CHAPTER 2 TREND IN DEVELOPMENT ASSISTANCE

2.1 Aid Flow

As noted in 1.1, foreign assistance remained stagnant because of "aid-boycott" by many bilateral donors during 1995 - 2000. With the country's stability recovered in mid-October 2001, foreign assistance increased sharply as indicated in the table below.

External Development Assistance

(unit: US$ million)

Aid	1997	%	1998	%	1999	%	2000	%	2001	%
Multilateral	6.315	86.2	5.181	79.4	2.718	66.2	7.523	70.1	6.187	64.1
Bilateral	1.014	13.8	1.348	20.6	1.388	33.8	3.214	29.9	3.473	35.9
Loans	2.605	35.5	2.605	39.9	2.078	50.6	6.186	57.6	4.981	51.6
Grants	4.724	64.5	3.922	60.1	2.028	49.4	4.551	42.4	4.680	48.4
Total	7.329	100	6.528	100	4.105	100	10.737	100	9.660	100
4.5% Subvention	7.600		8.600		5.900		13.100		8.600	

(Source: ZPRP Background Paper)

Following a 1996/97 agreement with the Union Government, 4.5% of general program aid to the Union Government (bilateral and multilateral) is provided as a subvention to the Zanzibar Government.

It reached roughly US$10 million in 2000 and 2001 and it is expected to increase further with the resumption of political and social stability, and successful conclusion of ZPRP. It is said that many donors have started to show keen interests in supporting Zanzibar's economic recovery plan.[3] Over 50% of the amount was distributed to the social sectors.

2.2 On-going Foreign-assisted Projects in Agriculture Sector

On-going projects with foreign assistance in Zanzibar are as follows:

No.	Name of Project	Donor	Loan/Grant, Amount
1	***Special Programme for Food Security***	***FAO***	***US$347,000-***
2	Coconut Research Programme	GTZ, Govt. of Germany	DM40,000 (G), Tsh.16.32 million (L), Tsh.23.3 million (Local)
3	Livestock Development Project	Intern'l Atomic Energy Agency	US$ 320.3 thousand (G), Tsh. 263.0 million (L), Tsh. 14.0 million (Local)
4	National Agricultural Extension Programme Phase II	IDA	US$ 2,474 thousand (G), Tsh. 2,028.7 million (L), Tsh. 25.0 million (Local)
5	Programme for Plant Protection and Produce Inspection	FAO, ASAREC, ICIPE	US$ 182 thousand (G), Tsh. 78.1 million (L), Tsh. 35.1 million (Local)

[3] Daily News June 18, 2002

6	Coordination for Natural Resources Supervision	Ford Foundation, Foundation of Govt. of Austria through CARE, GEF, Macarthur Fund, Mac Night Fund	US$ 552.0 thousand (G), Tsh. 452.6 million (L), Tsh. 80.0 million (Local)
7	Feasibility Study for Agriculture Sector Development	BADEA	US$ 200.0 thousand (G), Tsh. 164.0 million (L), Tsh. 25.0 million (Local)

(Source: Annual Development Plan Book II Ministry of Finance and Economics)

Out of 7 on-going projects listed above, there is only one project that includes irrigation as its project components. Special Programme for Food Security with financial assistance of US$347,000 (Grant) of FAO includes improvement of several irrigation schemes. In those components, GOZ is assumed to provide government staff to supervise the work, and the farmers (the beneficiaries) are assumed to provide a substantial contribution towards the cost of construction works by providing the labor associated with the development of irrigation infrastructure such as headworks, canals, drains and non-removable equipment (buried pipes, pump houses, etc.) and some materials (sand, stones etc.). Also, the cost of some irrigation devices like pumps are expected to be reimbursed by farmers through an appropriate financial arrangement. But since those government and farmers contributions are not valued in monetary terms, specific percentages of their contribution are not known.

2.3 Donors' Assistance Policy for Irrigation Project

As noted above, only FAO is currently implementing a project which includes irrigation component. FAO has implemented many projects in Zanzibar. Now FAO is implementing projects with the "Special Program Approach", which is appropriate. FAO used to provide most of the required inputs for projects, but now farmers provide inputs, such as fuel, pump, etc. themselves in order to increase the sense of ownership. Since "Special Program Approach" was adopted, the project sustainability has been improved. Therefore FAO appreciate the approach. Problem is that the farmers are not able to bear the cost of expensive items, such as pump. Replacement cost of a pump will be Tsh.77 million/unit. FAO does not intend to replace all pumps with its own money. Actually, some projects, such as Kibokwa Project had to stop because of malfunctioning of pumps. FAO have not decided how they should support the farmers for the project.

2.4 Activities of Non-government Organization

The government has recognized NGOs as potential partners for their significant roles in the provision of knowledge and mobilization of resources at the grass

roots level. It is because of this recognition that in 1995 the government enacted a law for the registration of NGOs. It was for the same reason that a special department, dealing with NGOs matters, has been established and put under the Chief Minister's Office.

NGO sector in Zanzibar is just emerging and is consisted of many small NGOs and Community Based Organizations (CBOs). According to Agriculture Sector Review prepared with assistance of FAO (June 1999), a total of 99 NGOs have been registered, of which 23 are members of the Association of Non-Governmental Organization (ANGOZA). But the Review also points out that most of agricultural related NGOs are dormant.

As noted in the table in section 2.2, currently there is only one project underway in agriculture sector: Coordination for Natural Resources Supervision, for which participating NGOs are Ford Foundation, CARE International Tanzania, Macarthur Fund, and Mac Night Fund. There is no irrigation project underway with support of NGO.

CHAPTER 3 FRAMEWORK FOR IMPLEMENTATION OF ZIMP

3.1 Macroeconomic and Policy Framework

GOZ has been pursuing the long-term policies, strategies and targets as laid out in Zanzibar Vision 2020 and medium and short-term policies through ZPRP and agriculture sector policy as well as each year's annual budget. They have set up various targets, including GDP growth rate, limiting expenditures, especially recurrent expenditure, increasing revenue, using the resources with maximum effects to improve economic and social services, and promoting greater private sector participation in not only commercial sectors, but also in the sectors which used to be dominantly the responsibility of the government. Utilizing those objectives, policies, measures and targets, the ZIMP has drawn its own macroeconomic and policy framework to attain the goal of poverty reduction and food security through sustainable irrigation development through effective use of national resources. Pillars of the framework and specific targets adopted for the projection of the financial resources envelope for the ZIMP are summarized below:

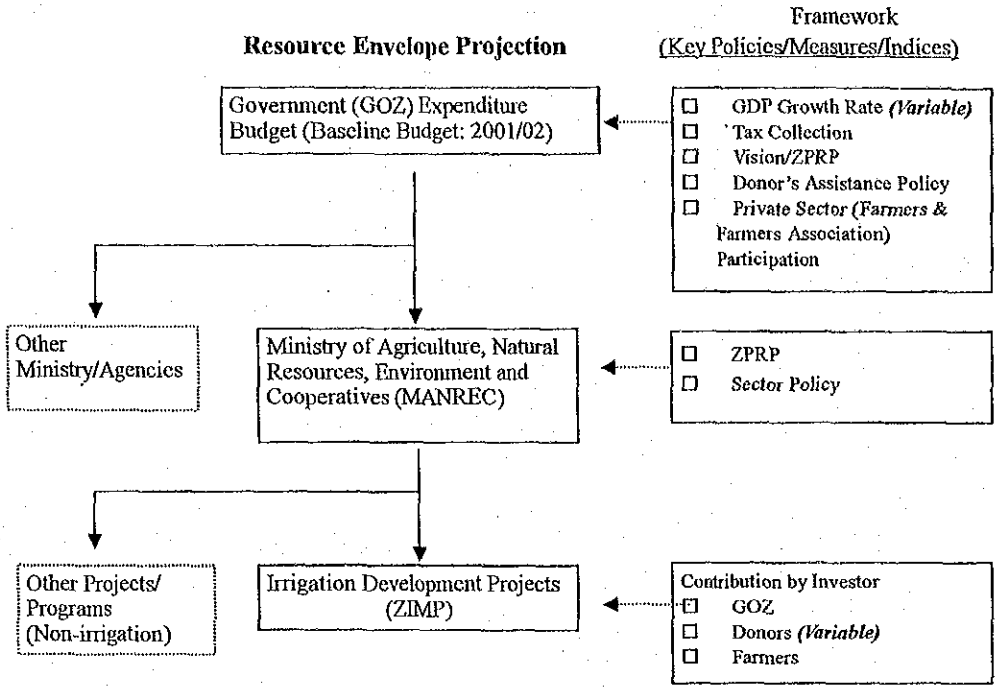
Pillars	Specific Measures/Targets
Stable and sustainable overall economic development	GDP growth rate
Accelerated and sustainable development of crop production	Allocation of Development Fund (Local and Foreign Funds) to MANREC
Expanded and improved irrigation program/projects	Allocation of Development Fund (Local and Foreign Funds) to irrigation projects implemented and/or managed by Rice and Inputs Division of Commission of Agriculture, Research and Extension of MANREC
Stable and increased donor assistance	Financial assistance of foreign donors, both multilateral and bilateral, to irrigation/water management projects

Macroeconomic and policy framework including other strategies and targets which should be the background and preconditions for the implementation of the ZIMP is shown in Table 3.1.1.

3.2 Projection of Financial Resources Envelope for ZIMP

3.2.1 Projection Process

Projection process of financial resources available for the implementation of the projects identified in the ZIMP is shown in the next page:



Variable indices applied to the resource envelope projection should be 1) GDP Growth Rate, 2) Percentage of irrigation development expenditure of MANREC budget, 3) Contribution by Investor (GOZ, Donors, and Farmers).

3.2.2 Assumptions for Projection of Financial Resources

(1) Initial Investment/Development Expenditure

GOZ has been implementing the long-term policies as laid out in Zanzibar Vision 2020 since its finalization in January 2002 as well as medium and short term policies through ZPRP and annual budget. They include achieving GDP growth rates, limiting expenditure, especially recurrent expenditure, increasing the revenue, reduction of national debt and using the resources with maximum effects to improve economic and social services, and promoting greater stakeholder participation, especially private sector in the provision of public services.

Historical data of development expenditure of GOZ, both actual and budget, and the budget of irrigation development managed by MANREC from 1992/03 to 2000/01 have been collected and analyzed, and the result is summarized in Table 3.2.1. Financial resources projection is made based on the analysis of the past budget and actual figures, and various assumptions, which are summarized below:

	Resources	Assumptions
1.	GOZ Expenditure Budget	☐ Budget is to increase annually in proportion with GDP (representing national income and consumption) growth rate, which varies as follows (same rates as adopted in ZPRP): ***(Variable)*** Base Case – Left; High Case – Right (Low Case: 4.5% for the entire NIMP period assuming that current level of growth is sustained.) ➢ 5 – 6% p.a. between 2000 and 2005; ➢ rising to 7 – 8%p.a. by 2010; ➢ reaching to 9 – 10%p.a. by 2020 ☐ Table 3.2.1 shows that actual amounts spent as development expenditure during 1995/96 – 2000/01 are only a few percent of the relevant budgets; the lowest is 2.3% in 1998/99 and the highest is 4.8% in 2000/01. (Refer to the column of "Ratio of Actual/Budget (%)") Actual amounts spent as development expenditure have been selected as the basis of the projection of GOZ Development Expenditure (local fund). Percentages of local fund of irrigation development to GOZ Development Expenditure (local fund) have been calculated based on the past budgets. (Refer to the column of "3)/1) (%)") ☐ Share of local fund portion of Development Expenditure is assumed to remain at 20.0% of total Development Expenditure through the period of ZIMP (2003/04 – 2020/21). This assumption is considered reasonable because average share of local fund portion of GOZ Development Expenditure between 1992/93 and 2000/01 is 17.31%, excluding 2years of 1995/96 and 1996/97 because the multiple of these 2 years are irregularly small. ☐ Availability of local fund of Development Expenditure during the implementation stages regulates actual disbursement ex-post facto of its foreign fund provided by foreign donors. ☐ Revenue base is to be broadened and strengthened sufficiently to meet expenditure, especially development expenditure.
2	Irrigation Development Program in ZIMP	☐ Average share of local fund allocated to irrigation development executed under Rice and Inputs Division of Commission for Agriculture, Research and Extension of MANREC for the period of 1992/03 – 1999/03 is 1.89%. Considering the past records and expecting a little increase because of the priority and importance of the sub-sector, the share of is assumed to be 2.0% throughout the period of ZIMP. ***(Variable)*** ➢ Base Case: 2.0%; ➢ High Case: 3.0%; ➢ Low Case: 2.0%, assuming that nearly actual average share for last 2 years is sustained..
3	Foreign Donors Contribution to Development Expenditure of MANREC (Fund portion)	☐ Calculation of external financial resources is made using the following multiplier. ***(Variable)*** ➢ Base Case: 6 times ➢ High Case: 9 times ➢ Low Case: 3 times As noted in 1.1 and 2.1, foreign assistance during 1995 – 2000 remained stagnant because of "aid-boycott" by many bilateral donors. It would be because of this particular reason that actual foreign funds allocated irrigation projects are in such small amounts. Therefore, it is not appropriate to use the average multiplier calculated based on the past figures. 6 times should be appropriate for the Base Case because the multiplier in 1999/00, which is the latest one, is 5.18, and assuming he increasing trend of development assistance from foreign donors. 9 times as the multiplier would be appropriate to High Case, in which local fund portion is 10% of total cost. 3 times would be appropriate to Low Case, in which foreign assistance is assumed to remain at roughly same level. Thus, 6 times would stand as the medium. It is still unsecured and risky to decide the multiplier to foreign donors' contribution in sensitivity analysis, therefore, it is reasonable to set wider margins for multipliers.

Out-of-budget contribution by foreign donors, which is considered in the analysis of the Mainland, is not considered in Zanzibar case because all projects are registered in the budget and controlled by MANREC.

(2) Management and Maintenance Expenditure

Financial resources for management and maintenance expenditure are analyzed on the following assumptions.

