PART I

Situation Analysis of the Study Area

2. Local Administration

2.1 Overview of Local Administration System in Mozambique

In Mozambique, there are ten Provinces and the capital Maputo City. Ten Provinces are sub-divided into 128 Districts and 394 Administrative Posts. Public administration in Mozambique has approximately 108,000 civil servants. The devolution of political and administrative powers to lower levels of government like Municipalities has been undertaken for the purpose of decentralization. As a result, 33 out of the 139 existing cities and towns have become Municipalities since the 1998 local elections, and a second round of local election is planned for 2003 in the name of "bringing the government closer to the people." However, Municipalities hardly play a key role in development due to limited financial, human, and physical resources.

According to the Law of No. 5/78, the Provincial Government comprises Provincial Governor, Provincial Permanent Secretary, and Provincial Directors in various socio-economic sub-sectors. The Provincial Governor is appointed by the President, and he/she is a representative of the central authority at Province. Province is sub-divided into Districts, and District is sub-divided into Administrative Posts.

District Government consists of District Administrator, District Directors in various socio-economic sub-sectors, and Chiefs of Administrative Posts. District Government is responsible for the planning and implementation of development activities including preparation of the budget. District Administrator is appointed by the Minister of the Local State Administration, and is responsible for supervising the execution of public works under related District departments, drawing of District draft plans and budget

The Chief of the Administrative Post is appointed by the Provincial Governor. Administrative Post is the lowest level local government organization whose staff receives monthly salary from the central government. The Chief of the Administrative Post is responsible for promoting the participation of local communities in social, economic and cultural development activities.

There are the Locality Councils that comprise community authorities, namely the traditional chiefs, secretaries of communal villages, other community leaders, as well as representatives of the socio-economic, professional and cultural organizations. District Administrator with the suggestion of the Chief of the Administrative Post appoints the Chief of the Locality.

2.2 Current Situation of the Administrative Post of Maluana, Manhiça District

There are eight Departments (plus Police/State Security) and six Administrative Posts in Manhiça District, serving some 135,000 people (depending on reports and statistics, it ranges between 124,761 and 180,000). Eight Departments are: (a) agriculture and fisheries, (b) industry, commerce and tourism,

(c) public works and housing, (d) education, (e) health, (f) environment and social action, (g) women, and (h) sports and culture. Six Administrative Posts are: (a) Ilha Josina Machel, (b) Xinavane, (c) 3 de Fevereiro (Palmeira), (d) Maluana, (e) Calanga and (f) Manhiça.

The Study Area is located in the Administrative Post of Maluana. Within this Administrative Post, there are two localities (Maluana and Munguine) and estimated 16,884 people are living in 468 km^2 in 1999: 10,708 inhabitants in Maluana and 6,176 inhabitants in Munguine. There are eight primary schools and two secondary schools with 4,086 students with 47 teachers.

According to the Chief of the Administrative Post of Maluana, the major problems facing the area today were as follows:

- resettlement after the flood of 2000 (to combat absolute poverty and to provide housing)
- water sources are insufficient
- electricity (at the moment, people are cutting trees to make money)
- lack of cattle

In the Administrative Post of Maluana, there are nine villages in two localities. In each village, there are five community leaders: a secretary and four persons responsible for i) farmland, ii) coordination with the state, iii) health and sanitation, and iv) law, order and security. So, in Munguine, there are five villages with 25 staff; in Maluana, there are three villages with 15 staff; and in Xirindza, there is just one village with 5 staff. They are all non-paid staff.

In the Administrative Post of Maluana, there are six paid staff working. There should be one paid staff working in Munguine, but the lack of funds prevents from hiring one.

The Chief of the Administrative Post draws up a one-year plan of the area by having meetings twice a month with seven traditional chiefs, 24 secretaries, chief of police, chief of health, school director, and so on. For the 2001 plan for the Administrative Post of Maluana, 33 projects were listed, ranging from construction of building/housing, installation of power lines, opening new boreholes with water pumps, construction of an emergency clinic and a primary school, conducting adult education and cultural activities for youth, and implementing military service census.[1] Majority of the projects do not have any financial backups. This is used to pressure the district government for possible funding and to inform community about the problems they are facing and potential projects. It is also used to raise money from potential donors, to let them know the kinds of projects that have great needs. The Chief of the Administrative Post of Maluana is always trying to match the needs of the community with the national plan and laws, but without enough financial backup from the national government, he usually succeeds in completing about one-third of the projects listed in the one-year plan.

[1] For the year 2002, the Administrative Post of Maluana has proposed 38 projects, which was submitted to the Manhiça District.

According to the Chief of the Administrative Post of Maluana, training needs for his staff and other public servants working at the District level are as follows:

- how to carry out their jobs;
- attending/meeting the needs of the public (especially quick response);
- getting rid of bureaucracy; and
- raising dedication.

The revenue is generated in the following manner at a local level. The Administrative Post is supposed to collect 10,000 MT per person who is over the age of 18 with a job. There are local tax collectors in villages. For the amount collected, 70 % will go to the Provincial Government, 25 % is allocated to the Administrative Post, and 5 % is paid to the tax collector.

Salaries for the staff at the Administrative Posts are paid by the Provincial Government. Because there are no housing for the staff at the Administrative Post of Maluana except for the Chief, some are commuting from Maputo. It cost 20,000 MT per day when using the large bus and 40,000 MT per day for the mini-bus.

2.3 Decentralization in Mozambique and Donors' Assistance

In the Study Area, decentralization has not yet been implemented, but decentralization in Mozambique are undergoing in the following manner:

The 1994 Law called elected councils in the 11 provincial capitals and later in the 128 districts which cover the rest of the country. It became clear, however, that district councils would be a logistic nightmare. Members of local assemblies would have to travel up to 100 km to go to meetings, and would need food and lodging. By contrast, in towns, people could walk to meetings and go home at night. Therefore, the parliament unexpectedly decided in the constitutional amendment that, in the first instance, there would be elected local government in urban areas only. The amendment defines two levels of local government: cities and towns will become "municipalities"; and since the remainder of the country is already divided into "administrative posts," elections will eventually be held only in the headquarters of administrative posts, which will be known as "villages". Rural areas remain under the control of an appointed district administrator. There are presently 23 cities, 116 towns, 394 administrative posts, so there will eventually be 533 elected local councils, instead of 139 as originally intended by the 1994 Law.

The government proposed the first election only in the 23 cities, but later extended this to one town in each province. This means a total of 33 cities and towns as of 1998 election. In the future years, there will be elections in other towns, but there is no plan yet to move on to villages. The next election is expected in 2003.

It is expected that municipal councils and elected assemblies will be powerful, autonomous bodies. The constitutional amendment charges them with promoting local development and they will have the

right to develop their own plans and budget and to collect a wide range of taxes and fees. The state can only intervene if local bodies bread the law.

Municipalities will be given responsibilities for local economic and social development, environment and quality of life, and urban planning, which include the following:

- roads, parks, cemeteries (opening and maintenance of access roads)
- markets, street traders, shop licenses (employment; food security)
- local police and a fire service (peace, justice, social harmony)
- street lighting
- electricity distribution
- water, sewerage, and rubbish disposal (environment)
- public transport
- pre-school education and primary schools
- adult education (civic education, promotion of patriotic spirit)
- libraries and museums (culture and education)
- sports facilities
- lowest level health facilities (public health)
- low cost housing (own houses, population census, good use of land)

※(responsibilities given to traditional local chiefs, as for comparison)

Municipalities will be free to create "municipal companies" and "autonomous services" which will operate on a commercial basis. This will provide significant opportunities for municipalities to become a driving force in economic development.

The local assembly has the right to contract out the provision of public services, but is not required to do so. Services users should be represented in the bodies supplying public services.

Finally, the municipal council is given the specific right to accept help from NGOs and other entities, and the council can accept donations. A number of international agencies have already indicated their interest in supporting projects in the new municipalities.

But this decentralization effort is one of the several components of larger efforts for Public Sector Reform in Mozambique. It currently has five components: (1) rationalization and decentralization of the structures and processes for the provision of services; (2) improvement of the formulation and monitoring of public policies; (3) professionalization of public sector employees; (4) improvement of financial management and accounting; and (5) good governance and the fight against corruption.

Various donors are assisting decentralization process in some provinces and districts in Mozambique. In order to discuss future decentralization in the Study Area, it is important to know the current situation of donor's assistance in decentralization. Table 2.1 summarizes donors' activities in the area of decentralization in Mozambique, and the decentralization projects carried out by GTZ, Sweden, Ireland, Norway and Netherlands are explained below.

Table 2.1 Summarize Donors' Activities in the Area of Decentralization

Thematic Area	Donor	Project
District Development	Austria	District Development Fund
	EU	Strengthening local institutions
	Ireland	District Planning and Financing
	Italy	District Planning and Financing
	Netherlands	Local Empowerment in Governance
	UNDP	Capacity building and infrastructure
	USAID	Rural Development Program
	World Bank	District Planning and Financing
Municipal Development	Austria	Capacity building and infrastructure
	GTZ	Capacity building and infrastructure
	Portugal	Training courses for Municipal staff
	Switzerland	Training/capacity building
	USAID	Local Empowerment in Governance
	World Bank	Municipal Development Project
Support to Provincial Government	Denmark	Capacity building
	Norway	Rural Rehabilitation Program
	Portugal	Provincial Linking Project
	Sweden	Decentralized Support
General Capacity Building	Norway	Local Government Courses
	Portugal	Support to UNDP project
	Sweden	Public Sector Reform
	UNDP	Decentralized Planning
Support to Civil Society	Austria	Support to Local Groups
	EU	Support to Local Organizations
	Netherlands	Integrated Rural Development Program
Media	Austria	Training of Journalists

(1) GTZ

Besides being involved in capacity building in the area of micro-enterprises, GTZ has been involved in two decentralization projects: Decentralized Social Policy Project (DESOPOL) and Decentralization and Municipal Development Project (PDDM).

Decentralized Social Policy Project (DESOPOL)

In 1994, the project started its activities in the Ministry for Planning and Finance, and in 1995, it was extended to provide technical assistance to the Provincial Directorate for Planning and Finance in Inhambane. Since 1999, the project has concentrated mainly on support and training within the elaboration of the strategic plans oriented at poverty alleviation in the provinces of Inhambane, Sofala and Manica. The project in Inhambane also promotes participatory planning at the basic level through

training and financing of community micro projects.

Decentralization and Municipal Development Project (PDDM)

PDDM is a technical co-operation project providing assistance to the on-going decentralization process in Mozambique. Its objective is to support partner municipalities to effectively perform local government functions with the active involvement of the local population and in line with their local economic potential. The key areas are:

- to strengthen co-operation between municipalities and the Ministry of State Administration (central and provincial level) and to foster inter-municipal cooperation.
- to assist the municipalities in delivering core tasks attributed to effective self-governance (training of personnel, provision of office equipment, etc.)
- to support municipalities in strategic and participatory planning exercises, involving a variety of civil society actors,
- to make use of existing economic interdependencies for a sound economic, social and cultural development.

GTZ's current partner municipalities are Angoche and Monapo (Nampula Province), Catandica and Manica (Manica Province), and Vilankulo (Inhambane Province).

GTZ emphasizes capacity building component in both education and rural development projects, as well. For example, in Basic Education Promotion Project in Sofala and Inhambane Provinces, GTZ tries to improve the quality of primary education and access for all children by way of:

- teacher training and pedagogical supervision system,
- co-operation between schools and communities, and
- capacity building for education management and administration

in selected Districts of the Provinces Sofala (since 1995) and Inhambane (since 1999).

