1	0	0	17	20
3. Bare/degraded/flood-prone land	65	9	4	0	5	1	2	86
4. Shrubland	251	450	529	241	452	991	134	3,048
5. Bushland with varying density	373	1,032	2,851	186	517	344	24	5,327
6. Open forest	99	3,419	1,151	474	3,843	309	21	9,316
7. Other forests	757	4,303	2,509	6,040	3,450	1,424	0	18,483
8. Water areas & miscellaneous uses	43	0	9	0	38	0	23	113
Total	3,260	9,506	7,125	7,197	8,429	3,661	286	39,464

Source: GIS database.

The cultivated land occupies highland areas of Angonia and northeastern part of Tsangano, and small patches of land mostly along the main tributaries of the Luia river. The shrubland and the bushland are distributed widely in the Zambezi lowland area and also along the border with Malawi in Tsangano and Moatize.

(2) Land regulations

All lands belong to the State of Mozambique, but land for various uses can be leased for 50 years, which may be extended automatically. Applications for use of specific land areas are filed with relevant authorities, depending on the land use types and the area, and use licenses are granted through reviews and consultations. Land for family farming is granted up to 4ha. Large land use is taxed. In addition, traditionally any land occupied faithfully for a certain period, say 10 years, may be granted to the user by approval of traditional authorities.

(3) Land capability

Land capabiity for agriculture is analyzed by using a soil map. For the planning purpose, the land in the Study Area is evaluated into five classes as shown in Table 1.10. The land most suitable for intensive and diversified agriculture is found mostly in Angonia and Tsangano in the highland area. The land suitable for semi-intensive agriculture is distributed in Tsangano, Angonia, Moatize, Macanga, and Chiuta. The land in Chifunde and Tete city is suitable only for extensive agriculture. For the Study Area as a whole,

60% of the land is suitable only for extensive agriculture.

Table 1.10. Land Capability in the Study Area

(Unit: km^2)

	Angonia	Chifunde	Chiuta	Macanga	Moatize	Tsangano	Tete city	Study Area
1. Most suitable for intensive agriculture	1,744	0	179	237	61	890	0	3,111
2. Suitable for intensive agriculture	99	0	1	60	111	0	0	271
3. Suitable for semi-intensive agriculture	1,090	0	333	489	784	1,498	0	4,194
4. Suitable for extensive agriculture	96	7,477	4,482	3,797	6,220	813	287	23,172
5. Not suitable for agriculture	173	1,752	2,130	2,528	1,132	407	0	8,122
Total	3,202	9,229	7,125	7,111	8,308	3,608	287	38,870

Source: GIS database.

2.2.3. Production performance

The Study Area produces a variety of food and non-food crops. Production performance is discussed for maize, other grains, groundnuts, potatoes and cassava, tobacco and cotton (Table 1.11). The Study Area produces also a variety of fruits, but their production data are not available as they are produced mostly for self-consumption without commercialization. Data are limited also on livestock production, and its production performance is only outlined.

Maize is by far the most dominant crop cultivated in the Study Area. It is cultivated in 151,000ha (three-year average in 1997-99, also hereafter), accounting for 67% of the total area cultivated under all the main crops listed above. The average yield is slightly over 1.0 ton/ha, higher than the national average. According to a UNDP study for the ZMM-GT, maize from Mozambique is sold in Eastern province of Zambia at a landed cost that is about 40% lower than local producer prices. This is due to low application rates of expensive chemical fertilizer. Other major grains are sorghum cultivated in 11,000ha and millet with 12,000ha. Tete province, in fact, is the largest producer of millet in Mozambique with high yields. Wheat is cultivated in Tsangano occupying some 300ha, exclusively for export to Malawi.

Pulses produced in the Study Area are represented by kidney beans cultivated in 30,000ha and cowpea occupying 5,000ha. Cultivated areas, production and yields for these crops vary widely for different years since they are produced as alternative crops to maize during the rainy season. Groundnut is an important cash crop in the Study Area cultivated in 12,000ha. Its yield is rather low at 0.3 ton/ha.

Table 1.11. Major Crops Production and Yield in the Study Area, 1997-1999 (1/5)

District	Maize				Sorghum				Kidney Beans			
	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)
Angonia	1997	53,270	32,578	612	1997	-	-	-	1997	12,374	4,332	350
	1998	74,300	85,230	1,147	1998	-	-	-	1998	39,010	15,604	400
	1999	40,100	33,900	845	1999	-	-	-	1999	6,684	2,674	400
	Ave.	55,890	50,569	868	Ave.	-	-	-	Ave.	19,356	7,537	383
Tsangano	1997	20,173	16,278	807	1997	-	-	-	1997	-	-	-
	1998	20,210	21,508	1,064	1998	-	-	-	1998	-	-	-
	1999	23,125	18,575	803	1999	-	-	-	1999	6,500	1,846	284
	Ave.	21,169	18,787	891	Ave.	-	-	-	Ave.	2,167	615	95
Macanga	1997	19,497	22,796	1,169	1997	-	-	-	1997	11,730	3,379	288
	1998	23,173	64,884	2,800	1998	-	-	-	1998	11,602	1,079	93
	1999	13,605	10,323	759	1999	-	-	-	1999	2,054	220	107
	Ave.	18,758	32,668	1,576	Ave.	-	-	-	Ave.	8,462	1,559	163
Moatize	1997	21,382	17,107	800	1997	6,572	3,284	500	1997	-	-	-
	1998	15,057	23,730	1,576	1998	3,150	315	100	1998	294	88	299
	1999	35,212	42,302	1,201	1999	5,021	502	100	1999	-	-	-
	Ave.	23,884	27,713	1,192	Ave.	4,914	1,367	233	Ave.	98	29	100
Chiuta	1997	6,000	3,840	640	1997	4,000	200	50	1997	-	-	-
	1998	9,910	8,912	899	1998	3,900	1,500	385	1998	10	2	200
	1999	9,023	13,535	1,500	1999	2,861	2,146	750	1999	-	-	-
	Ave.	8,311	8,762	1,013	Ave.	3,587	1,282	395	Ave.	3	1	67
Chifunde	1997	10,385	9,023	869	1997	100	-	-	1997	-	-	-
	1998	12,133	6,061	500	1998	-	-	-	1998	-	-	-
	1999	9,159	5,494	600	1999	-	-	-	1999	-	-	-
	Ave.	10,559	6,859	656	Ave.	33	-	-	Ave.	-	-	-
Tete city	1997	11,417	6,970	610	1997	-	-	-	1997	-	-	-
	1998	24,095	30,105	1,249	1998	4,577	1,831	400	1998	-	-	-
	1999	2,555	1,054	413	1999	2,748	275	100	1999	-	-	-
	Ave.	12,689	12,710	757	Ave.	2,442	702	167	Ave.	-	-	-
Total	1997	142,124	108,592	764	1997	10,672	3,484	326	1997	24,104	7,711	320
	1998	178,878	240,430	1,344	1998	11,627	3,646	314	1998	50,916	16,773	329
	1999	132,779	125,183	943	1999	10,630	2,923	275	1999	15,238	4,740	311
	Ave.	151,260	158,068	1,045	Ave.	10,976	3,351	305	Ave.	30,086	9,741	324

Table 1.11. Major Crops Production and Yield in the Study Area, 1997-1999 (2/5)

District	Cotton				Cowpea				Cassava			
	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)
Angonia	1997	-	-	-	1997	-	-	-	1997	-	-	-
	1998	-	-	-	1998	-	-	-	1998	-	-	-
	1999	-	-	-	1999	-	-	-	1999	-	-	-
	Ave.	-	-	-	Ave.	-	-	-	Ave.	-	-	-
Tsangano	1997	-	-	-	1997	-	-	-	1997	-	-	-
	1998	-	-	-	1998	-	-	-	1998	-	-	-
	1999	-	-	-	1999	-	-	-	1999	240	-	-
	Ave.	-	-	-	Ave.	-	-	-	Ave.	-	-	-
Macanga	1997	61	3	49	1997	3,000	70	23	1997	-	-	-
	1998	78	41	526	1998	3,007	15	5	1998	-	-	-
	1999	420	35	83	1999	770	18	23	1999	-	-	-
	Ave.	186	26	219	Ave.	2,259	34	17	Ave.	-	-	-
Moatize	1997	-	0.4	-	1997	229	2,964	12,943	1997	-	-	-
	1998	-	-	-	1998	1,120	112	100	1998	-	-	-
	1999	19	6	316	1999	765	304	397	1999	277	1,108	4,000
	Ave.	6	2	105	Ave.	705	1,127	4,480	Ave.	92	369	1,333
Chiuta	1997	19	4	211	1997	2,900	580	200	1997	-	-	-
	1998	120	24	200	1998	2,850	570	200	1998	-	-	-
	1999	135	89	659	1999	146	37	253	1999	-	-	-
	Ave.	91	39	357	Ave.	1,965	396	218	Ave.	-	-	-
Chifunde	1997	19	21	1,105	1997	-	-	-	1997	-	-	-
	1998	78	37	474	1998	-	-	-	1998	-	-	-
	1999	-	-	-	1999	-	-	-	1999	130	-	-
	Ave.	32	19	790	Ave.	-	-	-	Ave.	43	-	-
Tete city	1997	-	-	-	1997	5	1	200	1997	-	-	-
	1998	-	-	-	1998	32	3	106	1998	1.5	7.5	5,000
	1999	-	-	-	1999	40	8	200	1999	-	-	-
	Ave.	-	-	-	Ave.	26	4	169	Ave.	1	3	1,667
Total	1997	99	28	287	1997	6,134	3,615	589	1997	-	-	-
	1998	276	102	370	1998	7,009	700	100	1998	2	8	5,000
	1999	574	130	226	1999	1,721	367	213	1999	647	1,108	1,713
	Ave.	316	87	274	Ave.	4,955	1,561	315	Ave.	216	372	1,720

Table 1.11. Major Crops Production and Yield in the Study Area, 1997-1999 (3/5)

District	Wheat				Millet				Groundnuts			
	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)
Angonia	1997	-	-	-	1997	-	-	-	1997	-	-	-
	1998	-	-	-	1998	-	-	-	1998	-	-	-
	1999	-	-	-	1999	-	-	-	1999	5,500	2,750	500
	Ave.	-	-	-	Ave.	-	-	-	Ave.	1,833	917	167
Tsangano	1997	305	183	600	1997	-	-	-	1997	-	-	-
	1998	291	502	1,725	1998	-	-	-	1998	-	-	-
	1999	394	394	1,000	1999	-	-	-	1999	-	-	-
	Ave.	330	360	1,108	Ave.	-	-	-	Ave.	-	-	-
Macanga	1997	-	-	-	1997	-	-	-	1997	5,000	3,000	600
	1998	-	-	-	1998	-	-	-	1998	16,153	2,747	170
	1999	-	-	-	1999	-	-	-	1999	960	155	161
	Ave.	-	-	-	Ave.	-	-	-	Ave.	7,371	1,967	311
Moatize	1997	-	-	-	1997	5,927	2,964	500	1997	919	276	300
	1998	-	-	-	1998	4,000	400	100	1998	87	9	103
	1999	-	-	-	1999	2,704	1,899	702	1999	2,210	663	300
	Ave.	-	-	-	Ave.	4,210	1,754	434	Ave.	1,072	316	235
Chiuta	1997	-	-	-	1997	2,900	1,450	500	1997	210	59	281
	1998	-	-	-	1998	2,850	855	300	1998	300	90	300
	1999	-	-	-	1999	1,188	465	391	1999	864	467	541
	Ave.	-	-	-	Ave.	2,313	923	397	Ave.	458	205	374
Chifunde	1997	-	-	-	1997	-	-	-	1997	361	720	1,994
	1998	-	-	-	1998	-	-	-	1998	899	180	200
	1999	-	-	-	1999	-	-	-	1999	1,648	82	50
	Ave.	-	-	-	Ave.	-	-	-	Ave.	969	327	748
Tete city	1997	-	-	-	1997	7,771	3,105	400	1997	2	1	500
	1998	-	-	-	1998	6,981	1,396	200	1998	13	1.95	150
	1999	-	-	-	1999	1,216	124	102	1999	116	128	1,103
	Ave.	-	-	-	Ave.	5,323	1,542	290	Ave.	44	44	1,000
Total	1997	305	183	600	1997	16,598	7,519	453	1997	6,492	4,056	625
	1998	291	502	1,725	1998	13,831	2,651	192	1998	17,452	3,028	174
	1999	394	394	1,000	1999	5,108	2,488	487	1999	11,298	4,245	376
	Ave.	330	360	1,090	Ave.	11,846	4,219	356	Ave.	11,747	3,776	321