(a) Personnel Expenditure

In budget of 2002/03, personnel expenditure of entire MANREC is Tsh. 2,558,828 thousand for 3,483 personnel. Share of the number of staff of Rice and Inputs Division (164 personnel) who are directly involved in irrigation projects is 4.7%. During the ZIMP, a quarter (25%) of their personnel expenditure (emolument) should be the responsibility of the ZIMP. Therefore, Tsh. 30,066 thousand is assumed to have been allocated to the expenditure of irrigation development.

(b) Maintenance Expenditure of Irrigation Facilities

Budget of maintenance expenditure for entire MANREC for 2002/03 is Tsh. 664,101 thousand, out of which 7.5% is assumed to have been used for the maintenance of irrigation facilities.

For Base Case and High Case, both (a) and (b) are assumed to increase in accordance with GDP growth rate, but these items are not regarded as variable in sensitivity analysis. For Low Case, both (a) and (b) are assumed to remain in the same amount as the current level for the entire ZIMP period.

3.2.3 Financial Resources Envelope

(1) Initial Investment/Development Expenditure

Using indices assumed in 3.2.2 above, the calculation has been carried out and the result is Tsh. 1,183 million in Base Case, which is US$ 1.2 million converted at Tsh. 950/US$, over 18 years of ZIMP implementing period.

(2) Management and Maintenance Expenditure

The calculation result is Tsh. 2,981 million, which is US$ 3.1 million converted at Tsh. 950/US$, over 18 years of ZIMP implementing period.

The calculation is included in Table 3.2.2.

3.2.4 Sensitivity Analysis

Three scenarios, Base Case, High Case, and Low Case, for Initial Investment/Development Expenditure, are analyzed. Each scenario has the following indices:

Variable	Base Case	High Case	Low Case
GDP Growth Rate	2003/04-2005/06: 5.0%; 2006/07-2010/11: 7.0%; 2011/12-2020/21: 9.0%	1.0%p.a. above Base Case	4.5%p.a. for the entire ZIMP period
Irrigation Development Expenditure (Local Fund portion)	2.0% (of GOT Development Expenditure)	3.0%	2.0% (No increase)
Foreign Donors Contribution to Irrigation Projects (Fund portion)	6 times (of Local Funds)	9 times	3 times (Current situation)

(Source: JICA Study Team)

Base Case or baseline scenario has combined modest and most likely assumptions under the current economic and policy framework. High Case with combined higher than Base Case indices and expecting higher economic growth and increased donor assistance represents optimistic and buoyant development scenario. Low Case with combined more modest indices than those included in Base Case and expecting lower economic growth, but sustained growth at current level, and current level of donor assistance, represents rather pessimistic and low development scenario. The calculations are included in Table 3.2.3 and 3.2.4.

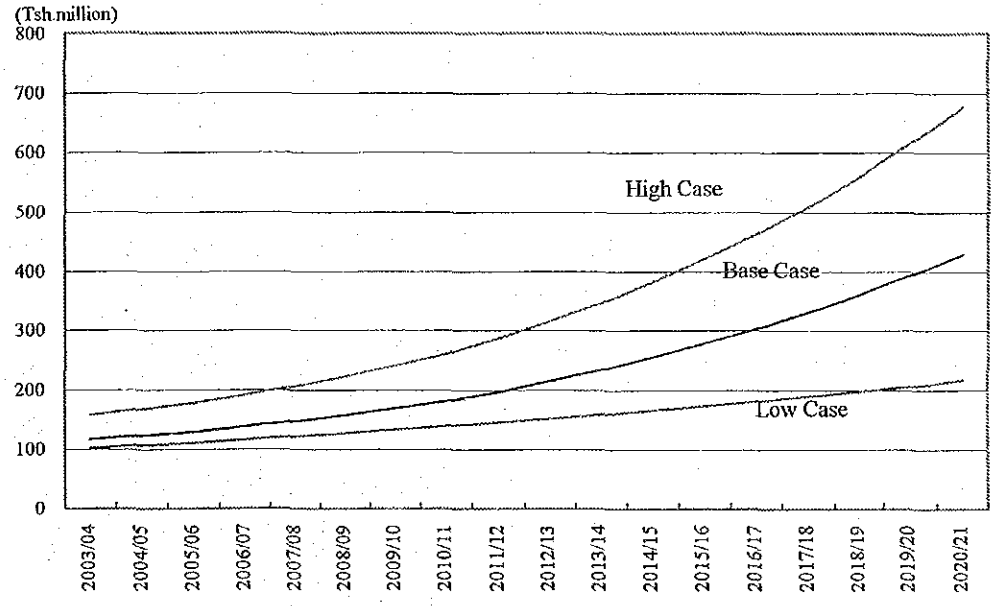
The results of the sensitive analysis are summarized in the table below:

Scenario	Financial Resources Envelope (million Tsh.)	Equivalent US$ (million US$)
Base Case	4,164	4.4
High Case	6,203	6.5
Low Case	2,746	2.9

(Source: JICA Study Team)

The results are also shown in the figure below:

Projection of Financial Resources Envelope



(Source: JICA Study Team)

Table

Table 3.1.1 Macro-economic and Social Framework for ZIMP
(Commencement Year: 2003/04 Target Year: 2020) (1/2)

Framework \ Issue	Diagnosis	Targets and Measures being Adopted	Existing Policies and Strategies	Framework for ZIMP (2003 – 2017)
Macro-economic Indicators	*Tanzania is politically stable and* ethnical friction is minimal. (CAS of World Bank) (Average of 5 years, 1996 – 2000) ➢ GDP Growth Rate: 4.1% ➢ GDP per capita: Tsh.154 thousand ➢ Inflation: 10.3% (6.5% in 2000) ➢ *Trade: Freer system*	➢ GDP Growth Rate: 5.0% in 2003/04; 5.5% in 2004/05; 6.0% in 2005/06 ➢ Inflation: 4.0% ➢ Fiscal Imbalance: ➢ Trade: Freer system ➢ *Financial Market:* Liberalized market ➢ Investment: "It is important that a pro-poor growth and investment policy is formulated soonest." (ZPRP)	Vision 2020; ZPRP	➢ GDP Growth Rate: 2003/04 – 2005/06: 5.0%; 2006/07 – 2010/11: 7.0% 2011/12 – 2020/21: 9.0% *(Vision 2020)*
Sector Policy for Agriculture Sector	Average agriculture sector growth rate over 5 years, *1996 – 2000 is* 2.0%, steady but unsatisfactory performance. Much of poor performance during 1995 – 98 is attributed to adverse climate and overvaluation of exchange rate, increases of input prices, and *incomplete liberalization of output.*	➢ Sector Growth Rate: Clove: 5.0%; Other Export Crop: 4.5%; Food Crop: 3.0% (ZPRP)	Agriculture Sector Policy	➢ Sector Growth Rate (Food Crop): 2003/04 and onward: 3.0% (ZPRP)
Investment in Agriculture Sector	➢ Insufficient investment from the central govt. budget ➢ Insufficient investment from private sector.			
Investment in Irrigation Sub-sector			Promotion of investment in rain harvesting structure and systems is pointed out in ZPRP as specific actions required. Development of agricultural investment programme is called for, and irrigation (or water management) is a priority component in the programme.	

Table 3.1.1 Macro-economic and Social Framework for ZIMP
(Commencement Year: 2003/04 Target Year: 2020) (2/2)

Technology	Appropriate level of technology for environmental aspect and mechanical aspect, especially maintenance-free pumping, has not been applied.	➢ Water harvesting technology; ➢ Water management and control ➢ Soil and water conservation technology ➢ Construction technology		
Poverty Reduction and Social Indicators	➢Basic Needs Poverty: 57% (HBS 1991/2) ➢Food Poverty: 32% (HBS 1991/2) ➢Population: 924,162 in 2000 ➢ Population growth: 3.13%p.a. during 1995 - 2000 ➢Land Area: Approx. 944,800km^2 ➢Cultivated Land: 10.1 million ha. ➢Irrigable Land: Approx. 1 mil. ha. ➢Irrigated Land: 157,000 – 200,000 ha.	➢ To improve quality of life. Life expectancy should have risen from 48 to 65 years. ➢ To improve and maintain high education standards and promote skill development cost effectively. ➢ To attain universal education by raising the primary school enrollment from 84.2% in 1997 to 100% by 2005. The transition rate to the second cycle of secondary education should reach 100% by 2020.	Implementation of ZPRP with assistance from foreign donors and the Union government.	
Financial Resources	➢Govt. has successfully increased revenue through effective tax collection, reduced exemption, tax simplification. ➢ Cash budget system has contributed to the improvement of fiscal balance.		➢Govt. will continue strengthening of tax collection, reduced exemption, tax simplification. ➢Cash budget system will be maintained.	For Development Expenditure, GOZ will continue to depend on external resources, but GOZ will maintain ownership by allocating local funds, although their share will be less than 10%.
Gender	Women are often poorer than men, own less land and livestock and have fewer years of schooling. But substantial portion of farming labor is born by women in general.		The new land legislation has represented an encouraging step towards securing the right of women to own, dispose of and inherit land.	
Donors Assistance	Since 1996, development assistance from foreign donors has fallen significantly with a corresponding impact on social indicators. (ZPRP Strategic Plan Background Paper) With the country's stability recovered in mid-October 2001, foreign assistance increased sharply.	It reached roughly US$10 million in 2000 and 2001 and it is expected to increase further with the resumption of political and social stability, and successful conclusion of ZPRP. It is said that many donors have started to show keen interests in supporting Zanzibar's economic recovery plan. Over 50% of the amount was distributed to the social sectors.	Donors Assistance will continue to dominant share of development expenditure.	"Special Programme Approach" developed by FAO

(Source: JICA Study Team)

Table 3.2.1 Historical Data of Development Expenditure
- Budget and Actual -

(unit: million Tsh.)

Year	(1) GOZ Development Expenditure Budget				Actual	Ratio of	(2) MANREC Budget				(3) Irrigation Development Expenditures Budget			
	1) Local	Foreign	Total	Share of Local (%)	Actual Total	Actual/Budget (%)	2) Local	Foreign	Total	2) / 1) (%)	3) Local	Foreign	Total	3) / 1) (%)
1992/93	3,281	17,987	21,268	15.4%	n.a.	n.a.	342	2,716	3,058	10.4%	90	239	329	2.7%
1993/94	2,546	19,031	21,578	11.8%	n.a.	n.a.	278	1,658	1,936	10.9%	80	0	80	3.1%
1994/95	2,850	18,580	21,430	13.3%	12,501	58.3%	290	1,589	1,879	10.2%	70	238	308	2.5%
1995/96	1,420	25,232	26,652	5.3%	889	3.3%	170	207	377	12.0%	39	0	39	2.7%
1996/97	1,400	22,330	23,730	5.9%	760	3.2%	95	2,874	2,969	6.8%	16	0	16	1.2%
1997/98	1,660	11,223	12,883	12.9%	635	4.9%	0.2	945	945	0.0%	21	0	21	1.3%
1998/99	3,250	12,544	15,794	20.6%	360	2.3%	150	325	475	4.6%	27	0	27	0.8%
1999/00	3,300	11,924	15,224	21.7%	599	3.9%	140	483	623	4.2%	28	145	173	0.8%
2000/01	5,400	15,775	21,175	25.5%	1,027	4.8%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

(Source: Actual from ZPRP Background Paper; Budget from Ministry of Agriculture, Natural Resources, Environment and Cooperative, MANREC)

Table 3.2.2 Projection of Financial Resources Envelope for ZIMP (Base Case)

(unit: Tsh. Million)

	Year	(1) GOZ Development Expenditure	(2) Local Funds of (1) ((1) x 20%)	(3) Development Expenditure Allocated to Irrigation Development (Local) ((2) x 2.0%)	(4) Development Expenditure Allocated to Irrigation Projects (Foreign) ((3) x 6)	(5) Management & Maintainance Expenditure	(6) Financial Resources Envelope ((3)+(4)+(5))
Execution of ZIMP	2003/04	1,189	238	5	29	84	117
	2004/05	1,248	250	5	30	88	123
	2005/06	1,311	262	5	31	92	129
	2006/07	1,402	280	6	34	99	138
	2007/08	1,501	300	6	36	106	148
	2008/09	1,606	321	6	39	113	158
	2009/10	1,718	344	7	41	121	169
	2010/11	1,838	368	7	44	130	181
	2011/12	2,004	401	8	48	141	197
	2012/13	2,184	437	9	52	154	215
	2013/14	2,381	476	10	57	168	235
	2014/15	2,595	519	10	62	183	256
	2015/16	2,829	566	11	68	200	279
	2016/17	3,083	617	12	74	217	304
	2017/18	3,361	672	13	81	237	331
	2018/19	3,663	733	15	88	258	361
	2019/20	3,993	799	16	96	282	393
	2020/21	4,352	870	17	104	307	429
				169	1,014	2,981	4,164
				Grand Total	1,183	-	-
				(@Tsh. 950/US$; million US$)	1.2	3.1	4.4

(Source: JICA Study Team)

Table 3.2.3 Projection of Financial Resources Envelope for ZIMP (High Case)

(unit: Tsh. Million)

	Year	(1) GOZ Development Expenditure	(2) Local Funds of (1) ((1) x 20%)	(3) Development Expenditure Allocated to Irrigation Development (Local) ((2) x 3.0%)	(4) Development Expenditure Allocated to Irrigation Projects (Foreign) ((3) x 9)	(5) Management & Maintainance Expenditure	(6) Financial Resources Envelope ((3)+(4)+(5))
Execution of ZIMP	2003/04	1,223	245	7	66	85	158
	2004/05	1,297	259	8	70	90	168
	2005/06	1,374	275	8	74	95	178
	2006/07	1,484	297	9	80	103	192
	2007/08	1,603	321	10	87	111	207
	2008/09	1,731	346	10	93	120	224
	2009/10	1,870	374	11	101	129	242
	2010/11	2,019	404	12	109	140	261
	2011/12	2,221	444	13	120	154	287
	2012/13	2,443	489	15	132	169	316
	2013/14	2,688	538	16	145	186	347
	2014/15	2,957	591	18	160	205	382
	2015/16	3,252	650	20	176	225	420
	2016/17	3,577	715	21	193	248	462
	2017/18	3,935	787	24	213	272	509
	2018/19	4,329	866	26	234	300	559
	2019/20	4,762	952	29	257	330	615
	2020/21	5,238	1,048	31	283	363	677
				288	2,592	3,323	6,203
				Grand Total	2,880	-	-
				(@Tsh. 950/US$; million US$)	3.0	3.5	6.5