(2) Sweden

Sweden has a long history of involvement in training of public administration in Mozambique since late 1980s. They have been involved in budgeting and accounting (in the Ministry of Finance), and management of personnel and computerization (in the Ministry of Sate Administration). They have given lots of scholarships in order for many Mozambicans to obtain Master's and Ph.D.'s in universities in Brazil, UK and Belgium. SIDA is also involved in a new building project for IFAPA (Training Institute for Medium-level Civil Servants, formerly called IMAP) in Lichinga, Niassa Province.

The person responsible for Niassa Province project said that there is a great need for approximately 70 % of civil servants who do not have adequate education. But who is responsible in carrying out the training for them is questionable: whether it is the responsibility of the Ministry of Education (adult education) or the Ministry of State Administration (training).

(3) Ireland

Ireland is another country involved in capacity building of the civil servants. Ireland Aid funded an assessment of training needs and a comprehensive training program in Niassa Province, in response to a request by the Provincial Governor to support for training of Provincial and District Officials. They have a similar program in Inhambane Province. It seems that their emphasis on training of low and middle level civil servants.

At the national level, they are working with IFAPA. Ireland Aid will not only support the building of IFAPA facilities in the North, but will work with IFAPA to run training courses from 2002.

Ireland Aid now plans to introduce a new organizational development approach called "Nucleus" or "Center of Excellence." They will try this out first at the Provincial level and move down to the District level later.

(4) Norway

One of the countries which are most heavily involved in capacity building effort of civil servants in Mozambique is Norway. Although UNDP might be responsible for initiating the National System for Training in Public Administration (SIFAP) together with the National Directorate for Public Service within the Ministry of State Administration (MAE), the major funder to this preparatory phase is Norway. Since SIFAP is described in 2.4, Norway's own projects are introduced here.

One of the projects was a rural rehabilitation program in the province of Cabo Delgado, which was implemented from 1997 to the end of 2000 with the total budget of 12 million NOK (Norway Kroner[2]). The objectives of the project were:

- improving the effectiveness of provincial and district government
- modernize and professionalize district and post administration
- implementation of minor projects by using participatory planning process (involving village people in participatory planning by identifying priorities)
- stimulating peasant agricultural production and increasing rural income.

Another project was the training courses for district administrators and chiefs of posts. According to the Report on Impact Evaluation of the training courses, the courses were conducted in Cabo Delgado, Gaza and Manica provinces. The majority of ex-trainees interviewed was unanimous in the opinion that these courses constitute the first good approach towards meeting the real needs of both levels of the local administrations (District Administrators and Chiefs of Administrative Posts). And, thus, participants are of the opinion that these training courses should continue and be extended to the rest of the staff in the district administrations, or at least to those in key positions.

Some of the shortcomings that the Report on Impact Evaluation mentions are as follows:

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[2] 1 Norway Kroner = 0.133863 US Dollar (as of September 30th, 2002)

- the length of the courses was claimed insufficient, considering the volume of the subjects delivered and the work demanded.
- Poor domain of andragogies (how to teach adult audience) and lack of adequate preparation for adult learning - this point will be discussed in section 20.
- For some of the subjects/areas, implementation/adaptability/adoption rates are quite low. This might be due to the lack of supervision and follow up programs which would not only be an incentive for the beneficiaries of the courses but could also helpful in adaptation and clarification of certain aspects in the field.

(5) Netherlands

Until recently, most of the Netherlands aids were concentrated in Nampula province. The Netherlands even had a consulate there until January 2002. After conducting so many different projects there, they are now focusing on four sectors: education, health, water and environment.

The Dutch model of decentralized district planning process in Nampula is illustrated in Figure 2.1. As can be seen in the figure, the focus is on planning, budgeting, execution, and monitoring, that is planning cycle at the district level. It seems that the levels A and B are directly carried out as a foreign aid in partnership with UNDP, and the level C, that is grassroots component is carried out by the Dutch NGO, SNV. This three-way partnership, as well as partnership with the National, Provincial, and District Governments of Mozambique, might be something that other donors need to look at in more depth and learn from their experience.

After conducting the extensive review of the project, they are now replicating their Nampula experience in Zambezia and Cabo Delgado.

There is also a network of donor agencies organized by UNDP, who are interested in capacity building of the civil servants. The ones that are in this network are: Ireland, Sweden, Holland, Norway, Britain, and the World Bank.

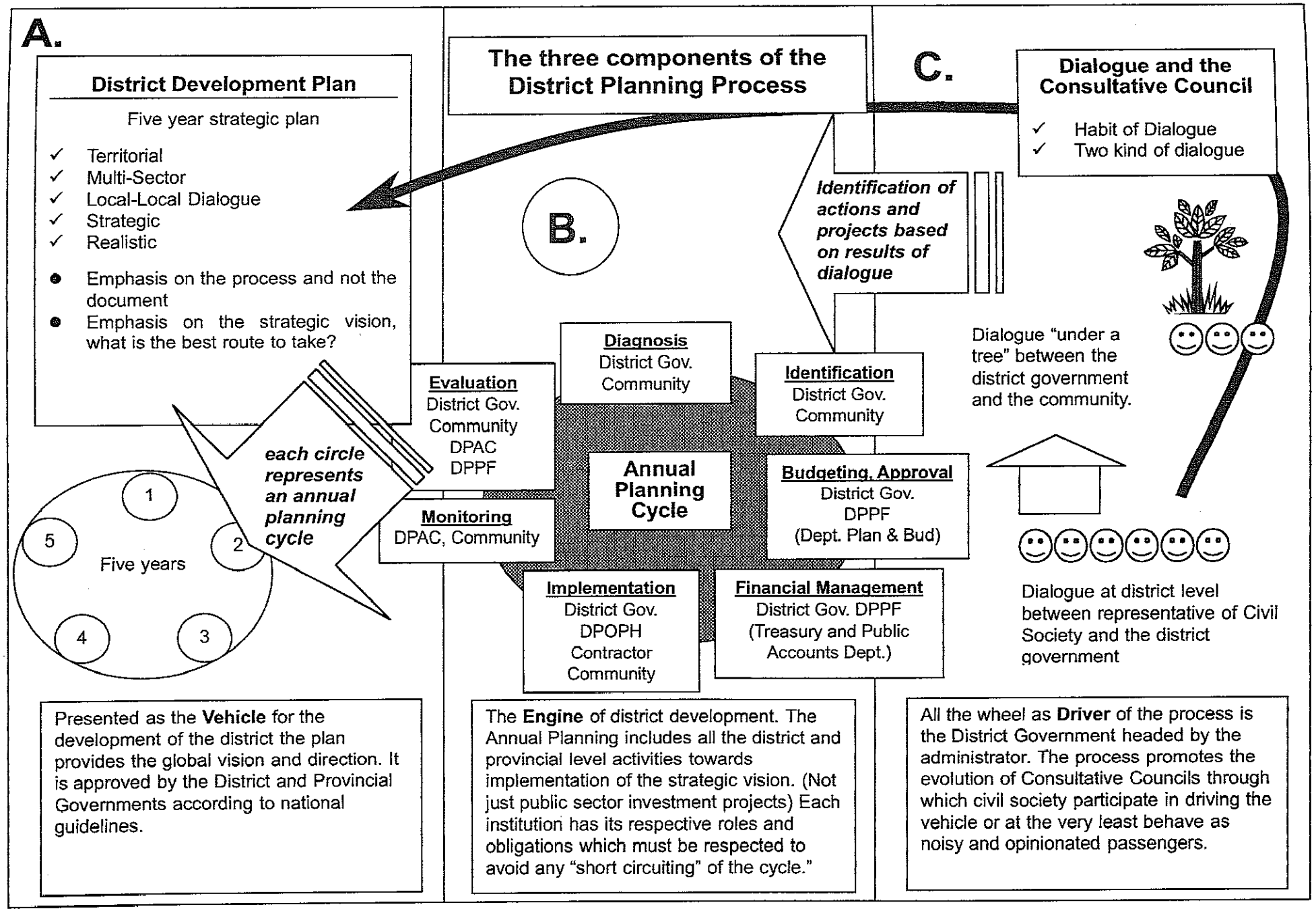


Figure 2.1 Three Components of the Nampula Model

2.4 National System for Training in Public Administration (SIFAP)

Because decentralization demanded the establishment of a technical capacity at a local level, the Government defined the training of public officers as priority in order to improve professionalism and the quality of services provided by the public sector, and it gave a significant step for making the public service providers more professional, with the establishment of the National System for Training in Public Administration (SIFAP), which integrates the formal and non formal views of the process of teaching and professional capacity building, as well as the ethical and deontological training of public officers. Within this frame of SIFAP, various actions have been taken regarding the training of consultants and trainers for training and building the capacity of District Administrations staff, Chiefs of Administrative Posts, among others, aimed at building the institutional capacity.

SIFAP was created in 1994, in order to (1) upgrade the academic and technical level of civil servants that were under-qualified for the tasks they have to perform, and (2) concentrate the manifold capacity building and training activities that are being organized under the umbrella of one official national system. The justification for the conception of such a system was the enormous capacity deficit in the civil service: 80% does not have medium (secondary) level and over 50% is under-qualified for their respective jobs. Only 1% of the managers have a university degree.

Even though the framework was laid out in 1994, actual implementation had not started until August, 1999, with the initiative of the Ministry of State Administration (MAE) and the financial and technical assistance from UNDP and some European donors, especially NORAD.

The first phase of the project included the following activities:

- A detailed quantitative and qualitative profile of the target groups (including their territorial and institutional distribution) was prepared in 1999 and updated in 2001. The main source for this analysis was the Personnel Information System (SIP), a database on all civil servants.
- A diagnosis of training needs was carried out based on performance, existing reports and interviews with both management and staff.
- An integrated modular framework for formal and non-formal training was designed, conceivably the best model to address the urgent need for capacity building within the rigid rules and formal character of a public service.
- A system of credit points based on the modular structure was developed in order to link training to career progress. An information system was designed to manage the process.
- An assessment of the physical condition of the existing IMAP (Training Institute for Medium-level Civil Servants) was done and subsequent rehabilitation and equipment within the limited means of the project. A separate assessment was done on the possibilities to create training institutes in Beira and Lichinga.
- The existing legal and organizational pre-requisites of training institutes were analyzed and a proposal for adjustments was prepared. As a result, the existing IMAP was transformed into IFAPA.

- A careful selection of trainers (42; but 30 had actually selected/completed) and specialists (24; but 16 had selected/completed) was carried out within the civil service. The trainers received an intense 15 weeks course and the specialists were trained for two months.
- A feasibility study on distance education was carried out and an agreement has been reached with the Teacher Improvement Institute (IAP) on the conception of a distance training program based on their experience.
- Based on the general structure of SIFAP, specific modules were identified course materials and handbooks drafted and didactic materials developed. A separate module was prepared to address the specific needs of the municipal staff. Four pilot courses were implemented to test module products.

Three most crucial aspects of SIFAP are: (1) two additional training centers in Beira and Lichinga, (2) training of trainers, and (3) development of module schemes for distance learning.

The above list of activities is quite impressive in order to meet the acute training needs of the country. However, a picture at a provincial level is quite different. Among 600 staffs who are working in eight districts, only three people have university degrees, about one-third are high school graduates and the remaining two-thirds have only elementary education. There are lots of training courses going on, but the provincial government is only responsible for running three seminars in 2001. Majority of the courses therefore were run by the national institutions.

There are at least two shortcomings on the training programs of the civil servants:

- big mismatch between supply side and demand side of training; and
- most of the courses are not conducted based on need assessment (i.e., demand).

There is a great need for the civil servants to change their habit of thinking and their way of working. Most of the civil servants who are working at district levels are so used to serving the bureaucracy. But they now need to serve the local people, instead. There is also a need to simplify the system, because they are doing so many paper work that are not even necessary. The civil servants need to have concrete experiences that they can in fact change the things by themselves, rather than waiting for the change to happen (or change brought in from outside).