Table 1.11. Major Crops Production and Yield in the Study Area, 1997-1999 (4/5)

District	Potato				Sweet Potato				Vegetables			
	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)	Year	Area (ha)	Production (ton)	Yield (kg/ha)
Angonia	1997	23	230.00	10,000	1997	-	-	-	1997	2	20	10,000
	1998	30	300	10,000	1998	-	-	-	1998	10	80	8,000
	1999	10	100	10,000	1999	800	8,000	10,000	1999	3	65	21,667
	Ave.	21	210	10,000	Ave.	267	2,667	3,333	Ave.	5	55	13,222
Tsangano	1997	405	2,100	5,185	1997	-	-	-	1997	95	820	8,632
	1998	410	2,076	5,063	1998	-	-	-	1998	120	916	7,633
	1999	492	2,366	4,809	1999	263	1,447	5,502	1999	106	5	47
	Ave.	436	2,181	5,019	Ave.	88	482	1,834	Ave.	107	580	5,437
Macanga	1997	300	2,400	8,000	1997	271	-	-	1997	20	120	6,000
	1998	315	140	444	1998	120	72	600	1998	10	40	4,000
	1999	382	1,528	4,000	1999	476	1,428	3,000	1999	21	84	4,000
	Ave.	332	1,356	4,148	Ave.	289	500	1,200	Ave.	17	81	4,667
Moatize	1997	-	-	-	1997	202	61	302	1997	-	-	-
	1998	-	-	-	1998	200	-	-	1998	57	342	6,000
	1999	-	-	-	1999	264	1,320	5,000	1999	-	-	-
	Ave.	-	-	-	Ave.	222	460	1,767	Ave.	19	114	2,000
Chiuta	1997	-	-	-	1997	-	-	-	1997	-	-	-
	1998	-	-	-	1998	300	900	3,000	1998	50	150	-
	1999	-	-	-	1999	395	632	1,600	1999	-	-	-
	Ave.	-	-	-	Ave.	232	511	1,533	Ave.	17	50	-
Chifunde	1997	-	-	-	1997	417	1,420	3,405	1997	10	42	4,200
	1998	-	-	-	1998	9	18	2,000	1998	1.5	3	2,000
	1999	-	-	-	1999	41	287	7,000	1999	-	-	-
	Ave.	-	-	-	Ave.	156	575	4,135	Ave.	4	15	2,067
Tete city	1997	-	-	-	1997	-	-	-	1997	30	215	7,167
	1998	-	-	-	1998	0.5	3	6,000	1998	46	57	1,239
	1999	-	-	-	1999	-	-	-	1999	3	5	1,667
	Ave.	-	-	-	Ave.	0.17	1	2,000	Ave.	26	92	3,357
Total	1997	728	4,730	6,497	1997	890	1,481	1,664	1997	157	1,217	7,752
	1998	755	2,516	3,332	1998	630	993	1,577	1998	295	1,588	5,392
	1999	884	3,994	4,518	1999	2,239	13,114	5,857	1999	133	159	1,195
	Ave.	789	3,747	4,749	Ave.	1,253	5,196	4,147	Ave.	195	988	5,071

Table 1.11. Major Crops Production and Yield in the Study Area, 1997-1999 (5/5)

District	Tobacco			
	Year	Area (ha)	Production (ton)	Yield (kg/ha)
Angonia	1997	-	755	-
	1998	550	935	1,700
	1999	1,550	1,055	681
	Ave.	700	915	794
Tsangano	1997	-	-	-
	1998	-	-	-
	1999	-	-	-
	Ave.	-	-	-
Macanga	1997	61	3	49
	1998	1,350	675	500
	1999	-	-	-
	Ave.	470	226	183
Moatize	1997	-	-	-
	1998	-	-	-
	1999	-	-	-
	Ave.	-	-	-
Chiuta	1997	19	4	211
	1998	-	-	-
	1999	52	47	904
	Ave.	24	17	718
Chifunde	1997	-	40	-
	1998	600	300	500
	1999	-	-	-
	Ave.	200	113	167
Tete city	1997	-	-	-
	1998	-	-	-
	1999	-	-	-
	Ave.	-	-	-
Total	1997	80	802	10,025
	1998	2,500	1,910	764
	1999	1,602	1,102	688
	Ave.	1,394	1,271	912

The Study Area produces both potato and sweet potato with combined cultivated area of some 2,000ha. The average yield is 4.4 ton/ha. Cultivation of cassava is very limited in the Study Area, in contrast with the importance of this crop in the diet of Mozambique people as clarified above. Presumably people in the Study Area consume a lot more maize as the staple.

Tobacco is the most important cash crop in the Study Area. It is cultivated mostly under the contract farming scheme by the Mozambique Tobacco Leaf Company (MTLC). Its cultivation area expanded rapidly to reach 2,500ha to produce 1,910 tons in 1998. Cotton is another cash crop, but its production by small farmers tends to be discouraged by poor marketing performance. In 1999, it was cultivated in some 600 ha.

Fruits produced in the Study Area include mango, peach, apple, crab apple, grapes, pear, papaya, citrus, passion fruit, guava, avocado and banana. Most of them are not commercialized. Mango used to be sold widely, but its plantations have not been rehabilitated. Grapes produced in Tsangano used to be processed into wine and bottled in Tete city. Tangerine in Moatize is marketed in Tete city as well as in local markets, and traders come from other districts as well.

Livestock population has been recovering rapidly from losses during the civil war (Table 1.12). Cattle population increase from 32,000 in 1995 to 49,000 in 1999 at the average annual rate of 9%. Angonia and Tsangano are leading cattle producers, followed by Moatize and Tete city. Population of goat and sheep recovered more quickly, and it fluctuates in 50,000-80,000 over 1996-1999. Moatize dominates in goat and sheep population. Swine population fluctuates more widely, dominated by Macanga. Slaughter data for cattle, goat and pig indicate the livestock in the Study Area are relatively lean (Table 1.13).

A crude estimate of livestock production is made based on livestock population. Optimistic estimates of unit annual meat production are 56kg for cattle, 10kg for goat and sheep, 45kg for swine, and 45kg for poultry per respective livestock population. Applying these unit production rates, meat production in the Study Area at present is calculated to be 2,887 ton beef, 661 ton mutton and goat meat, 617 ton pork, and 1,993 ton poultry. The total meat production of 6,158 tons/year makes the per capita annual meat consumption 8.0kg, as compared to the national average of 4.8kg (Table 1.5). Actual meat consumption in the Study Area is probably about a half of this, lower than the national average, as the livestock in the Study Area are relatively lean due to extensive stockbreeding practices.

2.2.4. Agro-business, marketing and trade

There was once the Agro-Industrial Complex of Angonia (CAIA) based in Angonia district undertaking a wide range of agricultural activities. The company constructed a dam and irrigation system in the district to produce various crops for marketing with and without

Table 1.12. Livestock Population and Production in the Study Area

(Unit: head)

	Cattle					
District	1995	1996	1997	1998	1999	Annual growth rate
Angonia	13,722	15,019	15,649	15,509	16,711	4.02%
Chifunde	-	290	551	560	665	23.06%
Chiuta	-	989	3,518	864	3,928	41.17%
Macanga	-	325	789	887	917	29.60%
Moatize	7,877	7,425	8,229	9,324	8,985	2.67%
Tsangano	6,009	7,882	9,091	11,525	10,312	11.41%
Tete	4,133	6,005	5,898	9,845	7,586	12.91%
Total	31,741	37,935	43,725	48,514	49,104	9.12%

(Unit: head)

	Goat and Sheep					
District	1995	1996	1997	1998	1999	Annual growth rate
Angonia	-	4,007	7,805	5,750	7,203	15.79%
Chifunde	-	266	63	480	665	25.74%
Chiuta	-	1,050	3,917	3,917	5,606	52.01%
Macanga	-	1,605	3,054	5,121	5,109	33.57%
Moatize	5,552	62,018	22,560	45,000	34,522	44.12%
Tsangano	1,835	2,542	7,556	3,070	4,117	17.54%
Tete	3,807	9,296	5,213	8,266	5,718	8.48%
Total	11,194	80,784	50,168	71,604	62,940	41.25%

(Unit: head)

	Swine					
District	1995	1996	1997	1998	1999	Annual growth rate
Angonia	-	1,428	3,191	2,432	3,062	21.01%
Chifunde	-	236	28	288	108	-17.75%
Chiuta	-	97	297	297	1,899	110.35%
Macanga	-	2,890	1,316	34,703	3,842	7.38%
Moatize	347	1,870	3,439	485	1,666	36.86%
Tsangano	634	371	4,312	1,918	2,146	27.62%
Tete	273	506	297	455	327	3.68%
Total	1,254	7,398	12,880	40,578	13,050	59.76%

Table 1.13. Monthly Slaughter Data in the Study Area, 1999

	Cattle		
Month	Heads	Total weight	Ave. weight
January	90	11,124	123.6
February	40	4,825	120.6
March	91	12,120	133.2
April	97	12,191	125.7
May	80	10,830	135.4
June	94	12,065	128.4
July	153	18,412	120.3
August	105	14,061	133.9
September	126	16,069	127.5
October	85	9,553	112.4
November	95	11,222	118.1
December	110	13,135	119.4
Total	1,166	145,607	124.9

	Goat		
Month	Heads	Total weight	Ave. weight
January	387	3,570	9.2
February	297	2,622	8.8
March	464	4,202	9.1
April	578	5,251	9.1
May	516	5,014	9.7
June	455	4,400	9.7
July	678	6,546	9.7
August	945	8,731	9.2
September	782	7,458	9.5
October	650	5,718	8.8
November	824	6,730	8.2
December	1,183	10,501	8.9
Total	7,759	70,743	9.1

	Pig		
Month	Heads	Total weight	Ave. weight
January	2	97	48.5
February	1	32	32.0
March	2	31	15.5
April	4	213	53.3
May	5	226	45.2
June	3	149	49.5
July	4	83	20.8
August	4	177	44.3
September	3	171	57.0
October	7	160	22.9
November	2	92	46.0
December	7	578	82.6
Total	44	2,009	45.7

Souce: Tete slaughter house, *Annual Report*.

processing. Its facilities were decapitalized due to destruction and neglect during the civil war and never restored.

The only significant agri-business existing in the Study Area is the Mozambique Tobacco Leaf Company (MTLC) based in Furancungo. Tobacco cultivated area has expanded rapidly under the contract farming scheme with small farmers in Macanga and Angonia. The company provides input and technical extension to contract farmers as they enter into a contract each year, and guarantees purchase of products. Payment is made to the farmers, deducting the costs of input.

Cotton used to be produced widely and marketed for processing outside the Study Area, but has not recovered due to unfavorable marketing conditions. Cotton is now produced mainly in Macanga and Chiuta in small scale, and production in Moatize started in 1999. The cotton from Tete province is processed in Zambezia province. Recently new industries were established in Tete city to process raw materials from Zambezia province: copra processed into soap and cashew processing. Maize is exported to Malawi and Zambia. Especially in Zambia, export maize has price advantage due to low production costs with low application of expensive chemical fertilizer. Wheat produced in Tsangano is exported exclusively to Malawi, while bakeries in the Study Area procure wheat flour from other regions, mainly from Beira. Excess maize stored by individual farmers is purchased usually by small traders from outside.

Most fruits are either self-consumed or sold at local markets, or otherwise neglected/wasted. Exceptions are tangerine in Moatize marketed in Tete city and also traders from other districts, and grapes in Tsangano, which used to be processed into wine for local market.

Potatoes are marketed widely throughout the Study Area. Good quality potatoes produced in Angonia, Tsangano and Macanga in particular, are marketed in Tete city and also in other towns even outside the Study Area. Some high value vegetables produced in Angonia and Tsangano are partly exported to Malawi and sold in Tete city as well.

The Study Area produces practically no dairy products. In fact, Mozambique imports meat and dairy products mainly from Zimbabwe. Import value of livestock and its products averaged US$13 million over 1995-99.

A wide variety of agricultural products are exchanged along the borders with Malawi and Zambia. At the municipal market in Zobue, they trade not only various vegetables and fruits from immediate vicinities but also fruits from South Africa, dried fish from Niassa and some agro-processed products such as soaps from Zambia and brown sugar from Malawi.

