

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

MASTER PLAN

MAIN REPORT

CHAPTER 1 INTRODUCTION

1.1 Authority

This Master Plan Report (the Report) was prepared in accordance with the Scope of Work for the Study on the National Irrigation Master Plan in the United Republic of Tanzania (the Study) agreed between the Ministry of Agriculture and Food Security, the United Republic of Tanzania (MAFS) and the Japan International Cooperation Agency (JICA) on April 10, 2001. The Report presents the results of the master plan study on irrigation development executed in the Phase 1 Works period from November 4, 2001 to September 6, 2002.

1.2 Background and Objectives of the Study

1.2.1 Background

Agriculture plays the most important role in the Tanzanian economy. In 1998, it absorbed over 70% of the total labor population¹ and generated 48% of GDP and 65% of export exchange earnings². On the Mainland, 10.0 million ha are cultivated at present although potential agricultural area would be estimated at 44 million ha, equivalent to about 46% of the 94.8 million ha of the Mainland area. Out of 1.0 million ha³ assessed as area suitable for irrigation, only 0.2 million ha⁴ is currently irrigated. This shows that land and water resources are not presently effectively utilized.

Cereals in Tanzania are maize, sorghum, paddy and wheat. These, especially maize and paddy, are mostly cultivated by smallholder farmers and production is remarkably low due to dependence on rainfed agriculture. In the seven years from

¹ *Agriculture: Performance and Strategies for Sustainable Growth.*

² *Page 11 of the Economic Survey 2000*

³ *Agriculture: Performance and Strategies for Sustainable Growth.*

⁴ *Agriculture: Performance and Strategies for Sustainable Growth.*

1992/93 to 1998/99, cultivated areas and crop production of maize and paddy, which are the staple foods in Tanzania, have largely fluctuated year by year depending on weather conditions⁵.

The Household Budget Survey executed in 1991/2⁶ showed a lower income in rural areas than in urban areas, identifying a severe poverty situation in rural area. Over 87% of all poor people live in rural areas where agriculture is the mainstay for livelihood. The proportions below the poverty line for basic needs and food requirements were 41% and 23% in rural and urban areas respectively. The recent Household Survey in 2000/01 also presents a similar poverty situation, although improvements of 2% to 3% have been achieved, respectively. From the analysis of the Food Security Department, MAFS, the cereal deficit for the year 2001/02 would be 820,000 tons at the national level⁷. In this regard, the expansion of cultivated area to increase crop production is thus an indispensable issue for agriculture in Tanzania.

In 1994, the National Irrigation Development Plan (NIDP) was prepared aiming at more stability and an increase in food production. The NIDP proposed implementation of 147 irrigation schemes and alleviation of many constraints. Since 1994, some constraints have been alleviated with external support; however, a significant number have still remained. There have also been a number of government policies formulated after the preparation of the NIDP, such as "Agriculture and Livestock Policy, 1997", "Tanzania Development Vision 2025", and "Agricultural Sector Development Strategy (ASDS)", which have had a direct effect of irrigation development in Tanzania. This situation creates a need to revise the NIDP.

The GOT requested the Government of Japan (GOJ) to extend the technical assistance for the revision of the NIDP. In response to this request, the GOJ dispatched the Preliminary Study Team from March 2001 to April 2001, to hold a series of discussions with the GOT, and both sides agreed on the Scope of Work (S/W) as per Attachments 1 and 2.

1.2.2 Objectives of the Study

The Study is to be executed phase-wise in three stages. The objectives of each phase are as follows:

Phase 1

- Formulate the Master Plan for Irrigation Development at national level with

⁵ Basic Data Agriculture and Livestock Sector, 1992/93 - 1998/99

⁶ Household Budget Survey 2000/01(draft version as of June 2002)

target year of 2017.

Phase 2

- Prepare the Action Plan for candidate irrigation schemes selected in the Master Plan Study.

Phase 3

- Conduct the Verification Study for the bottleneck items for successful implementation of the schemes.

Phase 1 to Phase 3

- Carry out the technology transfer for counterpart personnel through on-the-job training in the course of the Study.

This Report presents only the results of the Phase 1 activities.

1.3 The Study Area

Phase 1

- Mainland of Tanzania.

Phase 2 and 3

- Candidate irrigation schemes selected in the Master Plan Study.

1.4 Works Performed in Phase 1

The completed Phase 1 Works are largely divided into two categories. The first is to prepare the basic concept for the master plan based on analysis on data collected, which was carried out during 3 months from November 5, 2001 to February 1, 2002. In this period, an inventory survey was also conducted for the irrigation schemes to be rehabilitated and to be newly constructed on the district basis. The second works category is to formulate the master plan for irrigation development taking into consideration the results of inventory survey, problem analysis and PCM workshops, which were conducted for 4 months from May 11, 2002 to September 6, 2002. These results were compiled in the Report.

1.5 Technology Transfer

The counterpart personnel assigned for the master plan formulation are as follows:

Counterpart Personnel Assigned

JICA Study Team	Position	Counterpart Personnel
Mr. H. Shimazaki	Team Leader/Development Policy	Eng. A. H. Simba*
Dr. S. Matsushima	Irrigation Drainage Plan/Water Management	Eng. M. Futakamba
Mr. H. Ohnuma	Farm Management	Ms. R. Kweka
	Land Use Plan	Mr. R. Rushomesa
Dr. M. Osada	Institution/Organization/Management	Mr. R. R. Komanga
Mr. E. Maeda	Macro-economy/Assistance Trend	Mr. D. Mafuru
Mr. T. Igawa	Irrigation and Drainage Facilities	Eng. Masenza

⁷ A Statistical Analysis of the 2000/01, Final Food Crop Production Forecast for Food Security

Mr. Y. Ogata	Agro-economy/Marketing	Mr. D. Mafuru
Mr. Y. Ando/ Mr. T. Kuroda	Coordinator	Not Assigned

* : *Chief Counterpart Personnel*

Prior to commencement of the Study, the JICA Study Team submitted the Plan of Technology Transfer to the MAFS on November 21, 2001. This Plan was agreed by the MAFS, and thus the technology transfer was carried out through the on-the-job training and bi-weekly meeting as mentioned in it.

1.6 Steering Committee Meetings

During Phase 1, the Steering Committee meetings were held three times, namely for the Inception Report on November 6, 2001, for the Progress Report 1 on January 26, 2002 and for the Draft Master Plan Report on August 27, 2002. The meetings were attended by staff of Prime Minister's Office, RUBADA, Presidents' Office, Ministry of Finance, Ministry of Lands, Ministry of Water and Livestock Development, MEM, POPP, MNRT, SOFRAIP, and MAFS. The Embassy of Japan, JICA Tanzania Office and DANIDA also sent their staff to the meetings. The results of respective meetings were compiled in the Minutes of Meetings as shown in Attachments 3 to 5. The Report contains the comments raised in these Steering Committee meetings.

1.7 Website for the Study

The website for the Study was established on the official one of the MAFS, aiming at sharing of data and information on the Study. This includes the basic concept of the master plan, the schedule and progress of the Study, results of irrigation potential, and objectives of the master plan. The content would be updated from time to time. The website for the Study can be accessed using the following URL:

<http://www.kilimo.go.tz/projects/nimp/nimp.htm>

CHAPTER 2 NATIONAL SOCIO-ECONOMIC CONDITIONS AND DEVELOPMENT POLICIES

2.1 Overview of Macro-economic Performance

Since 1995, Tanzania's structural reforms have advanced steadily. Tanzania's economic policy has been basically supported by the IMF/PRGF and World Bank/PSAC and guided by a poverty reduction strategy. Tanzania reached the completion point under the IMF-World Bank's HIPC Initiative in November 2001. As a result Tanzania will benefit from not only debt relief of US\$3 billion, but also increasingly favorable donor assistance which would be utilized for economic and social development. A significant amount is expected for budget support and balance of payment support in the budget of 2002/03, which would improve government fiscal balance. The government has committed itself to create a more favorable macro-economic climate, and to provide a credible basis for sustainable improvements in the lives of the people. Fortunately, there are signs that Tanzania will remain a strong favourite partner of international donors.

The government has made considerable progress towards achieving macro-economic stability. The GDP growth rate jumped in 1995 to 3.6% from 1.4% in the previous year. It remained higher than 3% up to 2000 after a sharp decline by 0.9% in 1997 mainly due to severe weather conditions. Overall, the economy has retained steady growth for the last three years of 1998 to 2000, namely 4.0%, 4.7%, 4.9%, respectively; despite continued unfavorable weather conditions and low world prices for most of the country's export products. GDP growth rate is estimated to rise to 5.9% in 2002 (calendar year), 6.3% in 2003 and 7% in 2004. Other economic conditions such as inflation and domestic revenue and foreign exchange reserves are also expected to improve.

Major Economic Indicators

Description	1996	1997	1998	1999	2000
GDP at constant prices (Tsh. bn)	1,401.7	1,448.2	1,505.8	1,577.3	1,654.4
Real GDP growth (%)	4.2	3.3	4.0	4.7	4.9
Per capita GDP at factor cost (Tsh)	122,205	147,026	170,733	193,440	n.a.
(US\$)	210	240	256	259	n.a.
Consumer price inflation (av; %)	21.0	16.1	12.9	7.7	5.9
Population (m)	28.3	29.1	30.0	30.9	31.9
Exports of goods fob (US\$ m)	764.1	715.3	589.5	539.9	661.4
Imports of goods fob (US\$ m)	1,213.1	1,164.5	1,365.3	1,416.0	1,334.5
Current account balance (US\$ m)	-510.8	-629.8	-956.4	-807.1	-370.7
Foreign exchange reserves excl. gold (US\$ m)	440.1	622.1	599.2	775.5	974.2
Total external debt (US\$ bn)	7.4	7.1	7.6	8.0	7.4
Debt service ratio, paid (%)	19.1	13.2	20.8	15.6	18.8
Exchange rate (av) Tsh/US\$	580.0	612.1	664.7	744.8	800.4

(Source: EIU Country Report August 2001; Economic Survey 2000 Planning Commission; Bank of Tanzania Economic and Operational Report FY1999)

2.2 National Development Policies

2.2.1 Tanzania Development Vision 2025

The Tanzania Development Vision prepared in 2000, lays out the long-term development goals and perspectives. The Development Vision envisages that the people will be living by 2025 in a substantially developed society with a high quality of livelihood, having reached the level of a middle-income country where abject poverty will have disappeared. The economy will have been transformed from a low productivity agricultural economy to a semi-industrialized one led by modernized and highly productive agricultural as well as industrial and service activities in rural and urban areas. Consistent with this vision, Tanzania in 2025 should be a nation imbued with the five main attributes: high quality livelihood; peace, stability and unity; good governance; well educated and learning society; and competitive economy capable of producing sustainable growth and shared benefits.

Food self-sufficiency and food security are articulated as the top goal of the first attribute, high quality livelihood. The Development Vision puts a macro-economic growth target at 8% per annum or more, providing a macro-economic stability manifested by a low inflation economy and basic macro-economic balances.

2.2.2 Tanzania Assistance Strategy (TAS)

The TAS prepared in 2000, is a coherent national development framework for managing external resources to achieve the development strategies. The sub-title of TAS, "A Medium Term Framework for Promoting Local Ownership and Development Partnership" well indicates the background of its formulation. It provides a three-year strategic national framework articulating the following development issues: national development agenda; policy framework; best practices in development cooperation; priority areas/interventions; and framework for monitoring the implementation of the TAS.

Whereas the Poverty Reduction Strategy Paper (PRSP, described below) provides a medium-term strategy for poverty reduction in the context of the HIPC Initiative, the TAS provides a broad strategic national framework within operation of the PRSP.

2.2.3 National Poverty Eradication Strategy (NPES)

Tanzanian economy had staggered from the late 1970s and 1980s, and even up to mid-1990s. The NPES prepared in 1998, reported that the government efforts to address poverty hardly resulted in achievement for a number of reasons. The

government has a new resolve to reduce abject poverty by 50% by the year 2010 and total eradication of abject poverty by 2025, (which became the overall goal of NPES). In order to implement this resolve, the government has formulated the NPES. In its preface "the NPES emphasizes the importance of economic growth and improvement in social services. As one of the priority areas in "Policies and Strategies for Creating Capacity for Poverty Eradication" in the NPES, the agriculture sector has been given the utmost importance. The NPES states "Investment in agriculture should be promoted and enhanced." As regards irrigation, it states that "Encouraging increased investment in smallholder irrigation systems" is also part of the "Strategies for Agriculture Development".