2.5 Decentralization and Financing

The government through the Ministry of Planning and Finance (MPF) and Ministry of Public Works and Housing (MOPH) will be starting up the three-year Decentralized Planning and Financing Program with the World Bank funding in the four central provinces of the country, from 2003. After almost four years of studies, design and planning, it will aim to build the capacity of district and provincial administrations to undertake participatory planning and delivery of small infrastructure investments in rural areas. Funds will be channeled to provinces and districts for the purpose of 'learning by doing'. Much of the focus will be on strengthening the currently very weak district level, and stressing the role communities in participatory planning and decision-making. Until districts have adequate capacity, most of the responsibility for contracting and fund management will stay at the

province level. Experience gained from the decentralized district planning process in Nampula is being expanded and consolidated in a second phase that covers Nampula and Cabo Delgado Provinces. All other provinces are slowly taking initiatives to carry out decentralization initiatives, including Maputo Province.

(1) District-level Planning and Financing

Although the Ministry of State Administration is forging ahead with submitting the draft Law on Local State Bodies for approval by parliament that will give the district governments and district Consultative Committees increased powers and responsibilities, it may be some years before this takes effect. In the mean time, however, the participation of the community and its leaders in the local government decision-making process was legitimized in 2000, providing the legal basis for community participation in government resource allocation planning.

Operationally the district planning process is driven by the district government in a process that promotes the continued development of Consultative Councils constituted by community and civil society representatives to produce a district development plan, the five-year strategic plan for the district. With this vision in mind, each year an annual plan is implemented that involves actions and projects which are the results of continuing dialogue between communities and the district government. Annual planning includes all district and provincial level activities that contribute towards achieving the longer term development goal, and each institution involved is expected to fulfill its roles and obligations to ensure the quality of the process is maintained.

(2) Key issues Related to Decentralization

The decentralization process is complicated by many issues, among which and of relevance to this project are the following:

- Provincial and district sectoral directors are subject to a double subordination to their ministries in Maputo and to the provincial governor in the case of provincial directors, and to their provincial sectoral directors and the district administrator in the case of district directors. This decision-making process may thus result in uncertainty and tension inhibiting the responsive and co-ordinated provincial and district administrative and planning processes.
- The sector-wide approach (SWAP) to policy and public investments, the key investment tool of the health, education and agriculture sectors, has the potential to undermine the development of decentralised and multi-sectoral forms of planning at the district level. Within a SWAP, donors contribute funding to a particular sector objective, rather than earmarking such funding for particular projects, programmes or provinces. This enables the sector ministries to use donor funding to design their own programmes in a much more efficient and co-ordinated way, in line with nationally determined (rather than externally determined) priorities. Experiences from Nampula and Zambezia provinces for example have shown however that as a district initiative it is possible to dovetail the two funding sources for planning purposes, and operate through a transparent review and decision-making process of all funds available at district level (carried out by the district government) – whatever the source.

(3) Provincial-level Planning and Financing

The Provincial Directorate for Planning and Finance (DPPF) is responsible for supervising, capacity building and monitoring of budgeting, financial management, administrative procedures for contracting, human resource development (together with the Ministry of State Administration), cooperation, coordination and resource sharing information management at the level of the provincial directorates, the district level, Administrative Posts and the Locality level. In concert with most other provinces in the country, these efforts should have been initiated in 2001 by the DPPFs as all district governments are being urged to follow the district planning guidelines.

The DPPF allocates proportions of its provincial budgets to the districts to permit them to learn about fund management in practice. However, the provincial government is responsible for making the commitment to decentralizing funding allocations to districts to meet the needs identified in the district plans, and this is directly related to the capacity of the districts to manage these funds. Most provinces have selected pilot districts in which to start allocating larger amounts for district management as a means of building capacity before providing them with a district development fund.

The DPPF mandate of responsibilities includes monitoring and accompanying sector programs, following up the implementation of fund use attributed by it to other sectors in order to provide the necessary transparency.

The DPPF is often the leader of the multi-sectoral process to draw up and launch the Provincial Strategic Development Plan. Its role is then to supervise the financial expenditure related to the plan and take a lead role in coordinating NGOs and all external financing of activities in the province. DPPF is expected to promote the rationalisation of resource use.

(4) Provincial and District Budget

In most provinces, the Provincial Directorate of Planning and Finance (DPPF) annually receives General State Budget funds from the National Treasury for application in the province. The funds received are for operating costs (personnel, operation and maintenance and contracting services related to operation), it also receives funds for investment activities identified in annual plans and budget requests (derived from longer term strategic plans and mid-term budgets) made by each sector. These are then transferred in five tranches to the respective line ministry provincial directorates each year based on the budget proposed by each provincial directorate for that year. They are paid as an advance, and then subsequently against justifications of expenditure. SWAP funds and General State Budget funds are managed in this manner. The main problem of this system is that the budget is usually late in its distribution, arriving at the DPPF by May or June in a given year, effectively leaving only six to eight months for the sectors to expend their budgets. Most sectors do not manage to expend their allocations; some only spend as little as 50 % of the budget as a result of this process. Efforts are being made to improve the system.

Donor funds may enter the system directly into the DPPF for subsequent application in projects (usually managed by a project management unit based in the DPPF). These funds usually cover the project's investment program and capacity development to ensure the sustainability of management and maintenance systems set up.

Funds for use at district level for multi-sectoral decentralized initiatives are transferred in the same way, but may be applied either initially as a larger budget for district development activities paid to the District Administration or later after some capacity has been developed, as a more autonomously defined district development fund managed by the District Administration as the leader of the District Government and used to finance elements identified in the District Development Plan. All districts have limited operational budgets and where allocated as a result of their demonstration of financial management capacity they may have limited investment fund budgets for application in district development activities regardless of sector. These are at this stage generally targeted to small development infrastructure activities that can be managed (contracted and supervised) at district level.

For the SWAP programs of the three ministries mentioned above, donor funds for investment and capacity development generally enter the government system through direct payment to the respective ministry at national level. Other sectors that receive donor funds at national level expend them according to criteria and programs previously agreed on by the donor and the Mozambican Government. National level General State Budget funds are usually paid by the Treasury to the sector Ministries from where they are used for national level activities: either at central level of the Ministries and their Directorates (operational costs, capacity building etc.) or for national capacity building or investment programs (all provinces), regional capacity building or investment programs covering a number of provinces.

Operation and maintenance are not budgeted for at all in the water sector, it is expected that costs are covered by the users. In the roads sector, maintenance is budgeted for, but not of unclassified roads. In the energy sector, maintenance is not budgeted for. The District Administrations receive a very small amount to assist in operating electricity and water supply systems for which they are responsible, but it is an almost negligible amount. The health sector rarely has an adequate budget to cover operation and maintenance of water supplies or electricity to its rural facilities and the education sector generally has no budget for rural facilities.

(5) Income Sources for District

Current income sources at district level include:

- the General State Budget and SWAP donor funds allocated through the various sectors;
- donor funds paid through the DPPF for district development or through the sector agencies;
- occasionally NGO funds that are used for strengthening government capacity as well as implementing development activities at community level or other partnerships created at district level with NGOs;
- very small amounts of income generated from services rendered by the government such as the sale of medicines, health consultations, sale of water from small piped water supply

systems, sale of electricity in district centers and other areas with public utilities(where the latter three services are not part of municipalities, or have not yet initiated private management systems). A percentage of this income returns to the district after accounts and funds have been presented to the DPPF for application to the system initially generating them.

District expenditure is categorized as operational costs and investment funds. Their application has been discussed above.

(6) Funding Mechanism for District Level Development Projects

Multi-sectoral development is rarely practiced in Mozambique except within a project context where there is a mechanism (such as a project management unit) for co-ordinating the activities and use of funds. Only at District level does the possibility exist for the government to manage multi-sectoral activities co-ordinated by the District Administration and District Government.

Structurally the conflict lies between sector-defined funding mechanisms and the need for multi-sectoral participatory development initiatives at community level to guarantee sustainability and a more holistic approach to rural development. Access to funding from the bottom upwards, can only be transmitted to the District Administration and/or members of the District Government which have dual responsibilities to their respective sectors and to the District Administrator. Requests for funding may therefore pass through the appropriate sector's hierarchy to provincial or central level where fund allocations may be made in the long term, or additional funding allocated to support project development. The only possibility of a more immediate response is from a district level funding source, in the districts that have these.

It is recognised that one of the factors that most inhibits effective district level planning and development management is lack of access to funds for autonomous application. The Mozambican Government has demonstrated that it is prepared to move towards more participatory forms of administrative decentralisation (deconcentration) in the districts. In September 1998, the Ministry of Planning and Finance and the Ministry of State Administration issued a set of *Orientations* (guidelines) *for District Development Planning* to guide this process.

As part of the decentralisation process the Provincial Governments in Nampula, Inhambane, Niassa and other provinces are allocating funds from the provincial budget through the Provincial Directorate of Planning and Finance directly to districts. These are specifically for district development, to be disbursed according to community requests made as part of the participatory district planning process, and guided by the District Administrator and his government. Significant capacity must be built at district level to manage such funds, and the implementation contracts that accompany their use.

Maputo Province has not yet embarked on any kind of decentralised development planning or fund allocation. As such, it is still dependent on funds channelled via central and provincial sector

directorates to cover the development of sectorally defined activities. Pooling of these funds is not an option, and co-operation to use funds from different sectors to implement activities jointly is also very difficult in terms of accountability. Funds are allocated according to a five-year rolling plan. During the five year period the budgets are adjusted as new funds and new commitments appear, however, it is essential that in order to obtain a funding commitment from the Mozambican Government, that this becomes part of the plan of a given sector.

On the other hand, for projects operating at district level, one of the key sustainability requirements is the strengthening of links, confidence and collaboration between communities and the District Administration. State Administration is the only sector with the mandate for facilitating community development that has representation at local level that should be able to 'listen' to community needs. All other sectors (except for the social services of health and education) have policies that require that local level community development facilitators are outsourced. In addition the District Administrator as a member of the State Administration, is the head of the District Government, and actually represents the interests of any sectors not represented in the District Government by other personnel (Directors).

In the context of policy development that emphasises decentralised planning and financing, the unique position of the District Administrator and the proximity of his position and links with the local communities, means that the alternative financing mechanism with potentially greater flexibility of use for various community development activities, is through support to a district development fund. The planning horizon for the district level is an annual district development plan that should be developed in a participatory fashion and draw on capital investment funds from the Provincial Directorate of Planning and Finance. It is almost unknown for funds to exist at provincial level that can adequately support the fulfilment of any one district development plan in a given province. As a result of this, State Administration and the Ministry of Planning and Finance are finalising the design of the National Program for Decentralised Planning and Financing so that the reality of the need for District Development Funds can be supported in practice throughout the country.

Box 2.1. The Case of Model Decentralization in Nampula Province

The pilot program in Nampula Province that forms the basis for the design of the scaled-up decentralization program provides a useful illustration of the type of institutional and technical support provided by donors to ensure district level development. The donors provided budget support to the provincial capital investment budget to enable direct fiscal transfers to the district level. A technical assistance component, operated alongside these initiatives with the principal objective of building capacity and creating the conditions for the permanent continuation of such transfers.

The support interventions consist of:

- The provision of direct budget support to the provincial investment budget to facilitate substantial fiscal transfers from provincial to district levels.
- Technical support for the introduction of participatory district planning methodologies as part of the official government planning system.
- The provision and operation of small-scale public sector investments at the district level.