2.3. Agricultural Support Services

2.3.1. Irrigation

Of the potential agricultural land estimated to be 3.6 million km², only 20-30% has been cultivated, and irrigation is not a common practice by Mozambique farmers. Due to sugarcane plantations by Portuguese farmers, irrigation developed in the southern part of the Country, mainly in Maputo and Gaza areas. In 1968, Mozambique had only 65,000 ha under irrigation, which increased to 100,000 ha by 1973. As of 1986-87, a total area development for irrigation was reported to be some 120,000 ha. The biggest irrigation schemes are the Chokwe scheme in the Limpopo river basin and the sugarcane plantations in Incomati, Buzi, Pungoe and the Zambezi river basin. These schemes share about 50% of the total irrigation area. Recent estimates show the irrigated area has decreased to about 35,000 ha due to the destructions by the civil war, lack of credit, low flow in some international rivers, poor water management, and lack of maintenance of irrigation facilities (Consultec, 1998).

Irrigated agriculture is almost non-existent in the Study Area. There used to be an irrigation system in Angonia developed by CAIA, which has been dilapidated as mentioned already. At present, most farmers do not have any strong motivation to increase their produce beyond their own needs as marketing opportunities are quite limited. The amount of rainfalls is sufficient for traditional farmers to cultivate crops under rain-fed conditions and using residual soil moisture for their self-sufficiency. Irrigation in the Study Area is limited to very small schemes along rivers and streams to utilize gravity flow and contour canals or to water with tin cans.

2.3.2. Applied research

Limited agricultural research and experiment activities are carried out in the Study Area. Angonia district is most active with regional on-farm demonstration and related function within INIA. There is an experiment station doing research on maize varieties with high protein contents, and also multiplication of potato, sweet potato, cassava and beans. Zootechnica is carrying out demonstrations of various fodders and selection of cattle to maintain genetic materials of Angoni breed.

Tsangano district is conducting demonstration of 16 varieties of wheat, and multiplication of wheat and potato varieties suited to the region. The district also has an experiment station. No agricultural research and experiment station exists in Macanga, Chiuta and Chifunde districts.

Moatize district has a research center doing on-farm demonstrations and other agricultural research works. The district is also conducting seed multiplication and other research activities in cooperation with the provincial agricultural office. In Tete city, on-farm

demonstrations of millet and sorghum varieties are going on.

2.3.3. Extension services

Availability of extension services in the Study Area varies widely among the districts and the city. Practically no extension services are available in Chiuta and Chifunde districts due to lack of qualified personnel. Macanga district has two extension officers, but their activities are constrained by lack of vehicles/motorbikes. Tsangano and Moatize districts and Tete city are much better off with six extension officers, respectively.

Angonia district is most advanced in extension services through experiences with the DANIDA assisted project. It has seven extension officers, three agricultural technicians, and one supervisor. Their activities cover community reforestation, multiplication of tubers and roots, soil fertilization and livestock extension.

2.3.4. Agricultural credit

Agricultural credit is hardly available in the Study Area. An exception is the Mozambique Tobacco Leaf Company (MTLC) offering input credit to farmer to promote tobacco production. Repayment is made during the marketing period. The similar scheme is provided by two other tobacco enterprises in Chifunde. A Norwegian NGO once tried a credit program for small livestock targeted at women in Chiuta, and also provided credit for purchase of water pumps for irrigation in Tete city.

2.3.5. Post-harvest facilities

The Study Area produces surplus maize. The excess is commonly sold to traders from outside, but they do not necessarily have sufficient capacity to purchase all the excess. Besides, local governments encourage farmers to save excess maize for deficient years. Maize is stored usually in large bamboo baskets/containers by individual farmers. The Institute of Cereals of Mozambique does not have capacity to buy surplus maize to stabilize the supply and prices.

According to a recent report, the Study Area has 275 grain-mills (UNDO, 2000). They are more concentrated in Angonia and Moatize (71 each) as well as Tete city (66). These numbers are much smaller than they used to be, while grain production recovered quickly after the civil war.

Tobacco curing is undertaken by MTLC in producing areas before it is exported for further processing. On-farm processing of other crops is practically non-existent, although opportunities have been pointed out for wheat, vegetables, and fruits such as peaches, apples and pears especially in the high potential districts of Angonia, Tsangano and Moatize (UNDP, 2000). The existing storage facilities for cotton, paprika and tobacco are illustrated in Figure 1.3.

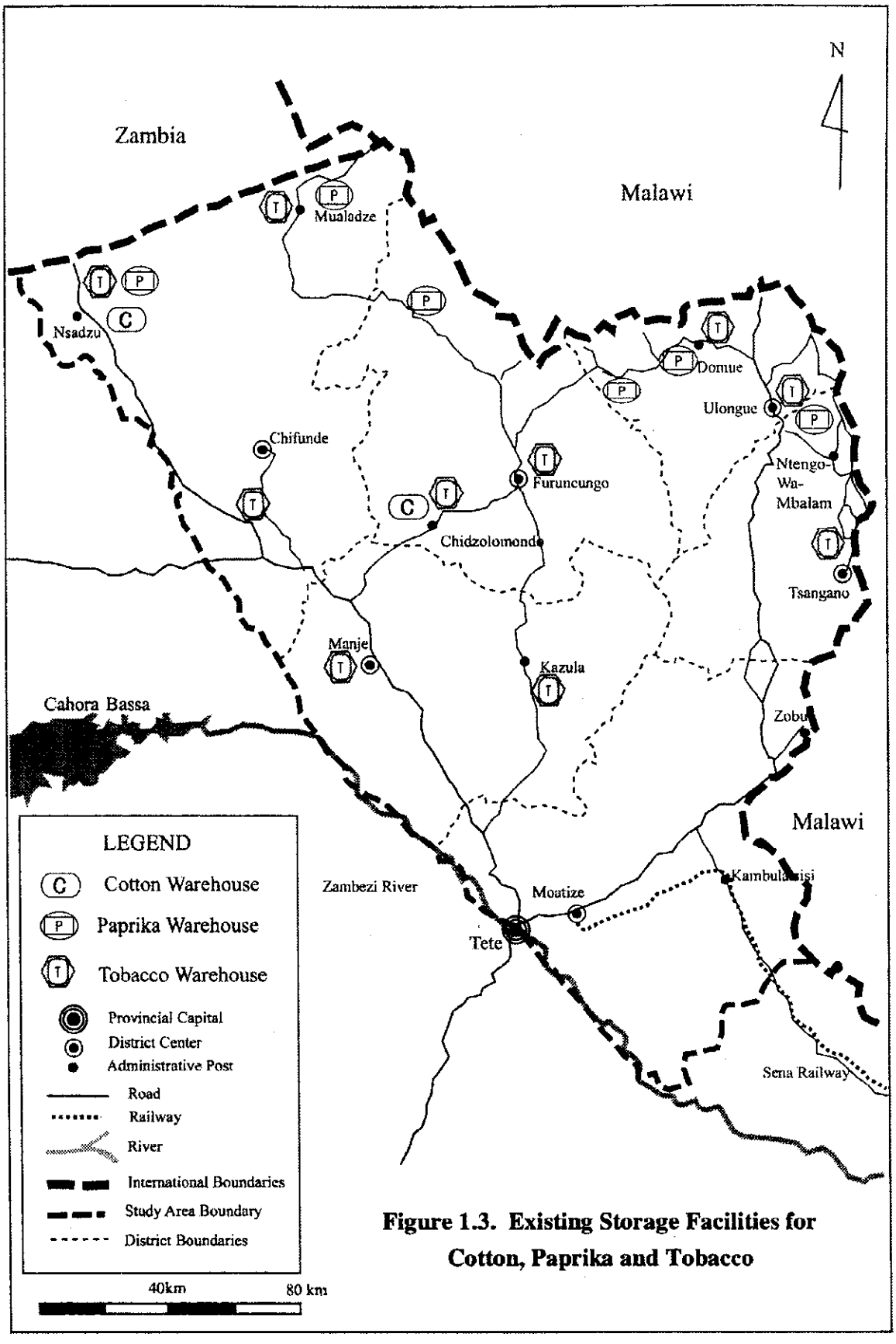


Figure 1.3. Existing Storage Facilities for Cotton, Paprika and Tobacco

Chapter 3. Objectives and Strategy for Agricultural Development in the Study Area

3.1. Objectives

3.1.1. Objectives for economic development

The economic sector provides the driving force for the attainment of the Angonia regional development objectives established by the Master Plan. The objectives for economic development have also been defined by the Master Plan in such a way as to support the regional development objectives in economic, social and environmental aspects. First, the following two basic objectives are defined, that should be attained in the medium term:

(1) To alleviate widespread poverty and to realize self-reliant and sustainable economic performance; and

(2) To attain self-sufficiency in basic foodstuffs and to improve nutrition of local people.

Three additional objectives are defined with varying emphasis on economic, social and environmental aspects, just like the regional development objectives. This dual structure of overall and sector objectives mutually supporting one another would ensure more balanced attainment of economic, social and environmental development. These objectives are specifically expressed as follows:

(1) To generate sufficient number of high earning employment opportunities through diversifying economic activities and promoting linkages among them;

(2) To enhance asset value of environment through more productive use of indigenous resources and proper management of external resources; and

(3) To contribute to national socio-economic integration and enhanced national status in the international society through outward-oriented production and services with inter-regional and international linkages.

Objective (3) represents social concerns of generating employment opportunities and raising income levels as well as economic concerns for high growth. Linkages between various agricultural, industrial and service activities should be promoted to diversify economic activities for robust economic structure. Through this process, objectives (1) and (2) should be attained.

Objective (4) represents mainly environmental concerns in relation to economic activities. For instance, sound agricultural practice with high productivity should help to protect the rural environment by enhancing economic value of environment. This objective also pursues proper management of external resources such as foreign capital and technology in balance with use of indigenous resources including human resources to ensure the quality of environment will be protected.

Objective (5) expresses an ultimate goal of the Angonia regional development to realize an open society, self-reliant but not self-contained, linked to the outside world with viable economic activities. This objective also pursues free exchange of information and ideas among peoples of different backgrounds to promote various socio-cultural values for a dynamic society.

3.1.2. Objectives for agricultural development

Agricultural development should contribute to the attainment of the economic objectives defined above. It would serve for the two basic objectives by increasing income levels of farmers through establishing viable production activities, organizing farmers for self-reliant production and marketing, and ensuring production of basic foodstuffs for all.

More market-oriented agriculture should be pursued to contribute to the third objective through creating high earning employment opportunities, diversifying crops and livestock activities, and expanding raw materials base for agro-processing. Agriculture in the Study Area should be transformed from extensive resource-exploiting practices dominant at present, represented by slash and burn, to environmentally sound and sustainable practices in line with the fourth objective. It should also be transformed from subsistence-oriented, enclave-type agriculture to outward-oriented agriculture for social cohesiveness or regional integration, which in turn would contribute to the integration and enhanced status of the national socio-economy.

Specifically, objectives for agricultural development of the Study Area may be defined as follows:

(1) To contribute to poverty alleviation, self-sufficiency in basic foodstuffs, and improved nutrition of all the local people;
(2) To expand and diversify agricultural production to enhance income levels, expand raw materials base for agro-industries and promote related manufacturing and services; and
(3) To establish environmentally sound and sustainable agricultural practices through proper management of land and water in combination with external resources by organized farmers.

3.2. Strategy

3.2.1. Constraints to agricultural development

To attain the objectives defined above, the agricultural development in the Study Area will have to overcome various constraints. To identify more critical constraints and establish more effective strategy and measures, it may be useful to distinguish two broad area in the Study Area: the Angonia highland and the Zambezi lowland.

The Angonia highland largely coincides with the districts of Angonia and Tsangano, and

parts of Macanga and Moatize districts. The area has most favorable conditions for agriculture centering around the Angonia plateau with relatively high rainfalls and perennial flow of rivers, generally good soil conditions, and moderate temperate climate. It has been affected by the market economy earlier, which allows the procurement of agricultural input on a commercial basis and marketing of surplus agricultural produce. Main markets are across the border in Malawi for maize, wheat and vegetables, and Tete city and other urban areas for potatoes, some fruits and other high value crops.

The other broad area coincides largely with the districts of Chifunde and Chiuta, occupying the lowland along the Zambezi river and its main tributary, the Luia. The area has lower rainfalls, although the soil conditions are generally favorable for agriculture. The area is characterized by subsistence agriculture, dominated by the slash and burn practice. Access to markets and access to production technology and commercial capital are limited.

Common constraints to agricultural development in both areas include soil erosion caused mainly by deforestation in the Angonia highland area and the slash and burn practice in the Zambezi lowland area, and the presence of mines. In the Angonia highland area, the population pressure and resultant land conflicts are becoming a constraint, while in the Zambezi lowland area, low population density itself poses a constraint to agricultural land development.

The main issue for agricultural development in the Zambezi lowland area is how to transform subsistence agriculture into market-oriented agriculture. Another main issue common to both areas is how to transform resource-exploitative agriculture into environmentally sound and sustainable agriculture. Market development and the establishment of price-competitive production system hold keys for agricultural development in the Study Area as a whole.