(Source: JICA Study Team)

Table 3.2.4 Projection of Financial Resources Envelope for ZIMP (Low Case)

(unit: Tsh. Million)

	Year	(1) GOZ Development Expenditure	(2) Local Funds of (1) ((1) x 20%)	(3) Development Expenditure Allocated to Irrigation Development (Local) ((2) x 2.0%)	(4) Development Expenditure Allocated to Irrigation Projects (Foreign) ((3) x 3)	(5) Management & Maintainance Expenditure	(6) Financial Resources Envelope ((3)+(4)+(5))
Execution of ZIMP	2003/04	1,172	234	5	14	83	102
	2004/05	1,225	245	5	15	87	107
	2005/06	1,280	256	5	15	91	112
	2006/07	1,337	267	5	16	95	117
	2007/08	1,398	280	6	17	100	122
	2008/09	1,460	292	6	18	104	127
	2009/10	1,526	305	6	18	109	133
	2010/11	1,595	319	6	19	114	139
	2011/12	1,667	333	7	20	119	145
	2012/13	1,742	348	7	21	124	152
	2013/14	1,820	364	7	22	130	159
	2014/15	1,902	380	8	23	135	166
	2015/16	1,988	398	8	24	142	173
	2016/17	2,077	415	8	25	148	181
	2017/18	2,170	434	9	26	155	189
	2018/19	2,268	454	9	27	162	198
	2019/20	2,370	474	9	28	169	207
	2020/21	2,560	512	10	31	176	217
				126	379	2,242	2,746
				Grand Total	505	-	-
				(@Tsh. 950/US$; million US$)	0.5	2.4	2.9

(Source: JICA Study Team)

Appendix C

Land Use and Agriculture

THE STUDY
ON
THE ZANZIBAR IRRIGATION MASTER PLAN
IN
THE UNITED REPUBLIC OF TANZANIA

MASTER PLAN

APPENDIX C

LAND USE AND AGRICULTURE

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APPENDIX C

LAND USE AND AGRICULTURE

CHAPTER 1 LAND USE AND FARMING SYSTEM

1.1 Land Use

1.1.1 Present Land Use

(1) Available Data on Land Use and Crop Production

The most obvious problem on land use and crop production statistics in Zanzibar is multiple and conflicting statistics issued by different government agencies.

In 1980-1982, a land use atlas of Zanzibar was produced by the National Coconut Development Programme based on aerial photographs taken in 1977. This was the only land use study covering both islands but is now out-of-date. In 1994 the Ministry of Natural Resources and Tourism (MNRT) launched a mapping project as a part of Forest Resources Management Project covering the whole country including Zanzibar by using Landsat satellite images. Since the result of this project provides the most up-to-date land cover of both islands, these data were utilized as basic data on the present land use for the current study.

Statistics on cultivated area and production for major crops are produced by the Ministry of Agriculture, Zanzibar and also by the Department of Statistics of the Ministry of State Planning and Investments. Although wide variation on the data was observed, since the data from Ministry of Agriculture is more up-to-date, the same data were utilized for the current study on ZIMP.

As for the survey on household characteristics, only a few survey results are available such as "A Baseline Survey for the Identification of Farming Systems in Zanzibar, 1988", "Zanzibar Agricultural Survey, 1990" and "Farming Systems Baseline Survey, 1992". Although these data are out-of-date, since other up-to-date data are not available, the data on household characteristics in these surveys were utilized for the current study.

(2) General Land Use

According to the land use data obtained through the above mentioned mapping project, the present land use is categorized into eight major land types, namely; forests, woodland, bushland, grassland, cultivated land, open land, water features and others. Table 1.1.1, Fig.1.1.1 and Fig.1.1.2 shows the distribution of land

cover in both islands of Unguja and Pemba. The summary table is shown as below. Total of forest and woodland occupies about 30% of the total land area of Zanzibar. The cultivated land occupies more than 50% of the land area that is equivalent to 140,000 ha. Such a high percentage of cultivated land is the major difference from the land use of main land. More than 70% of the land is already utilized for cultivation and about 5% is under woodland and bushland in Pemba Island. In Unguja Island, on the other hand, nearly 40% of the land is cultivated and another 40% is under woodland and bushland.

Distribution of Land Cover in Zanzibar

Land Cover	Unguja		Pemba		Total	
	Area (ha)	(%)	Area (ha)	(%)	Area (ha)	(%)
Forest	22,768	14.6	19,392	17.4	42,160	15.8
Woodland	34,022	21.8	3,919	3.5	37,941	14.2
Bushland	30,843	19.7	2,088	1.9	32,931	12.3
Grassland	3,115	2.0	217	0.2	3,332	1.2
Cultivated Land	62,038	39.7	78,263	70.3	140,301	52.4
Open Land	1,200	0.8	7,051	6.3	8,251	3.1
Water Features	0	0.0	206	0.2	206	0.1
Others	2,287	1.5	266	0.2	2,553	1.0
Total	156,273	100.0	111,402	100.0	267,675	100.0

(Source: National Reconnaissance Level Land Use and Natural Resources Mapping Project, 1997)

There are two categories of forest reserves in Zanzibar, natural conservation forests and plantation. The former are established to protect water resources, endemic flora and fauna and regulate ecosystems. The plantation forest reserves are established for the purpose of promoting supply of wood products in the country. Table 1.1.2 shows the distribution of such forest reserves in both islands. The total acreage of the forest reserves is about 12,000 ha and these protected areas should carefully be conserved according to the proper natural resource management policy.

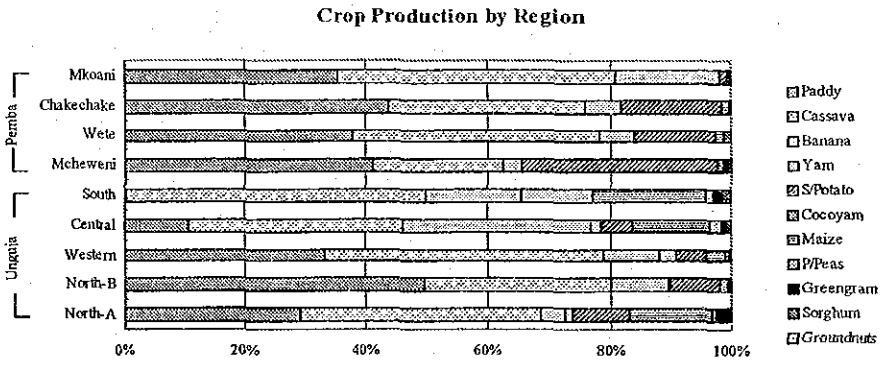
(3) Crop Production

About 40% of the total cultivated land is under export crops such as cloves, coconut, fruits and spices. Food crops occupy the remaining 60% and the main food crops grown in Zanzibar are cassava, paddy, sweet potato and bananas. Table 1.1.3 shows the changes of production for major crops between 1991 and 2000 obtained from "Zanzibar Report on the Implementation of the World Food

Summit Plan of Action". Since the farming system in Zanzibar is complex associations of tree crops and food crops, the data on planted area for each crop are basically not available. Table 1.1.4 shows the changes of planted area calculated from the above production data and the average yield of each crop. The main food crops grown in Zanzibar are cassava, paddy, sweet potato and bananas. Of the food crops grown, cassava is the dominant crop but the planted area is gradually decreasing during past 10 years. Rice is the second largest food crop and the planted area is fluctuating from year to year with slightly increasing trend. Sweet potatoes and bananas are also important food crops as a part of major staples and substantial areas are utilized for these crops. The yields of these food crops are generally low due mainly to the dependence on rain-fed agriculture and therefore fluctuate because of unstable rainfall.

Cash crops grown are cloves and coconuts. The clove crop has been the key foreign earner of Zanzibar but the production has been declining due to aging trees, diseases and world market competition. Clove industry is therefore deteriorating. Coconut crop is very important because it satisfies local demand for daily consumption, construction, industrial and export needs.

The cropping pattern varies considerably from district to district as shown in Table 1.1.5. Cassava dominates the cropping in many of the districts accounting for as much as 50% of the food crop area in South of Unguja. Land allocated for rice is generally higher in Pemba Island. In Unguja Island, on the other hand, land for rice fluctuates from district to district. Land allocated for maize is generally higher in Unguja Island.



Source: Data obtained from Ministry of Agriculture for the year 2001

(4) Livestock and Rangeland

Livestock remains an important economic sub-sector in Zanzibar and cattle, goats and chicken are the major types of livestock raised by agricultural holders. Table 1.1.6 shows the estimated number of livestock and by regions in the year 1993.

It is obvious that livestock activities are important in North region of Pemba Island. Cattle and chicken are raised more in Pemba Island, while goats are raised more in Unguja Island. Although the data are based on the aerial photographs taken in 1977, the distribution of grazing land is shown in Table 1.1.7. The total grazing land occupies more than 40% of the land area in Unguja Island, while it occupies less than 20% in Pemba Island. Since livestock raising is more active in less grazing area in Pemba, it can be considered that livestock keeping is more integrated with crop farming there.

(5) Household Characteristics

Table 1.1.8 shows the characteristics of household in different agro-ecological zones of both islands. The parcel size is about 0.15 ha in both islands. Since the number of parcel owned by household is less in Unguja, the total land area occupied by household is less than 0.5 ha and the area is larger in plantation area than in coral rag area. In Pemba, on the other hand, the area occupied is more than 0.5 ha and is larger in plantation area. The area allocated for one parson is less than 0.1 ha in both island. As for livestock raising, each household keeps one cattle in plantation area in Unguja and coral rag area in Pemba.

Table 1.1.9 shows the distribution and the area occupied by different farm group. The farm group with the farm size between 0.2 and 1.0 ha is widely distributed and occupies most of the land. In Unguja Island, however, the percentage of the farm group of small farmers (farm size is less than 0.2 ha) is higher than Pemba Island.

1.1.2 Land Tenure

Land tenure system strongly affects the crop production and land degradation in Zanzibar. Categories of land right within the tenure system are shown in the table below.

Categories of Land Right within the Tenure System

Agro-ecological Zone	Farming System	Land Right	Contents
Plantation Zone	Shamba	Three acre plots	These plots are distributed by the Government to the former plantation workers and landless people.
		Inherited Land	This land is properly inherited under the Islamic and existing law.
		Family Plots	These plots are inherited land belonging to several family members.
		Bought Land	These are inherited land which have been sold by the owner.
	Konde	Borrowed Land	These can be used for non permanent crops and the borrower can use the land during his life time.
		Seasonally Allocated	These are conditionally allocated in small plots for specified land uses e.g. rice.
Coralline Zone	Shifting Cultivation	-	Ownership is acquired by clearing a piece of land and utilizing it.

(Source: Evaluation of Land Resources in Zanzibar, FAO, 1990)

A Shamba farmer is one who owns or has assurance by law for long term utilization of the land. He is free to cultivate permanent crops, field perennials or annuals on the land. He has the right to allow Konde farmer to cultivate in the under-utilized portions of his land. On the other hand, a Konde farmer is primarily farming on someone else's land. He is not allowed to grow permanent tree crops but allowed to grow annual crops and field perennials. Since all land basically belongs to the Government, many farmers have no interest in conservation of the land resources. It is thus causing the accelerated erosion of good soil layers and land degradation. It is simultaneously subjecting the permanent tree crops on upper and mid slopes to severe moisture stress. This is finally reflected in the gradual decline of yields during the last decade.

1.1.3 Land Resources for Irrigation Development

There are various data on irrigated area and the estimated irrigable area in dry season for both islands. Some of these data are shown in the table below.

Irrigated Area and Estimated Irrigable Area in Dry Season

Category	Data Source	Unguja	Pemba	Total
Irrigated Area	Land Use Atlas (1977)	405	0	405
	Status of Irrigation Development (2001)	300	100	400
	Ministry of Agriculture (2002)	268	74	342
Estimated Irrigable Area in Dry Season	Ministry of Agriculture	2,692	1,284	3,976
	Master Plan by UNDP/FAO	5,142	1,047	6,189
	Land Use Plan (1994)	3,000	2,000	5,000
	ZIDP (1997)	2,500	1,250	3,750
	Ministry of Agriculture (2002)	4,244	596	4,840

(Source: Survey done by study team)

It is obvious that the area already developed for irrigation is quite limited compared to the estimated irrigable area in dry season. The total dry season irrigable area in both islands is said to be around 4,000 to 5,000 ha according to various past studies. This was practically confirmed through the current inventory survey under this master plan study. Since there is little scope for increasing agricultural production through expanding the area in Zanzibar, the irrigation development is considered to be one of the very important subjects for the intensification and improved management of the existing farmland.

1.2 Farming System

1.2.1 Farming Systems

In a baseline survey for the identification of farming systems in Zanzibar, it is mentioned that the principal farming systems in Zanzibar are shifting cultivation in coral rag area and permanent cropping with trees intercropped with perennials and annuals. Permanent cropping systems are further classified into sub-systems based on the ability of cultivating trees and generating income from tree crop production in the following manner.