The project is not a stand-alone donor initiative but part of an official pilot programme tied into the national government's decentralisation program. Thus all funds must be channelled through government disbursement mechanisms and are subject to government criteria for their use. The capacity building component focuses on the training of provincial technical staff to provide effective forms of technical support to the districts to enable them to introduce and sustain participatory approaches as part of the official planning system. Weak private sector capacity is addressed through training and improvements to the government tendering process, designed to build capacity amongst contracting companies, especially small locally-owned companies.

3. Village Organizations, NGOs and Land Tenure

3.1 Village Organizations: Associations and Co-operatives

One characteristic in the Study Area is that there are many existing village organizations which are called associations or co-operatives. So it is natural to promote village development through these village organizations. This section describes the historical background of village organizations in Mozambique, the current status in the Study Area, and discusses their constraints and potentials for village development.

(1) Historical Background

The establishment of co-operatives and associations was encouraged in the seminar on co-operative and association movement held in Morrupa, Niassa Province in 1974. In 1977, the third congress of the FRELIMO party introduced the concept of co-operatives, and then more than 100,000 co-operatives were created. The number of co-operatives and associations increased from 70,000 in 1980 to 6,000,000 in 1990. Some co-operatives consist of more than 500 members.

There are various types of associations: namely, humanitarian associations, youth and student associations, professional associations, religious associations, philanthropic associations, agricultural associations, and livestock co-operatives. Majority of co-operatives and associations are agricultural associations and livestock co-operatives. There is the General Union of Co-operatives (UGC) as a national organization for co-operatives. The right to constitute associations is legalized by the Law no.8/91 of 18 July 1991. Based on this Law, many NGOs and CBOs (Community-Based Organizations) have been officially established after paying official registration fees (4,150,000 MT).

Today there is no difference between co-operatives and associations in terms of activities and objectives, although the co-operatives used to work together and share benefit equally among the members. The members of the present co-operatives and associations basically work in their plot individually, but there is a weekly obligatory cultivation of the common land. The profit from this common land is used for running these organizations.

(2) Current Status of Village Organizations in Munguine and Maluana

There are 20 associations/co-operatives and one zonal union in Munguine and Maluana Localities as shown in Table 3.1. Each association/co-operative has its farmland in different places, namely in Munguine, Xerindza, Pateque, Maluana, Machovane, and Musutho, as shown in Figure 3.1.

Association of Small Farmers in Maluana was newly established in 2000, and has 68 male members and only 4 female members. Unlike other associations and co-operatives, their land is located in different areas, namely Munguine, Pateque, Maluana, Machovane, and Musutho. This association is

not a member of Zonal Union of Associations and Co-operatives in Munguine, but it established a Small Farmers Union together with Associations of Small Farmers in Manhiça, 3 de Fevereiro, Calanga, Xinavane, and Ilha Josina Machel Administrative Posts in Manhiça District.

Zonal Union of Associations and Co-operatives in Munguine, often called the Union in the Study Area, was established in 1986. The management of the Union consists of a president, vice presidents, a secretary, an accountant and a treasurer, and they are appointed for a three-year term by the representatives of all participating organizations. The committee of the Union consists of three representatives from each organization, and meets monthly. Zonal Union is supervised by District Union, and District Union is supervised by UNAC (Peasants National Union), a national organization for all unions in Mozambique.

According to Table 3.1, there are basically two periods for establishing associations and co-operatives, namely the period from late 1970s to early 1980s reflected by the FRELIMO party initiative, and the period of early 1990s reflected by the association movement. The land size differs from 0.11 ha to 9.18 ha for a member without taking into account the common land. Out of 21 village organizations, only seven of them have a bank account.

Four co-operatives and associations were selected for interviews: three in the north area (Munguine) and one in the south area (Pateque), and the results of the interviews are described in the following boxes.

Box 3.1 Association Tchuri

- 18 members
- Farm Land: 4 ha for the association, and 6 ha for the members (104)
- Management Team: president (female), vice-president (male), secretary (male), accountant (female), treasurer (female), elected by all members through members' discussion every 2 years
- Annual Membership Fee: 30,000 MT
- no bank account
- need livestock for income generation
- ask a private tractor to plow (one hour is 120,000 MT equal to two days of oxen plowing)
- the progress of land registration through the Union

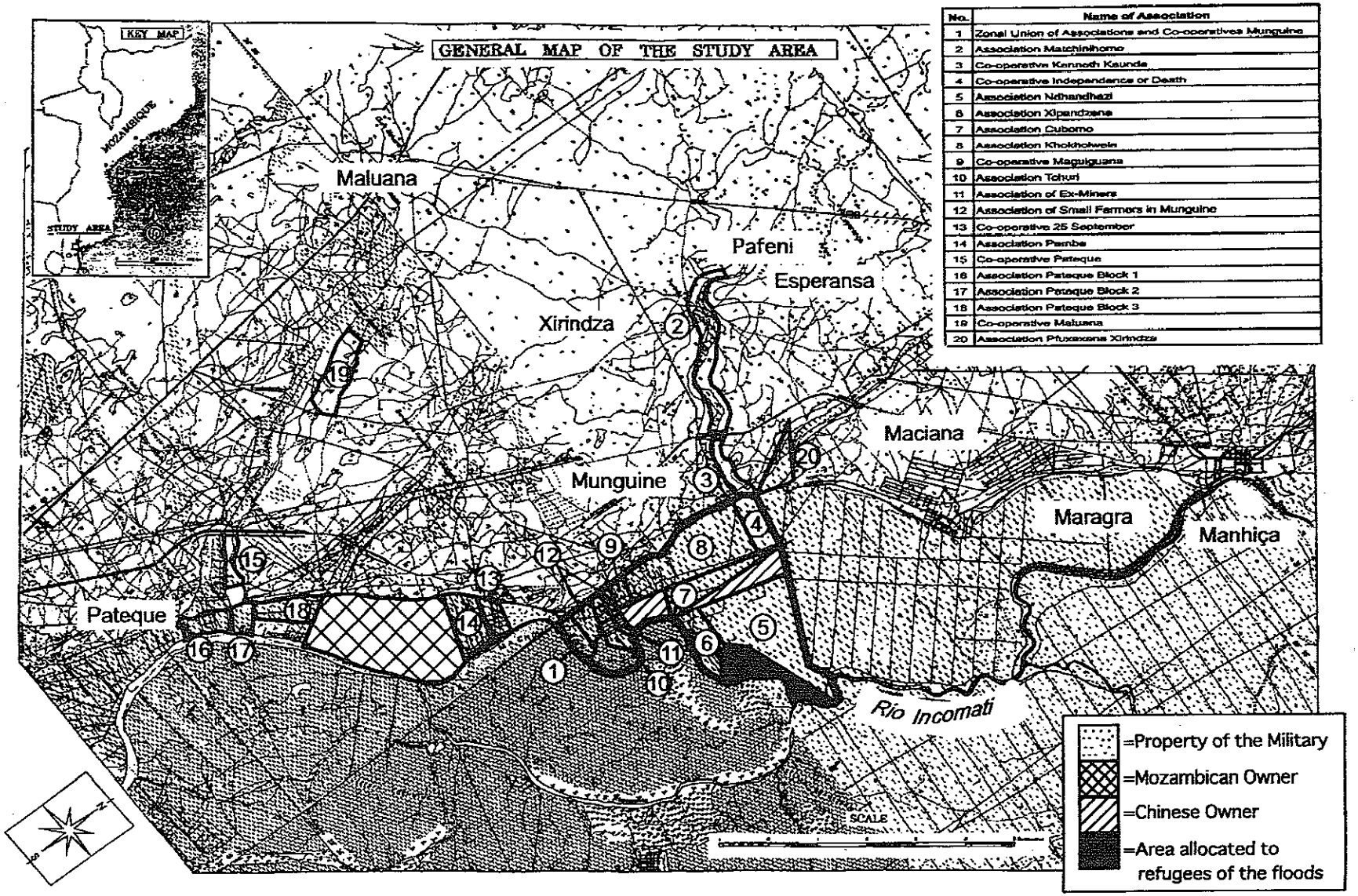
Box 3.2 Association Matchanihomo

- President: E. J. Mantha
- Management Team: president (male), vice president (male), secretary (male), deputy secretary (female), two production managers (female and male), woman organizer (female), treasurer and accountant (male), selected annually through discussion instead of voting (never changed since 1987)
- Annual Meeting: all member attend, twice a year regarding clear channels and water use
- Accounting by a man graduated from grade 4
- Problems: water control, agricultural tools including tractor

Table 3.1 Overview of Village Organizations in Munguine and Maluana Localities

No.	Association/ Co-operative	Contact Person	Position	Established Year	Number of Members (Male-Female)	Farm Land (ha)	Cultivated Crops	Legal Registration	Bank Account	Annual Fee (MT)	Location
1	Zonal Union of Associations and Co-operatives in Munguine	Armando Zuana	President	1986	-	10	Banana	Yes	Yes	100,000	Munguine
2	Association Matchnihomo	Ernesto Junior Mantha	President	1987	50-75	79	Banana,Maize Vegetables Cassava	Yes	No	24,000	Munguine
3	Co-operative Kenneth Kaunda	Armando Casimiro Tchambule	President	1978	12-54	75	Banana, Maize Sugarcane Vegetables	No	Yes	30,000	Munguine
4	Co-operative Independence or Death	Albino Chiau	President	1980	12-106	30	Cassava, Banana Sugarcane Vegetables	No	No	10,000	Munguine
5	Association Ndhandhazi	Aderito Cossa	President	1992	52-120	80	Banana, Maize Sweet Potato Vegetables	Yes	No	30,000	Munguine
6	Association Xipandzene	Carlota Ndzeco	Vice-President	1982	45-62	14	Maize, Sugarcane Sweet Potato	Yes	No	12,000	Munguine
7	Association Cubomo	Virginia Margarita J. Honwana	Superviser	1996	67-49	43	Banana Maize, Cassava Vegetables	Yes	No	12,000	Munguine
8	Association Khokholwele	Alxandre Vicente Chissicco	Secretary	1992	281-408	241	Banana, Maize Vegetables Cassava	Yes	No	12,000	Munguine
9	Co-operative Maguiguana	Francisco Ngovene	Superviser	1977	15-79	67	Maize, Banana Cassava Vegetables	Yes	Yes	25,000	Munguine
10	Association Tchuri	Felismina J. Chiridza	Member	1991	12-92	10	Maize, Cassava Sweet Potato	No	No	30,000	Munguine
11	Association of Ex-Miners	M. Zucuene	President	1992	14-4	35	Maize, Vegetables Cassava, Banana	No	No	60,000	Munguine
12	Association of Small Farmers in Munguine	Almerindo T. Honwana	Secretary	1991	31-0	28	Batana Vegetables Maize	Yes	Yes	20,000	Munguine
13	Co-operative 25 September	Alberto Tseco	Secretary	1983	47-19	33	Banana, Maize Vegetables Cassava	Yes	No	12,000	Munguine
14	Association Pembe	Juliao Mitilane	Secretary	1991	16-134	39	Banana/Maize Cassava	Yes	No	12,000	Munguine
15	Co-operative Pateque	Miguel Savel	President	1978	20-27	26	Cassava, Banana Sugarcane Vegetables	No	Yes	5,000	Maluana
16	Association Pateque Block 1	Eduardo Samuel Mboane	President	1986	8-6	38	Cassava Maize, Banana Vegetables	Yes	No	14,000	Maluana
17	Association Pateque Block 2	Simiao S. Novela	Secretary	1989	50-54	22	Cassava Maize, Banana Vegetables	Yes	No	14,000	Maluana
18	Association Pateque Block 3	Tsavane	President	1986	40-57	24	Cassava Maize, Banana Vegetables	Yes	No	14,000	Maluana
19	Co-operative Maluana	Vasco Maconjo Mothula	Presiident	1992	30-70	21	Cassava, Banana Sugarcane Vegetables	No	Yes	12,000	Maluana
20	Association Pfuxaxana Xerindza	Jose Catanino Massingue	Secretary	1992	45-55	10.5	Banana,Maize Mandioca Vegetables	Yes	No	12,000	Munguine
21	Association of Small Farmers in Maluana	Samuel J. Tomas	Secretary	2000	68-4	82.5	Banana Sugarcane Cassava	No	Yes	20,000	Maluana