3.2.2. Basic strategy

As indicated in subsection 3.1.2, the agricultural development in the Study Area should pursue higher productivity, more diversified activities, and environmentally, sound and sustainable practices. Important technical options include: (1) introduction of irrigated agriculture to enhance productivity, (2) improvement of rain-fed agriculture with increased use of agricultural input, (3) expansion of agricultural land, (4) establishment of new cash crops for export with or without processing, and (5) development of various livestock activities. Given the present subsistence-oriented agriculture and enclave-type rural communities, most important would be to organize farmers and motivate them for new types of agricultural activities.

This would hold a key for marketing new agro-products and procuring input to improve agricultural practices. The basic strategy for agricultural development in the Study Area is established, centering on farmer's organizing for marketing and input procurement in

combination with the technical options. More specific strategies for the Angonia highland and the Zambezi lowland are presented subsequently.

(1) Farmers' organizing

A prerequisite to transforming the agriculture in the Study Area from subsistence to market-oriented one is to organize farmers. This would allow farmers to produce strategically selected crops in a scale large enough for marketing outside their communities, districts or even beyond. This would allow prices of their products to reflect market conditions rather than dictated by middlemen. Organized farmers can procure various input to enhance agricultural productively also at competitive prices.

Farmer's do not usually organize themselves voluntarily without interventions from outside, while they are highly conscious of the necessity and effectiveness of farmers associations. Therefore, some interventions would be necessary and effective to encourage their formation. Farmers will make a certain level of contribution to start a farmers association with initial technical and financial supports by MARD channeled through its district officers, NGO's or other facilitators. Once an association is set up, it will be operated with financial autonomy by member farmers' contribution and repayment. A farmers' association may be equipped with a vehicle for transporting farm produce, input and daily commodities and also for other non-farm purposes. It may have retail functions as well.

Various types of farmers' associations should be established as operational vehicles to implement the technical options listed above. These technical options are further clarified.

(2) Irrigated agriculture

Irrigated agriculture is almost non-existent in the Study Area. Farmers do not have any strong motivation to increase their production when they see limited marketing opportunities, limited access to agricultural credit, and thus high risks involved in investing into irrigation facilities. Except in parts of the Angonia highland area, where farmers gained experiences in irrigated agriculture earlier under the Afro-Industrial complex of Angonia, experiences are quite limited in cultivation, management and marketing of crops under irrigation.

Farmers should be convinced of effectiveness of irrigation in increasing production and yields, and gain experiences in various irrigation technologies. Also production increase under irrigation should be attained along with market development. Therefore, step-wise introduction of irrigated agriculture may be recommended.

In the first step, small scale irrigation schemes may be introduced in areas along small tributaries by constructing simple weirs and contour canals for gravity irrigation. One promising possibility is to utilize gabions to be produced with gravels and stones by

skillful local people. Steel wire may be procured from outside the Study Area, or farmers can use bamboo widely available locally for low cost technology. Alternatively, other materials may be used such as sand bags for weirs. It is desirable to utilize self-help efforts of local farmers so that they will develop a sense of ownership and thus maintain the irrigation schemes properly. Farmers' associations should be promoted with technical support of MARD.

In the second step, larger scale irrigation schemes may be developed, where sufficient management capacities have developed with farmers' associations and experiences gained. Price competitiveness of crops cultivated under irrigation can be assessed more realistically based on attained production performance such as yields, crop budget and on-farm water management as well as initial marketing performance.

Areas suitable for the first step development may be found along small tributaries, and the second step development may be undertaken in the extensive lowland areas along the Luia the Mavuzi and the Zambezi rivers in Chifunde and Chiuta, where soil conditions are favorable for intensive agriculture and market access is expected to improve, linked with Tete city. Promising crops under irrigation may include rice as a cash crop, vegetables and possibly fodder crops. Production of potatoes and possibly wheat may also be expanded under supplemental irrigation in the Angonia highland area.

(3) Rain-fed agriculture

Rain-fed agriculture will continue to be the dominant agricultural practice in the Study Area, and its productivity increase needs to be pursued especially for maize. At present, maize production in the Study Area is characterized by low input-low yield. This results in low cost production and price competitiveness of maize export to Zambia and Malawi. To increase maize production, introduction of high input-high yield option would be inevitable.

Another potentially important crop under rain-fed conditions is wheat, currently produced in Tsangano district for export to Malawi. Wheat can find a growing domestic market within the Study Area, if the production increases and the physical access to/from production areas is improved. Combining maize and wheat, the Angonia region may have a potential to become a granary for the entire Central Mozambique.

(4) Agricultural land development

Extensive area in the Zambezi lowland is not much used for productive agriculture, except the slash and burn practice and extensive grazing. Horizontal expansion of agricultural land in this broad area is another technical option. At present, grasses and leaves in bush land and vines and undergrowth in woodland provide important roughages for cattle and goat. The horizontal expansion for crop cultivation, therefore, should be balanced with the livestock development to ensure sufficient supply of roughages in the dry season.

Another serious constraint to horizontal expansion of agriculture is lack of sufficient population in the Zambezi lowland area. The population density of Chifunde, Chiuta and even Macanga districts is smaller than 10 per km². To utilize the limited farming population and extensive land, high potential areas should be identified carefully, and a comprehensive package of measures should be taken to improve various socio-economic infrastructure by an integrated rural/agricultural development approach. Such areas should naturally be priority areas for demining activities as well.

(5) Establishment of new cash crops

The Study Area produces only a few cash crops at present, represented by surplus maize, potatoes and vegetables. Most crops, including various fruits, have not been commercialized. Tobacco, produced mainly in Angonia and Macanga districts under the contract farming, is practically the only real commercial crop in the Study Area. Paprika has been introduced recently in Macanga and Angonia with initial success for marketing.

Since the Study Area produces already a variety of crops, a few crops may be selectively strengthened to establish new cash crops. Promising crops include wheat, groundnuts, sunflower, soybean, garlic and other vegetables, peach and bamboo. Other crops that may be newly introduced as cash crops include rice, sesame, chilies, kapok and rattan. Expansion of cashew may deserve serious consideration for its opportunities to combine with livestock raising and/or natural silkworms for integrated farming as well as processing of nuts, nutshell, apple and bark.

(6) Livestock development

Livestock activities have been well established in the Study Area. Although livestock population decreased drastically during the civil war, it is recovering rapidly. The productive cattle of mixed local breed (Angoni breed) is available in the Angonia plateau area. The Study Area is known also for large goat population of good quality especially in Moatize and Tete city.

More intensive cattle production should be pursued in the Angonia plateau area in view of increasing land shortages. Breeding capacity of the Angoni breed needs to be expanded, and veterinary services improved. Semi-intensive livestock/poultry in the backyard by small farmers may be combined with crop cultivation for various forms of integrated farming.

In the Zambezi lowland area, control of animal diseases caused by tsetse flies is a prerequisite for further livestock development (Figure 1.4). Also, a balanced development with crop cultivation to ensure sufficient supply of roughages is another issue as mentioned above. In some areas with better access, more intensive cattle raising may be practiced, combining managed pasture and artificial feed. Improved breeding and veterinary services are pre-conditions for this.

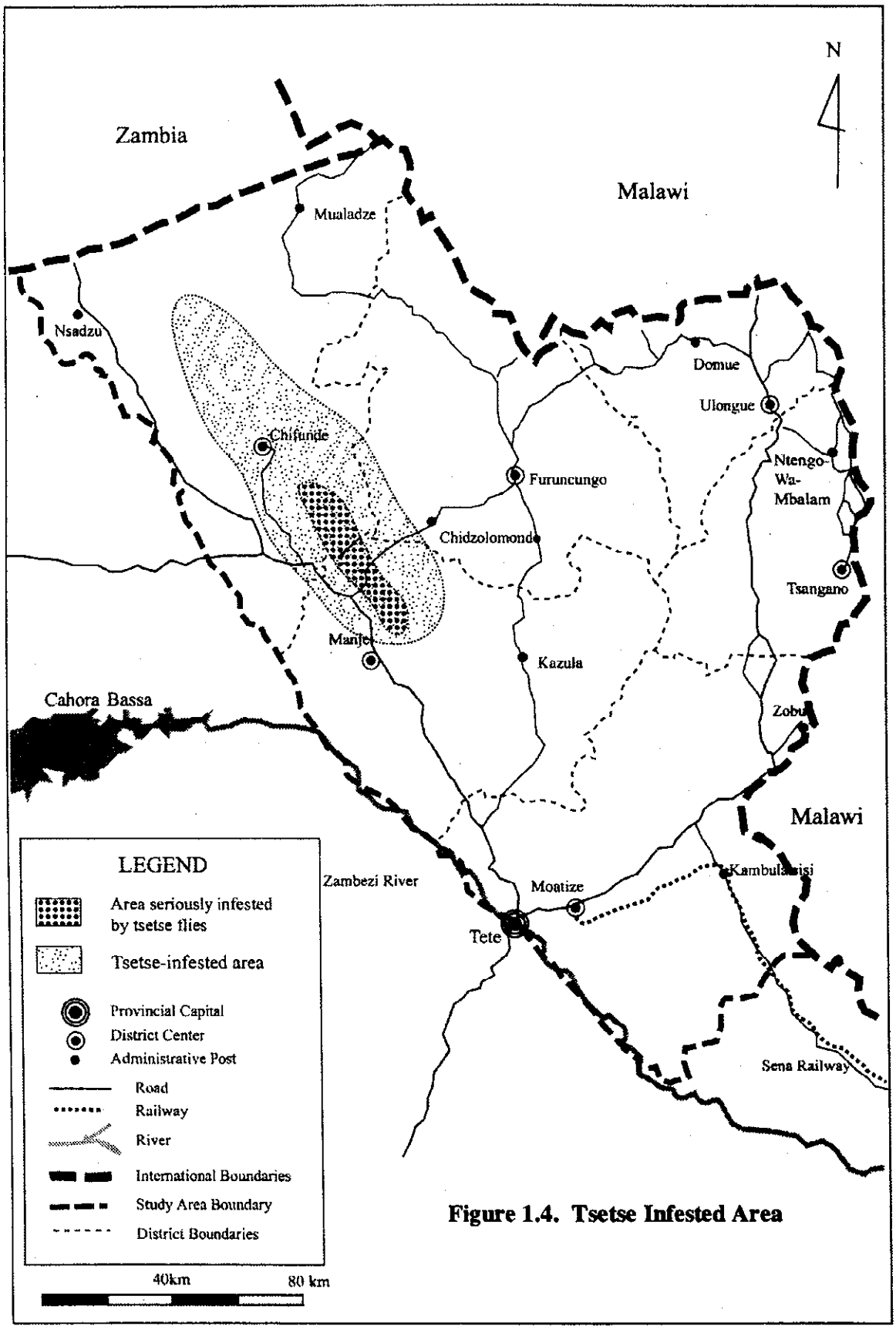


Figure 1.4. Tsetse Infested Area

For smaller livestock, more intensive raising in sheds/pens should be increasingly undertaken. To support this practice, the feed base needs to be expanded. As it will rely increasingly on artificial feed, breed needs to be improved to ensure the economies of operation. Supply of improved breed and extension for fattening with proper feeding are among the needs.

3.2.3. Strategy for Angonia highland area

The main theme for agricultural development in the Angonia highland area is how to enhance productivity further, given limited land. Important strategic components are irrigation for high value crops, integrated farming by small farmers, commercial plantations of fruits, agro-forestry on slope land, and high input-high yield production of maize. Research and extension services, agricultural credit, and other supports to be provided for these strategies are summarized in Table 1.14. Main points are highlighted below.

Crops to be cultivated under irrigation are mainly vegetables, including some less conventional ones such as paprika, chilies, garlic and asparagus. Yields may increase also for wheat and potatoes under supplemental irrigation. Integrated farming combines crop cultivation by small farmers with livestock in their backyards. In addition to the Angoni breed, dairy breed may be introduced. Fruit production should be commercialized focusing on more marketable fruits such as peach, apple, plum, and pear.

Agro-forestry should be promoted on slope land to reduce soil erosion, while ensuring adequate profitability for sustained agricultural practice. Grapes, cashew and other trees may be combined with field crops for contour farming. Maize production should be expanded by introducing high input-high yield option. Grain storage capacity needs to be much expanded to provide stable supply and prices to other regions as well.

Strategic crops to be strengthened under these schemes are summarized as follows:

- Maize with high input-high yield option,
- Wheat and potatoes with higher yields under supplemental irrigation,
- Vegetables including some exotic ones, and
- Fruits, such as peach, apple, plum, pear, grapes (on slopes), and cashew (to a limited extent, on slopes).