Factors Determining farming Systems of Zanzibar

Farming System	Konde	Shamba cum Konde		
Sub-System		I	II	III
Potential for tree crops cultivation	None	Low	Underutilized	Utilized
Constraints	Land tenure	Ecological factor, Competition between tree and food crops	Low yielding trees, Recently planted trees	No constraints

Source: A baseline survey for the identification of farming systems in Zanzibar

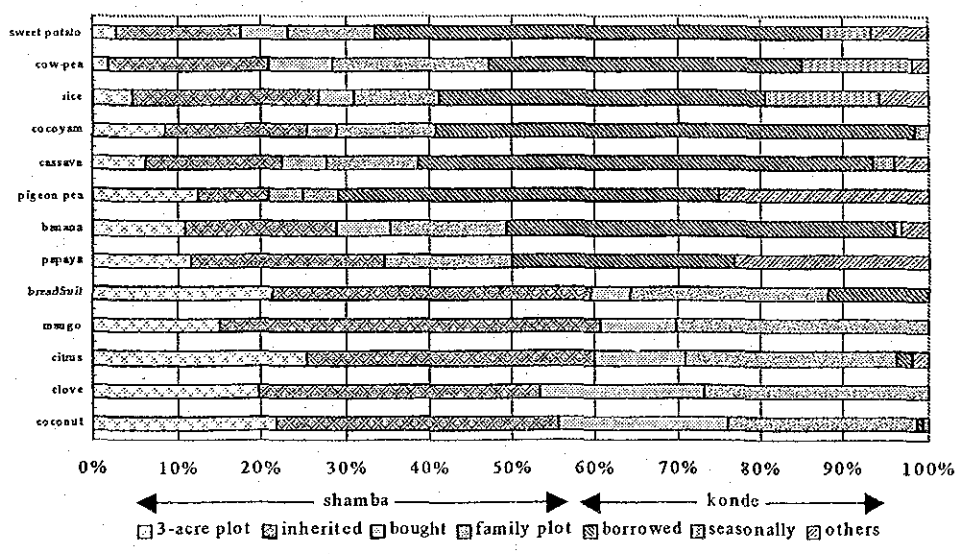
Farmers grow tree crops including cloves, coconuts and fruits usually intercropped with bananas and cocoyams. As for annuals, rain-fed paddy is cultivated during rainy season, while cowpeas and sweet potatoes are cultivated as second crops. Farmers grow cassava on the lighter soils and usually intercropped with sweet potatoes, maize, cocoyams and vegetables. Most households grow vegetables such as amaranths, tomatoes, egg plant and chilies on small plot almost throughout the year.

1.2.2 Land Tenure and Farming Systems

The land use atlas of Zanzibar presents the acreage of each land use category in cultivated land with relation to the farming system as shown in Table 1.2.1. According to the result, nearly 50% of the cultivated land belongs to associations of tree crops in Unguja Island and more than 45% of the cultivated land belongs to pure stand tree crops in Pemba Island. Cultivation of tree crops are thus dominant in Zanzibar and other continual rotational crop and rainfed rice occupies quite substantial area of the cultivated land.

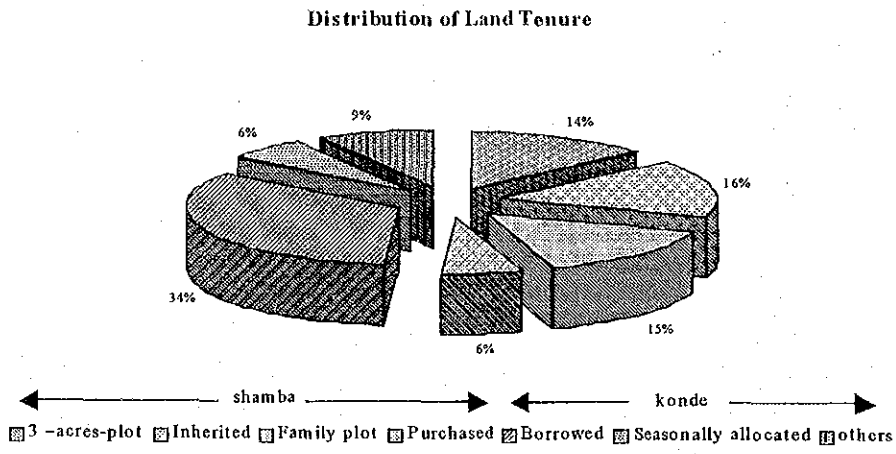
Table 1.2.2 shows the relationship between land tenure systems and cultivated crops. Tree crops including clove and coconut are almost exclusively cultivated by Shamba farms specially in inherited land. Perennial and annual crops are mainly cultivated by Konde farms specially in borrowed land. Seasonally allocated lands are mainly utilized for rice and cow-pea cultivation. Distribution of land tenure system is shown as below.

Relationship between Land Tenure Systems and Cultivated Crops



Source: A Baseline Survey for the Identification of Farming Systems in Zanzibar

Regarding the distribution of land tenure system, Shamba and Konde lands are almost equally distributed and borrowed land occupies more than 1/3 of total cultivated land as shown below.



Source: A Baseline Survey for the Identification of Farming Systems in Zanzibar

1.2.3 Irrigated Agriculture

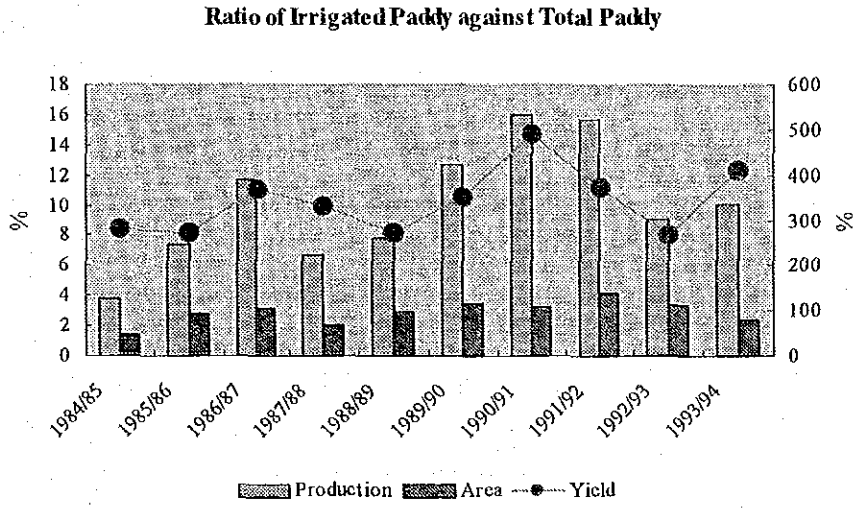
Farmers have been practicing simple water harvesting on Pemba and in some small valleys on Unguja for many years. It was based on the construction of bunds to permit rainwater to be collected on the fields during the rainy season. No canal systems were installed for better utilization of spring water or run-off. The Ministry of Agriculture developed a small irrigation scheme on Unguja as early as 1955. Limited development then took place on both main islands as shown in the table below.

Donor Funded Activities in the Zanzibar Irrigation Sector

Period	Donor	Project
1975-1984	UNDP	Improvement of Rice Cultivation and Extension in Food Crop Cultivation
1984	FAO/TCP	Technical Cooperation
1985-1987	UNDP	Development of Smallholder Oriented Rice Production in Zanzibar
1985-1987	ILO	Labour Intensive Special Public Work Programme
1987-1990	UNDP	Smallholder Oriented Irrigated Rice Production (Phase-2)
	UNDP/FAO	Smallholder Irrigated Rice Project

(Source: Zanzibar Irrigation Development Programme, 1997)

Most activities are focused on irrigated rice development. Table 1.2.3 shows the production and the planted area for domestic rice from 1984/85 to 1993/94. According to the results of comparison, the irrigated area for rice production is only a few percent of the total planted area. Since the yield is 3 to 4 times higher than rainfed rice, the production of irrigated rice reaches more than 10% of the total production as shown below. This fact clearly shows the importance of irrigation for the future development of agriculture.



Source: Status of Irrigation Development in Zanzibar, 2001 and Zanzibar Irrigation Development Programme

CHAPTER 2 LAND RESOURCES POTENTIAL

2.1 Soil Classification

The soils of Unguja and Pemba were characterized during the period of 1949-1955 and since then no recent soil classification work has been carried out. Table 2.1.1 shows the major soil types and their distribution in both islands together with the characteristics for agricultural use.

In Unguja, there are 5 main soil categories called Mchanga, Kinongo, Uwanda, Maweni and Kinamo. Maweni soil is located in the coralline reef limestone that forms the extensive eastern and southern portion of the island. This soil covers more than 40% of arable land and supports traditional shifting cultivation. Mchanga soil is found on the western part of the island covering 20% of land area. This soil is suitable for both tree and annual crops. Uwanda soil forms the interface between the plantation area and coral reef zones covering 17% of the area. This soil is generally open grass area for unimproved grazing. Kinongo soil is the most fertile in the island and provide high potential for food crop production. Konamo soil covers only 5% of the land area and is found in the north and small patches in Cheju and Muyuni. This soil is suitable for rice cultivation. The distribution of soil types in Unguja is shown in Fig. 2.2.1.

In Pemba, there are also 5 main soil categories called Bopwe, Utasi, Mtifutifu, Kinako and Makaani. Bopwe soil occupies 26% of the land area mainly in the western coast of the island. This soil is remarkably fertile and suitable for tree crops, annual crops and cloves. Mtifutifu soil occupies 29% of the land area mainly in the north and south coastal area. This is deep sandy soil and supports only coconut and short rooted crops. Makaani soil is found in the coral rag areas of the eastern coast covering 17% of the land area. Utasi soil is found on the plateau of north eastern areas and Semi Utasi soils is in the east of Utasi plateau. Both soils support tree crops. Kinoko soil covers only 9% of the land area and is suitable for rice growing. The distribution of soil types in Pemba is shown in Fig. 2.2.2.

2.2 Land Classification

Panchromatic aerial photographs, scale 1:20,000, flown during the period of August and October 1977 were stereoscopically analyzed together with ground correction to develop a comprehensive physiographic legend based on landforms and geomorphology. Physiographic legend for land evaluation thus developed for both islands is shown in Table 2.2.1. A map of the physiography has

accordingly been prepared with land unit as the mapping unit of which the detailed description is available in the report of "Evaluation of Land Resources in Zanzibar". Land unit is the area fairly homogenous in terms of physiography and parent materials and are characterized by a particular soil distribution as specified by soil association.

2.3 Land Suitability Classification

The land suitability classification was carried out according to the FAO Soil Bulletin by applying the guidelines for land evaluation of rain-fed agriculture. Since two farming systems (Shamba and Konde) are carried out on the same piece of land, the land suitability classification is needed for specified land utilization types. The land utilization types were classified into the followings.

- Traditional Smallholder Rice,
- Rain-fed Project Rice,
- Sugarcane Plantations,
- Mixed Intercropping Konde Farming System (Cassava, Banana),
- Mixed Intercropping Shamba Farming System (Cloves, Coconuts, Mango, Citrus), and
- Miscellaneous Uses (Rangeland, Forestry, Fishery, Tourism).

The following criteria were used in the suitability evaluation in order to reflect the various limitations and factors affecting the overall level of production and management.

- Drainage,
- Slope Gradient,
- Presence of Rock Out-crops,
- Rootable Depth of Soil,
- Salinity and Alkalinity,
- Retention of Water and Nutrients, and
- Climate Adaptability of Crops.

The interrelation between the selected criteria and major crops cultivated under the above mentioned land utilization types was analyzed through matrix method. Furthermore, the interrelation between the selected criteria and land unit mentioned in the previous clause was similarly analyzed. Finally the land suitability for major crops occurring within respective land utilization types was classified for each land unit in both islands. The results are shown in Table 2.3.1 and Table 2.3.2 for Unguja and Pemba respectively. Land evaluation and suitability classification maps for both Unguja and Pemba islands are attached to the report of "Evaluation of Land Resources in Zanzibar".

2.4 Land Resources Potential

Beside the land evaluation and land suitability classification of both islands carried out as a part of technical cooperation programme by FAO as mentioned above, several project levels soil studies of specific areas were carried out as shown in the following table.

Previous Studies on Land Resources

Soil Studies for Agricultural Development in Zanzibar (1975-1976)
This study was carried out to assess the agricultural potential of the soils of Zanzibar and was mainly confined to some depression areas and valleys.
Detailed Soil Survey of the Cheju Plain (1978)
A detailed soil survey was conducted to determine the extent and suitability of the lands for irrigated rice production in Cheju rice irrigation project area.
Detailed Soil Survey for Irrigated Rice (1979-1981)
A detailed soil survey of 4 rice growing areas of Unguja and 29 valleys of Pemba were carried out to evaluate the suitability for irrigated rice.
National Coconut Development Project Surveys (1980)
Land suitability studies for coconut cultivation in Salem and Bambi areas of Unguja island for the establishment of seed garden and extension areas.

Source: Prepared by the Study Team

Under the Detailed Soil Survey for Irrigated Rice, for example, the detailed soil and soil suitability map was prepared based on the soil profile description and the results of laboratory analysis. Soil suitability for irrigated rice was classified into the following 4 classes under this study.

Soil Suitability Classification System

Class	Description
1R	Highly suitable for irrigated rice, having no limitations
2R	Moderately suitable for irrigated rice, having moderate limitations
3R	Marginally suitable for irrigated rice, having severe limitations
4R	Unsuitable for irrigated rice

Source: Development of Rice Cultivation and Extension in Vegetable Production, Final Report Vol.5

Based on the various studies above-mentioned and further investigations, National Land Use Plan for Zanzibar was then produced by the Zanzibar Commission for Land and Environment under financial assistance from Finnish Government. In this plan, the agricultural land was classified into 3 categories according to the

suitability for cultivation as shown below.

Land Potential for Agriculture

Class	Characteristics	Suitable crops	Area (ha)	
			Unguja	Pemba
Ia	Ridge lands with soils more than 90cm deep	perennials, cassava, sweet potato, maize, legume	52,740	67,010
Ib	Flat lowland areas	irrigated paddy, sugarcane, legume, sweet potato	8,240	8,210
II	Shallow soils not normally deeper than 30cm	tree crops, sweet potato, cassava, sorghum, maize	26,610	15,840
Total			87,590	91,060

Source: National Land Use Plan (Zanzibar)

Policies on protection of agricultural land, integration of crop farming with forestry and intensification of crop production are described with strategies and recommendations. The suitable areas for sugar cane, rainfed rice, irrigated rice, tree crops & associations and ranch areas are also specified in this plan. Since most of the candidate schemes are located in the suitable area of irrigated and/or rain-fed rice, the Zanzibar Irrigation Master Plan is satisfactorily harmonized with this land use plan.