Figure 3.1 Farm Land Allocated for Village Organizations in Munguine and Maluana Locality



No.	Name of Association
1	Zonal Union of Associations and Co-operatives Munguine
2	Association Matchinihomo
3	Co-operative Kenneth Kaunda
4	Co-operative Independance or Death
5	Association Ndhandhazi
6	Association Xipandzana
7	Association Cubomo
8	Association Khokholweni
9	Co-operative Maguiguana
10	Association Tohuri
11	Association of Ex-Miners
12	Association of Small Farmers in Munguine
13	Co-operative 25 September
14	Association Pembe
15	Co-operative Pateque
16	Association Pateque Block 1
17	Association Pateque Block 2
18	Association Pateque Block 3
19	Co-operative Maluana
20	Association Ptuxaxana Xirindza

Box 3.3 Co-operative Independence or Death

- Secretary: Ms. C. Zuqueira
- Established Year: 1980
- 104 female members and 12 male members
- Farm land: 30 ha
- no idea about how much ha under association and the members, perhaps 0.2~0.3ha for one member by seeing
- on average, each member owns 20 banana trees, although the association owns 50 banana trees gaining 2 million MT every year.
- advantage of membership: to get an agricultural land, but no more new members are accepted due to the shortage of land
- problems and constraints: shortage of seed; plowing by hand only (cattle provided by ATAP, local NGO, died, and no money to ask a private tractor; no transport to sell agricultural production such as banana, cassava, and sweet potato
- land registration was processed, but not yet completed
- no bank account, a treasurer keeps the money at home
- no transparency in accounting
- adult literacy class supported by Education Department opens three times per a week from 10:00～12:00 by local language; teacher's monthly salary is 300,000 MT paid by Terre des Hommes

Box 3.4 Co-operative Pateque

- 12 members
- Farm Land: 26 ha, but 4 ha is for common land
- implement livestock project (e.g. 24 cattle, 7 cattle and 7 cattle for each of three families)
- need more livestock for income generation, plowing and channel cleaning
- need to improve the access road to main road

(3) Constraints and Potentials for Village Organizations

Village organizations in the Study Area are the good entry points for promoting village development, but their present activities are limited in allocation of agricultural land to the members (now no land available for new comers), land registration as a group, and arrangement of various activities requested by the Union. Their activities do not include the more sophisticated group activities such as group sale and purchase, financing, and technology transfer among the members, but there is a potential for the village organizations to expand their activities into those areas in the future.

In order to realize this potential, it is necessary to develop institutional capacity of the village organizations in the Study Area step by step. First, it is important to improve the basic management skills and accountability in village organizations through training in the areas such as transparent bookkeeping with the group money deposited in a bank account, democratic election of a management team, and participatory management and decision-making process. According to the interviews and Table 3.1, most of village organizations seem to be weak in terms of the basic management skills and accountability, because only seven out of 21 organizations have a bank account, and many organizations seldom informed the members about the collected group money and its use. Secondly, the current objectives, rules and activities of the village organizations should be reviewed by the

members themselves, and revised, if necessary, to better respond to the new demands by the members. It is important to use participatory institutional building methodologies for exploring the needs, weakness, strengths and visions of the members of the village organizations.

It is worth noting that the strong motivation of each organization to improve its management is essential. It is not wise to automatically support all village organizations in the Study Area without considering their willingness to improve the management, nor other conditions such as their level of management, their visions, their voluntary contributions, and their leadership. These conditions should be assessed by themselves, and new activities should be started from simple ones, and gradually move to more complex ones.

Institutional capacity building of village organizations is a long process which must be supported and sustained by various key stakeholders such as the Study Team's counterparts, local government officials and the Union.

3.2 Non-Governmental Organizations (NGOs) Working in the Study Area

According to *NGO Directory* (published by LINK in May 2000), there are more than 800 NGOs in Mozambique, including international NGOs. NGOs work in the various areas such as rural development, agriculture, education, health, etc., and many NGOs do not have e-mail communication. The right to constitute NGOs is legalized by the Law No. 8/91 of 18 July 1991. According to the Law, there are two types of NGOs: the financing NGOs and the assisting NGOs. The financing NGOs deal with a fund for programs, and the assisting NGOs support directly community activities including research and project formulation.

There are several NGOs working in the Study Area, namely Terre des Hommes Germany, ActionAid UK, ATAP (Association of Agro-Livestock Technicians), and so on. Terre des Hommes Germany has supported the construction of a primary school and a health post as well as agricultural production by providing seeds and agricultural equipment since 1987. However, Terre des Hommes Germany realized from the experience that capacity building is more important than construction and donation. Therefore, Terre des Hommes Germany has recently focused on training for community development as a part of capacity building. But since food security has become an important issue due to the floods in February and March 2000, Terre des Hommes Germany again provided seeds and constructed a agricultural machinery storage building near the Union. ActionAid UK and ATAP also supplied the seeds to the local population after the floods of 2000.

ActionAid UK is an international NGO established in the United Kingdom in 1972. ActionAid UK tries to achieve the following four poverty eradication goals:

1) the poor and marginalized people will increasingly be able to realize their potential;
2) the anti-poverty movement will be strengthened;
3) international constraints to poverty eradication will be mitigated; and
4) gender equity will be enhanced.

These goals can be achieved through the following measures:

- achieving gender equity
- devolving decision-making
- enhancing innovation and learning
- securing appropriate income
- ensuring cost-effectiveness
- internalizing governance

In Maputo Province, ActionAid UK has focused its programs on Marracuene and Manhiça Districts. ActionAid UK has supported adult literature at Munguine since 1978. After the flood in February 2000, ActionAid UK has distributed seeds, namely banana, sweet potato, and cassava, and housing materials for 147 flood victims at Munguine (escaped from Xilhale across the Incomati River), as an emergency assistance. For food security, ActionAid UK has focused more on cash crops for income generation, and a revolving livestock scheme (duck, sheep, pig, and cattle). In addition, ActionAid UK has considered training for institutional capacity building, particularly transparent management, opening a bank account, and utilization of local construction materials.

ATAP (Association of Agro-Livestock Technicians) is a Mozambican NGO established in 1995, and officially registered in February 1996. The enrolled members are approximately 60, but the permanent staffs are 3 - 5 only. The objectives are to promote environmental, agricultural and animal husbandry development among the rural small holders, and to promote self-employment for the national agriculture and animal husbandry technician for the purpose of the eradication of absolute poverty and famine. There are ATAP projects in the Study Area, namely an animal husbandry and restocking project for food security from 1998 - 2001 supported by EU, an emergency support to provide seeds from February to April 2000, and a participatory rural development research project until July 2000 supported by Oxfam GB.

3.3 Land Tenure

Under the Portuguese colonial administration, Mozambican rural families had to shift from rich land to poor land, and produce crops for Portuguese. After the independence in 1975, a whole land in Mozambique was nationalized as the property of the State. Socialist Government transformed private farmland to the land under agricultural co-operatives. However, the rural farmers could continue to use existing lands in the name of the right of usage. New farmers could use agricultural land as the members of co-operatives only.

The new Law of Land of 19/97 was approved on October 1997, and effective from January 1998. Under the new Law, the land is still owned by the State, but the right to use the land and users' duties are clearly stated. The new Law emphasizes individual land (family land) instead of community land, and community land can be then divided into individual land. An oral testament can be as valid as a

written registration to claim the right to use a piece of land. It is necessary for new land users to provide the government with a plan to use the land productively, and its plan must be implemented within two years for foreigners or five years for the Mozambican people. Otherwise they will lose their right to use the land.

As a result of the new Law, the private sector including those in neighboring countries such as South Africa and Zimbabwe has started to demand and register pieces of land in urban and rural areas in Mozambique owing to a new socio-economic stability since the peace accord in 1992. The land registration has become crucial in order to legally protect the small farmers' right to use land. The Ministry of Agriculture and Rural Development recently introduced the national policy of agricultural land as follows:

- the management and registration of land should be done at a local level starting from Locality to Province through District; and
- the procedure of registration of land should be done in a short time.

In Mozambique, NGOs and the church associations are also very active in supporting the legal procedures of land registration for small farmers. The National Committee for Land Campaign for Small Farmers was recently established, which consists of NGOs, associations and academic staffs. The purpose of land campaign is to inform small farmers of the meanings, their right, their duties, and procedures of land registration.

4. Women

4.1 Introduction

In the Study Area, it is easily observed that there are more women than men, because some men died during the civil war and other men are out of the village working in South African mines or other cities or towns, or just looking for a job in the urban area. As a consequence, women in the Study Area are considered as the important agents for village development, and it is important to understand the realities the women are facing in daily village life. The following methodologies were used to understand the situation of the women in the Study Area:

- Field visits and observation
- Group interviews and discussions with community groups and local NGOs
- Open or semi-structured interviews with the following key informants:
  - District Government officials and chief of the Administrative Post of Maluana
  - Secretaries of Bairros (Wards) of Munguine Locality and Maluana Locality
  - Presidents of village organizations
  - Groups of small farmers
  - International and national NGOs, which directly work in the Study Area

4.2 Current Situation of Women in the Study Area

In the Study Area, it is estimated that more than 70% of women are illiterate, and women are heavily busy with housework such as cooking, water and firewood fetching, cleaning the house and clothes, caring children, and farming in the low land which is often far from the homestead. These conditions limit women's participation in political and economic activities not only within a family but also in village organizations and in a community.

In Box 4.1, a women in Munguine was talking about the various difficulties in living in the Study Area.

Box 4.1. A Talk with Ms. Elisabeta Mondlane in Munguine

In Munguine, we can say that there's nothing. The recent natural disaster has killed everything. This year(2000), the agriculture is not going well because we don't have seeds and tools.

Here we don't have a pharmacy, we don't have a kindergarten for our children, we are farming with them in our back, we don't have a literacy program, we used to have a teacher but she's no longer coming, we don't know why. She used to come for a few times, sometimes once a month if she comes.

Many men migrated to a town or to South Africa. Those who cannot migrate, apart from agriculture, are to cut firewood and make charcoal. We have problems with our houses. Some do not have any house. It's a question of getting in to see. We are really miserable. See what you can do to help us.

This conversation with a woman in Munguine portrays a typical situation of poverty: a weak agricultural production structure, fragile environment, and a limited access to basic social services such as education, health, and safe water. Around 80% of village organization members are women, and most of them cannot earn enough income to secure an adequate diet for their family due to the low productivity of agriculture.

Apart from taking part in associations, co-operatives or religious groups, women in Munguine and Maluana do not have any other social groups. Sometimes women take leaderships in these groups, but these female leaders face many difficulties to exercise their power.

(1) Women and the Law of Land

Articles 66 and 67 of the Constitution of the Republic of Mozambique, which was approved in 1990, make a clear reference to women's right to land. The repeated reference to women's right to land is very positive, but since the Constitution itself is not enough to secure women's right to land, a major task of disseminating information and enforcing the rules is required in order to achieve its purpose. The Constitution has come to reinforce women's position, because it underlines women's equality to men in relation to entitling her to land usage and profit. Further, the Constitution confers protection of women by specifying a norm, which regulates the land inheritance without discrimination based on sex. This is an essential aspect, because, according to the customary right, women have no right to inherit land.