2.2.4 Poverty Reduction Strategy Paper (PRSP)

The Tanzanian PRSP was prepared and finalized in June 2000 under the initiative of the Tanzanian government with assistance of international partners. The PRSP presents a sector-wide development strategy in each sector by duly reflecting the objectives and priorities set in it. It emphasizes that international resources provided should be utilized in the way consistent with Tanzania's development policy objectives and channeled through specific projects in such a way as to ensure effective implementation of each project/program with maximized output toward poverty reduction. The PRSP provides a medium-term (five years), strategy to reduce poverty and is part of the Enhanced HIPC Initiative. This strategy requires the government to cut back on spending but it allows for various poverty-focused extra-budgetary activities and promotes a range of non-financial measures that should make an impact on poverty. The PRSP has brought a range of ideas and plans together, which are categorized into four groups. These four groups, and ideas and plans included in respective groups are given below:

- Macroeconomic Stability and Structural Reforms
 - Private Sector Development, Tax Reform, Export Growth, Safety Nets for Valuables, and Good Governance
- Priority Sectors
 - Education, Health, Water, Agriculture, Roads, and Legal System
- Cross Cutting Programme
 - HIV/AIDS, Local Government Reform, Rural Development, and Poverty Monitoring and Evaluation
- Emerging Issues and Supplementary Programmes
 - Gender, Environment, Employment, Urban Poverty, and Child Labor and Out-of-School Children

2.2.5 Decentralization Policy

(1) Background

The government started on reforming its public service in the early 1990s. In the first step, however, its efforts toward the reform were concentrated at the Central Government level. The government developed a separate decentralization program in 1996, the Local Government Reform Agenda 1996-2000 with a view of empowering the Local Government Authorities (LGAs) and allowing them more autonomy for socio-economic development and services provision. In addition, in 1998, the government released the Policy Paper on Local Government Reform. The policy framework of the local government reform in Tanzania is made up of these two documents. In order to implement the policy, the Local Government Reform Programme (LGRP) was established and the Action Plan and Budget, July 1999-June 2004 was developed by the government. It has been updated each year in the form of an annual Action Plan and Budget, approved by the Programme's Common Basket Fund Steering Committee.

(2) Implementation Progress

Phase I of the programme implementation began on January 2000 in 38 district councils chosen from among the 114 councils. According to the MTP (*the Medium Term Plan and Budget July 2002-June 2005, Local government Reform Programme*), implementation of the reforms has been delayed from the original plans and furthermore, expectations at that time were unrealistically high and the plans were over-ambitious. These comments imply some modification and/or adjustments of the original plans are necessary. However, it also points out some major achievements, such as the followings:

- There is a clear policy statement on reform, supported by the highest levels of government.
- Legislation to enable the reforms has been enacted.
- Regulations to support the reforms have been passed.
- Information on the reforms has been disseminated to all local authorities and to the public.
- Regional administration has been restructured in line with its new role.
- 38 LGAs have begun the process of restructuring their organizations.
- Work on improving financial management in LGAs and on fiscal decentralization is underway.
- The work of building capacity in LGAs is underway.
- Attitudes towards reform are slowly changing among government officials

and members of the public.

(3) Phasing of Reforms

The PSRP (Public Service Reform Programme) shows a series of broad reform phases to 2011 and local government reform should also be seen in this 9-year time frame as follows:

- 2002-2005: The LGPR as set out in the MTP.
- 2005-2008: Local government reform, now mainstreamed in PO-RALG, continues with central government support.
- 2008-2011: Strengthened LGAs themselves continue the reforms.

In the current plan, the concept of phasing of the reforms in LGAs has been fundamentally changed. The MTP envisages a different type of phasing, with all LGAs free to implement reforms, and central support being provided on a demand basis. In terms of fiscal decentralization, only those LGAs that meet agreed criteria will qualify in the first instance. However, all LGAs will be assisted to meet the criteria, and in many reform activities, in particular in the area of capacity building.

2.2.6 Rural Development Strategy (RDS)

In Tanzania, development of the rural areas is a key issue for its social and economic development. About 80% of the population in Tanzania resides in the rural areas, where poverty is prevailing. In order to improve living standards of the rural people, the government launched the formulation of the RDS focusing on the following lessons learned from the past rural area development policies and strategies:

- Failure of building up the necessary capacity that was needed to bring about a sustainable development in the rural areas.
- Less benefit to the majority of Tanzania, particularly those living in the rural areas by past macro-economic achievements.
- Unsatisfactory performance of the agricultural sector, the economic base of the rural areas.
- Absence of a comprehensive rural development strategy.
- Need for a rolling rural development strategy, which translates the TDV into a medium-term implementation programme.
- Need of emphasizing economic diversification in the rural areas.
- Need of recognizing the inter-relationship between the rural economy and the urban markets.

In the RDS which was finalized in December 2001, the proposed cohesive strategy for rural development consists of four strategic interventions: (i)

promoting widely shared growth, (ii) increasing opportunities and access to services, (iii) reducing risks and vulnerability, and (iv) good governance. The RDS mentions the strategic approaches by “Quick Wins”, “Medium-term Win”, and “Long-term Win” for implementing these strategic interventions, taking into consideration the problems and constraints envisaged.

With regard to irrigation development, the RDS proposes the specific objective in the long-term wins, which is to promote profitable irrigation infrastructure, and also three actions of encouragement of farmers to form the Water Users Associations (WUAs), assistance for the WUAs to access credit, and organization of relevant training modules for members of WUAs.

2.3 Administration and Current Economic Situation

2.3.1 Administration and Population

The Mainland administratively consists of 20 regions, 3 municipalities, 114 districts, 2,363 wards, and 9,288 villages according to the Regional Socio-economic Profile prepared in 1997. The President’s Office, Planning and Privatization provides the following projection of population estimated using 1988 population census as a baseline data and based on assumptions on future birth, deaths, internal and international migration.

Mainland Population Projection

Description	2002	2005	2010	2015	2017
Mainland Total	34,021,000	37,267,000	43,380,000	50,496,000	53,464,000
Growth Rate (%)	Projected annual growth rate : 3.08%				

Note: Rounded by the JICA Study Team

2.3.2 Current Economic Policies, Reforms and Strategies

The government has targeted several key areas in which strategic actions will need to be taken to create conditions favorable for higher economic growth, focusing on poverty reduction. The table below is a summary of current policies, reforms and strategies related to agricultural sector.

Summary of Current Economic Policies, Reforms and Strategies

Objectives	Reforms/Measures	Key Components
Improving market efficiency and productivity, and eventually improvement in macroeconomic performance, especially in agriculture sector	-Financial Sector Reforms -Tight money policy -Liberalisation of foreign exchange rate	- New bank license issuance and privatisation of government banks - Control of money supply - Increase of exports and foreign exchange inflows
Promotion of exports	-Agriculture Sector Reform -Development of new export commodities	-Production increase of traditional and non-traditional crops -Mining and horticulture
Increasing investment, both domestic and foreign investors	-Parastatal Sector Reforms -Private sector development	-Privatisation of government owned enterprises -Private sector
Efficient channeling of	-Tax Reforms	-Government revenue enhancement

government resources towards faster economic growth and poverty alleviation	-Integrated Management System (IFMS) -Parastatal Sector Reforms -Public Service Reform Programme (PSRP)	Financial	-Government expenditure management and control -Restructuring and privatisation of public enterprises. -Reduction of government employment; and other 4 components
Debt servicing and debt sustainability, and economic development and poverty alleviation	Enhanced HIPC Initiative and PRSP		-Agreement of PRGF with IMF -Attainment of Completion of Enhanced HIPC Initiative and PRSP -Increase of budgetary allocations for poverty reduction

Source: Memorandum of Macro-economic Development" prepared by Ministry of Finance

The structural reforms have been largely aimed at establishing a favorable environment for increased investment. At early stages, changes to legal and regulatory frameworks were the focus; the government has embarked on accelerating the pace of privatization of state-owned enterprises.

2.3.3 Foreign Trade and Balance of Payment

Trade Balance has been in deficit for a long time. The deficit in 2001 is likely to increase again after a drop in 2000. The value of export in 2001 is expected to increase by 17%, but imports are also likely to increase by 12%, thus trade balance deficit is likely to increase by 6%. However, both the current account and overall balance are expected to improve significantly due to increased grants from foreign donors.

Balance of Payment

(unit: million US\$)

Items	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Actual	2000 Actual	2001 Expected
Good Balance	-657.6	-448.8	-395.4	-777.5	-824.9	-671.7	-713.3
Export (fob)	682.9	763.8	752.6	588.5	543.3	663.2	776.4
Import (cif)	1,340.5	1,212.6	1,148.0	1,366.0	1,368.2	1,334.9	1,489.7
Current Account	-646.4	-461.2	-558.6	-993.1	-793.4	-382.0	-413.5
Overall Balance	-382.0	-231.2	-633.4	-646.0	-372.7	-35.5	55.0

Source: Economic Survey 2001

Foreign Direct Investment (FDI), to the country has been increasing steadily since 1995, reflecting improved business environment for foreign capital. The table shows the trend of influx of FDI.

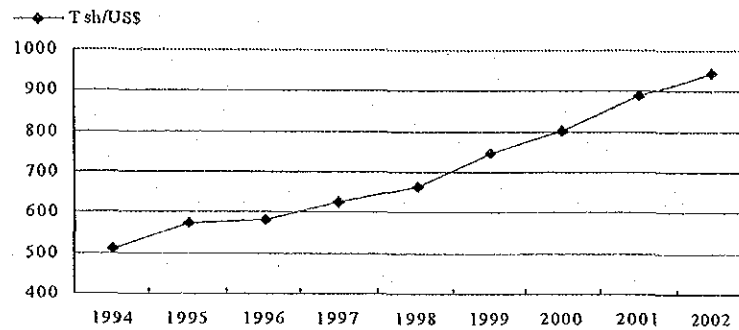
Growing FDI

Year	Amount (US\$ million)
1996	149
1997	155
1998	172
1999	183
2000	193
2001	224

Source: The Economic Survey 2001

Foreign exchange rate against US\$ has continued to depreciate as shown in the following figure:

Trend of Exchange Rate



Source: Economic Survey 2001; Bank of Tanzania

2.3.4 Government Finance

To cope with large fiscal deficits, the government has been committed to increasing tax revenue on one hand and imposing tight fiscal outlays on the other. Backed by various tax collection measures, the trend of domestic revenue is on upward trend, but strengthening of tax collection capability and the broadening of tax base will become more important. The government's fiscal discipline has improved since the introduction of a cash-budgeting system from FY1996/97, which has imposed tight spending constraints on ministries. But the government will definitely remain dependent on donor inflows, particularly for development expenditure to cover its budget deficit as the level of the government revenue has remained quite low.

Summary of Government Finance (Mainland)

(Unit: Tsh. billion)

Description	1997/98 (actual)	1998/99 (actual)	1999/00 (actual)	2000/01 (actual)	2001/02 (expected)
1. Domestic Revenue	627.5	689.3	777.6	929.6	1,026.1
(1) Tax Revenue	586.2	616.3	685.1	827.8	934.7
(2) Non-tax Revenue	41.3	73.0	92.5	101.8	91.4
2. Total Expenditure	856.2	927.7	1,168.8	1,307.2	1,545.6
(1) Recurrent Expenditure	670.0	791.2	808.9	1,021.0	1,250.8
(2) Development Expenditure	186.6	136.5	359.9	286.3	317.4
(3) Special Fund for Songosongo					3.0
3. Deficit/Surplus (1 - 2)	-228.7	-238.4	-391.1	-377.6	-519.6
4. Financing	237.1	201.5	476.0	377.6	544.9
(1) External Source	256.2	223.8	488.1	380.6	584.5
(2) Internal Sources	-19.2	-22.3	7.9	20.4	-5.5

Source: The Economic Survey 2001; for Development Expenditure, Local Funds, and Foreign Funds, figures in 2001/02 are obtained from Planning Department of MAFS.

2.4 Socio-economic Setting

2.4.1 Consumption, Income and Employment

The changes of labour force at an annual average rate of 2.4% in 1999 and 2000 are as shown in table below. Over half of the labour force is aged 15-29 years,

and only 8.5% of workers are educated to secondary level or above. Women comprise more than half of the labour force. It is estimated that about 400,000 to 500,000 new entrants join the labour market every year.

Labour Force

Year	Males	Females	Total	Percentage Chang
1966	6,991,631	7,604,137	14,631,768	-
1997	7,234,453	7,886,176	15,120,529	3.3
1998	7,465,722	8,118,526	15,584,248	3.1
1999	7,576,040	8,330,138	16,006,178	2.7
2000	7,876,171	8,530,576	16,406,747	2.4

Source: *Planning and Privatization*

Agriculture is the largest employer, mostly through self-employment on smallholdings. The informal sector is an important source of employment and income. Unemployment in the period April–June 2000 was 16% for the whole country, 36% in urban areas and 9% in rural areas. The definition of unemployed includes people with unreliable jobs, those who work less than 40 hours per week, and farmers who were not engaged in any agricultural activity during the season.

Information from the household income survey includes a wide variety of types and sources including employment, self-employment and payment in kind. Information was collected as gross revenue for many sources; hence average per capita receipts may be well above per capita expenditure. The correlation between income and expenditure per adult equivalent has an r-square coefficient of 0.596 (significant at the 1% level). The table below shows the mean per capita receipts for different sources. Per capita income is highest in Dar es Salaam, at nearly Tsh. 41,000, and lowest in rural areas at Tsh. 14,134.