CHAPTER 3 BASIC PLAN FOR AGRICULTURAL DEVELOPMENT

3.1 Target Crops for Irrigation Development

3.1.1 Zanzibar Cash Crops Farming Systems Project (ZCCFSP)

In order to increase the export earnings through the development of alternative export crops by diversifying the Zanzibar's agricultural exports away from clove mono-crop economy, the government launched "Zanzibar Cash Crops Farming Systems Project (ZCCFSP)" in 1991. Various cash crops were evaluated with the aim of selecting candidate crops for further development. The selection process involves a combination of agronomic, farming systems and marketing research and investment appraisal. Crop profiles were prepared through field visits and interview surveys on existing cash crops in Zanzibar. Followings are the crops profiled, however, no single export crop was found capable of replacing clove as the main cash crop.

Food Crops	Local cash crops	Candidate crops
Cassava, Sweet potato, Rice, Bananas	Groundnuts, Oranges, Tomatoes, Cloves	Black pepper, Cinnamon, Coconut, Ginger, Guava, Henna, Hibiscus, Chili, Mango, Papaya, Passion fruits, Turmeric, Vanilla, Vetiver

Source: Zanzibar Cash Crops Farming Systems Project, 1991

3.1.2 Zanzibar Irrigation Development Programme (ZIDP)

The principle policy objectives of Zanzibar's agricultural sector are (i) sustainable food security and (ii) sustainable economic growth. In order to achieve such policy objectives, the strategies needed are (i) crop diversification and (ii) increased cropping intensities and the following are the conceivable problems for the implementation of such strategies.

- Shortage of planting materials,
- Second crop sometimes ended up destroying later maturing crops to make way for rice crops,
- Insufficient knowledge about yield expectation of alternative crops,
- Ineffective utilization of fertilizer and insufficient knowledge on fertilizer application,
- Higher insect infestations on alternative crops and insufficient knowledge on agro-chemicals application, and
- Insufficient extension services.

Crops with potential for increasing food security and/or economic growth are as follows.

Crop	Potential for increasing;			Suitable as;		Irrigation potential	
	Food Security	Economic growth by;		Main crop	Second crop	Short term	Medium to Long term
		Importing	Exporting				
Banana	High	Moderate	Low	Only	Non	Good	Good
Black Pepper	Low	None	High	Only	Non	None	Maybe
Cardamon	Low	None	Moderate	Only	Non	None	Limited
Chili	Good	None	High	Yes/Only	Possible	Good	Good
Citrus	Limited	None	Moderate	Only	Non	Limited	Good
Cacao	Limited	None	Some	Only	Non	None	Limited
Coconut	Significant	None	Some	Only	Non	Good	Good
Green Maize	Good	None	None	Yes	Yes	None	None
Maize	Good	Some	None	Yes	Yes	None	None
Mango	Low/Limited	None	Some	Only	Non	None	None
Pineapple	None	None	Some	Yes	Non	Limited	Good
Pulses	High	Some	Limited	Yes	Yes	Good	Good
Rice	High	High	None	Yes	Yes	Good	Good
Sweet Potato	High	Some	Limited	Yes	Yes	Good	Good
Vegetables	Some	Some	Some	Yes	Yes	Good	Good

Source: Zanzibar Irrigation Development Programme

It was finally concluded that the food security crops to be included for planning purposes are rice, banana and sweet potato and the additional options for a second crop are pulses and vegetables.

3.1.3 Integrated Tourism Development Project

Tourism has expanded rapidly in Zanzibar during the last 10 years. Integration is thus needed for tourism with agriculture because there are opportunities for tourist hotels and restaurants to source more of their food requirement locally. Current sources of hotel food supplies are as follows;

Fresh Food Item	% Sourced in Zanzibar	Comment
Fruits	80%	Some seasonal imports from mainland Tanzania and Kenya
Herbs and spices	60%	Most spices and spice mixes abundantly available in Zanzibar
Vegetables	20%	More sourced locally in wet season. Bulk of supply from mainland Tanzania and Kenya
Jams, pickles, chutneys	5%	No effective fruit and vegetable processing centers on the island
Staples (cereals, potatoes, cassava, sweet potatoes)	2%	Most hotels assume that tourists want European staple foods which are little grown in Zanzibar

Source: Report on the Hotels, Hotel Training School and Tourism

It is obvious that the staples including rice and vegetables together with processed food such as jams and pickles are not satisfactorily sourced in Zanzibar. Since the major constraints to local food sourcing are unreliable supply mainly due to unavailability during dry season, there is a great opportunity for irrigation development to improve the situation. Actions needed for promoting local food

sourcing are as follows;

- Farmers need production inputs (seeds, agro-chemicals, irrigation equipment etc.) and technical back up. For example, hotel supplies local farmers with seeds, chick and food left over. In turn, the farmers sell vegetables and eggs to the hotel under symbiotic partnership.
- Producers need to organize themselves in associations to facilitate dealing with buyers as well as access to inputs and services. Small group of about 10 members may be more viable than island-wide associations.
- Farmers need up-to-date information on markets and prices in order to plan their production.

Furthermore, there are other opportunities to utilize agricultural resources for encouraging tourism activities including the promotion of spice tour and other green tourism.

3.1.4 Target Crops for Irrigation Development

By taking all the above mentioned issues into account, rice, banana and sweet potato are considered important as food security crops and pulses and vegetables as second crop options as concluded in ZIDP. Among those candidate crops, emphasis should be given to rice because most of the past irrigation development study was focusing on rice cultivation. Most of the candidate schemes were thus selected from the viewpoint of the suitability for rice cultivation. The total potential area for irrigation development is, however, limited to 8,500 ha in both islands. Since there is a land (it is said to be around 17,000 ha) that is suitable for rain-fed rice, the production of rain-fed rice should also be promoted in order to contribute to the food self-sufficiency.

Since water resources are mainly surface flow in Pemba Island, rice cultivation under gravity condition seems most appropriate with financial and economical viability. In Unguja Island, on the other hand, water resources are mainly underground water. Irrigated rice is rarely financially viable due to high pumping and equipment cost. Subsidy system is indispensable to sustain such pumping scheme for rice cultivation. Pulses and vegetables are therefore recommended as target crop options for the local market. Various high value crops should also be introduced in a small proportion responding to the local food requirement for tourist hotels and restaurants.

3.2 Land Use Plan

3.2.1 Agro-ecological Zone

Unguja and Pemba have traditionally been divided into 2 broad agro-ecological zones that are the plantation area and the coral rag area. This classification, however, fails to describe the increasing complexity and geographical diversity of farming system in Zanzibar.

According to the national level agro-ecological zone map, Unguja Island belongs to C7 and Pemba Island belongs to C6 both under the coastal lowlands with medium and long growing period respectively. Major farming systems are rice, maize, coconut, cloves and cassava for both classifications. This classification similarly fails to describe the increasing complexity and diversity of farming systems.

The new classification of farming systems developed by ZCCFSP (Zanzibar Cash Crops Farming Systems Project) in collaboration with other department of MALNR incorporates a better understanding of soil types and their fertility. The following table shows the brief description of each zone in connection with farming systems. This classification can be a useful tool for agricultural research and especially for planning purposes.

Agro-ecological Zones and Farming Systems

Island	Zone	Description
Unguja	1	This is peri urban zone of Zanzibar town and cash cropping and subsistence production are common with many urban residents.
	2	This north central zone has generally deep relatively fertile soils and is intensively cultivated with a diverse range of multi-storey cropping systems.
	3	This zone is characterized by sandy soils dominated by cassava and coconut intercropping system.
	4	Farming in this coral rag zone is based on a shifting cultivation formerly sustainable but soil fertility is declining due to population pressure.
	5	This south central zone is dominated by shallow soils mainly used for coconut production but for annual food crops in open areas.
Pemba	1	This zone is characterized by sandy soils and coral rag and used for the commercial production of annual food crops such as sweet potato.
	2	This zone is characterized by sandy soils of moderate to poor fertility and the main crops cultivated are coconut, cassava and rice.
	3	Clove based multi-storey cropping systems are dominant on the hills and ridges with some rainfed upland rice and irrigated paddy in the valley floors.
	4a	This is the area of coral rag with exhausted soils used for subsistence food production but the area is not self-sufficient.
	4b	Intensive food and cash crop production is dominant in this coral rag zone but land availability is insufficient to meet food need.
	5	This zone is characterized by different soil types and rainfed rice is dominant in heavier soils but off-farm income is important.

(Source: Farming System Zones in Pemba and Unguja, 1995)

Thorough study based on the above mentioned agro-ecological zoning for the irrigation development was already carried out and most of the suitable areas for the irrigation development were selected and inventoried as candidate schemes. It can therefore be concluded that the land use plan for irrigated agriculture is almost covered under the proposed schemes.

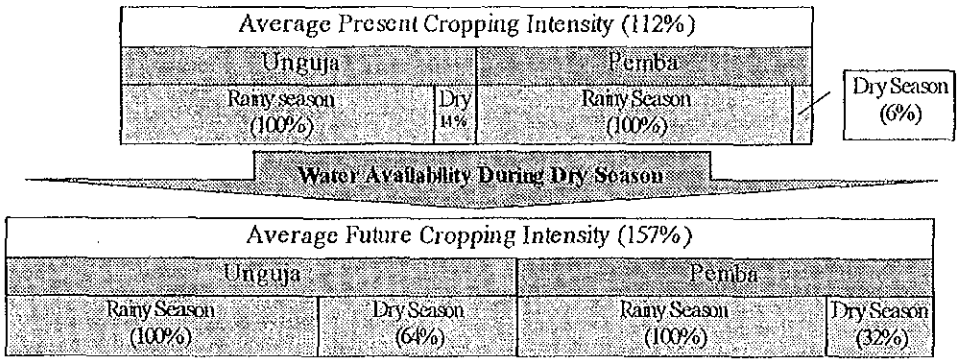
3.2.2 Cropping Pattern

As a result obtained through inventory survey under the current master plan study, the present and future cropping pattern for each candidate scheme was presented as shown in Table 3.2.1. Out of 57 candidate schemes, 11 schemes are already irrigated. The cropping intensity was compared between irrigated and non-irrigated schemes and also between Unguja and Pemba islands.

As for the irrigated schemes, rainy season paddy under irrigated area was completely irrigated and some part of dry season paddy was also irrigated. Together with limited rain-fed beans in dry season, the present cropping intensity ranged from 107% to 200% with the average of 118%. As for the non-irrigated schemes, on the other hand, rainy season paddy was completely rain-fed. Together with some rain-fed beans in dry season, the present cropping intensity ranged from 100% to 148% with the average of 110%. It is obvious from this result of present cropping pattern that the irrigated scheme can keep higher cropping intensity than the non-irrigated scheme. The highest average cropping intensity was observed for the irrigated schemes in Pemba Island and the lowest for the non-irrigated schemes in Pemba Island.

Although the pure double cropping is required by introducing the irrigation system, the future cropping intensity is largely affected by the water availability during dry season. The cropping intensity for each scheme was therefore assessed through the water availability mainly from reservoir capacity. According to the results, more than 150% of average cropping intensity can be anticipated in general. Higher cropping intensity can be expected in Unguja Island than in Pemba Island due mainly to the heavy reliance on ground water resources. The overall alteration of cropping intensity for both islands is shown as below. The present and the future cropping intensities thus obtained were served for the estimation of economic feasibility of each scheme.

Present and Future Cropping Intensities



Source: Prepared by the Study Team

3.3 Farming System Improvement Plan

3.3.1 Farming System

The present farming systems are divided into shifting cultivation and permanent cropping based on the soil characteristics. Permanent cropping systems are further classified into sub-systems based on the potential for tree crop cultivation that is mainly affected by the land tenure system. Among such a variety of farming systems, irrigation development is relevant largely to the cultivation of annuals such as paddy as main crop and also cowpeas and sweet potatoes as second crops. The most important contribution of irrigation development is to increase cropping intensities and it is also the desire of farmers who wish to introduce irrigation scheme. But the cropping intensity can be increased on the land wherever resources permit. Another contributions of irrigation development are of course to stabilize and increase the crop yield per unit area. Irrigation development is also helpful for the production of certain kind of high value crops including chili and vegetables that should be adopted into smallholder farming systems.

Proper farming practices should be adopted to take full advantage of irrigated agriculture and promote the productivity of crops cultivated based on the proper application of farm inputs. It is thus indispensable to apply certified seeds of high yielding varieties or improved varieties with proper dosage of fertilizer and agro-chemicals under sufficient supporting services such as research and extension. The detailed plan on input supply and supporting services will be described in the following clauses.

3.3.2 Input Supply

The main agricultural inputs employed in Zanzibar agriculture are chemical fertilizer, agro-chemicals, improved seeds and others. Such materials except

improved seeds are mainly imported and it is difficult for farmers to afford such expensive input materials under rain-fed condition in which the water supply is not secured. In case of irrigated agriculture, on the other hand, the proper application of farm inputs is necessary to take full advantage of irrigation and to promote the productivity of crops cultivated.

The procurement of transportation means was carried out in order to establish suitable input delivery mechanism under Zanzibar Smallholder Support Project. Furthermore, various seminars were held for input traders to promote the farm inputs supply for smallholders. The transfer of responsibility of input distribution to private sector has, however, not yet been fulfilled.

Under such circumstances, there is a possibility to improve input supply in connection with the integration of tourism and agriculture. Farmers always need production inputs such as seeds, fertilizer, agro-chemicals, irrigation equipments and also stable market. If tourist hotels supply local farmers with seeds, chicks and even food left over from restaurants, farmers in turn sell vegetables and eggs to the hotels under symbiotic partnership. Tourist hotels can thus be encouraged to invest in local production by prefinancing the supply of inputs to local farmers.

3.3.3 Farmers Supporting System

In addition to the improvement of input supply system, sufficient supporting services such as research and extension are needed for farmers to show the effect of proper application of input materials under irrigated condition and also to provide accurate knowledge on identification of pests and diseases with appropriate application of agro-chemicals. Following are the important issues for the improvement of research and extension relevant to the irrigation development.