Other strategic activities are milk industry and silage production. Development of various integrated farming models would be particularly important for agricultural development in the Angonia highland area. In principle, stock raising should be combined with cultivation of grains and pulses to ensure subsistence of small farmers at the very least. This is an important consideration when small farmers are to embark on new livestock activities like dairy cattle. Other models, however, should also be developed, combining other crops and

small livestock. One innovative model would be a combination of swine raising, biogases production, and organic agriculture for vegetables. Another model may be expansion of maize combined with silage production to support livestock. Expansion of cashew may provide opportunities for different kind of integrated farming combined with goat or swine raising and/or natural silkworms.

Table 1.14. Strategy for Enhancing Agricultural Productivity in Angonia Highland Area

Strategic component	Research and extension services	Agricultural credit	Other supports
Irrigation for high value crops (vegetables, wheat, potatoes, etc)	• Crop selection and cycles • Land preparation • On-farm water management	• Irrigation facilities	• Provision of seed • Support in marketing (export to Malawi and urban markets) • Support for farmer organizing
Integrated farming by small farmers (grains and pulses in combination with cattle including milk cow)	• Integrated farming models • Veterinary services and breeding • Silage production • Small on-farm dairy production	• Livestock sheds by small farmers • Purchase of stock and calves • Dairy facilities	• Breed improvement for milk cattle • Establishment of milk collection system or guidance for linkages with processors • Slaughterhouses
Commercial plantations of fruits (peach, apple, plum, pear, etc.)	• Selection of fruits and other tree crops depending on land suitability • Disease control	• Land development for orchards • Purchase of seedlings	• Provision of seedlings • Support in marketing or guidance for linkages with processors • Mediation of contract arrangements with farmers
Agro-forestry on slope land (grapes, cashew, etc.)	• Selection of fruits and other tree crops depending on land suitability • Disease control • Sloping agricultural land technology • Products development	• Purchase of equipment and device for land stabilization • Purchase of seedlings	• Provision of seedlings • Support in marketing or guidance for linkages with processors • Support for farmer organizing
High input-high yield production (maize)	• Input use • Selection of second crops	• Purchase of agricultural input • Grain storage facilities	• Provision of improved seed • Grain storage facilities

3.2.4. Strategy for Zambezi lowland area

The main theme for agricultural development in the Zambezi lowland area is how to transform subsistence agriculture into market-oriented agriculture. Important strategic components are integrated rural development, establishment of new cash crops, small scale

irrigation by self-help efforts, livestock improvement, and small livestock development. Research and extension services, agricultural credit, and other supports to be provided for these strategies are summarized in Table 1.15. Main points are highlighted below.

Table 15. Strategy for Transforming Subsistence Agriculture into Market-oriented Agriculture in the Zambezi Low Land Area

Strategic component	Research and extension services	Agricultural credit	Other supports
Establishment of new cash crops (sunflower, soybean, sesame, exotic vegetables, etc.)	• Crop selection on the basis of land suitability • Input use • Post harvest treatment	• Purchase of seed and agricultural input	• Provision of seed • Support in marketing or guidance for linkages with processors • Support for farmer organizing • Mediation of contract arrangements between farmers and trader/processor
Small scale irrigation by self-help efforts (rice, vegetables, fodder crops, etc.)	• Site selection and land preparation • Crop selection and cycles • Design and construction of weirs • On-farm water management	• Purchase of materials for weirs	• Provision of seed • Support for farmer organizing • Support in marketing
Livestock improvement	• Veterinary services and breeding • Disease control • Management of grazing land	• Purchase of improved stock and calves	• Breed improvement • Guidance for linkages with processors • Slaughterhouse • Dips
Small livestock development	• Veterinary services and breeding • Disease control • Extension for fattening with artificial feed	• Livestock sheds by small farmers • Purchase of stock, piglets, etc.	• Breed improvement • Mediation of contract arrangements
Integrated rural development	• Crop selection	• Improvement of living environment • Post harvest facilities	• Improved rural infrastructure • Assistance in settlement

Horizontal expansion of agricultural land should focus on high potential areas to be carefully identified along the Luia, the Mavuzi and the Zambezi rivers. A comprehensive package of measures should be taken by an integrated rural development approach to establish new rural communities supported by productive agriculture.

Farmers need to be motivated to produce beyond their subsistence levels. One effective

way, as manifested by tobacco production in the Study Area, is to introduce cash crops with all the supports including purchase guarantee for products. Alternative models may be established through farmer organizing and a package of support measures. Small scale irrigation should be developed by self-help efforts of organized farmers with the full support of the provincial agricultural office from site selection to marketing of products as well as technical guidance on construction works.

Livestock improvement will establish more disease resistant yet drought tolerant breed of cattle and provide improved veterinary services to establish livestock as the major economic activity in the Study Area. Grazing will continue to be dominant, but more intensive cattle raising may be introduced in steps, combining managed pasture and artificial feed. Small livestock development by small farmers should be promoted, supported by MARD for breed improvement and improved veterinary services. Contract arrangement for fattening with artificial and natural feed should become a common form of practice.

Strategic crops to be strengthened under various schemes are summarized as follows:

- Oil crops: sunflower,
  groundnut (expansion) mainly for confectionary and condiments with extension to control afrotoxin,
  soybean as the second crop in maize field under supplemental irrigation, and
  sesame with extension,
- Vegetables under irrigation for urban markets,
- Fruits such as mango, citrus, avocado, guava, and banana, and
- Cashews (on slopes).

Related strategic activities are various kinds of complete cycle processing. Oil crops and cashew particularly fit this scheme. Oil crops are processed into edible oils and related products with oil cakes used in animal feed manufacturing to support livestock development. Cashew may be processed in multiple ways as well known: apple into wine, nut into processed nut, and nutshell and bark for industrial oils. Its leaves can feed small livestock. An innovative way is to utilize natural silkworms on cashew leaves for textiles.

Particularly important for agricultural development in the Zambezi lowland area is the identification of high potential areas and development of integrated rural development models to fit to local conditions. Government initiative is expected in planning for various rural infrastructure and agricultural land development. Farmers should be assisted for initial establishment of livelihood and agricultural practice.

Chapter 4. Frameworks for Agricultural Development in the Study Area

4.1. Agricultural Land Development

Future land use in the Study Area is examined by combining the existing land use and the land potential presented in subsection 2.2.2. A future land use plan has been prepared by using a GIS, and results are summarized in Table 1.16.

Table 1.16. Future Land Use in the Angonia Region

(Unit: km^2)

	Angonia	Chifunde	Chiuta	Macanga	Moatize	Tsangano	Tete city	Total	Share (%)
Diversified agriculture	1,620	0	82	22	0	822	0	2,546	6.7
Intensive agriculture	212	4	99	244	55	37	0	651	1.7
Semi-intensive agriculture	90	1,555	2,242	489	850	248	128	5,602	14.7
Grazing land	393	2,962	2,014	457	3,485	691	21	10,023	26.2
Forests	713	4,703	2,676	5,533	3,851	1,611	0	19,087	49.9
Development areas	20	3	11	10	23	10	126	203	0.5
Miscellaneous uses	72	9	10	0	7	1	25	124	0.3
Total	3,120	9,236	7,134	6,755	8,271	3,420	300	38,236	100.0

Source: GIS database.

Most productive land for diversified agriculture is found mostly in Angonia and Tsangano, occupying in total 2,546km^2 or 67% of the total land area. Less productive land for intensive or semi-intensive agriculture occupies 6,253km^2, accounting for 16.3%, found dommantly in Chiuta, Chitunde, Moatize, and Macanga. Extensive grazing land is available with over 10,000km^2 or one quarter of the total land, especially in Moatize, Chitunde and Chiuta.

4.2. Projection of Agricultural Production

4.2.1. Crop production

As clarified in the previous section, potential land for crop cultivation, including areas for diversified, intensive and semi-intensive cultivation, is 2.9 times as large as the presently cultivated land. The cultivated land can expand at the average rate of 4.3% per annum to the year 2025, if sufficient resources are allocated for the development. With the transformation of the agriculture in the Study Area from subsistence to market-oriented one, larger increase of crop production can be attained in smaller cultivated land.

Maize production, for instance, may increase at an annual average of 5.5% to the year 2025, if the high input-high yield model is successfully established. This may be attained with the increase in maize cultivated area from some 130,000ha at present to 200,000ha in 2025 as shown in the next section.

Demand-supply balance of maize is presented in Table 1.17. As shown, the surplus

production of the maize may reach 110,000 tons in 2025. For other basic crops, demand-supply has been worked out by assuming changing per capita consumption as presented in Table 1.18, which also shows assumed changes in per capita consumption of livestock products. Food balance is projected in Table 1.19. As shown, the per capita calorie intake is projected to increase from 1,911 cal/day, the present average in Mozambique, to 2,811 cal/day in 2025, comparable to the present intake in South Africa.

Table 1.17. Estimate and Projection for Maize (2000-2025)

	1997	2000	2005	2015	2025
Requirement (kg/maize flower/person)[1]	240	230	200	170	160
Population	711,000	761,600	857,500	1,152,400	1,504,200
Total maize flour required (tons)	170,640	175,168	171,500	195,908	240,672
Adjustments for stocks (% of requirement)	5	5	10	15	20
Total maize flour required with stock adjustments (tons)	179,172	183,926	188,650	225,294	288,806
Production (tons)[2]	108,601	132,068	172,608	294,839	503,627
Less: seed and post-harvest losses, 10%	10,860	13,207	17,261	29,484	50,363
Net maize milled (tons)	97,741	118,861	155,347	265,355	453,264
Milled maize production at 90% recovery	87,967	106,975	139,812	238,820	407,938
Less: maize for other uses, 1%	880	1,070	1,398	4,776	8,159
Net milled maize available (tons)	87,087	105,905	138,414	234,043	399,779
Surplus/deficit	-92,085	-78,021	-50,236	8,749	110,973
% self-sufficiency	-54%	-45%	-29%	104%	146%

Notes: 1. No adjustments for stocks; 2. Production growth rate 5.0%/year.
Source: JICA Study Team.

4.2.2. Livestock Production

Livestock production is expected to expand rapidly in the Study Area. Cattle raising will become more intensive from the present extensive mode to include managed pasture, artificial feed, integrated farming, and dairy production. The extensive grazing land available, as clarified in the previous section, would allow grazing of 200,000 cattle easily. Including more intensive cattle raising, cattle population may increase at the average rate of 7.0% per annum to reach 285,000. Population of smaller livestock is projected equally. This high rate of increase is necessary to ensure self-sufficiency in all the meat products in 2025 at much higher per capita consumption assumed.

Based on the projection of livestock population, demand-supply balance of meat products has been worked out as shown in Table 1.18. As shown, substantial export margins will be generated by 2025 for beef (43% of the total production), goat meat and mutton (18%), and poultry (16%).