In 1997, the new Law of Land was approved by the Parliament, as a result of works conducted at a grassroots level such as listening to the peasants' opinions as well as to the whole civil society's opinions. It is important to note that the new Law of Land continues to regard land as an exclusive State property, which is considered as a protective measure for small farmers, because they cannot compete for the land in the free market. The impact of the new Law of Land is the fact that it succeeds to grant to women an equal right as those of men. The Article 10 of the Law 19/97 states that:

> *The right of access and usage of the land could be applied to national citizens, collectively and individually, men and women, as well as local communities.*

However, it is good to note that, although the new Law of Land contains articles which strengthen and secure the land ownership to small farmers and women by constituting a transparent way of acquiring and losing land, this Law depends, to a certain extent, on the good capacity of those who implement it.

It is hardly expected that, with the implementation of the Law of Land, all the problems women are facing will be sorted out. The efficacious applicability of the present Law of Land, which aims at an effective protection of small farmers and women, depends greatly on the Regulations on the Law approved by the Council of Ministers in 1998. In the Law of Land, many aspects are approached in general terms, so the definition of how to implement the Law is up to the Regulations. Therefore, it is very crucial that such Regulations are well done against the risk of becoming the Law inefficient and

being unable to protect small farmers and women, but the current Regulations are too complicated and very difficult for small farmers and women to understand.

(2) Women and Agriculture

In the agriculture, women have the task of hiring plows for men. Animal plowing in agricultural production is particularly important in the Southern Mozambique, where bulls are strictly linked to plowing work and transportation. According to the official statistics, the peasant families farm manually about 1.5 hectares of agricultural land on average in Mozambique. If they are able to utilize animal plowing, the cultivated area will increase up to 5 hectares per a pair of bulls.

After men's plowing with or without bulls, it is up to women to sow, weed and then harvest. Generally, in order to fulfil these duties, she has to wake up early before sunrise, usually between 4 and 5 o'clock, and work on the farm until around 10 o'clock, when the sun begins to hit heavily on the field. After working the farmland, she has to look for firewood, collects water and goes back home where she has the duty of preparing food for the family. In case there are girls in the family, they help their mother in domestic activities, namely fetching water and firewood.

Women, who have a farm in lowland, also do the work of growing vegetables throughout a year. Women have to work not only in their individual farm, but also in village organization's common farm. Women tend to work in less productive land (arid highland) than men. Forty-one percent of women's farms are located in the arid highland and only 28 % in the lowland or 23 % in the irrigated land.

Women are thus tightly busy in agricultural activities almost throughout the year. For women to take part in community development activities, the introduction of labor-saving technologies, which will help women to take less time in cooking, collecting water or firewood, farming, and so on, is highly required. Since women play an important role in the provision of food and income for the family members, it is important to create conditions and opportunities for women to participate in development. The increase of productivity of female farmers can be achieved through the intensified extension activities which include the introduction of low-cost technologies, such as plowing animals, organic fertilizers, improved cooking stoves, and so on.

The task of deforesting and preparing land is usually up to men. Apart from the agricultural activity, men collect firewood and make charcoal for sale, which constitutes a major source of income in the Study Area. Normally and in general, the breeding of animals is a boy's task. In case boys go to school, their sisters, who do not go to school, replace the grazing work during their absence.

The agricultural productivity in the Study Area is low due to a lack of tools, agricultural inputs such as seeds, fertilizers, bulls for plowing, plows, and so on. According to the President of the Association of Small Farmers in Munguine:

The level of commercializing the products remains very low due to a lack of a marketing network, storage, and bad road conditions. Only 29 % (an estimated value) of the produces are commercialized through some town's tradesmen, who go there with their own transports to buy products. Almost 61 % of the individual produces are not commercialized and consumed at home, and the rest (10 %) is wasted. This produce comes from a farm comprising between 1.8 to 2.5 ha per household.

Various factors restrict the increase of agricultural production, which include a lack of credit services for buying agricultural inputs, low incomes, weak development of the market, bad distribution of land for the family sector and little utilization of land due to the lack of plowing animals. Great part of farming, sowing, weeding and harvesting is basically done by hand with a hoe. When a family or a village organization used to own the plowing bulls before the civil war, they were able to cultivate more land and earn more money. One example of this situation is portrayed in the Box 4.2.

Box 4.2. A Talk with Mr. Sonâncio Chirindza in Maluana

When we had cattle before the civil war, we prepared the farm in the following way: one day we plowed in someone's farm with bulls, on the following day in another person's farm, until we covered all the co-operative members.

I and this man on my side, Mr. Dlavela, live together. He used to own six plowing bulls, and I used to own two pairs of bulls .We used to farm our land together and help each other. We used to grow maize, cassava, sweet potatoes, and we succeeded to get good harvest of maize. This man, as he owned six bulls, he put three of them plowing in the morning and three others in the afternoon. And he was producing more than me, then he was selling a 20-liter tin of maize at 40 Escudos (Portuguese currency). We were selling these to a Portuguese in Manhiça called Augusto Carlos, who used to re-sell to wholesalers. Since he was not able to carry all the merchandise at once, he had to come two times a day. He paid us 150 Escudos for a 100-kg bag of maize.

(3) Women and Livestock

Within the Mozambican society, the livestock is associated with a significant importance in the context of social and economic development. The livestock constitutes a form of economic reserve in the rural area, and it contributes to increasing agricultural production through animal plowing, as described in the previous section, as well as through providing manure, the organic fertilizer.

Livestock also contributes to food diversification, apart from the ceremonial roles it plays. The present consumption of products of animal origin is very low in Mozambique (about 1.2 kg of meat, 2.4 liters of milk and one egg per capita per year), if compared to average consumption in Africa (13 kg of meat and 30 liters of milk per capita per year). In 1998, more than 50 % of products of animal origin in the market are imported, while, in 1981, only 10 % of these came from overseas.

Increasing the number of cows/bulls through a livestock revolving scheme is considered as one of the most needed activities for the families in the Southern Provinces (Maputo, Gaza, and Inhambane Provinces), certain districts of Sofala and Manica Provinces, and Tete Province, because, in these areas, cows/bulls play important roles such as increasing agricultural production through animal

plowing and soil fertilization, a social and cultural support, a source of income, a source of protein (meat and milk), and a banking reserve. Box 4.3 illustrates the typical small farmer's need for cattle for agricultural production as well as transporting agricultural produce.

Box 4.3. A Talk with Mr. Filipe Mucave in Maluana

There is a lack of transport to carry our goods. Sometimes it takes two to three days while a person is still waiting with cassava, cabbage and sugarcane for one tractor to carry his goods up to the street. If it doesn't come, the merchandise is spoiled in sacs.

We used to have tractors, but at this moment, they are damaged and there is no money to repair them. I think we would be better if assisted with cattle, because they help us to plow and even to carry sacs, water and other things.

(4) Women and Education and Training

As UNDP's *National Human Development Report 1998* states that the poverty can mean an insufficient access to the opportunities to make choices, rather than lack of income, the rural poverty is often the result of low educational status of women and children. Women's access to education and training opportunities have been severely limited in Mozambique, and becomes one of the most important factors in perpetuating rural poverty. In the Study Area, literacy rate is estimated around 30 % for adult men and around 15 % for adult women, although many villagers pointed out the actual literacy rate among adult women must be much lower than this official statistics.

Investment in education and training of women will contribute for the reduction of school dropout rates among girls as well as illiteracy rates among the adult women. Reinforcing a functional adult literacy program, paying a priority attention to the basic skill development for women, and promoting the establishment of kindergartens in the Study Area will contribute for better participation of the women in development.

Since the majority of the members of village organizations are women, it is also important to improve overall organizational capacity of village organizations for women to participate in development more actively. The following are some measures to improve organizational capacity of village organizations:

- Providing technical and financial assistance to existing village organizations so that they can initiate the process of development at a local level and fight against poverty.
- Assisting the establishment of local institutions which act as an intermediary between the government and the community and work to ensure sustainability of development actions.
- Training as many members of village organizations as possible in relevant fields such as practical skill development for agriculture and income generation, participatory and democratic management, transparent accounting, etc.

There is no kindergarten in the Study Area, but the construction of a kindergarten in the village might contribute to women's development in several ways. Although the kindergarten network tends to be concentrated in urban centers, if a kindergarten is constructed in rural areas, mothers can send their children to a kindergarten and will have more time for various economic and household activities. Thus construction of a kindergarten, in coordination with the District Education Office, village organizations and non-governmental organizations, will contribute not only to reducing inequalities in school opportunities for pre-school children, but also to improving women's participation in economic development.

(5) Women and Health and Nutrition

Women and children living in the rural area suffer from the poor hygienic conditions of their houses, chronic malnutrition (especially protein-deficient malnutrition is prevalent among children in the Study Area), and various diseases resulting from these unhealthy conditions. Most of rural houses do not have a pit latrine, and the access to safe water is not always easy for most of rural women. While there are several health centers in the Study Area, they are always suffering from shortage of drugs and trained medical staff, and health education and nutrition education are not regularly provided to mothers.

Due to mothers' lack of education and understanding of the need for immunization for their children, the Study Area still has many children who are not immunized. It is important to hold an immunization campaign to sensitize the local population, especially young mothers, to explain the importance of immunization as preventive health care.

Since access to safe family planning methods is almost non-existing in the Study Area, it is also important to start reproductive health service for women in the health centers.

(6) Women and Micro Credit

There is always a strong need by rural women for micro credit, because women not only play active roles in economic activities in the village, but also accomplish various social obligations within the family. In order to satisfy their family's everyday needs, women are always struggling with various problems such as shortage of the labor force, seasonal shortage of food before the harvest, and lack of capital assets such as money and animals.

The small farmers including female farmers experimented various practices of mutual funding that aimed at agricultural and livestock production. These practices include the traditional mutual help among the small farmers, which are quite often not paid back in money but in the form of the labor force or in kind. These traditional mutual help has contributed to satisfy the essential food needs and improve agricultural production, because it is mostly utilized in agricultural operation, that is one of the major bottlenecks. In social terms, the traditional mutual help reinforces the values of the community solidarity, creates repaying conditions through a group pressure, and increases their economic power.

In Munguine, there is a traditional rotating fund called "Xitique," which is practiced by women traders. Members usually pay 10,000 MT every month, each month one member receives all the money collected in that month, and a recipient of the money is rotating month by month.

But these traditional forms of credit are limited, due to the low possibility for its expansion resulting from lack of the labor force and cash income. However, they present an important potential, due to their possible contribution for the food security at a community level and the re-stocking of animals in the countryside.

So there is a strong need to create a local institution which provides small farmers and women with small funding to complement the traditional practices of mutual aid. Creating a micro credit fund for local initiatives can be a good tool aimed at women's development by:

- improving women's access to essential social services;
- improving women's capacity to invest for the future; and
- promoting self-employment and income generation activities by women.

Micro credit fund can support a variety of women's development activities which target to improve socio-economic conditions in the areas such as basic sanitation, housing, micro irrigation, land conservation, marketing, livestock, etc. Micro credit scheme can reinforce women's productive capacity and help to create an alternative form of accumulating assets in the community. It also helps the rural communities, in an individual or a collective form, to create a condition which allows the local population to get out of poverty cycle and stimulates the process to create a locally sustainable mechanism to satisfy their priority needs.

(7) Collaboration with NGOs Working for Women

In Mozambique, NGOs are active in the implementation of various development programs, particularly with participatory methods. Therefore it is important to promote coordination and collaboration between the public sectors and NGOs in the community when designing and implementing development activities.