As already mentioned, tremendous efforts have been carried out to find out alternative export crops to diversify from clove mono-crop economy under Zanzibar Cash Crop Farming System Project. Although no export crops could get close to the compensation of the lost clove revenue, 4 potential export crops such as mango, vanilla, papaya and chili were identified. In order to make use of such research results, further research should be continued to develop alternative crops. Since chili was selected as one of the potential crops with good irrigation potential in ZIDP, more research should be carried out for further development.

Various research activities were carried out in order to improve the productivity of food crops such as maize and cassava with germplasm collection and multiplication under Zanzibar Smallholder Support Project. But no enough activities were carried out for irrigated paddy. Improved seed production and

distribution system for irrigated paddy should therefore be established in Zanzibar in order to provide farmers with appropriate varieties.

Many extension activities including the operation of demonstration plot, trainings and seminars were so far achieved under the assistance of UNDP and IFAD. Further strengthening of extension services is considered essential for the successful development of irrigated agriculture. Extension officers are required to give the guidance concerning the proper farming practices to farmers and to show the effect of proper application of farm inputs under irrigated condition.

Table

Table 1.1.1 Distribution of Land Cover in Zanzibar

Island	Pemba Island					Unguja Island							Zanzibar
District	Michewen	Wete	Chakechake	Mkoanl	Total	North "A"	North "B"	Kati	Kusini	Mjini	Magharibi	Total	Total
Natural Forest	2,693	207	643	4,032	7,575	0	0	5,948	11,066	0	1,295	18,309	25,884
Mangrove	3,591	3,547	2,390	2,289	11,817	74	994	1,934	585	163	401	4,151	15,968
Plantation	0	0	0	0	0	0	0	308	0	0	0	308	308
Forest Total	**6,284**	**3,754**	**3,033**	**6,321**	**19,392**	**74**	**994**	**8,190**	**11,651**	**163**	**1,696**	**22,768**	**42,160**
Woodland (unspecified density)	0	0	0	0	0	0	0	0	0	0	0	0	0
Closed Woodland	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Woodland	0	0	0	0	0	99	0	2,230	239	0	0	2,568	2,568
Woodland with scattered cropland	62	3,479	0	378	3,919	6,306	6,316	7,560	11,141	0	131	31,454	35,373
Woodland Total	**62**	**3,479**	**0**	**378**	**3,919**	**6,405**	**6,316**	**9,790**	**11,380**	**0**	**131**	**34,022**	**37,941**
Bushland (unspecified density)	0	0	0	0	0	0	0	0	0	0	0	0	0
Dense Bushland	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Bushland	0	0	0	0	0	0	0	0	0	0	0	0	0
Bushland with scattered cultivation	1,389	122	311	0	1,822	12,476	6,732	5,474	1,839	0	594	27,115	28,937
Bushland with emergent trees	0	266	0	0	266	0	0	1,441	2,287	0	0	3,728	3,994
Thicket	0	0	0	0	0	0	0	0	0	0	0	0	0
Thicket with emergent trees	0	0	0	0	0	0	0	0	0	0	0	0	0
Bushland Total	**1,389**	**388**	**311**	**0**	**2,088**	**12,476**	**6,732**	**6,915**	**4,126**	**0**	**594**	**30,843**	**32,931**
Wooded Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Bushed Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Grassland	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassland with scattered cropland	217	0	0	0	217	0	0	1,360	0	0	0	1,360	1,577
Wooded Grassland (seasonally inundated)	0	0	0	0	0	0	0	0	0	0	0	0	0
Bushed Grassland (seasonally inundated)	0	0	0	0	0	0	0	971	0	0	784	1,755	1,755
Open Grassland (seasonally inundated)	0	0	0	0	0	0	0	0	0	0	0	0	0
Grassland Total	**217**	**0**	**0**	**0**	**217**	**0**	**0**	**2,331**	**0**	**0**	**784**	**3,115**	**3,332**
Mixed Cropping	8,784	3,967	5,217	4,155	22,123	2,560	6,477	7,842	9,079	423	3,571	29,952	52,075
Cultivation with tree crops	9,872	0	0	0	9,872	117	1,027	12,779	195	157	14,102	28,377	38,249
Cultivation with tree crops (& shade trees)	0	0	0	0	0	0	0	0	0	0	0	0	0
Cultivation with bushy crops	0	0	0	0	0	0	0	0	0	0	0	0	0
Cultivation with herbaceous crops	6,140	13,526	9,349	17,253	46,268	72	2,080	1,234	323	0	0	3,709	49,977
Cultivated Land Total	**24,796**	**17,493**	**14,566**	**21,408**	**78,263**	**2,749**	**9,584**	**21,855**	**9,597**	**580**	**17,673**	**62,038**	**140,301**
Bare Soil	717	391	0	4,066	5,174	1,200	0	0	0	0	0	1,200	6,374
Salt Crusts	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock Outcrops	193	0	359	1,325	1,877	0	0	0	0	0	0	0	1,877
Ice-cap/Snow	0	0	0	0	0	0	0	0	0	0	0	0	0
Open Land Total	**910**	**391**	**359**	**5,391**	**7,051**	**1,200**	**0**	**0**	**0**	**0**	**0**	**1,200**	**8,251**
Ocean	0	0	0	0	0	0	0	0	0	0	0	0	0
Inland Water	206	0	0	0	206	0	0	0	0	0	0	0	206
Swamp/Marsh (Permanent)	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Features Total	**206**	**0**	**0**	**0**	**206**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**206**
Urban Area/Airfields	153	22	91	0	266	0	0	28	0	1,268	991	2,287	2,553
Others Total	**153**	**22**	**91**	**0**	**266**	**0**	**0**	**28**	**0**	**1,268**	**991**	**2,287**	**2,553**
G.Total	**34,017**	**25,527**	**18,360**	**33,498**	**111,402**	**22,904**	**23,626**	**49,109**	**36,754**	**2,011**	**21,869**	**156,273**	**267,675**

(Source: National Reconnaissance Level Land Use and Natural Resources Mapping Project, November 1997)

Table 1.1.2 Distribution of Forest Reserves in Zanzibar

Island	Reserve	Area (ha.)	Category
Unguja	Jozani	2,512	Natural Forest
	Masingini	566	Natural and Plantation Forest
	Chaani	420	Plantataion Forest
	Kibele	900	Plantataion Forest
	Dunga	887	Plantataion Forest
	Ukuu	3,130	Natural and Plantation Forest
	Sub-Total	8,415	-
Pemba	Ngezi	1,456	Natural Forest
	Ras Kiuyu etc.	2,170	Plantataion Forest
	Sub-Total	3,626	-
Zanzibar	Total	12,041	-

(Source: National Land Use Plan, 1995)

Table 1.1.3 Crop Production Performance in Zanzibar (Production)

(Unit: ton)

Production	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Food Crops										
Cassava	179,352	175,826	149,122	168,340	141,128	133,940	126,948	96,768	112,624	122,846
Maize	1,392	1,235	645	812	1,093	522	229	551	286	591
Paddy	12,186	11,258	15,580	11,690	11,719	18,607	26,045	14,462	11,741	17,542
Banana	46,672	23,184	18,476	20,472	16,626	21,824	15,796	11,508	24,745	28,865
Sorghum	563	443	445	272	139	113	68	52	0	265
Sweet potato	34,735	34,405	34,600	26,011	12,853	15,432	6,941	16,044	32,865	37,887
Yams	5,478	5,074	4,199	3,940	1,889	2,000	246	932	1,972	1,742
Cocoyam	7,862	3,946	7,017	10,340	4,312	4,180	1,528	2,752	3,908	3,733
Cow peas	1,599	796	589	950	473	563	0	511	0	516
Pegeon peas	261	206	133	208	97	125	90	132	28	34
Groundnuts	166	206	269	245	370	228	0	49	51	101
Cash Crops										
Cloves	15,394	1,692	1,843	4,927	1,576	10,339	2,506	204	8,027	1,847
Copra	3,691	4,060	3,677	3,293	2,780	2,223	1,207	94	296	972
Chillies	2	1	2	2	1	4	0	0	0	0
Clove stems	482	943	38	450	251	1,624	771	20	19	50
Seaweeds	2,493	2,487	1,768	2,542	4,287	4,961	3,667	3,394	4,834	4,991
Rubber	39	94	208	137	59	225	-	-	-	42

(Source: Zanzibar Report on the Implementation of the World Food Summit Plan of Action)

Table 1.1.4 Crop Production Performance in Zanzibar (Planted Area)

(Unit: ha.)

Planted Area	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Food Crops										
Cassava	22,419	21,978	18,640	21,043	17,641	16,743	15,869	12,096	14,078	15,356
Paddy	10,155	9,382	12,983	9,742	9,766	15,506	21,704	12,052	9,784	14,618
Banana	4,667	2,318	1,848	2,047	1,663	2,182	1,580	1,151	2,475	2,887
Sorghum	1,126	886	890	544	278	226	136	104	0	530
Sweet potato	5,789	5,734	5,767	4,335	2,142	2,572	1,157	2,674	5,478	6,315
Yams	548	507	420	394	189	200	25	93	197	174
Cocoyam	655	329	585	862	359	348	127	229	326	311
Cow peas	1,599	796	589	950	473	563	0	511	0	516
Pegeon peas	261	206	133	208	97	125	90	132	28	34

(Calculated)

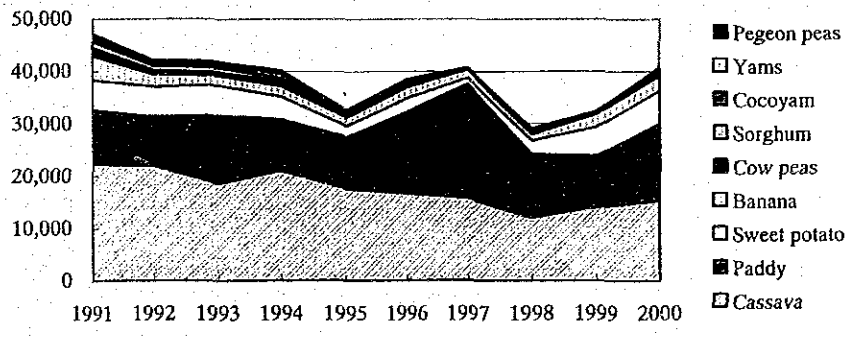


Table 1.1.5 Production and Cultivated Area of Major Food Crops by Region

Production

(Unit: ton)

Island	District	Paddy	Cassava	Banana	Yam	S/Potato	Cocoyam	Maize	P/Peas	Greengram	Sorghum	Groundnuts
Unguja	North-A	830	7,651	882	336	1,251	351	339	9	64	0	0
	North-B	2,970	12,320	4,836	84	2,428	923	65	0	38	0	4
	Western	1,177	11,025	2,685	864	894	485	98	13	0	7	26
	Central	469	10,150	11,220	574	1,078	1,557	465	71	28	15	20
	South	10	6,958	2,832	2,058		6	330	23	20	14	7
Sub-total		5,456	48,104	22,455	3,916	5,651	3,322	1,297	116	150	36	57
Pemba	Mcheweni	3,125	10,722	2,025	0	12,140	118	63	0	37	18	8
	Wete	3,203	23,016	4,035	0	5,800	123	88	0	6	46	5
	Chakechake	2,867	14,010	3,115	0	5,480	19	75	0	3	5	20
	Mkoani	3,801	32,586	15,700	0	660	34	25	0	25	4	0
Sub-total		12,996	80,334	24,875	0	24,080	294	251	0	71	73	33
Grand-Total		18,452	128,438	47,330	3,916	29,731	3,616	1,548	116	221	109	90

Cultivated Area

(Unit: ha.)

Island	District	Paddy	Cassava	Banana	Yam	S/Potato	Cocoyam	Maize	P/Peas	Greengram	Sorghum	Groundnuts
Unguja	North-A	692	956	88	34	209	-	339	9	64	0	-
	North-B	2,475	1,540	484	8	405	-	65	0	38	0	-
	Western	981	1,378	269	86	149	-	98	13	0	14	-
	Central	391	1,269	1,122	57	180	-	465	71	28	30	-
	South	8	870	283	206	0	-	330	23	20	28	-
Sub-total		4,547	6,013	2,246	392	942	-	1,297	116	150	72	-
Pemba	Mcheweni	2,604	1,340	203	0	2,023	-	63	0	37	36	-
	Wete	2,669	2,877	404	0	967	-	88	0	6	92	-
	Chakechake	2,389	1,751	312	0	913	-	75	0	3	10	-
	Mkoani	3,168	4,073	1,570	0	110	-	25	0	25	8	-
Sub-total		10,830	10,042	2,488	0	4,013	-	251	0	71	146	-
Grand-Total		15,377	16,055	4,733	392	4,955	-	1,548	116	221	218	-

Percentage

(Unit: %)

Island	District	Paddy	Cassava	Banana	Yam	S/Potato	Cocoyam	Maize	P/Peas	Greengram	Sorghum	Groundnuts
Unguja	North-A	28.9	40.0	3.7	1.4	8.7	-	14.2	0.4	2.7	0.0	-
	North-B	49.4	30.7	9.6	0.2	8.1	-	1.3	0.0	0.8	0.0	-
	Western	32.8	46.1	9.0	2.9	5.0	-	3.3	0.4	0.0	0.5	-
	Central	10.8	35.1	31.1	1.6	5.0	-	12.9	2.0	0.8	0.8	-
	South	0.5	49.2	16.0	11.6	0.0	-	18.7	1.3	1.1	1.6	-
Sub-total		28.8	38.1	14.2	2.5	6.0	-	8.2	0.7	1.0	0.5	-
Pemba	Mcheweni	41.3	21.3	3.2	0.0	32.1	-	1.0	0.0	0.6	0.6	-
	Wete	37.6	40.5	5.7	0.0	13.6	-	1.2	0.0	0.1	1.3	-
	Chakechake	43.8	32.1	5.7	0.0	16.7	-	1.4	0.0	0.1	0.2	-
	Mkoani	35.3	45.4	17.5	0.0	1.2	-	0.3	0.0	0.3	0.1	-
Sub-total		38.9	36.1	8.9	0.0	14.4	-	0.9	0.0	0.3	0.5	-
Grand-Total		35.3	36.8	10.9	0.9	11.4	-	3.5	0.3	0.5	0.5	-