Mean Per Capita Household Monthly Income by Source

Income Source	Dar es Salaam	Other Urban	Rural	Mainland
Employment in cash	15,251	7,936	1,261	2,982
Employment paid in kind	218	156	75	94
Non-farm self-employment	20,868	14,026	3,722	6,138
Agricultural income	431	3,923	7,387	6,510
Producers co-operative	316	195	33	72
Interest and dividends	21	59	7	15
Rent received	408	365	59	122
Transfers	1,041	1,058	770	826
Other receipts	2,213	2,709	821	1,169
Total	40,767	30,426	14,134	17,928

Source: *Household Budget Survey 2001*

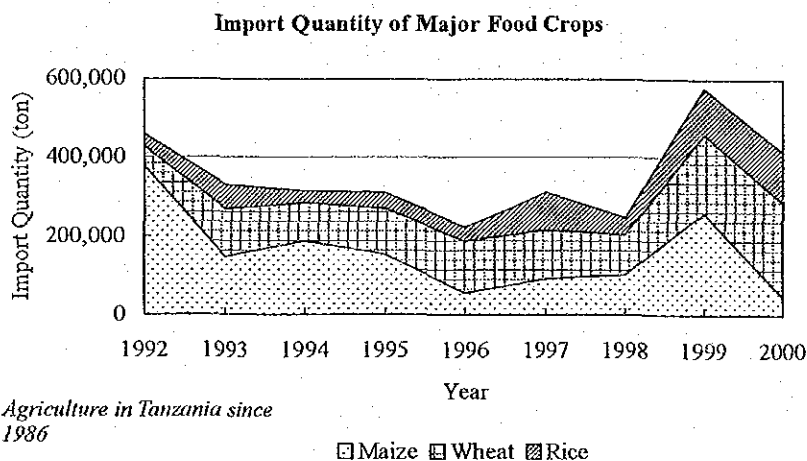
Wages and other income from employment provide 41% of household income in Dar es Salaam and 24% in other urban areas. Income from self-employment represents almost 30% of income in Dar es Salaam, and 33% in other urban areas. In rural areas, 60% of income is from agricultural sources with off-farm income

being important in rural areas.

Rural households display a diversity of income sources. By contrast, over one third of households in Dar es Salaam depend on a single source.

2.4.2 Food Deficit

In order to ensure a stable food supply and also to secure access by all consumers to their nutritional needs, the government once took the responsibility of production, marketing and distribution of food crops. A number of institutions and agencies have been involved in procurement, importation, storage and distribution of food crops until 1986. Such organizations were, however, unable to supply the food needs and had to depend on imports and food aid to meet the production deficit. In 1991, the Food Security Act was passed and the government has moved from a controlled economy to a market economy. Information on the commercial and food aid imports and exports during the past decade was obtained from the Food Security Department and the result was summarized in Table 2.4.1. The following figure shows the import quantity of major food crops.



Although the amount fluctuates from year to year, the import quantity of maize shows decreasing trend. In the case of wheat and rice, however, the import quantity is gradually increasing. When import and export amounts are compared to production, the imported amount of maize and rice is 7% and 15% of the production amount on average, respectively. The export amount of maize and rice are negligible. In the case of wheat, however, import amount usually exceeds the production and a substantial amount is also exported. In addition to these major cereals, beans are imported when necessary and cassava is exported when there is surplus.

Table 2.4.2 shows the result of food supply analysis and self-sufficiency ratios from 1992/93 to 2002/03 (projection) by regions and is summarized in the following table.

Frequency of Self-sufficiency Status of Stable Foods

Region	Surplus $120 \leq SSR^{*1}$	Self Suf. $100 \leq SSR < 120$	Deficit $SSR < 100$
1. Arusha	1	0	7
2. Coast/DSM	0	0	8
3. Dodoma	0	1	7
4. Iringa	5	3	0
5. Kagera	3	1	4
6. Kigoma	0	2	6
7. Kilimanjaro	1	1	6
8. Lindi	2	1	5
9. Mara	0	2	6
10. Mbeya	4	3	1
11. Morogoro	0	3	5
12. Mtwara	4	1	3
13. Mwenza	2	4	2
14. Rukwa	8	0	0
15. Ruvuma	5	2	1
16. Sinyanga	5	1	2
17. Singida	3	1	4
18. Tabora	2	0	6
19. Tanga	0	2	6
Total	45	28	79

*1: Self Sufficiency Ratios

Unit: Year

Source: Food Security Bulletin, Ministry of Agriculture, Crop Monitoring and Early Warning Unit, 1992/93 - 2002/2003

According to the table, in recent years the Mainland is not self-sufficient for cereals, but is self-sufficient for non-cereals at a national level. Out of 19 regions, 10 regions have experienced food deficit more than four out of eight years. The food self-sufficiency rate by the regions fluctuates often and is more pronounced in the drought years when many regions experience food shortage. Moreover, the table shows that there is a clear difference on the supply capability of the staple-food crops among the regions. For example, in Arusha, Coast, and DSM, Dodoma, Kigoma, Kilimanjaro, Mara, Tabora and Tanga, the quantity of production is constantly less than demand. In contrast, the regions which have attained stable self-sufficiency or the regions that have produced a surplus are Iringa, Mbeya, Mwenza, Rukwa, Ruvuma, Shinyanga.

According to the report which directs its attention to people's nutrition status, per capita food production or per capita food availability is not a good measure of food security or nutritional status. Table 2.4.3 shows the rate of child malnutrition according to place or region (Tanzania Demographic and Health Survey, 1996). Among three different indexes (rate of moderate stunting, wasting and underweight) that are shown in the table, the moderate stunting rate is useful to evaluate the nutritional status because the measure is less affected by

seasonal and annual variation. The regional pattern in moderate stunting indicates that malnutrition is highest in Iringa, Lindi, Mtwara, Tanga and Mbeya. Iringa, Mbeya, and Ruvuma are regions where production of staple-food is stabilized and self-sufficiency exists. The statistic data on staple-food production is inconsistent with the study result on nutrition status. This situation shows that while excessive staple-food crops are produced and circulating commercially, the poverty class cannot access sufficient food, even in a granary zone.

2.4.3 Poverty Status

Poverty is pervasive and deep in the Mainland as is shown by the Household Budget Surveys carried out in 1990/91 and 2000/01.

Poverty is in principle described in two aspects: income poverty (less than one US\$ per day) and non-income poverty. As well, poverty lines are explained in two ways: food poverty line and basic needs poverty line. The food poverty line defined in HBS 2000/01 represents food consumption pattern of the poorest 50% of the population, which is adjusted to be equal to 2,200 kilo calories per day in caloric value, and then this calorie amount is further adjusted to be valued in monetary terms. The food poverty line and the basic needs poverty line calculated in the said survey are tabulated below:

Poverty Lines per Adult Equivalent for 28 Days

Poverty Line	Area			
	Dar es Salaam	Other Urban Areas	Rural Areas	Mainland
Food Poverty Line				
HBS 2000/01	Tsh. 6,719	Tsh. 5,607	Tsh. 5,107	Tsh. 5,295
HBS 1991/92	Tsh. 3,031	Tsh. 2,387	Tsh. 1,958	Tsh. 2,083
Basic Needs Poverty Line				
HBS 2000/01	Tsh. 8,313	Tsh. 6,386	Tsh. 6,348	Tsh. 7,253
HBS 1991/92	Tsh. 3,045	Tsh. 2,419	Tsh. 2,116	Tsh. 2,777

Sources: HBS 2000/01 Draft Final Report National Bureau of Statistic

The percentage of the population below the two poverty lines in 1991/92 and 2000/01 are shown below:

Incidence of Poverty in Mainland

Poverty Type	Dar es Salaam		Other Urban Area		Rural Area		Mainland	
	'91/92	'00/01	'91/92	'00/01	'91/92	'00/01	'91/92	'00/01
Food Poverty (%)	13.6	7.5	15.0	13.2	23.1	20.4	21.6	18.7
Basic Needs Pty. (%)	28.1	17.6	28.7	25.8	40.8	38.7	38.6	35.7

Sources: HBS 2000/01 Draft Final Report National Bureau of Statistic

Thirty six percent of the total population falls below the basic needs poverty line and 19% below the food poverty line in 2000/01. Both of them represent a decrease by 2.9% compared with those in 1991/92. Rural areas have the highest

population below the poverty lines: 20.4% in food poverty and 38.7% in basic needs poverty. These percentages are evidence of a wide gap of poverty incidence between urban and rural.

Fifty nine percent of children aged seven to thirteen years are in school, with the remaining 41% not studying. Illiteracy rate is 29% in 2000/01. The remaining 71% are literate in at least one language. Women, particularly in rural areas, are more likely literate. Fifty three percent of the households in rural areas still depend on unprotected sources of drinking water.

In the Mainland poverty is mainly a rural phenomenon. Incomes are lower and poverty is more widespread and deeper than in the urban centers. Another aspect of the issue of poverty in the Mainland is that the poor are concentrated in subsistence agriculture. Farmers in rural areas are in general poorer than non-farmers. According to the 1991/1992 HBS, the poverty incidence for household whose head works in their own farm is 57%. The PRSP provides a composite deprivation index, which makes evident the division of "Most Deprived Region" and "Least Deprived Region" in the country.

Regional Variation in Poverty as of 1999

Indicator	L. D. R.* ¹	M. D. R.* ⁴	Most Deprived Regions
Per capita GDP in 1997 (Tsh.)	371,811 (US\$608)	95,623 (US\$156)	Kagera, Kigoma, Dodoma, Kilimanjaro,
Literacy rate (%)* ¹	96.4	68.1	Shinyanga, Arusha, Singida, Kigoma
Gross primary school enrollment rate (%)	100	63.0	Kagera, Kigoma, Rukwa, Tabora, Dodoma
out of which, Boys	99.0	65.0	Tabora, Dodoma, Kagera, Kigoma, Rukwa
out of which, Girls	100	60.0	Tabora, Dodoma, Kagera, Kigoma, Rukwa
Life expectancy (years)	59	45	Dodoma, Morogoro, Mtwara, Kagera, Rukwa, Iringa
out of which, Men	57	44	Dodoma, Morogoro, Mtwara, Kagera, Rukwa, Iringa
out of which, Women	62	45	Dodoma, Morogoro, Mtwara, Kagera, Rukwa, Iringa
Infant mortality (per 1000)	52	130	Dodoma, Lindi, Kagera, Mtwara
Under-5 mortality (per 1000)	78	220	Dodoma, Lindi, Kagera, Mtwara
Low birth weight	4.7	15.6	Mara, Ruvuma, Mtwara
Severe malnutrition	2.7	14.7	Iringa, Lindi, Kagera, Singida
Food security (ccereal equivalent) * ²	590	177	Coast, Dodoma, Morogoro, Tanga

Note *1: For women the most deprived regions were Shinyanga, Tabora, Coast and Kigoma.

*2: Availability of cereal equivalent levels (in kilograms) during 1992 - 96.

*3: Least Deprived Region

*4: Most Deprived Region.

2.4.4 Gender Issue

Women play an important role in irrigation activities. Women between 15 and 59 years old contribute to 63% of agricultural labour supply. Any agricultural

development, including irrigation, could not be discussed without the involvement of women. Women are often faced with some constraints in land acquisition, crop cultivation, and participation in WUAs and training, which are highly relevant to irrigation development.

Women in Tanzania have legal rights to land, and the law has a legal structure based on equity. In principle, women can legally acquire land through the village government. However, married women are unlikely to exercise that right because their husbands are considered by all parties as the landowner (customary law).

In cultivation of crops, there is a tendency that men concentrate on cash crop production on their plots (shamba la Baba), while women cultivate family food crop on their plots (cambia la mama). The cambia la mama is more likely to be on rainfed than irrigated land, which results in less benefit to women. Land improved by being provided with irrigation often undergoes a shift from maize to rice cultivation, for economic reasons, and this brings about a negative impact to the family as a whole due to the smaller food field plots resulting in food shortage.

In general, women are rarely represented in water users' committees, and according to reports from several irrigation schemes, women have very little influence on water management. However, in reports from improved traditional and modern schemes, the trend is different. There is a remarkable change following the sensitization of farmers on gender issues. Men are now accepting women as equal partners in water management. Women, however, have often had fewer chances to participate in training. To improve this situation, consideration should be given to facilitating women contributing to the preparation of training program.

CHAPTER 3 SECTORAL DEVELOPMENT POLICIES AND ECONOMIC CONDITIONS

3.1 Sectoral Development Policies

3.1.1 Agriculture and Livestock Policy

Faced with fundamental economic and social changes during the 1980s and mid-1990s in Tanzania, it had become clear that it would be difficult for the agriculture sector to operate with its old traditions and instruments. In order to address structural changes challenging environments in the sector, the Agriculture and Livestock Policy, 1997 was prepared. Until the Agricultural Sector Development Strategy was finalized in 2001, Agriculture and Livestock Policy, 1997 has been the core development guideline for the sector.