The following is a list of NGOs that have already carried out some community development activities in the Study Area and can be invited to take part in future community development activities in Munguine and Maluana:

- Terre des Hommes Germany working on children's health, adult literacy, education and training, and agriculture.
- ORAM (Rural Association for Mutual Support) working on registration of land for small farmers as well as a cattle bank (revolving scheme) and micro credit.

- AMRU (Mozambican Association for Rural Women) working on micro credit, agriculture, livestock restocking, housing, and other local initiatives.
- AMODEFA (Mozambican Association for Family Development) working on family planning.

AMRU is a national NGO founded in 1991, fundamentally aimed at helping rural women and rural communities in improving their socio-economic conditions. AMRU implements programs in the fields of water, education, agriculture and livestock. In the field of water, AMRU dug water boreholes in areas where this need is felt. AMRU constructed houses for teachers and primary schools. In agriculture, AMRU carried out activities aimed at improving food security as well as a revolving scheme for livestock.

4.3 Planning for the Future

The importance of women's role in the economic development needs to be recognized adequately. If women's roles and needs are well recognized, the planning of development activities will involve women and the projects will be designed based on the needs of women. Women tend to understand their needs based on their family's daily practices, and look for means to make their family live better. When women meet these urgent practical needs, they are ready to pursue the long-term strategic needs which aim at improving women's status in the family as well as in the society.

To fully realize the productive capacity of women, it is necessary:

- to reduce the volume of women's work, for instance, through adequate location of water sources, supply of a grinding mill, and construction of improved cooking stoves;
- to improve women's health, for instance, through a first aid health post which supports family planning and safe and potable water supply;
- to improve social services to women, for instance, through construction of kindergartens and primary schools and improving road and housing;
- to increase income for women, for instance, through professional training, introduction of a group credit, and improved access to a market;
- to improve education opportunities for women, for instance, through conducting a literacy campaign, increasing female teachers, and making textbooks that value women's roles more positively;
- to improve women's access to the means of production such as land tenure, right to use common proprieties, and bank accounts;
- to improve women's participation in making decisions, for instance, in a family, in local committees, in elections, in village organizations;
- to open equal employment opportunities for women, for instance, through recruitment of women for the post traditionally reserved to men, and providing equal salaries for men and women;
- to create conditions to enable the female members of village organizations to participate in economic activities more actively, which ensures women to acquire more profit and income;

- to facilitate women's access to the means of production and other resources through micro credit, which allows the development of activities to generate income and employment; and
- to animate women into new employment and self-employment opportunities by improving their productive capacity through training programs and education.

5. Rural Water Supply

The rural water supply component initiated its activities with a survey of groundwater resources to assess the potential for development in the Study Area. The survey was made up of two parts, a hydrogeological assessment based mainly on available secondary information referring to the area, and a field survey of existing water points. The field survey of water points verified the technical and management status of community and some private water points. Water quality analyses were made from selected sites in the Study Area to learn the extent of groundwater contamination with organic matter as well as verify the overall chemical content.

5.1 Current Water Supply Situation in the Study Area

The hydrogeological survey was carried out in September 2000, occurring at the same time as an inventory of water points in the Study Area. The results of the two studies were cross-referenced so that a meaningful compilation could be made for this report and further field activities.

(1) Location and Geomorphology

The Study Area is located between the meridians 32°37 00 and the 32°48 00, and between the parallels 25°26 00 and 25°35 00. To the East, the area is delimited by the Incomati River.

In the Study Area, two geomorphological units can be distinguished:

1) Inland dunes

The inland dunes lying in the western part of the Study Area consist of unconsolidated eolian and fine sands, and they are NNW-SSE oriented. The most important depressions cutting through this geomorphological unit are related to valleys of the tributaries of the Incomati River. However, some isolated swamps can also be found.

In general the altitude varies from 30 to 40 meters above sea level. The highest points of the Study Area are located in the western part and reaching 80 meters above sea level (a.s.l.)

2) Incomati valley

To the East lies the valley of the Incomati River, consisting of clayey to silty sands. The topography is gently undulating varying between 2 and 6 meters a.s.l.

(2) Surface Hydrology

The Incomati is the main river of the region, within the Study Area it has very few and small tributaries, the most important being the Tiluene. Upstream water from the Incomati River is

withdrawn to supply the Xinavane Sugar Company and other sugar companies in neighbouring upstream countries. The discharge in the lower part of the river comes principally from the Chuali Lake and from groundwater leakage from the dunes.

The river mouth is located 23 km NE of Maputo, and the flow is influenced by the tides up to 90 km upstream, including the Study Area.

(3) Precipitation and Temperature

Climatically characterised as subtropical with maximum rains in the hot season from October to March, mean annual precipitation is between 842 mm and 890 mm. The mean monthly temperature is between 19° and 26° centigrade, December and January being the hottest months, while May to July experience the lowest temperatures.

(4) Geology

Geologically, the area belongs to the meso-cenozoic sedimentary basin that extends from the Province of Zambézia south to port Durnford in South Africa. Its eastern limit is the Indian Ocean. The outcropping basaltic and rhyolitic rocks forming the Libombos Range are the Western boundary of the basin. The Libombos lavas constitute the base of the basin.

The process that filled this basin with sediment started in the Cretaceous period and was controlled by epirogenetic movements as well as marine transgression and regression events.

(5) Hydrogeology

The lithological units and aquifers can be distinguished as the following:

<u>In the Inland dunes</u>

Fine sand (the dunes)	- phreatic aquifer
Clayey/silty sand (the dunes)	- semi-pervious layer
Medium to coarse sand	- deep aquifer
Limestone, clayey/calcareous sandstone	- deep aquifer

<u>In the Incomati valley</u>

Alluvial deposits (clayey, silty, sandy material)	- shallow phreatic aquifer
Limestone	- deep aquifer

The unconsolidated sediments are Quaternary deposits and the clayey/calcareous sandstone and limestone were correlated with the Tertiary Salamanga formation. The West-East profile indicates a facies change in the Salamanga Cheringoma formation from clayey sandstone to calcareous sandstone and finally to limestone.

The hard rocks (sandstone/limestone) are found at 15 meters (mean a.s.l) in the West, to 30 meters below sea level in the Incomati valley. The thickness varies from 30 meters to 60 meters. These rocks are fractured and in some places cavernous and therefore very permeable.

In the dunes area, fine eolian sand provides surface cover material, that deeper become more clayey and consistent. A thin layer of medium to coarse sand (fluviatile deposits) occurs locally between the clayey sand and the clayey/calcareous sandstone or limestone.

Hydrogeologically the clayey sand layers separating the top fine sand and the deeper sandstone and limestone can be considered an aquitard (semi pervious layer) permitting some water circulation. Practically, it is difficult to determine the limits between the top sand and these clayey sand layers. The top of the dune sand aquifer varies with the topography and its thickness varies from 10 to over 30 meters.

- In the river valley, alluvial deposits directly overlie the hard rock (limestone). Some clayey strata can locally induce a semi-confined condition. The thickness of the alluvium can reach 40-50 meters.
- The thin layer of coarse sand that occurs locally between the clayey sand and the hard rock can be considered as a part of the deep aquifer.
- Deep sandstone and limestone is found throughout the Study Area, though there is a facies change from clayey sandstone to limestone from the western side towards the coast.
- Below the deep sandstone / limestone, the impermeable Grudja formation (marl and glauconitic sandstone) is found and should be considered the lower limit of the system in the Study Area.

(6) Recharge and Flow Direction in the Aquifer System

Recharge into the phreatic dune aquifer is by direct rainfall. Recharge occurs only when precipitation exceeds 30 mm in 3 days, and 100% of the rains infiltrate when they don't exceed 100 mm for the time interval. In the Study Area 195 and 180 mm of annual recharge in the inland dunes is a reasonable estimation. Using a surface area of 86 km^2 (excluding the Incomati valley) and the annual recharge in mm, 16.77 and 15.48 million cubic meters of water per year are reached respectively.

The global recharge of the aquifers in the Study Area is approximately 16,106 m^3/year. From this recharge, the local population abstracts only 0.5% - 1%. Aside from losses of about 10% draining into the valley, 90% of recharge to the phreatic aquifer recharges the deep aquifer. From the deep aquifer one part drains upward to the Incomati River through the alluvium and the rest flows to the ocean through the deep aquifer.

There is not enough available data to determine the maximum exploitable discharge without causing a significant rise of the saline interface in the Incomati Valley. The horizontal flow in the phreatic dune aquifer is most likely controlled by land morphology, and in the Study Area this flow is mainly

oriented toward the Incomati valley. With respect to the vertical flow the groundwater levels suggest that in the inland dunes the phreatic aquifer recharges the deep aquifer.

In the Incomati valley the groundwater flow levels increase with depth suggesting that the vertical flow is upward: the deep limestone aquifer is draining to the river. The two artesian wells found during field visits (one in Pateque and one in Maragra), would support this suggestion.

The groundwater level contour map of the deep aquifer indicates a flow in the direction West-East, draining to the sea.

(7) Geophysical Studies

Three geophysical studies have been performed in the region of Marracuene and Manhiça, in 1986, 1997 and 1999. In the profile of the second study, the orientation West-East was adopted in order to investigate the geological change from inland moving in the direction of the coast, and to determine the position of the saline groundwater near the Incomati Valley. The Vertical Electrical Soundings (VES) do not show any interface between fresh and saline water. If there is no occurrence of highly mineralised water at the depth reached by the VES investigation it may be absent or lying below the depth reached.

In the Incomati valley, the VES reveal a very heterogeneous lithology. An overall low resistivity was found and related to clayey fluviatile deposits and to saline or brackish water possibly originating from the river.

(8) Aquifer Characteristics

The "Hydrogeological Assessment of the Marracuene - Manhiça region" by L. Chairuca (1997) involved several pumping tests in the phreatic fine sand aquifer and in the deep aquifers. Results show that the higher transmissivity values (varying from 300 to 600 m^2/day) correspond to the deep aquifer, whereas the dune sands are characterised by low transmssivity (from 10 to 100 m^2/day). In the alluvial aquifer the transmissivity is very variable depending on lithology.

The storage coefficient of the deep and alluvial aquifers range from S 10-3 to 10-5 indicating semi-confined to confined conditions, while for the phreatic fine sand aquifer S 10-3 indicates semi-confined to unconfined conditions.

(9) Expected Borehole Discharge

- In the phreatic fine sand aquifer (the dunes) the discharge of a borehole will range from 0.5 to 5 m^3/h.
- In the alluvial aquifer of the Incomati River the expected discharge will vary (due to the heterogeneous lithology), from 5 to 50 m^3/h, or more depending on the diameter of the borehole and the kind of filter used.

- In the deep calcareous sandstone and limestone aquifer the discharge will range from 10 to 100 m^3/h and sometimes more (See borehole No. 40), the rate being higher in the limestone and lower in the sandstone which is only fractured.

(10) Water Quality

The international limit of salinity for drinking water is an electrical conductivity of 1,500 $\mu S/cm^3$ (micro Seimens per cm^3). In the Study Area conductivity measured at operational boreholes and hand-dug wells was found to be well below this.

- In the inland dunes the groundwater conductivity ranges from 100 to 700 µS/cm3, from the phreatic and deep aquifers.
- In the Incomati valley in the area of Munguine, the VES do not show any interface between fresh and saline or brackish water at depth. However, toward the South, this interface rises and it cannot exclude that in the Pateque area, a deep borehole could reach saline water.

Within the Study Area, the river is influenced by salt water intrusion from the Indian Ocean, and some of the shallow hand dug wells located near the river may occasionally have brackish water.