Table 1.18. Food Consumption per Capita per Year

(Unit: kg per person per year)

Year	Wheat					Rice					Maize					Millet				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	11.3	64.8	29.5	6.3	12.7	7.1	11.1	2.3	2.5	1.2	49.4	102.4	122.4	141.6	138.5	1.6	0.2	8.2	0.9	2.5
1995	13.8	66.4	20.4	4.3	12.0	7.1	12.1	2.6	3.1	1.3	50.1	98.6	120.9	149.4	139.1	1.8	0.2	8.5	1.7	2.6
1996	13.0	68.1	30.8	7.7	12.6	7.9	12.5	1.5	4.4	2.6	54.8	101.7	122.1	144.8	141.8	2.2	0.2	7.3	1.9	2.6
1997	10.8	65.5	30.3	9.9	14.7	7.1	14.8	2.8	4.0	1.7	54.2	102.1	121.8	133.9	139.4	2.2	0.2	7.0	1.5	2.6
1998	13.1	71.5	29.9	7.1	14.7	7.8	13.2	2.8	3.9	0.7	53.9	95.9	122.0	136.5	136.2	3	0	5	2	3
Growth rate/yr (%)	3.00	1.99	0.27	2.42	2.97	1.90	3.53	4.01	9.30	-10.22	1.76	-1.30	-0.07	-0.73	-0.33	10.20	0.00	-10.92	13.56	0.79
Year	Sorghum					Cassava					Potatoes					Sweet Potatoes				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	9.0	3.8	5.0	0.9	2.9	187.2	0.0	11.5	23.0	71.5	4.3	26.6	2.4	26.1	1.3	3.2	1.5	0.1	0.0	6.0
1995	12.4	4.3	3.3	2.3	4.2	205.3	0.1	13.1	31.0	68.4	3.9	28.9	2.3	27.5	1.1	2.8	1.2	0.1	0.0	5.6
1996	12.3	4.2	4.8	2.7	2.8	217.1	0.1	12.9	48.9	70.2	4.1	31.5	2.4	50.4	1.3	2.9	1.0	0.1	0.0	5.8
1997	12.6	2.6	4.9	2.0	2.3	231.5	0.0	13.6	63.9	77.7	4.1	30.4	2.3	67.5	1.1	2.9	1.3	0.1	0.0	5.3
1998	15.0	2.5	5.2	2.0	2.3	233.4	0.0	13.8	72.9	88.4	4.2	28.8	2.2	113.4	1.3	3	1	0	0	5
Growth rate/yr (%)	10.76	-8.03	0.79	17.32	-4.53	4.51	-	3.71	25.95	4.34	-0.47	1.60	-1.73	34.15	0.00	-1.95	-6.02	0.00	-	-3.20
Year	Sugarcrops					Sweeteners					Pulses					Oilcrops				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	0.1	-	0.0	-	-	4.4	37.5	23.5	16.7	16.0	5.6	3.6	3.5	13.0	2.4	2.3	0.7	6.0	1.1	1.7
1995	0.1	-	0.0	-	-	4.2	36.6	24.3	17.0	14.4	7.4	4.0	3.7	12.0	2.1	3.9	1.2	5.1	1.1	1.8
1996	0.1	-	0.0	-	-	4.1	36.4	22.2	16.9	13.7	6.9	3.5	3.7	13.1	2.2	2.5	1.2	5.7	0.8	1.6
1997	0.1	-	0.0	-	-	4.0	37.1	22.7	16.3	13.7	7.3	3.5	3.5	12.8	1.6	3.1	1.1	7.6	1.1	1.7
1998	0.1	-	0.0	-	-	4.4	36.7	23.9	16.8	12.7	8.9	2.5	3.6	12.9	1.3	3	1	7	2	3
Growth rate/yr (%)	0.00	-	-	-	-	0.00	-0.43	0.34	0.12	-4.52	9.71	-7.03	0.57	-0.15	-11.54	6.83	7.39	3.42	6.40	8.02
Year	Vegitable oils					Vegetables					Fruit					Stimulants(Coffea,Cocoa,Tea)				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	6.8	12.1	6.9	2.1	2.5	7.8	47.5	11.6	24.4	30.2	16.9	35.3	14.5	46.1	11.7	0.2	1.2	0.5	0.1	0.1
1995	6.6	12.4	7.3	3.0	2.5	8.1	50.2	11.7	23.5	28.6	17.6	35.5	12.5	47.0	11.2	0.1	1.3	0.7	0.1	0.1
1996	7.1	12.2	7.6	3.9	2.6	8.5	48.3	11.7	24.1	29.4	18.3	41.6	15.8	47.1	11.5	0.2	1.2	0.6	0.1	0.1
1997	7.0	13.4	8.0	3.4	2.7	8.6	49.4	11.5	22.0	27.3	18.3	43.4	13.1	45.2	11.4	0.2	1.1	0.5	0.1	0.1
1998	6.6	13.1	8.2	3.6	2.5	8.7	47.8	10.8	22.1	25.6	18.3	37.3	10.9	44.6	10.7	0	1	1	0	0
Growth rate/yr (%)	-0.60	1.60	3.51	11.38	0.00	2.21	0.13	-1.42	-1.96	-3.25	1.60	1.11	-5.55	-0.66	-1.77	-12.95	-1.73	6.96	0.00	0.00
Year	Beef and Veal					Mutton and Goat					Pigmeat					Poultry meat				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	2.2	16.7	4.4	1.5	5.4	0.2	4.4	1.0	0.4	0.3	0.7	3.5	0.9	1.2	1.3	1.9	12.5	1.5	1.4	3.0
1995	2.2	15.1	4.5	1.4	4.6	0.1	4.2	1.0	0.4	0.3	0.7	3.7	1.0	1.3	1.2	1.8	13.8	1.7	1.4	3.1
1996	2.1	13.6	4.5	1.7	4.7	0.1	4.3	1.1	0.5	0.3	0.7	3.5	0.9	1.1	1.2	1.8	13.4	1.9	1.5	3.3
1997	2.1	13.7	4.7	1.8	3.3	0.1	4.2	1.1	0.5	0.3	0.7	3.2	1.0	1.2	1.2	1.9	13.6	1.9	1.5	3.5
1998	2.1	13.4	4.6	1.7	3.2	0.1	4.1	1.1	0.5	0.4	0.7	3.3	1.0	1.1	1.2	2	13	2	2	4
Growth rate/yr (%)	-0.93	-4.31	0.89	2.54	-9.94	-12.95	-1.40	1.92	4.56	5.92	0.00	-1.17	2.13	-1.73	-1.59	0.00	0.32	5.92	2.71	4.28
Year	Milk					Eggs					Fish, Seafood					CALORIES (per day)				
	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia	Mozambique	S. Africa	Zimbabwe	Malawi	Zambia
1994	7.0	60.0	23.8	5.0	11.3	0.5	5.0	1.3	1.6	3.6	1.9	6.5	3.7	6.2	9.1	1,616	2,908	2,106	1,970	1,962
1995	6.3	71.8	24.7	3.9	10.1	0.6	5.3	1.6	1.6	3.6	2.1	8.8	3.8	5.6	9.0	1,752	2,930	2,027	2,061	1,941
1996	6.8	66.5	32.9	4.2	9.3	0.6	6.0	1.4	1.6	3.9	2.1	6.6	3.9	6.5	8.3	1,822	2,946	2,110	2,172	1,969
1997	6.2	71.2	41.9	4.3	7.2	0.6	5.7	1.2	1.6	4.1	2.1	8.0	3.5	6.7	8.3	1,847	2,971	2,164	2,114	1,962
1998	5.7	68.2	37.0	4.2	7.1	0.6	6.3	1.3	1.6	4.3	2.0	7.9	3.5	5.5	8.1	1,911	2,909	2,153	2,226	1,950
Growth rate/yr (%)	-4.03	2.60	9.23	-3.43	-8.88	3.71	4.73	0.00	0.00	3.62	1.03	3.98	-1.11	-2.37	-2.30	3.41	0.01	0.44	2.47	-0.12

Souse: Food balance sheet FAO statisticaldatabases (http://apps.fao.org/default.htm)

Table 1.19. Food Balance Projection

	Mozambique											South Africa	
	Year	1998		2000		2005		2015		2025		1998	
Food type	Energy per kg (kcal/kg)*	Annual consump. (kg)†	('000kcal/ year)	Annual demand (kg)‡	('000kcal/ year)	Annual demand (kg),	('000kcal/ year)	Annual Demand (kg)‡	('000kcal/ year)	Annual demand (kg)‡	('000kcal/ year)	Annual consump. (kg)†	('000kcal/ year)
Rice	3,300	7.8	25.7	8.0	26.4	9.0	29.7	12.0	39.6	16.0	52.8	13.2	43.6
Other cereals and root crops	955	325.1	310.5	326.0	311.3	320.0	305.6	339.0	323.7	389.0	371.5	200.0	191.0
Sugar crops	290	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.1	0.0	0.0
Sweeteners	3,483	4.4	15.3	4.4	15.3	4.4	15.3	7.0	24.4	14.9	51.9	36.7	127.8
Vegetables	190	8.7	1.7	8.7	1.7	10.9	2.1	13.6	2.6	18.2	3.5	47.8	9.1
Oil crops and vegitable oils	6,900	9.8	67.6	9.8	67.6	10.7	73.8	13.1	90.4	16.2	111.8	14.1	97.3
Fruits	807	18.3	14.8	18.3	14.8	20.2	16.3	24.6	19.9	30.2	24.4	37.3	30.1
Beef	2,790	2.1	5.9	2.1	5.9	2.6	7.3	3.9	10.9	6.0	16.7	13.4	37.4
Mutton and goat	2,690	0.1	0.3	0.1	0.3	0.2	0.5	0.6	1.6	2.0	5.4	4.1	11.0
Pork	2,113	0.7	1.5	0.7	1.5	0.9	1.9	1.5	3.2	2.5	5.3	4.3	9.1
Poulitry	1,935	1.9	3.7	1.9	3.7	2.4	4.6	3.8	7.4	6.0	11.6	12.7	24.6
Milk	785	5.7	4.5	5.7	4.5	6.3	4.9	6.8	5.3	16.0	12.6	68.2	53.5
Egg	1,490	0.6	0.9	0.6	0.9	0.9	1.3	2.1	3.1	5.0	7.5	6.3	9.4
Fish	1,110	2.0	2.2	2.0	2.2	2.8	3.1	5.3	5.9	10.0	11.1	7.9	8.8
Others			243.0		243.0		280.0		340.0		340.0		410.0
(Total per capita)			697.5		699.0		746.5		878.0		1,026.0		1,062.6
Average per capita (kcal/day)			1,911		1,915		2,045		2,405		**2,811**		**2,911**

Notes: *USDA Nutrient Database / †Food Balance Sheet, FAO / ‡Estimated by JICA Study Team.

4.3. Projection of Agricultural Value-added

4.3.1. Crop value-added

(1) Value-added

The value-added of crop cultivation is calculated for selected crops from available information on production, farm-gate prices and input costs. Calculation for maize, the most dominant crop, is shown in Table 1.20.

Table 1.20. Value-added Estimate and Projection for Maize

	2000	2025	Notes
Farm-gate price	Mt. 2,000,000/ton	Mt. 2,000,000/ton	As of December, 2000
Production costs	Mt. 787,500/ha[a]	Mt. 1,962,000/ha	[a]Only labor cost
Yields	1.0t/ha	2.5t/ha	
Net production value	Mt. 1,212,500/ha	Mt. 3,038,000/ha	
Unit value-added	Mt. 2,000,000/ton	Mt. 1,530,200/ton	
Annual production	132,068 ton	503,627/ton[b]	[b]Projection by JICA Study Team
Total value-added	Mt. 264 x 10^9	Mt. 771 x 10^9	

Source: JICA Study Team.

The production costs of maize in 2000 are only labor costs excluding fertilizers and agro-chemicals, and the yield is the average attained in the Study Area in 2000. The production costs in 2025 include costs of fertilizers and agro-chemicals, and the yield is the estimate by MARD for Tete province under rain-fed conditions. Thus, these estimates and projections represent the transformation of maize production from the low input-low yield to the high input-high yield models. The following are observed.

Both the production costs and the yield will increase by 2.5 times by adopting the high input-high yield model, but unit value-added per production will decrease. Per capita consumption of maize may decrease from 230kg in 2000 to 160kg in 2025 due to diversification of diet along with income increase. The estimated maize value-added in 2000 accounts for 20.5% of the agricultural GRDP (Mt. 1,290x10^9 in 2000) and 13.1% of the GRDP (Mt. 2,020x10^9 in 2000) in the Study Area. The maize value-added is projected to increase at 4.4% per annum over 2000-25.

Similar calculation has been made for pulses, potatoes and tobacco. For other crops, rough estimates have been made for the present value-added, which has been projected to the year 2025 by applying plausible grown rates. The results are summarized in Table 1.21.

The share of maize in the total crop value-added is 43% in 2000, while maize occupies about two-thirds of the total cultivated areas. It will increase to 48% by 2025. Other grains, potatoes and vegetables as well as tobacco are considered cash crops in the Study Area. The combined value-added of these crops will increase at 4.6% per annum over 2000-25.

Table 1.21. Crop Value-added in the Angonia Region

Crop	2000	2025	Growth rate % p/a	Notes
Maize	264	771	4.4	as calculated
Other grains	30	100	4.9	
Pulses	30	48	1.9	as calculated
Potatoes	100	260	3.9	as calculated
Vegetables	50	150	4.5	
Tobacco and Other cash crops	50	200	5.7	including new cash crops for 2025
Others	86	91	0.2	
Total	610	1,620	4.0	

Source: JICA Study Team.

(2) Area cultivated

Following the projection above, the area cultivated under maize will increase from some 130,000ha at present to 200,000ha in 2025. This represents 54% increase at 1.74% increase per annum, which is considered quite manageable. The area cultivated under other crops may increase more rapidly as crops are diversified and new cash crops established. It may increase from some 70,000ha at present to 120,000ha in 2025, representing 2.18% average annual increase. This seemingly modest increase in cultivated land will allow several-fold increase in production due to significant yield increases. A major factor for the yield increases of these crops is irrigation, which is practically non-existent at present. The total irrigated area may reach 50,000ha by the year 2025, corresponding to 16% of the total cultivated area.