(Source: Data obtained from Ministry of Agriculture for the year 2001)

Table 1.1.6 Livestock Situations of Zanzibar in 1993

Total Number of Livestock by Type and Regions

Region		Cattle	Goats	Sheep	Chicken	Ducks	Donkeys	G/Fowls	Rabbits
Unguja	North	15,305	10,071	103	95,980	3,952	245	248	32
	South	16,149	9,681	169	76,209	5,775	148	357	35
	West	14,296	6,720	103	152,468	15,193	242	729	268
	Sub-total	45,750	26,472	375	324,657	24,920	635	1,334	335
Pemba	North	41,300	13,914	202	271,680	4,192	343	1,048	198
	South	24,643	4,728	63	193,752	4,235	357	1,126	181
	Sub-total	65,943	18,642	265	465,432	8,427	700	2,174	379
Total		111,693	45,114	640	790,089	33,347	1,335	3,508	714

Number of Households with Livestock Keepers by Type and Regions

Region		Cattle	Goats	Sheep	Chicken	Ducks	Donkeys	G/Fowls	Rabbits
Unguja	North	3,562	1,696	10	11,809	620	115	79	9
	South	3,012	1,705	14	8,741	909	77	78	5
	West	3,076	1,655	9	15,298	1,832	104	157	51
	Sub-total	9,650	5,056	33	35,848	3,361	296	314	65
Pemba	North	10,862	2,190	57	21,070	769	284	244	39
	South	7,496	1,896	39	16,241	687	236	261	34
	Sub-total	18,358	4,086	96	37,311	1,456	520	505	73
Total		28,008	9,142	129	73,159	4,817	816	819	138

Number of Livestock per Households by Types and Regions

Region		Cattle	Goats	Sheep	Chicken	Ducks	Donkeys	G/Fowls	Rabbits
Unguja	North	4	6	10	8	6	2	3	4
	South	5	6	12	9	6	2	5	7
	West	5	4	11	10	8	2	5	5
	Average	5	5	11	9	7	2	4	5
Pemba	North	4	6	4	13	5	1	4	5
	South	3	2	2	12	6	2	4	5
	Average	4	5	3	12	6	1	4	5
Grand Average		4	5	5	11	7	2	4	5

(Source: 1992/1993 Livestock Census, Preliminary Report, MALNR, May 1993)

Table 1.1.7 Land for Grazing Activities

Land Use Category	Unguja		Pemba		Zanzibar	
	ha.	%	ha.	%	ha.	%
1. Cultivated land	63,770	41.6	67,800	73.8	131,570	53.7
2. Grazing land	62,785	40.9	16,915	18.4	79,700	32.5
- Ranches and dairy	2,140	-	0	-	2,140	-
- Unimproved grazing	60,645	-	16,915	-	77,560	-
3. Forest and woodland	24,890	16.2	5705	6.2	30,595	12.5
4. Other land use	1,895	1.2	1,410	1.5	3,305	1.3
5. Total	153,340	100	91,830	100	245,170	100

(Source: Land Use Atlas prepared under National Coconut Development Programme)

Table 1.1.8 Characteristics of Household in Zanzibar

Variables (Average)	Unguja		Pemba	
	Plantation Area	Coral Rag Area	Plantation Area	Coral Rag Area
Area/Household (ha.)	0.40	0.35	0.58	0.53
Area/Parcel (ha.)	0.14	0.15	0.14	0.14
Parcel/Household	2.81	2.27	4.18	3.83
Household Size (head)	5.91	5.78	6.53	6.00
Family Worker (head)	3.16	2.9	2.9	2.54
Area/person (ha.)	0.07	0.06	0.09	0.09
Cattle/Household (head)	1.01	0.40	1.74	1.01
Goat/Household (head)	0.37	0.58	0.56	0.14

(Source: Zanzibar Agricultural Survey 1990)

Table 1.1.9 Distribution and Area Occupied by Different Farm Group

Island	Agro-ecological Zone	Group	Farm Size (ha.)	Distribution (%)	Area (ha.)
Unguja	Plantation Area	Group-1	0-0.2	29.0	8.0
		Group-2	0.2-1.0	66.0	72.0
		Group-3	1.0<	6.0	20.0
	Coral Rag Area	Group-1	0-0.2	49.0	18.0
		Group-2	0.2-1.0	44.0	57.0
		Group-3	1.0<	7.0	25.0
Pemba	Plantation Area	Group-1	0-0.2	8.0	1.0
		Group-2	0.2-1.0	81.0	62.0
		Group-3	1.0<	11.0	27.0
	Coral Rag Area	Group-1	0-0.2	9.0	2.0
		Group-2	0.2-1.0	86.0	81.0
		Group-3	1.0<	5.0	16.0

(Source: Zanzibar Agricultural Survey 1990)

Table 1.2.1 Land Use and Farming System

Land Use Category	Unguja		Pemba		Zanzibar	
	ha.	%	ha.	%	ha.	%
1. Cultivated land	63,770	41.6	67,800	73.8	131,570	53.7
Sugar Cane	1,850	(2.9)		(0.0)	1,850	(1.4)
Rainfed Rice	5,395	(8.5)	8,385	(12.4)	13,780	(10.5)
Irrigated Rice	405	(0.6)		(0.0)	405	(0.3)
Other continual rotational crop land	8,815	(13.8)	11,980	(17.7)	20,795	(15.8)
Purestand tree crops	2,375	(3.7)	31,145	(45.9)	33,520	(25.5)
Complex associations						
associations of tree crops	31,655	(49.6)	10,180	(15.0)	41,835	(31.8)
associations of tree crops and food crops	12,685	(19.9)	6,030	(8.9)	18,715	(14.2)
other associations	590	(0.9)	80	(0.1)	670	(0.5)
2. Grazing land	62,785	40.9	16,915	18.4	79,700	32.5
3. Forest and woodland	24,890	16.2	5,705	6.2	30,595	12.5
4. Other land use	1,895	1.2	1,410	1.5	3,305	1.3
5. Total	153,340	100.0	91,830	100.0	245,170	100.0

(Source: Land Use Atlas prepared under National Coconut Development Programme)

Table 1.2.2 Relation between Land Tenure System and Cultivated Crops

(Unit: %)

Crop	Shamba	Konde	Shamba				Konde		
			3-acre plot	inherited	bought	family plot	borrowed	seasonally	others
Trees									
coconut	98.6	1.4	21.8	33.8	20.5	22.5	0.7	0.7	0.0
clove	100.0	0.0	19.7	33.8	19.7	26.8	0.0	0.0	0.0
citrus	96.4	3.6	25.5	34.5	10.9	25.5	1.8	0.0	1.8
mango	100.0	0.0	15.2	45.5	9.1	30.2	0.0	0.0	0.0
breadfruit	88.1	11.9	21.4	38.1	4.8	23.8	11.9	0.0	0.0
Perennial									
papaya	50.0	50.0	11.5	23.1	0.0	15.4	26.9	0.0	23.1
banana	49.3	50.6	10.9	17.9	6.4	14.1	46.8	0.6	3.2
pigeon pea	29.2	70.8	12.5	8.3	4.2	4.2	45.8	0.0	25.0
cassava	38.7	61.3	6.1	16.4	5.2	11.0	55.0	2.5	3.8
cocoyam	40.7	59.3	8.5	16.9	3.4	11.9	57.6	1.7	0.0
Annual									
rice	41.2	58.8	4.6	22.2	4.1	10.3	39.2	13.9	5.7
cow-pea	47.2	52.8	1.9	18.9	7.5	18.9	37.7	13.2	1.9
sweet potato	33.5	66.5	2.7	15.1	5.4	10.3	54.1	5.9	6.5

(Source: A Baseline Survey for the Identification of Farming Systems in Zanzibar)

Table 1.2.3 Domestic Rice Production from 1984/85 to 1993/94

Year	Total Rice Production		
	Production (ton)	Area (ha.)	Yield (ton/ha.)
1984/85	13,122	11,801	1.1
1985/86	10,162	9,197	1.1
1986/87	5,273	6,490	0.8
1987/88	13,234	10,180	1.3
1988/89	13,371	9,586	1.4
1989/90	11,673	8,979	1.3
1990/91	7,921	9,428	0.8
1991/92	7,318	6,682	1.1
1992/93	10,127	7,846	1.3
1993/94	7,598	10,816	0.7

(Source: Status of Irrigation Development in Zanzibar, 2001)

Year	Irrigated Rice Production		
	Production (ton)	Area (ha.)	Yield (ton/ha.)
1984/85	495	158	3.1
1985/86	750	250	3.0
1986/87	619	206	3.0
1987/88	882	205	4.3
1988/89	1,050	274	3.8
1989/90	1,477	322	4.6
1990/91	1,269	308	4.1
1991/92	1,151	281	4.1
1992/93	923	265	3.5
1993/94	764	263	2.9

(Source: Zanzibar Irrigation Development Programme)

Year	Irrigated Rice/Total Rice		
	Production (%)	Area (%)	Yield (%)
1984/85	3.8	1.3	281.7
1985/86	7.4	2.7	271.5
1986/87	11.7	3.2	369.8
1987/88	6.7	2.0	331.0
1988/89	7.9	2.9	274.7
1989/90	12.7	3.6	353.4
1990/91	16.0	3.3	490.9
1991/92	15.7	4.2	373.4
1992/93	9.1	3.4	270.1
1993/94	10.1	2.4	413.1

(Calculated)

Table 2.1.1 Major Soil Types and Distribution

Island	Local Classification	FAO/UNESCO Classification	Area (ha)	(%)	Agricultural Use
Unguja	Mchanga	Acrisol Fluvisol	31,598	20.60	Suitable for both tree crops and annual crops
	Kinongo	Ferralsol Cambisol	21,143	13.79	Most fertile and provide high potential for food crop production
	Uwanda	Mollic Leptosol	26,606	17.35	Generally open grass land used for unimproved grazing
	Maweni	Rendzic Leptosol	65,045	42.42	Shifting cultivation for banana, papaya, pigeon peas, tomatoes and chilies
	Kinamo	Cambisol Vertisol	8,244	5.38	Suitable for rice cultivation
	Total		152,636	100.00	
Pemba	Bopwe	Ferralic Cambisol	24,123	26.20	Remarkably fertile and suitable for tree crops, annual crops and cloves
	Utasi	Humic Cambisol	8,998	9.80	Suitable for tree crops and others
	Semi Utasi	Dystric Cambisol	7,329	7.90	Eroded version of Utasi soils and suitable for tree crops
	Mtifutifu	Dystric Cambisol	26,564	28.90	Suitable for coconut trees and short rooted crops
	Kinako	Gleyic Cambisol	8,212	8.90	Suitable for rice growing
	Makaani	Mollic/Rendzic Leptosol	15,836	17.20	Suitable for drought resistant crops such as sorghum, millet, maize, cassava
	Shell		704	0.46	
	Total		91,766	100.00	

(Source: National Land Use Plan)

Table 2.2.1 Physiographic Legend for Land Evaluation

Unguja				Pemba			
System	Sub-system (1)	Sub-system (2)	Description	System	Sub-system (1)	Sub-system (2)	Description
A			Alluvial System	A			Alluvial System
	A0		Alluvio-Colluvial Subsystem		A0		Alluvio-Colluvial Valleys
	A1		Reworked old Corridor Subsystem				
		A11	Open Corridors				
		A12	Close Corridors				
	A2		Plains				
	A3		Depressions and Basins				
B			Marine System	B			Marine System
	B1		Beaches and Dunes		B0		Beaches and Dunes
	B2		Marshes and Swamps		B2		Marshes and Swamps
C			Ridge System	C			Ridge/Plateau System
	C1		Low Elevated Ridge Subsystem		C1		Steep Sided Dissected Ridges
		C11	Coastal		C2		Moderately Dissected Ridges
		C12	Central		C3		Elevated Plateau with Incised Valleys
		C13	Rounded		C4		Elevated Flats on Ridges and Plateau with Drainage Impedance
		C14	Isolated		C5		Moderately Elevated Plateau
		C15	Transitional		C6		Low Plateau
		C16	Raised Corridors				
	C2		Low Medium Elevated Ridge Subsystem				
	C3		Medium Elevated Ridge Subsystem				
		C31	Elongated single slopes				
		C32	Rolling with Complex Slopes				
D			Shallow Coralline and Raised Reef System	D			Calcarious/Coralline System
	D1		Wanda Subsystem		D1		Makaani Plains
	D2		Maweni Subsystem				
		D21	Reserved Shifting Cultivation Areas				
		D22	Unimproved Grazing and Shifting Cultivation				
		D23	Thickets				
		D24	Open Forest				
		D25	Mined Forest				

(Source: Evaluation of Land Resources in Zanzibar, Land Evaluation and Land Suitability Classification - Unguja and Pemba Island)