3.1.2 Agricultural Sector Development Strategy (ASDS)

The primary objective of the ASDS was to create an enabling and cooperative environment for improving the productivity and profitability of the agricultural sector as the basis for improved farm incomes and reducing rural poverty in the medium and long-term. Various innovative and practical actions are included in the ASDS as part of its strategy. Among them is a focus that agricultural productivity and profitability comes first. Other actions include: the promotion of private sector/public sector and processor/contract grower partnerships, and the participatory implementation of the strategy through District Agricultural Development Plans (DADPs). The ASDS is intended to assist the attainment of the objectives envisaged in the PRSP. It proposed a realistic target for the overall agricultural sector to grow by 5 % per year on an average over the 3-year period 2005/07. The total indicative costs of implementing the ASDS would be estimated at US\$ 255.3 million.

3.1.3 Agricultural Sector Development Programme (ASDP)

After completion of the ASDS in October 2001, the lead ministries in the agricultural sector, namely, the Ministry of Agriculture and Food Security, Ministry of Cooperative and Marketing and Ministry of Water and Livestock Development, decided to prepare the ASDP.

The Inter-ministerial Coordination Committee (ICC) consisting of Permanent Secretaries of the lead and collaborating Ministries and representatives of the private sector is the authority agency for the ASDP. The Technical Inter-ministerial Committee (TIC) was established to act as the Secretariat for the ICC.

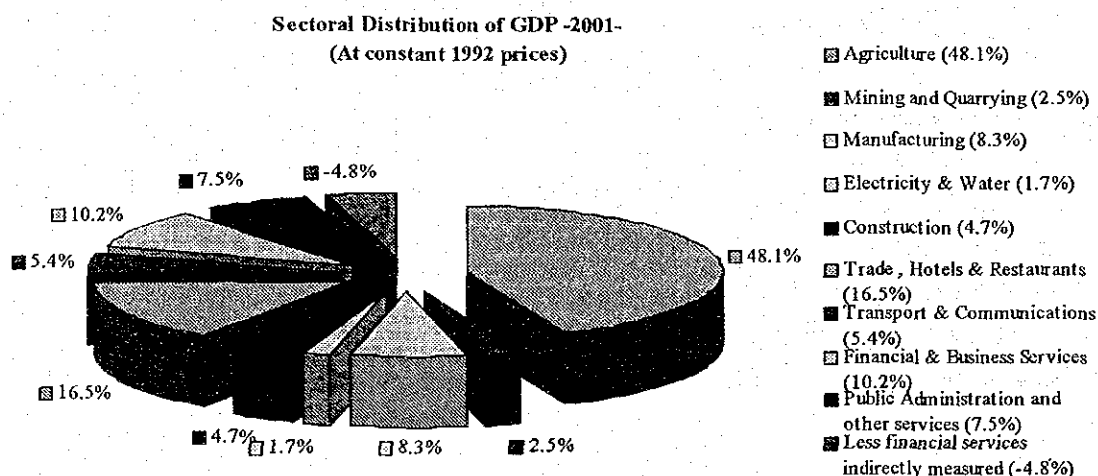
The ASDP is a five-year rolling programme, and will be revised and updated annually. The government technical team and consultants under supervision of the TIC are in charge of preparation of the ASDP.

The ASDP, which is still in draft form as at the end of August 2002, documents twenty-two sub-programmes for implementation. Of these, the sub-programme entitled irrigation and water management is taken up under the theme of Public and Private Roles in Improving Supporting Services, to reduce climatic risk of crop failure due to droughts and allow better crop intensities to ensure sustainable crop production and productivity. The preparation of the NIMP is positioned as one of four priority interventions in this sub-programme.

3.2 Sectoral Economic Analysis

3.2.1 Overall Characteristics

Despite the efforts of structural reforms, the country's per capita income is only US\$259 in FY1999. The economy is heavily dependent on agriculture (primarily, coffee, cotton, tea, cashew-nuts, sisal, maize, rice, wheat, cassava, and tobacco), which accounts for 48% of its GDP and provides 65% of its foreign exchange earnings. Manufacturing accounts for only 8% and is limited to processing agricultural products and light consumer goods. The mining sector has good potential, but has yet to be fully developed. Tourism is one of the country's dynamic sectors and has shown significant growth in recent years. The service sector is increasingly becoming an important source of employment.



Source: *The Economic Survey 2000*

3.2.2 Sectoral Distribution of Government Expenditure

The government appears to have put top policy priorities on education, transport (roads) and health sectors, and not on the agriculture sector, as noted from the Economic Survey 2000. Percentages of those three sectors against total

government expenditure in 2000/01 (estimate) are 19.0%, 5.5% and 5.2%, respectively. The percentage of agricultural sector in the same year is only 2.6%, and that has even decreased from the peak of 4.6% in 1998/99 and 3.9% in 1999/00. To fill in the shortage of the government budget, there have been out-of-budget financial resources coming in from foreign donors. According to the UNDP Tanzania Development Co-operation Report 1999, approximately half of donor money is reflected in the government budget, and the remaining will go directly to projects/programme as out-of-budget funds.

3.2.3 Agricultural Sector and Irrigation Sub-sector

Tanzania's agricultural sector, consisting of crops, livestock, fisheries, forestry and wildlife, contributed 48.2% to GDP and 65% of foreign exchange earnings in 2000. The sector's annual growth rate declined by 0.7%, from 4.1% in 1999 to 3.4% in 2000 but increased by 2.1% in 2001 due to mainly good weather conditions. The ASDS put the growth target of the sector at 5% per year in average over 3-year period, 2005 – 2007, but actual growth rates have never reached this level since 1988 except in 1990, 1995 and 2001, as evidenced in the table below. Considering its dominant share in the whole economy, enhanced growth in the sector is critical to the attainment of the development target of the whole country.

Growth Rate of Agriculture Sector – at constant 1992 prices – (unit: %)

Description	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01
Agriculture	2.2	3.9	5.5	3.6	1.2	3.1	2.1	5.8	3.9	2.4	1.9	4.1	3.4	5.5
Crops	2.0	4.3	6.4	3.9	0.7	3.1	2.0	6.8	4.2	2.3	1.8	4.5	2.9	5.9
Livestock	2.8	2.7	3.0	2.7	2.7	2.7	1.4	2.7	2.7	2.7	1.9	3.5	3.9	3.3
Forestry & Hunting	2.7	2.7	2.8	2.7	2.7	2.9	2.7	2.7	2.7	2.7	1.2	2.4	4.8	3.6
Fishing	3.0	3.1	2.9	2.9	3.0	4.4	3.9	4.0	4.1	3.7	3.5	3.2	7.2	7.0

Source: *The Economic Survey 2001; National Bureau of Statistics*

Average share of irrigation development for the five year, 1998/99 – 2002/03, is 1.46% of the government's Development Expenditure (local cost portion), which is allocated to Crop Development Division of the MAFS.

3.2.4 Private Sector Development

The government has been shifting its roles and interventions from direct involvement in productive and commercial activities towards provision of social and economic infrastructure as well as providing technical assistance and advisory services. In order to speed up private investments, the government has implemented policies aimed at encouraging more private sector participation. Establishment of the Tanzania Investment Center in 1990 and the Presidential Parastatal Sector Reform Commission in 1993 are measures in line with this objective.

CHAPTER 4 BACKGROUND AND CONSTRAINTS IN IRRIGATION DEVELOPMENT

4.1 Natural Conditions

4.1.1 Land

Tanzania is located on the south-eastern coast of Africa and comprises the Mainland and some islands. Its total area is about 94.8 million ha, lying approximately between latitudes 1° and 12° south and longitudes 29° and 41° east. The cultivated area is estimated at about 10.0 million ha, or 10.7 % of the total land area.

4.1.2 Topography

Tanzania is characterized by a narrow coastal plain occupying the eastern seaboard of the Indian Ocean. Most of the country lies on the Great Africa Plateau with altitudes ranging between 1,000 m and 2,000 m above the mean sea level. The area in the north-east is characterized by a shelter-belt of block mountain topography and by highlands associated with volcanic mountains. Most of the other highlands are associated with the Rift Valley. Substantial portions of the three great lakes (Victoria, Tanganyika and Nyasa) are located within country's borders.

4.1.3 Meteor-hydrology

Tanzania has small seasonal temperature variations caused by the country's proximity to the equator. Mean temperatures range from 26 °C on the coast to 17°C on the Southern Highlands. Potential evaporation in the country varies from about 1,000 mm/year in the highlands to 2,200 mm/year in the dry plains at the center of the country, showing high potential evaporation rates in the areas with a little precipitation. The annual rainfall varies from 500 mm to 1,000 mm over most of the country with highest rainfall of 1,000 mm to 3,000 mm in the north-east of Lake Tanganyika basin and in the Southern Highlands. More than half of the country receives an average rainfall less than 800 mm. Most regions receive rain from December to April, and this is referred to as the "wet season". The "dry season" generally occurs in the months of June to October. Due to these meteorological characteristics, river run-off in the country is not steady. More than 30 % of rivers in Tanzania show intermittent or ephemeral river regime.

4.1.4 Groundwater

Groundwater is an important water source in Tanzania supplying more than 25 % of the domestic water consumption. Areas using groundwater are scattered

throughout the country. The hydro-geological formation and lithology is very complicated. In general, a potential zone of groundwater would be observed in the areas of some tectonic and major faulting formed as a result of tectonic movement of the Kilimanjaro volcanism. Furthermore, the Karoo sandstone near Tanga and the fault zones around Arusha are groundwater potential zones.

4.2 National Irrigation Development Plan (NIDP)

4.2.1 Philosophy of NIDP

The objectives of the NIDP were in line with the then agriculture policy; to contribute towards attaining “food security” and “economic growth” at all levels. Through identification of constraints in irrigation development, two sub-objectives, “Removal of the sectoral constraints” and “Rehabilitation, upgrading and development of irrigation infrastructure” were induced. Furthermore, the Plan proposed five major components for achieving the plan’s objectives as follows:

General Structure of NIDP

Development Objectives	Sub-objectives	Five Major Components
Food Security at All Levels	Removal of sectoral constraints	Sector policy review and monitoring and sectoral coordination
Economic Growth (by means of upgrading national capacities in the planning, execution, operation, maintenance and monitoring of sustainable irrigation schemes, the rehabilitation of particularly the traditional smallholder schemes along with the facilitation of the private sector, all in the context of sound environmental stewardship).		Irrigation Infrastructure (Rehabilitation, upgrading and development of irrigation infrastructure)
	Planning and management information systems and research	
	End user involvement, cost recovery and commercialization	
		Infrastructure improvement (Planning studies, implementation)

Source: NIDP, 1994

Under the above objectives, the NIDP was formulated with the specific modalities that irrigation development in Tanzania shall be “in affordable-scale, for smallholder, by simple and low-cost technology”.

The NIDP was designed with a timeframe to the year 2014, with four components for the “Removal of the Sectoral Constraints” planned to be completed by 1999, and the remaining one component for “Irrigation Infrastructure” planned to be implemented for 147 ranked priority irrigation schemes by the year 2014.

4.2.2 Progress of Implementation of NIDP

The envisaged outputs of the NIDP have not been adequately achieved in the past 8 years since inaugurated as shown in Table 4.2.1. About 70 % of the components for the “Removal of Constraints” have not been completed to date,

and even those commenced have not yet achieved their expected target.

As for the other sub-objectives of "Irrigation Infrastructure", progress has not been satisfactory. Below are tabulated the irrigation development programme/projects already completed or under implementation since the NIDP was launched:

Irrigation Development Programme/Projects Related to NIDP

Name of Programme/Project	Period	Donors	Remarks
Pawaga Irrigation Project	1993 - 1995	UNCDF/UN DP/WFP	It commands traditional irrigated area of 2,000 ha. The project was mainly to construct a weir structure and was a phase I scheme proposed in the F/S.
Madibira Agricultural Smallholder Development Rice Project	1995 - 2000	ADB	It targets 3,000 ha. The irrigation system is now operational.
Rehabilitation of Kilimanjaro Traditional Irrigation Schemes	1987 -	UNDP	It covers traditional irrigation schemes of about 6,400 ha.
Smallholder Development Project for Marginal Area (SDPMA)	1992 - 1999	IFAD	Rehabilitation of smallholder irrigated schemes using water harvesting technology for 4,300 ha. (18 schemes).
Participatory Irrigation Development Programme (PIDP)	2000 -	IFAD	It expands from SDPMA to wider areas (7,000ha; 16 SDPMA schemes rehabilitation, 36 new schemes, 8 charco dam schemes) with integrated approaches.
River Basin Management and Smallholder Irrigation Improvement Project(RBM-SIIP)	1996 - 2002	World Bank	It covers traditional irrigation schemes in Pangani and Rufiji River Basins having about 4,000 ha.(15 schemes out of 34 identified areas).
Agricultural Sector Programme Support - Irrigation Component (ASPS-IC)	1998 - 2002	DANIDA	It is an upgrading project of smallholder traditional irrigation schemes (5 schemes) in Morogoro, Iringa and Mbeya Regions.
Special Programme for Food Security (SPFS)	1995 -	FAO	Once the Pilot Phase was phased out in 1998, it is now in Expansion Phase. Improvement of existing water abstraction and distribution system has been done together with iterative learning process.
Mwega Smallholder Irrigation Project	2000- 2002	Gov. of Japan	It targets 580 ha of irrigation development. Improvement work of irrigation system was completed in March, 2002.
Traditional Irrigation Programme (TIP)	1987 -	SNV (transformed into a trust fund of TIPDO)	It is a rehabilitation project of traditional irrigation schemes in Iringa, Dodoma, Tanga and Kilimanjaro with target of 8,000 ha.