4.3.2. Livestock value-added

Livestock population in the Study Area consists of 52,500 cattle, 67,300 sheep and goats, 14,000 pigs, and 442,800 poultry in 2000 (Tete Provincial Directorate of Agriculture and Rural Development). This is converted to the annual meat production by assuming the period of maturity for sales, loss ratio and dressing ratio. Prices of meat products are taken from statistics and the socio-economic survey. Production value for livestock products is calculated based on these data. Since only labor costs are involved in the processing of livestock, the production value is practically equivalent to the value-added as summarized in Table 1.22.

Livestock population is projected to increase at 7.0% per annum until the year 2025. This high rate of increase is necessary to ensure self-sufficiency in meat products by 2025 at much higher per capita consumption assumed. With such increase, substantial export margins will be generated by 2025 for beef (43% of the total production), goat meat and mutton (18%), and poultry (16%). Livestock value-added in 2025 is calculated accordingly (Table 1.23).

Table 1.22. Estimated Livestock Production and Value-added in the Study Area, 2000

Livestock	Population	Production (1,000 ton)	Price (Mt. million)	Value-added (Mt. billion)
Cattle	52,500	2,940	68.8	202,272
Goat and sheep	67,300	673	39.7	26,718
Hog	14,000	628	13.9	8,729
Poultry	442,800	1,993	8.5	16,940
			Total	254,659

Source: JICA Study Team.

Table 1.23. Projected Livestock Production and Value-added in the Study Area in 2025

Livestock	Population	Production (1,000 ton)	Price (Mt. million)	Production value (Mt. billion)	Value-added ratio (%)	Value-added (Mt. billion)
Cattle	285,200	15,969	68.8	1,098,832	90	988,949
Goat and sheep	365,500	3,655	39.7	145,162	90	130,646
Hog	75,800	3,410	13.9	47,420	80	37,936
Poultry	2,403,300	10,815	8.5	91,477	60	54,886
			Total	1,382,891		1,212,417

Source: JICA Study Team.

4.3.3. Agricultural value-added

Value-added of other components of agriculture is difficult to estimate due to lack of data. Applying the per capita consumption of meat in Tete province, the meat consumption in the Study Area is estimated at 1,581 tons for beef and veal, 75 tons for mutton and goat meat, 527 tons for pork, and 1,431 tons for poultry. This may correspond to value-added of some Mt. 130 x 10^9, about a half of the estimate above. Clearly a large amount of home consumption and informal transactions elude the value-added estimate. This applies also to various fruits produced in large quantities mostly for self-consumption. These are not included in the crop value-added estimate presented above. Moreover, fishery and forestry activities, though minor, are almost exclusively informal.

It is judged that minor activities including crop cultivation for staple crops, fruits and vegetables, simple on-farm processing, fishery, and forestry account for at least 30% of the agricultural GRDP. The agricultural GRDP is roughly projected by component to the year 2025 as shown in Table 1.24.

The growth of agriculture due to macro projections is attainable. It may be led initially by the crop cultivation subsector dominating in the Study Area, but the livestock subsector will become increasingly more important supported by large land available and increasing availability of feed.

Table 1.24. Agricultural Value-Added in the Angonia Region

(Unit: Mt. billion in 2000 prices)

Component	2000	2025	Growth rate 2000-25 (% p.a.)
Crops	610	1,620	4.0
Livestock	255	1,210	6.4
Others	425	450	0.0
Total	1,290	3,280	3.8

Source: JICA Study Team.

Chapter 5. Agricultural Development Plan for the Study Area

Land capability for agriculture was analyzed in subsection 2.2.2 based on soil conditions. Other conditions such as rainfall and elevation are also considered to conduct macro-zoning for agricultural development in the Study Area. Another study conducted by the World Bank is also referred to in the macro-zoning (1991).

The study classified the land by climatic and soil conditions into (1) specialized and diversified use, (2) intensive use, (3) semi-intensive use, (4) semi-extensive use, and (5) extensive use (Figure 1.5). In the Study Area, distribution of different potential classes coincides largely with the elevation. The specialized and diversified use class is found in the highland area along the border with Malawi. The intensive and the semi-intensive use classes occupy respectively the immediate interior of the higher potential class. The semi-extensive use class is located in further lowland area, and the area along the Zambezi mainstream is good only for extensive uses. A small area near Manje in Chiuta is classified for intensive use.

Comprehensive assessment of all of these conditions is schematically shown in Figure 1.6. As shown, assessment of soil conditions corresponds very well to the classification of agro-ecological zones, and rainfall patterns and difference in altitude support the respective agricultural land use.

Based on this assessment, six broad zones are defined as shown in Figure 1.7. The characteristics of each zone are described below, and indicative crops to be introduced/strengthened are suggested.

Zone I occupies the southern part of Tsangano and most of the eastern part of Moatize. The altitude ranges in 500-1,000m, the annual rainfall is in the range of 800-1,000mm, and the dominant soil is KG: fine textured brown soil of Pre-Cambrian rock origin. Grapes are recommended as most suitable crops. Also, integrated farming is recommended in highland areas, and Banza is selected from the communities surveyed.

Zone II occupies the highland area of Angonia and Tsangano. The altitude is over 1,000m, the annual rainfall is in the range 800-1,000m or more, and the dominant soil is VG: fine textured red soil of Pre-Cambrian rock origin. This is the most productive zone. Tree cops may be strengthened, especially apple and coffee, as well as various vegetables and integrated farming.

Zone III extends from the southern part of Macanga to the western part of Chifunde. The altitude is generally over 1,000m, and the annual rainfall over 800mm. Mixture of two soil types, KG and VG mentioned above, is found within this zone. Various vegetables may be cultivated in different parts of the zone depending on micro local conditions, but paprika is recommended as a typical crop in the zone.

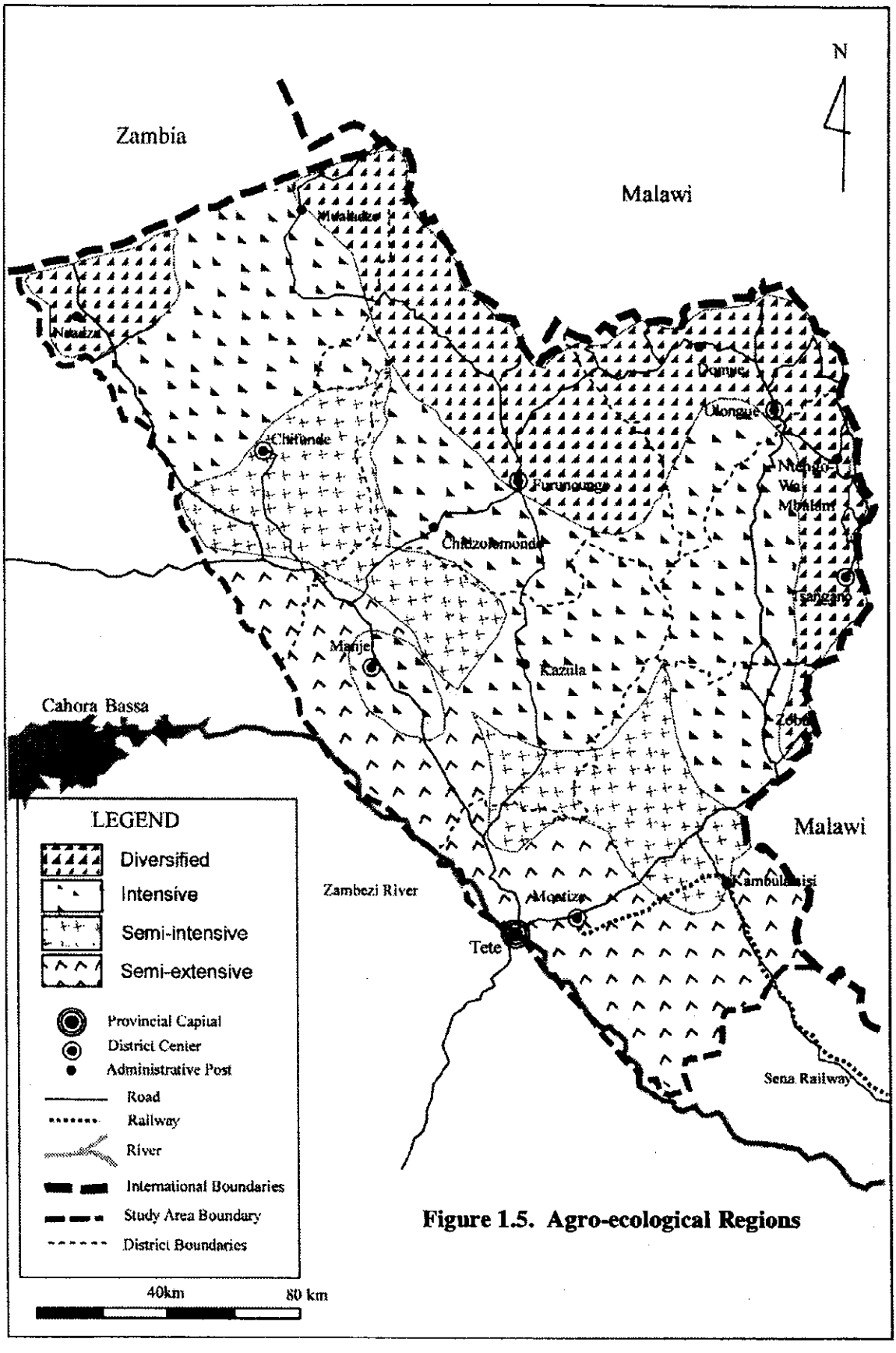
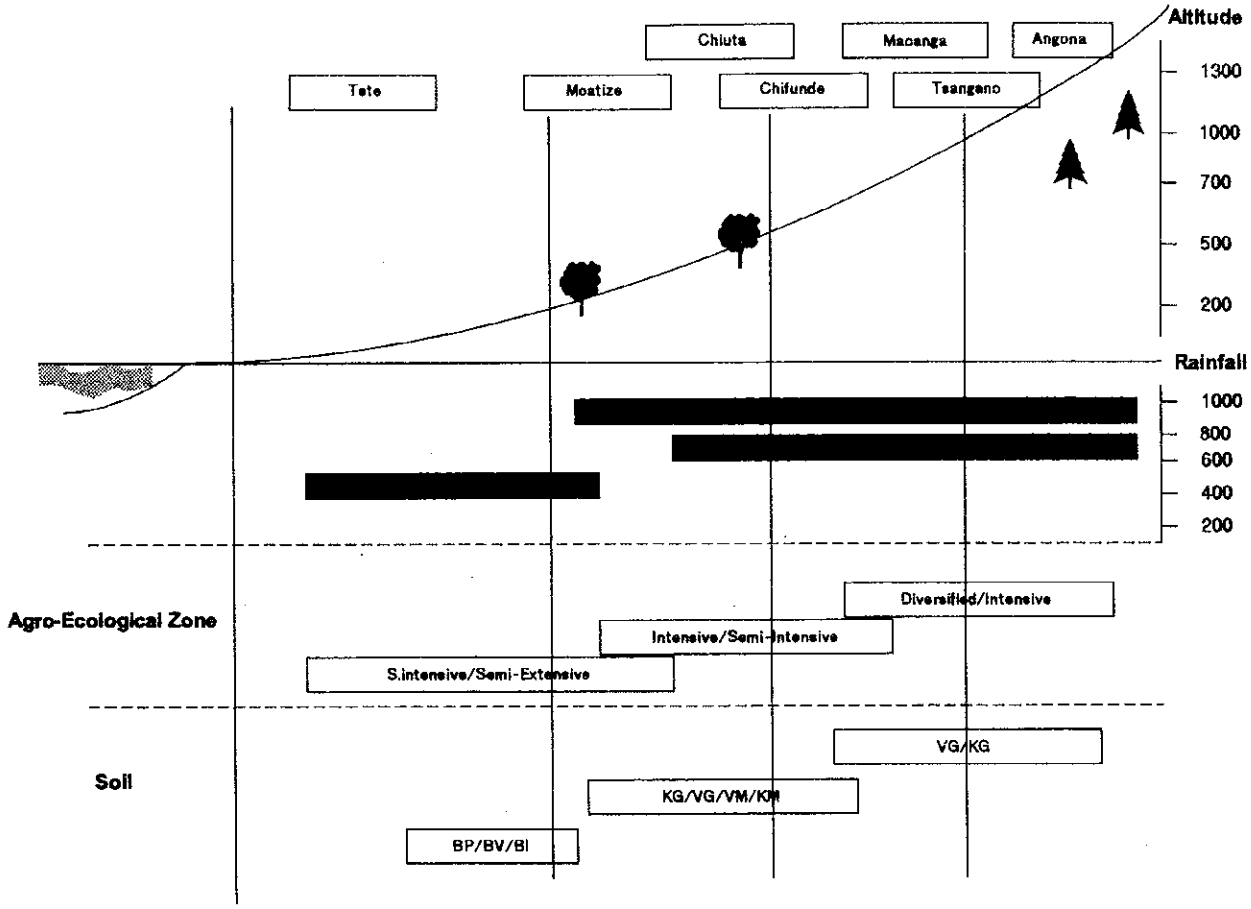


Figure 1.5. Agro-ecological Regions

Figure 1.6. Schematic Presentation of Assessment of Various Conditions Affecting Agriculture



Zone IV encompasses a large area including most parts of Chitunde and the area along the boundary between Macanga and Chiuta. The attitude is in the range of 500-1,000m, the annual rainfall in 800-1,000mm, and the dominant soil is VM/KM: medium textured red/brown soil of the Pre-Cambrian rock origin. Various field crops may be cultivated in different parts of this zone, but oil crops, especially sunflower, are recommended as strategic crops.