Table 2.3.1 Land Evaluation and Suitability Classification in Unguja Island

LAND MAPPING UNITS	Area	Associated Soils	Rainfall	LUT -1	LUT-2	LUT-3	LUT-4		LUT -5				MISCELLANEOUS USES			
SYSTEMS & MAIN UNITS	(ha)	Local Classification	Mean annual range in mm	Traditional smallholder	Rainfed Project	Sugarcane plantations	Mixed inter cropping Kombe farming system		Mixed tree inter cropping Shamba farming system				Rangeland for Animal Production	Conserv Forestry	Brackish water Fisheries	Tourism Recreation
				Rice	Rice		Cassava	Banana	Cloves	Coconut	Mango	Citrus				
A-ALLUVIAL SYSTEM																
A0 Alluvio - Colluvial Valleys		Unclassified	1,500-2,500	S3	S2/S3*	S3	N	N	N	N	N	N	NR	NR	N	NR
A1 Reworked Old Corridors																
A11 Open Corridors	7,610	Greyish Mchanga	1,500-2,500	S3	S2/S3*	S2	N	N	N	N	S3	N	NR	NR	NR	NR
A12 Closed Corridors	2,980	Greyish Mchanga	1,500-2,500	S3	S2/S2*	S2	N	N	N	N	S3	N	NR	NR	NR	NR
A2 Plains	1,300	Kinamo	1,500-2,000	S3	S2/S2*	N	N	N	N	N	S2	N	NR	NR	NR	NR
A3 Depressions & Basins	530	Sandy Mchanga	1,500-2,000	S3	S2/S3*	S3	N	N	N	N	N	N	NR	NR	NR	NR
B- MARINE SYSTEM																
B1 Beaches & Dunes	1,190	Sandy Mchanga	1,000-2,000	N	N	N	N	N	N	S3	N	N	NR	NR	NR	S1
B2 Marshes & Swamps	4,210	Swampy Wanda	1,000-2,000	N	N	N	N	N	N	N	N	N	NR	S2	S2	NR
C-RIDGE SYSTEM																
C1 Low Elevated Ridges																
C11 Coastal	8,620	Sandy Mchanga	1,500-2,000	N	N	S3	S2	S2	S3	S1	S1	S2	NR	NR	NR	NR
C12 Central	12,130	Reddish/Greyish Mchanga & Deep Kinongo	1,500-2,000	N	N	S3	S1	S1	S2	S1	S1	S2	NR	NR	NR	NR
C13 Rounded	800	Kinamo	1,500-2,000	S3	S2/S3	N	S2	S2	N	S3	S1	S3	NR	NR	NR	NR
C14 Isolated	2,340	Deep & Shallow Kinongo	1,000-1,500	N	N	N	S1	S1	S3	S2	S1	S2	NR	NR	NR	NR
C15 Transitional	8,550	Shallow Kinongo Uwanda Kinongo	1,500-2,000	N	N	N	S1	S1	S3	S2	S1	S1	NR	NR	NR	NR
C16 Raised Corridors	840	Shallower and Shallow Kinongo	1,500-2,000	S3	S3/N*	S2	S1	S1	S3	S1	S1	S1	NR	NR	NR	NR
C2 Dissected Ridges	3250	Kinamo	1,500-2,500	N	N	N	S3	N	N	S3	S2	N	S1	S1	NR	S2
C3 Medium Elevated Ridges																
C31 Elongated Single Slopes	10,550	Reddish Mchanga, Deep Kinongo	1,500-2,500	S3	S3/N*	S3	S1	S1	S1	S1	S1	S1	NR	NR	NR	NR
C32 Complex Slopes	1,490	Kinamo	1,500-2,500	N	N	S3	S2	S1	S2	S2	S1	S2	S1	NR	NR	NR
C4 Erosional Remnants	1,340	Unclassified	1,000-2,000	N	N	NR	NR	NR	N	N	NR	NR	S2	S1	NR	S2
D-CORAL LINE SYSTEM																
D1 Wanda	16,720	Uwanda Kinongo	1,000-2,000	NR	NR	NR	S3	S3	NR	NR	NR	NR	NR	NR	NR	S2
D2 Maweni (Coral cover 50-80%)	530	Maweni Kinongo														
D21 Reserved Shifting cultivation	4,530	-do-	1,000-1,500	NR	NR	NR	S3	S3	NR	NR	NR	NR	NR	NR	NR	NR
D22 Unimproved grazing & Shifting Cultivation	45,590	-do-	1,000-1,500	NR	NR	NR	S3	S3	NR	NR	NR	NR	S2	S2	NR	S2
D23 Thickets	4,900	-do-	1,000-1,500	NR	NR	NR	N	N	NR	NR	NR	NR	S3	S2	NR	S2
D24 Open Forest	18,970	-do-	1,000-1,500	NR	NR	NR	N	N	NR	NR	NR	NR	S3	S2	NR	S2
D25 Dense Forest	1,090	-do-	1,000-1,500	NR	NR	NR	N	N	NR	NR	NR	NR	N	S1	NR	S2

(Source: Evaluation of Land Resources in Zanzibar, FAO)

Note;
The D2 Maweni coralline deposits have been subdivided according to the Land use existing at the time of photography (1997) Although those subdivisions do not confirm to normal format in a physiographic legend they are nevertheless useful in demarcating boundaries within the Maweni for planning purposes.

* denotes;
Suitability ranges considering the rainfall variability factor when the required S3 consecutive humid months do not occur during Masika season

Ratings;
S1-Highly suitable
S2-Moderately suitable
S3-Marginally suitable
N-Conditionally and permanently not suitable
NR-Not Relevant
LUT-Land Utilization Types

Table 2.3.2 Land Evaluation and Suitability Classification in Pemba Island

LAND MAPPING UNITS	Area	Associated Soils	Rainfall	LUT - 1	LUT-2	LUT-4		LUT -5				MISCELLANEOUS USES			
SYSTEMS & MAIN UNITS	(ha.)	Local Classification	Mean annual range in mm	Traditional smallholder	Rainfed Project	Mixed inter cropping Konde farming system		Mixed tree inter cropping Shamba farming system				Rangeland for Animal Production	Conserved Forestry	Brackish water Fisheries	Tourism Recreation
				Rice	Rice	Cassava	Banana	Cloves	Coconut	Mango	Citrus				
A-ALLUVIAL SYSTEM															
A0 Alluvio - Colluvial Valleys		Bonde	1,500-2,500	S3	S2/S2*	N	N	N	N	N	N	NR	NR	NR	NR
B- MARINE SYSTEM															
B0 Beaches & Dunes		Ufukwe	1,000-2,000	N	N	N	N	N	S2	N	N	NR	NR	NR	S2
B2 Marshes & Swamps	11,220	Jangwa	1,000-2,000	N	N	N	N	N	N	N	N	NR	S2	S2	NR
C-RIDGE/PLATEAU SYSTEM															
Range in elevation 0-97m															
C1 Steep sided dissected ridges, Slope range 13-55%	33,250	Bopwe	1,500-2,500	N	N	S3	S3	S1	S3	S1	S3	NR	NR	NR	NR
C2 Moderately dissected ridges, Sloping to rolling, Slope range 6-33%	3,930	Semi Utasi	1,500-2,000	N	N	S3	S3	S1	S2	S1	S2	NR	NR	NR	NR
C3 Elevated plateau with incised valleys undulating to rolling, Sloping range 2-20%, Elevationrange 20-70m	11,220	Utasi	1,300-2,000	S3	S3/N*	S1	S1	S1	S1	S1	S1	NR	NR	NR	NR
C4 Elevated flats on ridges and plateaus with drainage impedance, Slope range 0-2%, Elevation range 20-70m	1,020	Ndamba	1,000-2,000	N	N	N	N	N	N	N	N	S2	S3	NR	S3
C5 Moderately elevated plateau undulating to rolling, Slope range 2-13%, Elevation ranges 10 -25m	19,150	Mtifutifu	1,000-2,000	S3	S2/S3*	S1	S1	S3	S1	S1	S1	NR	NR	NR	NR
C6 Low plateaus generally flat to undulating to rolling, Slope 0-6%, Elevation range 0-15m	6,830	Kinako	1000-2,000	S3	S1/S3*	S3	S2	N	S2	S1	N	NR	NR	NR	NR
D-CALCARIOUS/CORAL LINE SYSTEM															
Range in elevation 0-15m															
D1 Makaani plains	15,010	Makaani	1,000-2,000	NR	NR	S3	S3	NR	NR	NR	NR	S1	S2	NR	S2

(Source: Evaluation of Land Resources in Zanzibar, FAO)

* denotes;
Suitability ranges considering the rainfall variability *factor when the required three consecutive humid* months do not occur during Masika season.

Ratings;
S1- High sitable
S2-Moderately suitable
S3-Marginally suitable
N-Conditionally and permamently not suitable
NR-Not relevant
LUT-Land Utilization Types

Table 3.2.1 Present and Future Cropping Pattern

No.	Name	Potential Area	Irrigated Area	Present							Future				
				Rainy Season			Dry Season			Cropping Intensity	Rainy Season		Dry Season		Cropping Intensity
				Rain-fed Paddy	Irrigated Paddy	Total	Irrigated Paddy	Rain-fed Beans	Total		Paddy	Total	Paddy	Total	
Irrigated															
1302	Cheju Irrigation Scheme	1,198	42	96	4	100	4	4	7	107	100	100	40	40	140
1306	Mwera	12	12	0	100	100	100	0	100	200	100	100	100	100	200
1501	Bumbwi Sudi	560	136	76	24	100	24	0	24	124	100	100	80	80	180
1502	Mwango Irrigation Scheme	120	78	35	65	100	65	0	65	165	100	100	100	100	200
	Unguja Sub-Total	1,890	268	86	14	100	14	2	16	116	100	100	56	56	156
2603	Kinyakuzi	40	8	80	20	100	20	0	20	120	100	100	76	76	176
2611	Saninga	38	16	58	43	101	43	0	43	144	100	100	56	56	156
2702	Kwalempona	53	14	74	26	99	26	0	26	125	100	100	26	26	126
2703	Mangwena	29	10	66	34	100	34	0	34	134	100	100	21	21	121
2704	Mipopooni	65	14	78	21	99	21	0	21	120	100	100	30	30	130
2706	Tungamaa	33	6	82	18	100	18	0	18	118	100	100	60	60	160
2807	Tibirinzi	25	6	76	24	100	24	0	24	124	100	100	28	28	128
	Pemba Sub-Total	283	74	74	26	100	26	0	26	126	100	100	42	42	142
	Zanzibar Total	2,173	342	84	16	100	16	2	18	118	100	100	54	54	154
Non-Irrigated															
1101	Chaani	250		100	0	100	0	2	2	102	100	100	100	100	200
1102	Kibokwa	250		100	0	100	0	48	48	148	100	100	100	100	200
1201	Kilombero	850		100	0	100	0	47	47	147	100	100	44	44	144
1202	Kipange	400		100	0	100	0	13	13	113	100	100	100	100	200
1203	Mahonda/Chechele	300		100	0	100	0	17	17	117	100	100	50	50	150
1204	Upenja	418		100	0	100	0	0	0	100	100	100	75	75	175
1301	Bambi	165		100	0	100	0	0	0	100	100	100	100	100	200
1303	Kisima Mchanga	800		100	0	100	0	0	0	100	100	100	70	70	170
1304	Koani/Ubango	20		100	0	100	0	0	0	100	100	100	100	100	200
1305	Mchangani	300		100	0	100	0	0	0	100	100	100	67	67	167
1307	Ubago	14		100	0	100	0	0	0	100	100	100	100	100	200
1401	Mtende	330		100	0	100	0	0	0	100	100	100	50	50	150
1402	Muyuni	586		100	0	100	0	0	0	100	100	100	50	50	150
1503	Tomondo, Kijitoupele and Kwarara	53		100	0	100	0	0	0	100	100	100	50	50	150
	Unguja Sub-Total	4,739		100	0	100	0	13	13	113	100	100	67	67	167
2601	Bule	12		100	0	100	0	0	0	100	100	100	100	100	200
2602	Chwaka	17		100	0	100	0	0	0	100	100	100	100	100	200
2604	Kinyasini	23		100	0	100	0	0	0	100	100	100	40	40	140
2605	Makwararani	114		100	0	100	0	0	0	100	100	100	27	27	127
2606	Matungatwani	19		100	0	100	0	0	0	100	100	100	38	38	138
2607	Mgong'ombe	41		100	0	100	0	0	0	100	100	100	0	0	100
2608	Mshashani	25		100	0	100	0	0	0	100	100	100	61	61	161
2609	Mwanasoza	32		100	0	100	0	0	0	100	100	100	31	31	131
2610	Ngwia	76		100	0	100	0	0	0	100	100	100	44	44	144
2701	Gando	24		100	0	100	0	0	0	100	100	100	33	33	133
2705	Mleteni	31		100	0	100	0	0	0	100	100	100	29	29	129
2707	Weni	35		100	0	100	0	0	0	100	100	100	0	0	100
2801	Dobi	25		100	0	100	0	0	0	100	100	100	48	48	148
2802	Kwamavi	22		100	0	100	0	0	0	100	100	100	100	100	200
2803	Kwapweza	62		100	0	100	0	5	5	105	100	100	44	44	144
2804	Mabieni	35		100	0	100	0	0	0	100	100	100	52	52	152
2805	Mlemele	73		100	0	100	0	5	5	105	100	100	93	93	193
2806	Ngue	5		100	0	100	0	40	40	140	100	100	0	0	100
2901	Donge Manyiga	19		100	0	100	0	0	0	100	100	100	37	37	137
2902	Egezni	12		100	0	100	0	17	17	117	100	100	38	38	138
2903	Giriama	33		100	0	100	0	0	0	100	100	100	41	41	141
2904	Kiguni	16		100	0	100	0	0	0	100	100	100	50	50	150
2905	Kimbuni	21		100	0	100	0	0	0	100	100	100	51	51	151
2906	Kwamachigi	51		100	0	100	0	7	7	107	100	100	15	15	115
2907	Kwamkoba	93		100	0	100	0	8	8	108	100	100	46	46	146
2908	Machigini/Gae la Mnungi	547		100	0	100	0	0	0	100	100	100	3	3	103
2909	Makunge	54		100	0	100	0	9	9	109	100	100	48	48	148
2910	Maotwe	13		100	0	100	0	23	23	123	100	100	100	100	200
2911	Masingini	15		100	0	100	0	0	0	100	100	100	55	55	155
2912	Maumbwini	29		100	0	100	0	10	10	110	100	100	25	25	125
2913	Mchangapwaga	10		100	0	100	0	24	24	124	100	100	76	76	176
2914	Mizingani	25		100	0	100	0	0	0	100	100	100	25	25	125
	Pemba Sub-Total	1,609		100	0	100	0	2	2	102	100	100	30	30	130
	Zanzibar Total	6,348		100	0	100	0	10	10	110	100	100	58	58	158
Total of Irrigated and Non-Irrigated															
	Unguja Total	6,629	268	96	4	100	4	10	14	114	100	100	64	64	164
	Pemba Total	1,892	74	96	4	100	1	2	6	106	100	100	32	32	132
	Zanzibar Total	8,521	342	96	4	100	4	8	12	112	100	100	57	57	157

(Source: Inventory Survey Result)