Source: Internal information in Irrigation Section of MAFS

4.2.3 Problems and Constraints in Implementation of NIDP

The problems in irrigation development pointed out in the report of "Agriculture: Performance and Strategies for Sustainable Growth" February 2000, are as follows:

- Absence of hydrological data for irrigation planning
- Failure of development planners to appreciate the need for human, equipment and financial resources to implement irrigation projects
- Continued emphasis on sophisticated, expensive and uneconomic irrigation projects
- Poor project planning and inadequate project preparation
- Under-resourcing of irrigation services at national, zonal and regional levels
- Failure to develop extension packages for irrigated agriculture and the ineffectiveness of extension services to farmers
- Inadequate human resource development and lack of funding for training, leading to low staff motivation

Similarly, the Irrigation Section (IS) of MAFS reviewed the progress of the NIDP in 2001, focusing on current status of constraints clarified in the NIDP. Their reviews indicate the following problems:

Summary of Problems in Implementing NIDP Identified by IS

Constraints Identified in NIDP	Problems in NIDP Implementation
Marginalization and under-resourcing of the irrigation services	The constraints still remain. Irrigation sector continues to have low autonomy, and working conditions are unsettled being 'tossed about' by donors activities.
Badly defined institutional structures and responsibility	The coordination capacity of IS has faded due to a trend change within a short period. The levels of investment are not standard for different projects.
Inadequate operational support and farmer management mechanisms at completed irrigation schemes	The situation has been aggravated by the re-establishment of the local government. Unclear relationships and responsibilities for extension services and lack of harmonized O&M guidelines have hampered adequate operational support.
Shortage of national competence in project planning, designing and construction of irrigation schemes	Resources are not made available. Authority and criteria are poorly off for harmonization of the level of investment on irrigation development.

Source: Internal information in Irrigation Section of MAFS

Although more than 60 schemes out of 147 schemes, have been implemented or commenced, the schemes have not been directly selected from the high-ranked schemes proposed in the NIDP. Even the constraints specified in the NIDP have hardly been settled and still remained unresolved. Weakness of the institutional capability and vulnerability of the Irrigation Section were given great attention in the NIDP, and thus the NIDP aimed at elimination of the constraint through institutional building with a high priority. However, these very constraints have tended to hamper successful implementation of the NIDP. Root causes of the weakness are supposedly due to poor basic institutional circumstances. Strengthening should not be done part by part, but be undertaken comprehensively in a stream of efforts, as lessons are learnt from the NIDP implementation.

4.3 Water Policy and Type of Irrigation Development

4.3.1 Irrigation Water Use under the Country's New Water Policy

In general, it is compulsory to acquire a water right for irrigation water use in Mainland. The Water Utilization Act prescribes that "law requires that any person who intends to use the water of a river shall obtain a water right, and the law also requires that any person who wants discharge effluent and waste water in a water body shall obtain the water right". The issue of granting water rights is dealt with in accordance of Section 15 of the Act No.45 of 1974 and also the Regulations of 1997 made under Section 38 (2) of the Act.

Customary water use from traditional irrigation schemes is condoned and water rights are granted provided the application is prepared and submitted. However, pressures for irrigation water use will increase with the recent establishment of a new "National Water Policy". The National Water Policy was drafted in December 2001, and will be soon authorized. Shortly, the effective "Water Utilization Act" shall be revised in conformity with the philosophy presented in the Policy.

The Policy is likely to have a dramatic effect on water use for the irrigation sector. It requires that water resources development and management shall be dealt with in an effective manner in line with the concept of "water as a common use resource". There are two great threats for irrigation. One is that new irrigation water resources development will be restrained in competition with other water uses from a viewpoint of economic superiority. The other is that continuous irrigation water use may be hindered according to the attitude of the existing rights holder on water use or need of water for new users.

These new proposals for water resources development and management have been already incorporated in the RBMSIIP for Pangani and Rufiji River Basins. The RBMSIIP is under a basic development concept that no allocation of water is given to new irrigation water use, on the basis that the results of economic evaluation show that water use for hydro-power generating is much superior to that for irrigated agriculture. The only way to achieve irrigation development under this concept is to improve the irrigation efficiency and use the saved water for further irrigation development.

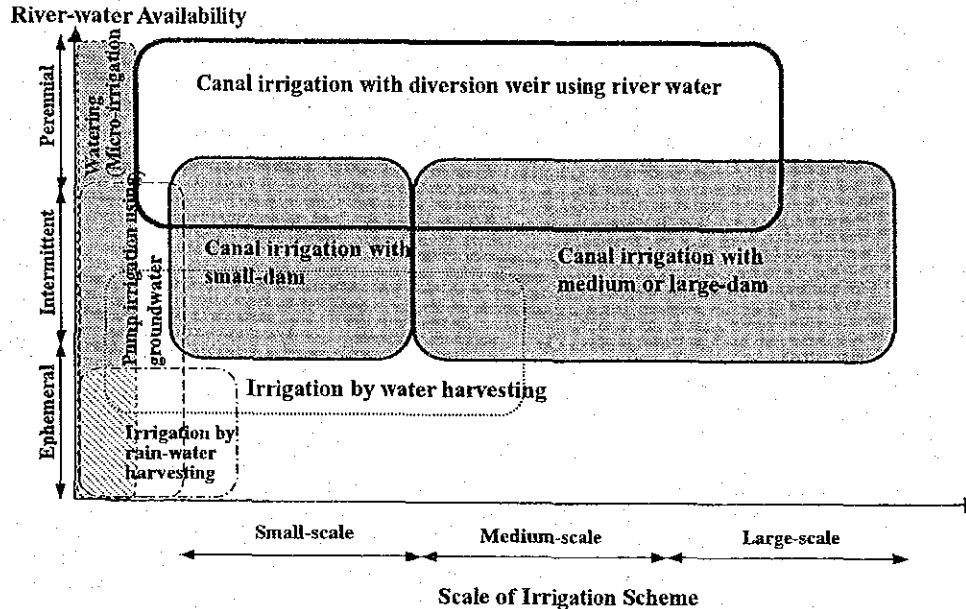
Recently, there have been strenuous claims that water abstraction for irrigation causes an environmental hazard by drying up the river during the dry season as happened at Usangu Basin. However there is no scientific justification of the opinion. The river basin approach should focus not on exclusion of irrigation within the river basin, but development of sustainable irrigation by means of

improving methods and modality of irrigation water use.

4.3.2 Type of Irrigation Development in Mainland

Irrigation practices in the Mainland are categorized into several patterns by scheme size, availability of water sources etc, as shown in the following figure:

Classification of Irrigation Practices in Mainland



A system of canal irrigation with a diversion weir and a water source of perennial river is the most prominent irrigation system in the Mainland. Traditional water harvesting practice of diverting flood water into fields is widely performed in the marginal areas in Central Tanzania. Watering by hand or by simple manual pump from a spring source, called “*kisima*”, is practiced by individual farmers or small groups throughout the country. These systems are referred to as micro-irrigation.

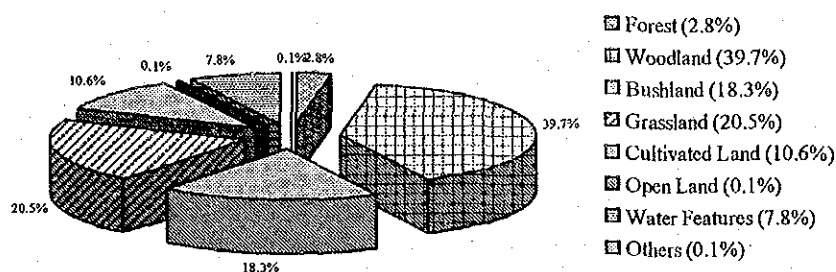
4.3.3 Land Use

(1) Present Land Use

(a) General Land Use

According to the land use data, the present land use is categorized into eight major land types, namely; forests, woodland, bushland, grassland, cultivated land, open land, water features and others. As shown below, the total of forest and woodland occupies more than 40% of the total land area of the Mainland. The cultivated land occupies about 10% of the land area, equivalent to 10 million ha. Bushland and grassland occupies around 20% of the total land area.

Distribution of Land Cover in Mainland



Source: *National Reconnaissance Level Land Use and Natural Resources Mapping Project, Final Report 1997*

(b) Crop Production

The main food crops grown in the country are maize, sorghum, millet, paddy, wheat, sweet potato, cassava, pulses and bananas. Of the food crops grown, maize is the dominant crop with the planted area of over 1.5 million ha during recent years. Sorghum is the second largest food crop with the planted area of 0.6 to 0.7 million ha. The planted area of paddy has increasing from less than 0.4 to more than 0.5 million ha within the past few years. Wheat is grown mainly on large farms in several regions. Roots and tubers such as cassava and sweet potato and also pulses such as beans, pigeon pea and cowpea are important food crops as a part of major staples and considerable areas are utilized for these crops. The yields of these food crops are generally low due mainly to the dependence on rainfed agriculture and also fluctuate because of unstable rainfall.

The cropping pattern regional-wise varies considerably. Maize is a dominant crop in the most of the regions, accounting for more than 50% of the food crop area in Iringa. Sorghum, with its drought resistant characteristics, dominates in dry regions such as Dodoma and Singida. A considerable part of the land area is allocated for paddy in Morogoro, Tabora, Mwanza and Mbeya. Similarly, cassava is important in Mtwara, Coast and Lindi and pulses are important in Kagera.

(c) Livestock and Rangeland

Livestock sector plays a significant role in the Mainland. Cattle, goats and sheep are the major types of livestock raised by agricultural holders. It is obvious that livestock activities are important in regions such as Arusha, Shinyanga and Mwanza.

About half the total land area is considered as suitable land for grazing, but it is estimated that 25% of the grazing areas are affected by tsetse fly. The population increase has, to some extent, resulted in an expansion of agriculture into marginal lands, many of them being drier or seasonally flooded areas that are important grazing areas for pastoralists. Particularly in drier regions, such encroachments have resulted in a reduction of land available for pastoralists, who have responded by moving into new areas with previously low livestock population, thus creating land use conflicts in the receiving areas.

(d) Household Characteristics

The total number of households increased over the period of 1993/94-1998/99 with an annual average increase of 4.5%. Out of the total agricultural households in 1998/99, 64% were involved in growing crops only, 36% were involved in growing crops and raising livestock, while only 0.4% raised livestock only. The average planted area per holding is 1.76 ha ranging from 0.94 ha in Kigoma to 3.00 ha in Shinyanga. This average area per holding is fragmented into 2.5 plots on average and the average area per plot is 0.7 ha.

(2) Land Tenure

Uncertainty and insecurity of land tenure for many rural households results in a reluctance to invest in land improvements. Most farming systems in the Mainland still do not use adequate external inputs, and fertility is mainly restored through fallows. However, such fertility is steadily reduced by population pressure and also by the aforementioned insecurity of land tenure. Soil erosion is consequently spreading throughout all parts of the country. A reform of the land tenure system and land use legislation is therefore needed in order to minimize the land use conflict and the degradation of land resources.

(3) Land Resources for Irrigation Development

According to "Basic Data Agriculture and Livestock Sector 1992/93-1998/99", about 33% of cultivated land is actually utilized for crop production as planted land. Only 6% of the planted land (approximately 200,000 ha) is being irrigated. This figure was confirmed by the results of the inventory survey carried out under the Study. The substantial areas were managed by smallholder farmers through traditional irrigation systems of flood recession or water harvesting. The total irrigation potential is so far estimated as 1 million¹ ha. This estimation was also

¹ *The National Irrigation Development Plan, October 1994*

confirmed by the results of the inventory survey of the current study and the preliminary estimate on potential area for large-scale irrigation schemes.

4.3.4 Farming System

(1) Crop Based Farming Systems

The National Coordination Unit for Farming Systems Research of the Department of Research and Training of the Ministry of Agriculture and Cooperatives (MAC) carried out the zoning of crop based farming systems based on the agro-ecological zones. In this zoning, the major crops grown and the suitable agro-ecological zone are shown for each farming system.

Variety preference survey was carried out through on-farm testing and evaluation with farmers. The result of this survey can provide the researchers and farmers with valuable information on suitable varieties for respective zones. This result is also useful to understand the diversity of farming systems and interaction with farmer's variety choice. Furthermore, farmer strategies on variety selection according to land use type, purpose of production either home consumption or sale, and implications to labor force were also clarified.