Zone V occupies the central part of Chiuta. The altitude is low in 200-500m, and the annual rainfall ranges in 800-1,000mm. This zone contains highly fertile land with soil type FS: alluvial soil. Otherwise, VM/KM mentioned above dominates. The land with the soil type FS is highly suitable for irrigated agriculture, where even rice may be introduced. For the zone as a whole, soybean is recommended to be introduced in combination with maize.

Zone VI occupies a lowland part of Moatize. The altitude ranges in 200-500m, and the

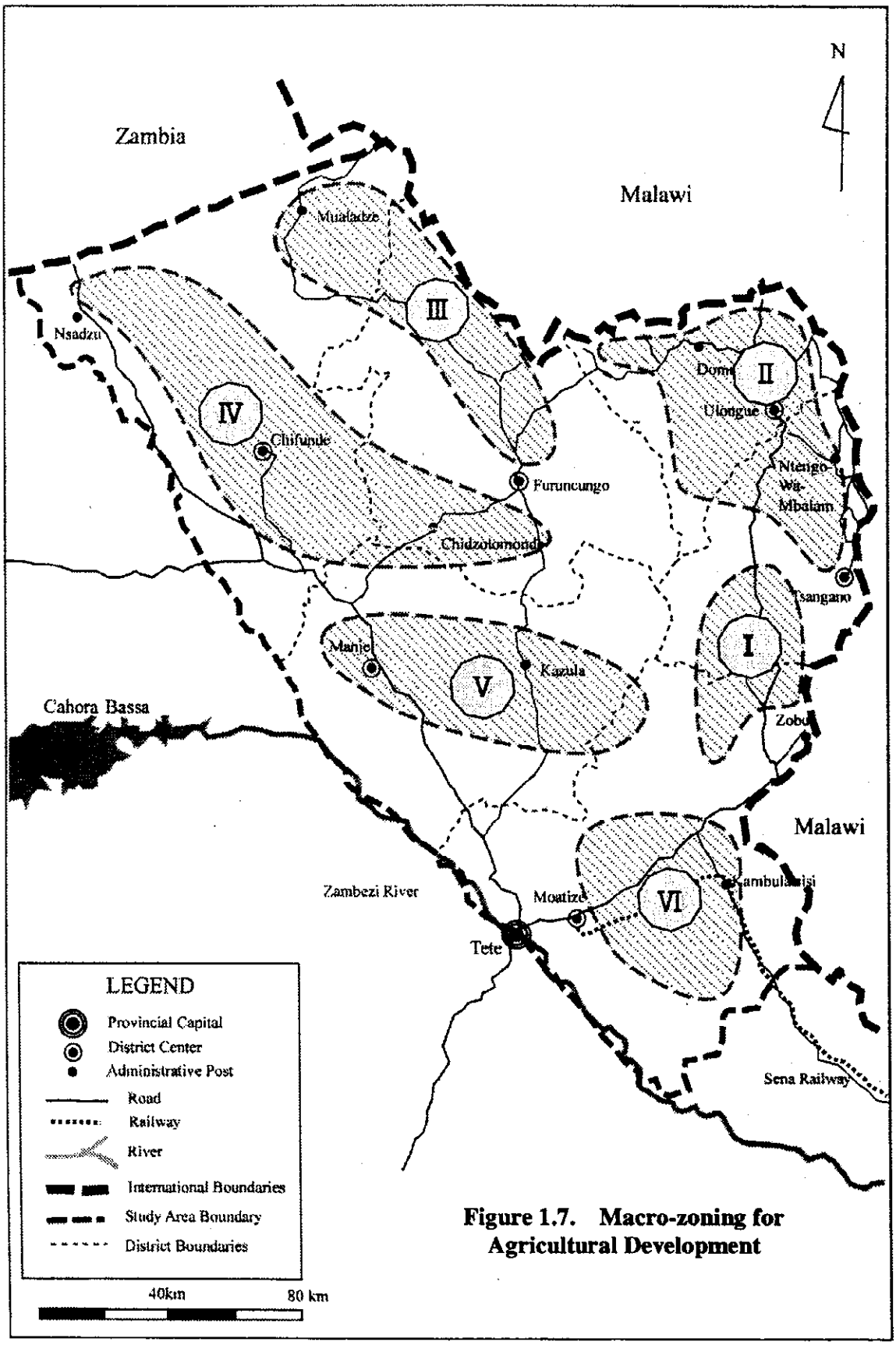


Figure 1.7. Macro-zoning for Agricultural Development

rainfall in 400-600mm. The dominant soil is BP/BV/BI of basalt origin. Tree crops are generally recommended in this zone, including cashew.

Of the recommended crops indicated above, indicative locations of promising cash crops are shown in Figure 1.8.

5.2. Development Projects and Programs

Under the strategy defined in Chapter 5, the following eight projects and programs have been formulated on the agricultural sector.

Project No. 2.1 Integrated Rural Development Program,
2.2 Small Irrigation Schemes Development,
2.3 Integrated Farming Systems Development Program,
2.4 Revuboe Multi-purpose Dam,
2.5 New Cash Crops Establishment Program,
2.6 Livestock Development Program,
2.7 Farmer s' Associations Promotion Program, and
2.8 Grain Storage Development.

Of the six components of the basic strategy, the farmers' organizing supports all the other components. Correspondence between the other five components and the proposed projects/programs is clarified, and the application of these projects/programs to the Angonia highland and the Zambezi lowland, and also different zones is indicated.

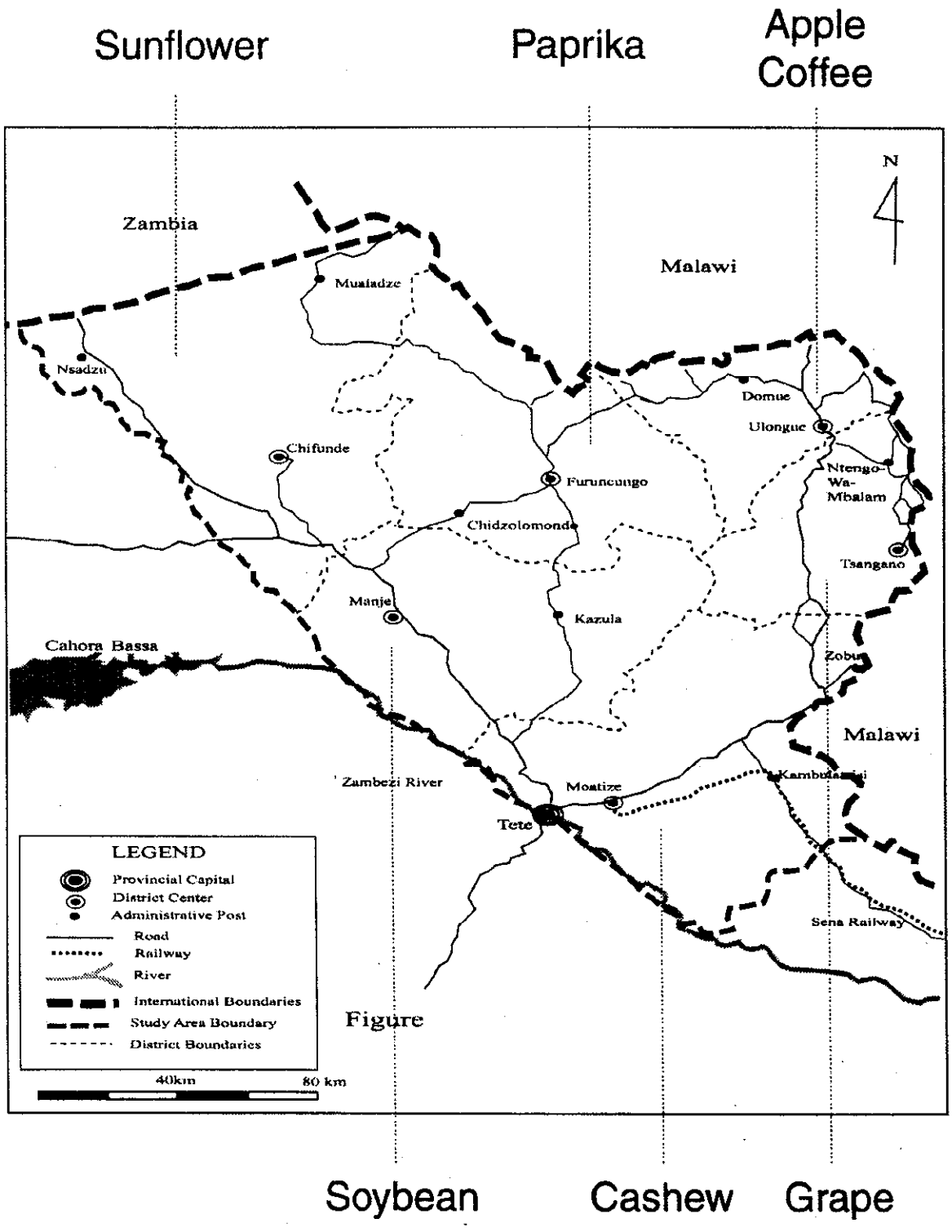
(1) Irrigated agriculture

This strategy is reflected in Project No. 2.2 and the Project No. 2.4. Project No. 2.2 will be implemented in both the Angonia highland and the Zambezi lowland, particularly for various vegetables in Zones I, II and IV and soybean in combination with maize in Zone V. Project No. 2.4 will be implemented subsequently to irrigate sizable area in the Zambezi lowland. Other larger scale irrigation may develop in Zones IV and V, along the Luia and the Mavuzi rivers, respectively. Project No. 2.7 will support farmer's organizing particularly for small irrigation schemes.

(2) Rain-fed agriculture

This strategy is effected by Project No. 2.1, No. 2.3 and No. 2.5. Project No. 2.1 is implemented in the Zambezi lowland, especially in Zones IV, V and VI. Project No. 2.3 is implemented in the Angonia highland, particularly in Zones I and II. Project No. 2.5 is implemented in selected areas of each zone to establish strategic crops. Representative crops are grapes in Zone I, apple and coffee in Zone II, paprika in Zone IV, sunflower in Zone IV, soybean in Zone V, and cashew in Zone VI as well as other vegetables and tree crops. Project No. 2.7 will be instrumental in producing each of the selected crops in a scale large enough for marketing outside.

Figure 1.8. Indicative Locations of Promising Cash Crops



(3) Agricultural land development

This is a strategy for horizontal expansion of agriculture in the Zambezi lowland, and to be effected through Project No. 2.1. In particular, high potential areas in Zones IV and V will be selected for its implementation.

(4) Establishment of new cash crops

This strategy is implemented directly by Project No. 2.5. It is reflected also in Project No. 2.1, No. 2.2, No. 2.3, and No. 2.4 as already mentioned. For any of these projects, Project No. 2.7 will be instrumental in organizing sufficient number of farmers.

(5) Livestock development

This strategy corresponds to Project No. 2.6. In the Angonia highland, the livestock development may take the form of integrated farming by small holders (Project No. 2.3) or introduction of dairy cattle, especially in Zone II. In the Zambezi lowland, Project No. 2.6 will support the control of tsetse flies in Zone IV and small livestock development in Zones V and VI.

Production of maize will expand in all the zones under various schemes, and wheat production will increase in Zones I and II. Project No. 2.8 will facilitate stable supply and prices of these grains. Grain storage facilities may be owned and managed by farmers associations supported by Project No. 2.7.

The profiles of the proposed projects and programs are contained in the Project Report (separate volume). In-dept studies have been carried out for Project No. 2.1, No. 2.4 and No. 2.7, and the results are found also in the Project Report.