(2) Farm Management

Small-scale subsistence farming is dominant in the Mainland. The majority of farmers rely on hand hoes as main cultivating tools, though a small percentage use tractors and draft animals. The present cropping also depends on rainfed agriculture. Such a conventional low-input together with population increase and low-output production systems have resulted in high rates of soil degradation mainly due to the reduced fallow period. The government should therefore formulate strategic plans so that farmers are encouraged to be involved in sustainable agricultural production practices including proper land management. In this context, the irrigation development can contribute to an appropriate soil and land management not only through stable supply of irrigation water to the field but also through flood control, erosion control, augmentation of underground water resources and so on.

Due to heavy reliance on rainfed agriculture, there are two production systems according to the seasonal types. Major production depends on Masika (the long rains) for most of the cereals but Vuli (the short rains) production is important in some regions. When irrigation is introduced, dry season cropping can be achieved. In addition to that crop, the cropping pattern should carefully be designed as part of the development plan for each irrigation scheme.

It is said that the major constraints related to farm management are low use of

improved varieties, late transplanting, low plant density, poor weeding control and low inputs. These constraints should be improved through strengthening of farmers supporting systems such as research, extension, input supply, marketing and access to available loans. In case of irrigation development, even more careful support might be needed for proper operation of irrigation system and maintenance practices for sustainable utilization of the facilities. The comprehensive strategy on farmers supporting system should thus be organized.

The traditional irrigation crops are rice, maize, beans, onions, horticulture, bananas, sugarcane, coffee, tea and cotton. Out of these irrigated crops, rice is by far the most important crop. Purely rainfed rice is not common and rice is produced twice or three times per year in some regions mainly by using water harvesting method or simple river diversions. In the NIDP, the typical rainfed and irrigated paddy yields were compared and the result is shown below.

Typical Rainfed and Irrigated Paddy Yields in Mainland

Irrigation System	Yield (ton/ha.)	Remarks
Rainfed	1.0-1.8	Hand cultivation
Traditionally Irrigated	1.0-2.0	Water harvesting/River diversions
Improved Traditional	4.0	River diversion/Improved land development
New Small Holder Scheme	2.0-6.0	Mechanization/High Inputs/Modern varieties
State Farms	2.8	Mechanization/High Inputs/Modern varieties

Source: National Irrigation Development Plan

It is clear that irrigation can contribute to the increase of yield per unit area. The effect will be upheld when accompanied with mechanization, high inputs and modern varieties.

4.3.5 Marketing

(1) Marketing Channel of Staple Foods

The staple foods of the Mainland are classified into the cereals: maize, sorghum, millet, rice and wheat, and the non-cereals: pulses, cassava, bananas, and potatoes. The marketing channel of cereals is mainly described in this chapter. The distribution of these cereals from producers to consumers follows a multi-channel structure ranging from direct marketing to intensive distribution involving several intermediaries. The distribution structures also vary with location.

Producing Center

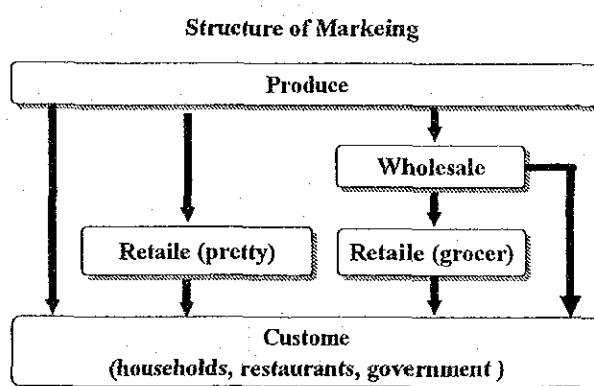
Due to differing climatic conditions in the mainland, different areas support the growth of different major crops. There are 63 agro-ecological zones based on variations in altitude, soil type and rainfall pattern (FAO/WFP 1999). In case of rice, it is mainly smallholder farmers some of who are assisted by the agricultural

department in certain areas (Mbarali-Mbeya and Kilombero). Wheat is cultivated at a larger scale in Arusha region in the North. Peasants and small-scale farmers almost exclusively produce Millet and Sorghum.

The main surplus regions for maize are Iringa, Mbeya, Rukwa and Ruvuma, which collectively supply most of the country. Rukwa mainly supplies the North-Western Region, which also receives maize from Moshi and Arusha. Most of the maize from Iringa and Mbeya is destined for Morogoro and Dar-es-salaam. Dodoma receives most of its maize from Iringa, Singida and Arusha, whilst the main source of supply for Lindi and Mtwara in the south, is Ruvuma.

Marketing Channel

The surplus production of cereals is exported to other regions in the country that face shortages of food and/or are big consumer centers, such as Dar es Salaam. Domestic trade is mostly undertaken directly between traders and producers with a limited role played by middlemen. In the main surplus areas retailers take on the functions of intermediaries (inter-regional traders and wholesalers) and in normal years there is easy access to plentiful supplies. The presence of bigger specialized wholesalers is largely confined to Dar-es-Salaam. Maize, Millet and Sorghum marketing is almost exclusively characterized by a large number of small traders operating from main producing areas and urban centers. Rice marketing has characteristics of both the presence of many petty traders as well as wholesalers who mainly supply retailers in urban centers. The structure of the marketing channels is presented in the right figure.



In case of Wheat, the marketing channel is different from the other cereals. Wheat is first sold almost entirely to large grain millers who process grain and package flour for selling to urban retailers or wholesalers.

(2) Marketing Facilities

Marketing Place

The physical exchange process in the marketing of the major cereals in rural areas takes place mainly through periodic food market fairs, which usually take place once to three times a week. It is commonly called 'gulio', and where producers

from neighboring villages meet to sell their surplus produce. Exchanges can be in cash or in barter form.

In urban centers physical exchange of cereal and non-cereal produce occurs mainly at the open food stalls "masoko", or at grocery retailers. The local authorities own and maintain the premises housing these "masokos" including taking care of sanitation although the efficiency with which they carry out these activities is very poor.

Transportation

Transportation of the major cereals and non-cereals in the country is done by various means. This ranges from the use of human couriers and bicycles to pickup trucks, buses, and heavy-duty lorries for inter-district/regional transportation. The former are mainly practiced where distances are short and it is common for producers themselves to perform the carrying (women usually carry produce.).

The main impediments to transportation of cereals from surplus to deficit regions are the extremely large distances and the agro-diversity (uneven distribution of products) of the Mainland. The flow of food from surplus to deficit regions is heavily constrained by grossly inadequate transport systems and insufficient haulage capacity, vehicles and rail wagons (FAO/WFP 1999).

Storage Facilities

The storage facilities for most cereals are far from perfect. At the smallholder level, producers store grain in traditional silos whose sizes are roughly equal to the one-room huts that peasants occupy. A silo might have the capacity to store the equivalent of between 10 and 40 one hundred kg sacks of grain. This method of storage is vulnerable to some degree of pests

(3) Price Fluctuation of Staple Foods

In contrast to cash crops such as coffee, tea, and cashew nuts, there is currently no institution that is mandated to control the marketing of food crops. The pricing of all food crops in the Mainland is completely market determined, since the time the government liberalized the marketing of most agricultural products. Prices therefore depend on the supply-demand situation and for many of the foodstuffs they fluctuate considerably according to seasons of the year. High and sometimes exorbitant prices are common during seasons of high demand for food crops and low prices during the high supply season. The pricing problem is compounded by the unavailability of facilities such as packaging and temporary storage, which leads to an unstable pricing system. Some indication of the fluctuation of food crop prices in a major urban center in the Mainland is illustrated in table below for

three different periods of the recent year.

Price Fluctuation for Products

Product	Unit	Price at Dec 2001	Price at Mar. 2002	Price at May 2002	Maximum Deviation
Sorghum	TSh.100 kg bag	8,000*	13,000	16,000	5,000
Finger Millet	TSh.100 kg bag	22,000*	30,000	N/A	8,000
Rice	TSh.100 kg bag	35,000*	N/A	38,000	3,000
Wheat	TSh.100 kg bag	38,000	26,000	28,000	12,000
Maize	TSh.100 kg bag	25,000**	27,000**	N/A	2,000
Cow Peas	TSh.100 kg bag	15,000*	30,000	17,000	15,000
Cassava	TSh.100 kg bag	20,000*	9,000	12,000	8,000
Irish Potatoes	TSh.100 kg bag	18,000	19,000	17,000	2,000
Cooking Bananas	TSh.10 kg bunch	7,000	5,000	5,500	2,000

Key: * prices are for October 2001, ** prices are at retail, N/A – not available

Source: Business Times: Markets and Economy, October, December 2001; March, May 2002, Financial Times October 2001; March 2002

(4) Problems and Constraints

The marketing sector for foodstuffs in the Mainland has a number of problems. Among the major problems facing the efficient functioning of food crop marketing in the major cereals and non-cereals area is the unregulated market which mainly disadvantages the small producers, most of whom are semi-literate. Other major constraints are the underdeveloped transportation infrastructure, poor storage facilities, and absence of market information and promotion.

Small and medium sized producers are also facing a lot of problems in terms of financing and insurance. This is especially so when it comes to obtaining vital inputs or when they face adverse conditions. There are also natural physical constraints such as the diverse and vast geographical terrain, as well as the erratic weather patterns that often occur in non-periodic cycles. From the motivational point of view, these factors and the country's historical past serve as disincentives to small holders to produce food crops in greater surplus. Finally, from the consumer point of view, the problems they face mainly center on their vulnerability to exploitation in the form of hiked prices and sometimes limited product choices as a result of the periodic fluctuations in the supply-demand conditions.

4.3.6 Institution

(1) Background

During the four decades since independence, the agricultural policy in the Mainland has experienced a drastic fluctuation. The early stage was influenced by socialist ideology and experienced extensive governmental intervention. Later, in the mid 1980s, the policy reform and market liberalization began to be

implemented.

Along these policy changes the role of government has been also changing from being an active participant to being a facilitator playing a regulatory role as providing support services and technical backstopping. Instead of the governments' strong intervention, the participatory approach of all stakeholders in the agricultural development has been emphasized. Consequently, farmers and other private sectors are now expected and encouraged to play a much greater part in all stages of agricultural development including irrigation development. However, as the transformation of institutional framework is still under way, a further effort of strengthening the institutional framework should be made to attain efficient and sustainable agricultural development.

(2) Constraints identified in NIDP

A number of constraints facing irrigation development in the Mainland were identified in the NIDP as described in Sub-clause 4.2.3. They essentially stemmed from various factors and their complex interactions. However, the overall institutional setting for irrigation development has been unfortunately considered as one of major causes for the poor performance of irrigation in the past. Therefore, the institutional setting has to be carefully reviewed and effectively reformed to alleviate the constraints, although some of them have been improved to some extent since the mid '90s through the implementation of various externally supported projects. However, most of them are still directly applicable to the present problem situation.

In addition, as described in Sub-clause 4.3.3, the importance of adequate security of land tenure for irrigation farmers is also mentioned as a crucial factor for success. The government should provide an institutional guarantee of tradable tenure, long leases for example, in order to encourage farmers to invest in irrigation development. In the same way, the development of smallholder irrigation must be accompanied by government support for savings and credit development so that farmers can purchase the initial inputs that will enable productivity increases to be achieved.

Furthermore, it is important that the government holds strictly to its policy of addressing environmental issues for any irrigation development. Similarly, the possibility of conflict over water use between competing stakeholders should be carefully handled. Conflicts can arise not only between villages along rivers, cultivators and pastoralists, but also between the agricultural sector and other sectors like hydropower generation. The government, especially at the district level, will need to establish an institutional mechanism to mediate such conflicts

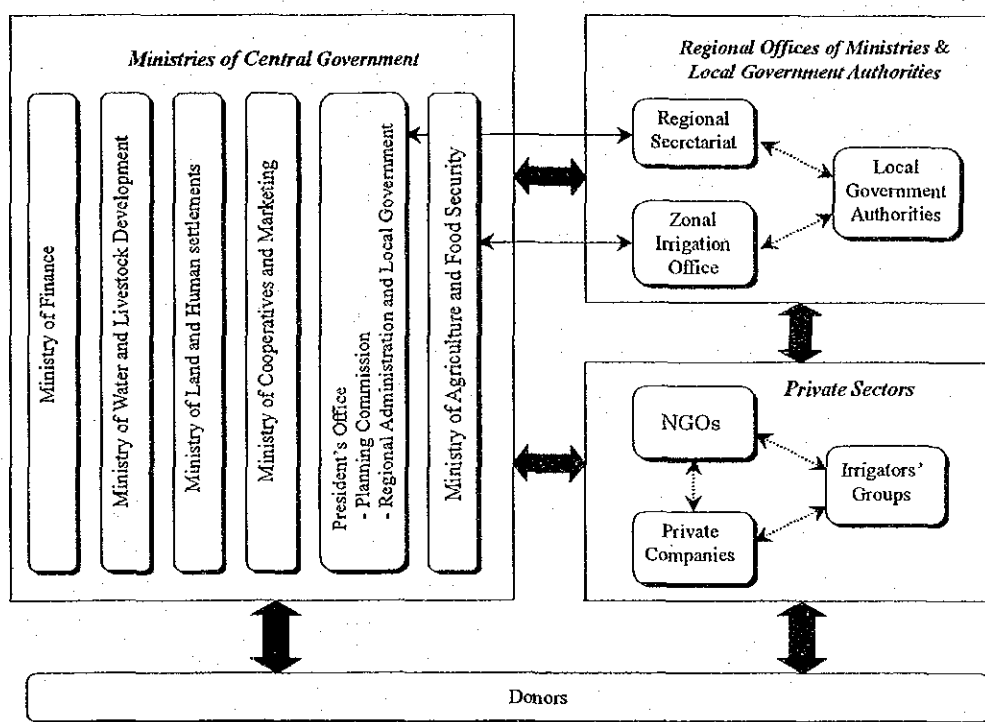
so that irrigation development is implemented smoothly without delay.

4.3.7 Organization

(1) Present Situation

Presently various organizations are involved in the field of irrigation development in the Mainland. They generally include; (1) Ministries of the Central Government, (2) Regional Offices of the Ministries and the Local Government Authorities (LGAs) and (3) the Private sectors (Irrigators' groups, Non-governmental organizations (NGOs), and private companies). In the Central Governmental body, there is no organization holding all necessary mandates of irrigation in the block. The major participants at the central level include PO-PC, PO-RALG, MOF, MAFS, MWLD, MLHS, and MCM. Coordination mechanism of the relevant organizations is, needless to say, necessary. However, no comprehensive mechanism among them has been established yet. The detailed organizational and functional relations among the above organizations are described in Appendix H.

Organizations Pertaining to Irrigation Development in Tanzania



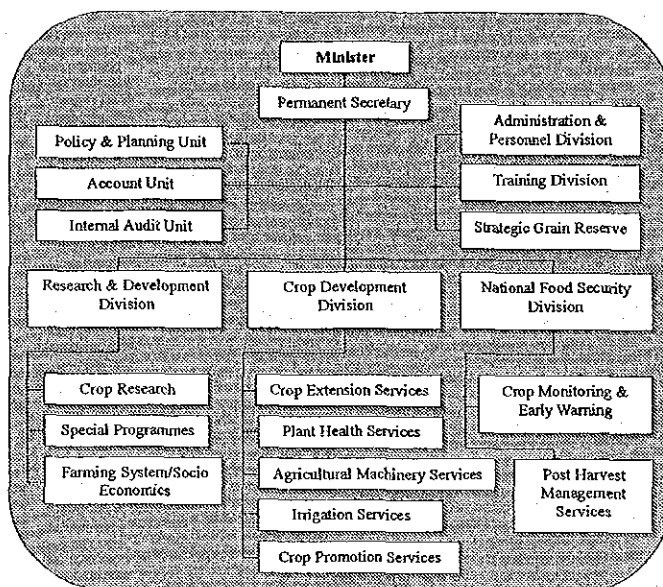
Remarks: (↔) Organizational Linkage,
(- - -) & (↔) Functional Linkage

Source: JICA Study Team

(2) Present Organization of Irrigation Section

The Irrigation Section is at present one of five sections belonging to the Crop Development Division in the MAFS. In 1988 the section was downgraded from the division. Taking an importance of irrigation development for economic development and poverty alleviation in the rural areas into account, the present institutional position of irrigation development unfortunately seems inappropriate to coordinate and harmonize the different organizations involved in irrigation development and, furthermore, to make prompt decisions. The section may also need strong mandates of the personnel administration and budget allocation.

Present Institutional Position of Irrigation Services in MAFS



Source: MAFS

(3) Regional Secretariat

The Regional Secretariat is a local agency of the Central Government whose functions are to encourage and coordinate Local Governments to execute and to implement policies. The quota of the staff is at present 83 which has decreased from more than 400 because of the decentralization policy, i.e. the LGRP. A proportion of the staff has been transferred to the Local Governments. At the Regional Secretariat the agricultural officer is currently responsible for the irrigation development. However, no staff is provided and his function is generally confined to an advisory role.

(4) Local Government Authorities

The LGRP will bring about the dramatic change of the roles and functions of the Local Governments through decentralization of those of the Central Government. These reforms will be particularly critical to the delivery of support services to

smallholders, rural infrastructure development, and farmer's access to financial services. However, Local Governments presently face a lot of constraints that limit their capacity building. The LGRP is still under way. Its efficient and smooth implementation may be very crucial to reform the institutional and organizational setting of irrigation development. The progress of LGRP should be carefully monitored and its attained results will be documented in the NIMP.

In the District Council the District Agriculture and Livestock Development Officer (DALDO) is in charge of irrigation development. However, not all DALDOs have irrigation officers and some are seriously understaffed.

Although their expected roles and functions have expanded, the LGAs presently face a number of constraints that limit their capacity including:

- Lack of a legal mandate, technical skills and facilities to enforce some roles.
- Lack of expertise for strategic and financial planning and management.
- Very limited resources for local level institutional building for community participation in the development process.
- A shortage of competent personnel and, in some cases, technical equipment to manage and control the development process. For example, all local governments lack the technical capacity for effective and timely land use planning.

(5) Present Performance of Governmental Organizations

The demarcation of roles and functions of irrigation farming among the relating governmental organizations was clearly defined conforming to the LGRP in June 2001. They are presently not necessarily well performed by each organization, however. Details are mentioned in Clause 2.5 of Appendix H.

For the MAFS, the high priority of institutional and/or organizational strengthening is to formulate and review policy, laws, procedures, regulations and guidelines on irrigation farming. It indicates that the formation of an effective institutional framework including securing the stronger institutional and organizational position of the Irrigation Section is urgent for efficient irrigation development.

The LGAs and Regional Secretariats are presently being transforming under the decentralization policy, i.e. the LGRP. Therefore, it is too early to judge their present performance of the demarcated roles and functions. However, it is quite obvious that they need strong support from the Central Government for a certain period after completion of the LGRP to secure their self-reliance.

(6) Private Sector Organizations

The private sector, in particular farmers themselves, is expected to become a main actor in irrigation development. However, at present farmers face a lot of constraints to perform their roles to a large extent. ASDS pointed out the followings:

- Institutional and governmental constraints, including an uncertain regulatory environment, inappropriate policies, inadequate extension, research, marketing and regulatory services.
- Financial constraints, including lack of access to capital assets and credit, exacerbated by low prices of output, high cost of inputs, multiple taxes and limited incomes.
- Natural environmental constraints, which include limited access to land and water, frequent outbreaks of pests and diseases and a deteriorating natural resource base.
- Human constraints that include limited knowledge and skills, poor health and low productivity.
- Infrastructure constraints, including poor roads, inadequate marketing infrastructure, lack of electricity, water and communication facilities.

This complexity is hampering farmer's efforts. However, the constraints should be carefully studied further to identify some key factors for practical and efficient countermeasures, and a gradual stage-wise support programme should be formulated to overcome the persistent constraints one by one.

The water users groups, i.e. the irrigators' groups (IGs), are generally classified into three categories, (i) registered irrigators cooperative society (ICS), (ii) registered irrigators association (IA), and (iii) non-registered group. Neither cooperative nor association is necessarily an optimum organizational form for the irrigators' group. Sustainable operation and maintenance of the scheme is one of major tasks for the irrigators' group. However, the cooperative is primarily a business-oriented organization (buying, selling and marketing) whereas the association is more involved with social activities. The rights and obligations of the irrigators' group members can't be always clearly and uniformly defined under the present legal framework. A new legal framework exclusively for the irrigators' groups seems to be very important and necessary.

The investment by the private companies in irrigated farming will be one of important alternatives in the future and will play an important role for the irrigation development. The relevant governmental agencies need to prepare favorable and attractive legal and institutional framework for the private investors.

4.4 Problems on Selected Existing Irrigation Schemes

(1) Objectives and Methods of Problem Analysis

The NIDP should be improved due to the changes of current circumstances related to irrigation development in Tanzania, and additional issues which were overlooked when the NIDP was being prepared. In order to identify these changes and additional issues, a problem analysis was carried out for the selected existing irrigation schemes.

In the Study, an original form for project analysis was adopted to examine the existing irrigation projects in conjunction with project procedures from planning stage to O&M stage of the project. The form was devised so as to pursue problems in each stage of project implementation, with grading and appraisal according to five ranks that can be obtained in each stage of the project. The problem analysis has been undertaken in the following procedure:

- Finalize analysis form and schedule of the work
- Select projects to be examined
- Deliver the forms (analysis form and project sheet) to personnel concerned in the project through the counterpart giving adequate guidance
- Collect entered forms through the counterpart
- Review the reply on the form
- Inquire the personnel concerned with the project to give details, if necessary
- Analyze the results in consideration with other information for the projects available, and findings obtained through project site inspection

(2) Scheme Selection for Problem Analysis

It is judged that projects implemented some time ago were not appropriate for this analysis because circumstances surrounding irrigation implementation at those times have changed. Furthermore, some projects are also inappropriate for the study due to lack of generality of problems found on the projects. Based upon these understandings, projects which have been implemented under the NIDP, were selected.

A total of ten projects were nominated for this problem analysis. However, four projects were excluded because of no significant reply.

(3) Problem Analysis

Problem analysis was carried out for six projects for which replies to the questions had been received. Consequences of the problem analysis and salient features of the selected projects are given in Appendix D.

General viewing of the entered analysis forms of the answered projects showed

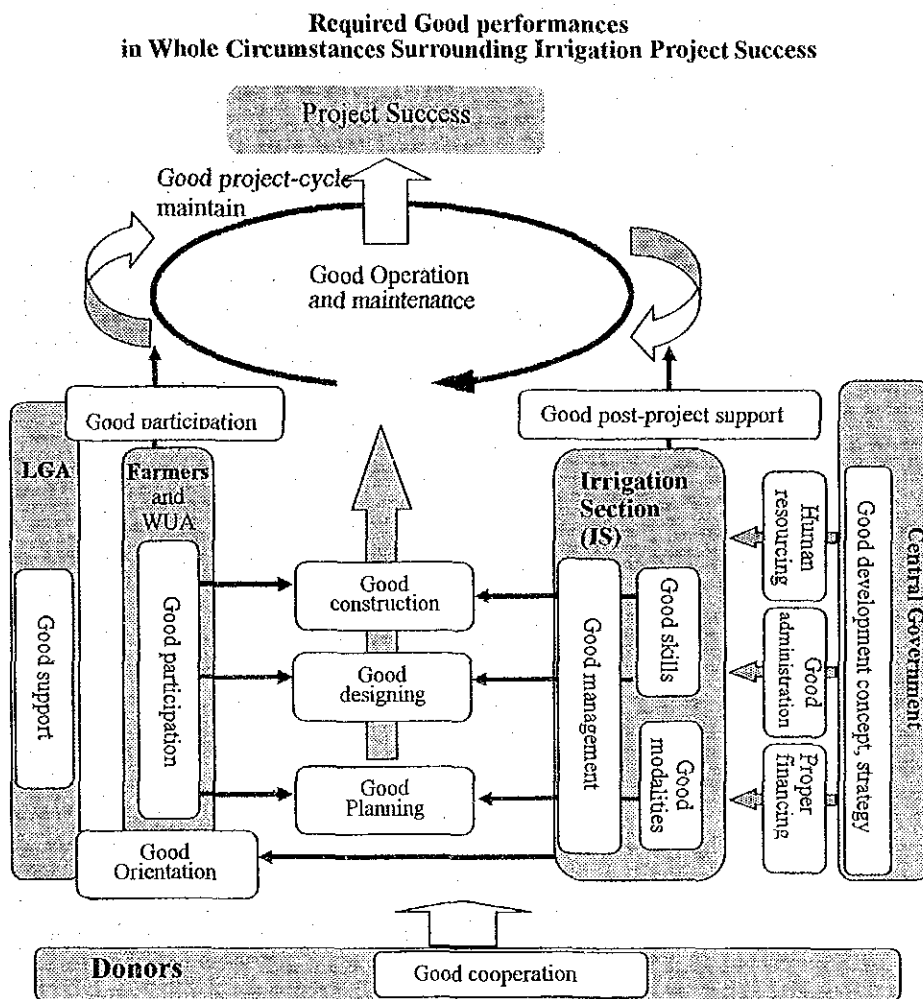
that each stage of the project plays an important part on overall success of the project. Important points concluded from the problem analysis in irrigation development are summarized and enumerated as follows:

Conclusions from the Problem Analysis

No.	Conclusion	Related Field
P.1	Adopting manner of farmers' participation is not always adequate, though participatory approach is an important direction for the success of project. There are some projects which had not succeeded because of misleading participation of farmers.	Farmers' participation
P.2	Logical structure of irrigation projects are generally not always sound. Sometimes important assumptions of the projects are not appropriately considered. These factors left off from previous consideration influenced project's success or failure. Also, linkage between the project purpose and projects outputs is generally weak.	Planning
P.3	A concept of "in affordable scale, for smallholder, by simple and low-cost technology" is a main stream in irrigation development. However, definition of "simple and low-cost" is sometimes an apt to be misunderstood as "easy and no concern of technical knowledge and aspect"	Technology
P.4	Presently IS works in general planning and project management much exclusively. Basic technology in irrigation which must be a foundation of such planning and management techniques, are apt to be looked down on. These movements seem to be a hotbed building unrealistic project formulation.	Management
P.5	Overlooking the selected projects in chronological order, it is notable not to reflect previous failures into the next projects. Feedback system to accumulate lessons learnt and reflect the experiences to others does not exist in IS. Accumulation of technical experiences is made light of, too much thinking about management.	Technology
P.6	Technical references such as guidelines and manuals are not adequately prepared or missing. Although some technical references were prepared under previous programmes/projects, those were not systematic or general enough. This has not only caused a misinterpretation of the contents of the prepared references, but also brought about by inadequacy of information management system.	Technology
P.7	Besides the inadequate preparations in contract system and supervising, capability and experiences of contractors are definitely below expectation. Substantial measures for improvement of contractors' capacity should be taken immediately. Provisional alternatives to successful construction work in irrigation schemes should be considered.	Private sector
P.8	WUA must play an important role in operation and maintenance of irrigation scheme. Besides encouraging WUA's effort on their duties, supporting system for the WUA's activities is essential during post implementation of irrigation scheme.	O&M
P.9	LGA is in charge of a significant part for the success of irrigation development. At present, function of office and personnel concerned in irrigated agriculture is still powerless in every district. Consideration should be given to adequate participation to meet their present status.	LGA

Source: JICA Study Team

The above points identified through the problem analysis seem to be related with only to implementation methodologies or plans, but also other circuitous sub-sectors. The project can succeed and have good performances in all circumstances surrounding irrigation development if implemented according to the following schematic figure.



4.5 Study on Irrigation Development Level

4.5.1 Needs for Benchmarking of Irrigation Development Level

As identified in Clause 4.4, irrigation development in the Mainland has been executed without certain authorized guidelines prescribing for irrigation development level. From the outset, it is difficult to contain great variation in natural condition and social situation in the Mainland to produce a unified criterion. It also seems out of place for the Mainland to set unified criteria in irrigation development level and to integrate all projects into a single criteria.

The differences in technical aspects among implemented projects are too significant even considering the variation of characteristics in regional conditions. The big differences in irrigation development level may be due to; (i) ineffective utilization of limited resources to be appropriated for irrigation development, (ii) complaints from farmers concerned about the irrigation schemes being in depleted level, (iii) confusion in expansion of model effects to other areas, and (iv) complexity in supervising and monitoring irrigation schemes under a wide range of development levels. It is therefore required to prepare an original criterion on irrigation development level that is elastic or widely accommodating for the variation of conditions of relevant projects.

4.5.2 Previous Guidelines and Criteria

Irrigation development level is a basic assumption or a fundamental condition of the technical standards in irrigation planning, designing and construction. So far, several technical guidelines have been prepared in relation to the specified projects. The following table shows general views of the technical guidelines already prepared:

Existing Technical Guidelines in Irrigation Development

Name of Project	Prepared Term	Title	Comments
ISID	1991 - 1994	Project Planning manual	The manual consisting of several volumes covers all technical fields related to irrigation. Unfortunately, the manual has been hardly utilized by all concerned personnel.
ASMP	1996 -	Technical Manual for Planning and Design of Irrigation Systems, Construction Manual for Irrigation Works, Technical Manual for Operation & Maintenance of Irrigation Systems	The manual provides technical and procedural guidance to all personnel involved in planning, designing, implementation and O & M of irrigation system. But, it is still a draft, and has not been finalized.
RBMSHIP	1999 - 2000	Irrigation Design Manual	A design manual for irrigation system consists of Guidelines and Drawings. It is a well-organized outcome. It is expected to give some improvements in the contents.
PIDP	2000 - 2001	Rainwater Harvesting Design Manual for Irrigated Agriculture in Marginal Areas	A design manual consists of eleven chapters. Many parts of the manual present design methods for conventional irrigation system, and few special modalities for water harvesting scheme design.
ASPS-IC	2001 -	Irrigation Water Management Field Handbook for Extension Staff	The handbook is not yet finalized. The handbook will provide information on water management to extension workers as a quick reference manual.

Source: Information from Irrigation Section of MAFS

Existing technical guidelines and manuals are not utilized in irrigation development widely and effectively. Although this is caused by inadequacy of knowledge management system or failure of information delivering and circulating arrangement in the IS, contents of the existing references also have

room for improvement. The existing technical guidelines and manuals comprise an introduction and explanation for technical subjects on an item-by-item basis, diverting from the approach of international technical guidelines, such as "Irrigation and Drainage Paper, FAO". These existing technical references scarcely mention issues such as the irrigation development level.

In the Mainland, irrigation development should be promoted in various manners corresponding to the characteristics of each project area. Pursuing optimum irrigation development for each target area, which has its own constraints and locality, requires enthusiastic debate.

As a basic irrigation development concept, "low-cost technology" was advocated in the preparation of the NIDP. Later, lower investment cost became an object of argument. However, the argument has been seen from a viewpoint of affordability, rather than suitability or optimality of the project. Irrigation development level should be based on the suitability or optimality of the project.

4.5.3 Objectives of Study on Irrigation Development Level

The appropriate approach should correspond to the natural and social conditions in the concerned project area. In general, many options can be conceived for irrigation improvements. In many cases, the same agricultural productivity could be ensured by different ways of irrigation practice; for example one may be realized by means of systematic irrigation operation with substantial initial investment in hardware, another could achieve the same result by simple facilities with close attention to human behavior and technology transfer post-implementation. Concept of the combination between hardware (initial investment) and software (post-project implementation) components by several typical irrigation systems are illustrated in Figure 4.5.1.

From these understandings, objectives of the study on irrigation development level are to provide conceivable options for irrigation development with appropriate combinations of hardware and software components to meet any unusual characteristics of the concerned project area.

4.6 Privatization of NAFCO

After the Arusha Declaration of 1967, the government proposed to construct a number of large-scale mechanized irrigated rice projects, to be run by a parastatal, the National Agriculture and Food Corporation (NAFCO), in order to substitute growing imports of rice. The government at that time placed great emphasis on Tanzania's self-reliance and chose large-scale state farms and agricultural collectives to achieve the national and local food self-sufficiency. Presently

NAFCO has 22 farms including 4 rice farms, Mbarali rice farm, Ruvu rice farm, Dakawa rice farm, and Kapunga rice farm. However, the farms, in particular the rice farms, are today facing severe financial and managerial difficulties because of policy change conforming to market oriented economy since the mid '80s and poor management.

In order to revive the farms through privatization, the government established the Ministerial Committee for agricultural sector privatization. The expert committee, was also established as a working group and presented the report on March 2001, to the Ministerial committee meeting held on July 28, 2001 in Dodoma. The expert committee proposed the following:

- The Tanzanians should be given higher priority to foreigners in privatization.
- The large farms should be divided into economically feasible size plots (small plots) and redistributed to the Tanzanians.
- Each economic activity of the farms should be sold separately to the Tanzanians.

Based on the proposed suggestions of the experts committee the Ministerial Committee instructed the relevant Ministries to visit each farm and obtain suggestions and advise from the stakeholders.

Then, at the Ministerial committee on March 31, 2001 the MAFS established the sub-committee of the experts to prepare the privatization strategy of the agricultural farms, particularly the NAFCO. The experts of the committee were appointed from the MAFS, MLHS (Ministry of Land and Human Settlements) and the NAFCO. The strategy has not yet been completed, however.

4.7 Existing Construction and O & M Equipment of MAFS

The MAFS possesses construction and O & M equipment comprising 347 items as of end of July 2002, as shown in Table 4.7.1. Most of them are out of order and would require repairing, for which the necessary cost has been estimated at Tsh.976 million in total by the MAFS. This amount would give heavy financial load to the MAFS. Prior to repairing, it is necessary to urgently make a study on effective use of each item. To obtain the necessary data and information for the study, a detailed inventory survey should be carried out for them. The results will be classified into four categories; no repair required, minor repairing, major repairing and scrapped. The appropriate measures shall be considered category by category, for example, to sell the scrapped ones at auction is an effective way for ensuring the budget for repairing of remaining equipment.

4.8 Past Existing Irrigation Development Plans

The irrigation schemes listed through the inventory survey executed in this Study and also in the RBMSIIP in 1997 are estimated at 1,428 in total. In addition to these schemes, there are many existing irrigation development plans that have been conducted under bi-lateral assistance. Table 4.8.1 shows the list of existing irrigation development plans. These plans are classified into three different study levels: the preliminary study level, master plan study level, and the feasibility study level. These plans often overlap with the irrigation schemes listed up through the inventory survey. The following irrigation development plans in Moshi Districts that do not overlap with the scheme list of the inventory survey are as follows:

- Miwareni Pump Lift Scheme
- North Groundwater Scheme
- East Groundwater Scheme

These schemes were studied in 1980, and those requiring further study will be identified.

4.9 International Relationship in Irrigation Development

4.9.1 International Cooperation and Assistance

Enhanced donor coordination and improved partnership between the government and foreign donors is increasingly critical to the sustainable development of the country, especially to the challenge of poverty reduction. This principle for the improved coordination is set out in the TAS. There are currently 20 major development assistance organizations in total, consisting of 6 multilateral donors and 14 bilateral donors. Their aid policy and assistance fields are as follows:

(1) Donor's Aid Policy

A different JICA study implemented in 2000 provides a comprehensive view on aid policy of each donor. This survey results show that the World Bank (study only), Denmark, Finland (forestry sub-sector), Germany and Japan regard the agricultural sector as the priority and/or target sector for assistance.

(2) Effectiveness of Basket-funding

There are some comments on the effectiveness of the basket-funding from the donors. Some embassy officers considered that the basket-funding scheme had worked effectively when monitored and consulted about the performance properly. Others did not support it and one commented that it had taken a long process and time to advance the money to the end beneficiaries because of cumbersome handling decided by Tanzanian side or insufficient fund and project management

capacity.

(3) Assistant Fields by Respective Donors

At present, respective donors/agency provides their assistance for 222 projects in 16 sectors. Out of 222 projects, 71 projects relate to the agricultural sector. Irrigation sub-sector in the agricultural sector is supported with 27 projects by UNDP, World Bank, Japan, Denmark, USAID, etc.

4.9.2 Activities of NGO in Irrigation Development

It is said that there are roughly 3,000 NGOs working in Tanzania including foreign NGOs; some of them are dormant. Active local NGOs established an umbrella organization called Tanzania Association of Non-governmental Organizations (TANGO) in 1988 to promote the growth and improved performance of the NGO sector through capacity building, coordination of its members, and by acting as a resource hub for information and skills exchange. Currently TANGO has about 500 members (all of them are local). According to TANGO, major constraints to the work of NGOs are limited availability of human and financial resources.

Traditional Irrigation and Environmental Development Organization (TIP), based in Moshi and not a member of TANGO, has been active in the irrigation sector, and at the time of the interview survey had five on-going irrigation projects. TIP finances its operations from consultancy and donor funding.

4.10 Environment

There have been environmental issues identified in reports on different schemes, which are summarized as follows:

Negative Impact

- Overuse of water by upstream beneficiary to the detriment of downstream beneficiary, leading to loss of income and quality of life for downstream beneficial and finally accelerating over grazing and wide spread land degradation.
- Overuse of water leading to falling replenishment of groundwater reserves.
- Local flooding due to poor water control/management.
- Soil erosion leading to loss of soil cover.
- Water logging and salinity in vulnerable soils leading to poor agricultural production.
- Water-born diseases such as bilharzia and malaria.
- Increased use of fertilizer and pesticides resulting in negative impact to environment.

- Deforestation for reclamation of new farming land.

Positive Impact

- Creation of cattle grazing during periods when there are not many alternatives using end points of drains.
- Creation of an incentive for highly beneficial soil and water conservation practices through irrigation.
- Reduction of i) damage to downstream and upstream cultivation areas, ii) health risks associated with flooding and iii) soil erosion through flood alleviation.

Inevitably, it is likely that any intervention that increases or changes the utilization of water in a system would bring about an impact on the environment. It is therefore important that the government adheres strictly to its policy of addressing environmental issues for any irrigation development. Similarly, the potential for conflict on water use especially for upstream and downstream beneficiaries, requires careful management. Water conflicts are increasingly observed between cultivators and pastoralists, and also between the agricultural sector and other sectors like hydropower generation. The government needs to provide proper approach to cope with such water conflicts on time from the viewpoint of appropriate river basin management.