1) Physical and chemical characteristics

In general, the groundwater in this area is clean, has a good taste and is chemically potable and problems are localised in particular water points. Of the 28 boreholes registered with hand pumps, 13 were tested for chemical characteristics, and out of these, just under half (six) were found to be chemically unsuitable for drinking. For example, as a result of poor construction, borehole No. 12, 21, 26, 30 and 77 have highly turbid water, and suffer from sanding up. The sanding up of boreholes seems to be a common problem for those tapping the phreatic fine sand aquifer. Although investigation was recommended in the report, practical implementation of the pilot activities and subsequent meetings with communities found that no illness appears to be attributed to suspended particles that may remain in suspension after decanting. Cleaning the boreholes with a compressor may reduce the problem somewhat. In the mean time communities using the sources were urged to decant their water, and where possible boil drinking water.

The water from borehole 21 registered high iron content and possibly the existence of iron related bacteria, which are found elsewhere in the region. The single borehole (No. 12) found not to be potable. High acidity and very high organic contamination were registered, and during the course of the Study this was reported to the government water and health sectors, but no further investigation or cleaning was undertaken aside from alerting the community to its potential danger. (It should be noted that the laboratories are occasionally wrong, and this was proven later in the project when a similar result concerning contamination was obtained, and another sample submitted from the same source where its portability was proclaimed.

2) Bacteriology

Six bacteriological analyses were made in six different boreholes equipped with hand pumps: F 19, F 30, and F 36 in January 2000 and F11, F 20, and F 26 during this study. All the results indicated the water was potable except for at borehole N°30. At this well N°30, recommendations were made after the survey results were disseminated that the community should seek assistance to clean and treat the water point, the bacteriological contamination probably having had an external origin.

(11) Demography, Water Demand and Groundwater Abstraction

1) Demography

In 1999, there were estimated 16,884 inhabitants in Administrative Post of Maluana, divided in two localities: Maluana with 10,708 inhabitants and Munguine with 6,176 inhabitants.

2) Water demand

Taking water consumption of 30 liters/person/day between the World Health Organisation minimum (20 l/p/day) and the 40 l/p/day recommended in Mozambique, and a population of 17,000 inhabitants, a total of 186,150 m^3/year is potentially consumed.

Using the example of an Afridev hand pump, the pump installed on most boreholes in the Study Area, with an average of 8 hours of pumping per day and a maximum discharge of one m^3/h, the demand can be expressed as a total of 64 water points equipped with hand pumps. According to the inventory carried out, there are 28 boreholes equipped with pumps in the Study Area: one with a windmill (private) and 27 with hand pumps of which one is private.

Of the remaining 26 pumps supplying the population, 22 are or will shortly be operational. In this situation, demand calculations indicate the need for an additional 42 operational and protected water points.

Practically this suggests a number of possible actions:

- Rehabilitate the non operational pumps including if necessary borehole cleaning
- Equip existing boreholes with hand pumps if the boreholes are still operational
- Protect and strengthen some good hand-dug wells and based on willingness and capacity of the user community to contribute, install new pumps on them,
- Drill new boreholes and install new pumps,
- Dig new wells and install new pumps.

3) Groundwater abstraction

In the Study Area groundwater abstraction is only used for domestic consumption. There is no industry or major irrigation system. In the area there are 23 hand pumps functioning, 1 wind pump, and many hand-dug wells (25 were visited).

For a hand pump an average of 8 hours of pumping per day is considered reasonable with a discharge of 1 m^3/h. (The same rate may also be used for the wind pump). For hand-dug wells (not equipped with a hand pump) it is estimated that 30 wells may produce an average yield of 2 m^3/day per well. Therefore global groundwater abstraction in the area is currently about 252 m^3/day.

(12) Water Point Inventory

1) Methodology

Questions and reporting formats were developed prior to the field survey with a series of questions pertaining to the water and health situation. In the field contacts were made with the local government authorities, community leaders and water point users encountered during the field visits. The objectives of the study were explained and opinions solicited concerning water supply in the area. Questions raised included the number of residents in an area, the criteria for selecting sites for water point construction at the time, the degree of participation in water point maintenance, the types of water points and construction materials used. The use of the survey format provided the information presented in Table 5.1 and Table 5.2 in the end of this chapter.

The water points were located in the field with assistance from community leaders in each area visited, and reference was made to population data concerning these areas. Due to difficulties in locating people who had such information, it was not possible to register the number of users of each water point, but instead, general figures of residents in the area have been used. Road access to the majority of the areas was adequate for light vehicles with four wheel drive.

Location of the water points was made using a GPS 75 and a GPS 3000xL. Following the readings, when it was necessary to locate the water points on the map it was noted that differences exist between identified points. On the map compiled for project use, shown access routes have been taken as the defining factor in water point location on the map. The average distance of the "errors" of congruence are approximately 300 meters, so that co-ordinate readings may provide the location of a water point on the wrong side of a mapped access road in relation to its "real" field location with reference to the road. Figure 5.1 shows the locations as far as possible as the "real" locations, that is, located on the side of the road one would expect to find them in the field.

Communities were selected to visit based on the overall objective of the Study, that is the focus on rural farmers as target groups, particularly those participating in co-operatives or association with fields in the Incomati Valley. After consulting the leaders, visits were made to existing water points in each community. The aim was to visit all boreholes and hand-dug community wells identified to evaluate technical and managerial aspects, and to visit as many private wells as possible with the same objective.

Many private hand-dug wells were encountered and their construction followed similar trends. As a result the field survey included wells that were most used, and principally when for domestic use such as consumption, cooking and washing. Other pragmatic criteria such as access and availability of users in the vicinity to consult were also used.

In Maluana Administrative Post, 28 boreholes, one spring, and 25 hand dug wells both community and privately owned were visited. Communities visited included Pateque Village, Musutho, Barriga, Matchovane, Munguine, Xirindza and Maluana trading and administrative center.

2) Rural Water Supply policy and water point construction

Community water supply in the Study Area is obtained from boreholes and hand-dug wells. Almost all boreholes have Afridev hand pumps installed on sealed headworks with and apron and drain. These village level operation and maintenance (VLOM) hand pumps are standardised in Mozambique and the government has made efforts to promote a policy to encourage community responsibility for operation, maintenance, repair and management of their pumps. Establishing such responsibility requires community participation in identifying needs, site selection, construction and training of elected members to carry out the care taking activities as well as promoting the hygienic collection, transport, storage and use of water.

The National Water Policy provides guidelines concerning community water points, but not privately owned sources. Community hand-dug wells should provide potable water according to national norms. Potable water is guaranteed via sealed well lining, headworks and a hand pump where feasible. Where this is too costly, an alternative system for raising water must minimise the possibility of surface contamination. Until the end of 2001 the government were happy to recommend the use of a single bucket on a pulley system, high walls around the well and a cover that can be completely closed when not in use. However since the first part of the Implementation Manual for Rural Water was approved in December 2001 the government is reluctant to promote anything other than a hand pump to raise water.

Owners of private water sources may construct hand-dug wells to the best of their technical ability and the limit of their financial capacity. As a result these are generally of lower construction quality than community wells in rural areas. Very few hand-dug wells in the Study Area are lined from top to bottom, instead most use a system of lining the top three meters either with cement blocks or 200 liter drums, and lining the last few meters either with blocks, but more commonly with 200 liter drums. Few of these wells have lids, and none have aprons or drains. Surrounding walls are usually approximately 60 cm above ground and made of cement blocks.

In the dune sand area the wells are fairly insecure and with heavy rain (as occurred in 1998/99 and 2000) there is a high risk of subsidence and caving in. In some cases, due to unprotected sides of the wells and the lack of apron and drain, saturated sand tends to break up the well walls and cause

collapse from the top. In others, increased flow of water at the bottom with the rise in the water table causes undermining of the blocks/drums and cavernous development around the edges, which eventually causes subsidence and collapse of the well. The uses of drums at the bottom of the wells are slightly advantageous insofar as they can be inserted into the aquifer and therefore withstand horizontal flow changes more effectively. A negative aspect of the use of drums is their tendency to corrode, and taint the water in the well in terms of colour and taste.

The hand-dug wells in the dunes are deep, ranging between 15 and 30 meters. Deep wells are not only expensive to line, but present the additional problem of being difficult to clean internally, requiring electric pumps that are expensive and scarce in the country.

3) Community water supply characteristics

Generally communities show their preference for borehole supplied water where ever possible. Due to their high cost, these sources are scattered thinly through the Study Area, mostly in the higher dune area between the main EN1 highway and the Incomati valley. Aside from the government, only donors to health and educational rehabilitation have constructed community water points. The Catholic Church constructed three water points in the area.

The principal activity of people living in this are is farming, some in the highland area and some in the Incomati valley lowlands. The only internal migration evident was after the end of the war when people who had been refugees in Pateque Village (where they joined agricultural associations) returned to their original areas of residence in Barriga and south of Maluana Center, there encountering difficulties is securing access to water. Others who had been refugees in Munguine returned to Maluana Locality after the civil war.

One spring in the area of Matchovane was visited. This has been partially improved so that water is fed into a small tank and a tube constructed so that water may be collected from it. The water flows continuously with a yield of approximately 1 m^3/hour. The improvements were made in colonial times. The community uses this water without paying. It is of good quality and used for all domestic ends. Water issues are not a priority in this area.

In Xirindza Pfuxane, the hand-dug wells are lined with cement blocks close to the surface and with 200-liter drums at the bottom. The wells have small lids made from corrugated iron. The owners of the wells join together with the users of the same well to contribute when necessary to cleaning the well or purchasing a new rope or bucket. The owners contract well diggers at their expense to dig the well. After this, others using the well pay for rope and when repairs are required, some pay an annual amount of 5.000,00 MT to cover these costs. The majority of these wells as well as others throughout the northern and central Study Area were destroyed with the rains of February 2000.

Currently a number of the owners of the previous wells are trying to construct new wells, moving between 100 and 200 meters from the previous location. None of these wells were registered with GPS

co-ordinates because of their non-permanent nature. Boreholes are the only secure long-term water sources in the Study Area.

(13) Site Location

Almost all boreholes in the Study Area were implanted without community participation in site location. For the boreholes belonging to the Catholic Church, schools and health units, the financers of the related institution located the sites of wells as part of the support facilities for the institution. The Provincial Directorate of Public Works and Housing was involved in siting of boreholes between 1994 and 97, however almost all boreholes constructed during and since the war used an emergency methodology, and user communities were left without tools or instructions concerning their responsibilities in regard to the hand pumps.

(14) Operation, Maintenance and Repair

Emergency interventions, even through 1998 and 1999, have created various problems in the community. Without being informed or involved in decision-making, they have been encouraged to "wait until the next emergency" when their water points will be put back in working order.

Communities from Xirindza, Pafeni, Musutho and Munguine have observed the National Policy in terms of contributing funds for the repair of their water points without soliciting government assistance. From approximately 1998 local Secretaries were involved in awareness raising among communities to contribute funds, however since it is these very Secretaries who are often those who actively collect and supposedly look after the money, though without presenting any form of accountability concerning their use, the system is weak.

In Maluana Administrative Post, the main sources of income of almost all residents are from agricultural activities, the sale of charcoal and firewood. This should be enough to contribute funds for maintenance of water points (at approximately US$1.00 per family per year).

(15) Sanitation

Although people claim latrines in the area were destroyed in the floods, the main local habit has been to use the bush for defecation, while the screened-off family washing areas serve for urination by all family members. Some families are aware of the dangers of open-air defecation, but many continue through force of habit. In the homes of some of leaders more sanitary conditions exist with dish racks and places for water storage and a hole for burning or burying solid waste.

5.2 Analysis of Potentials and Constraints

The Study Area has an important groundwater potential. With an annual recharge of about 16×10^6 m^3, these renewable groundwater resources can easily sustain the domestic water demand for the next 20 years. These resources could be also exploited for irrigation development. Nonetheless large scale groundwater exploitation for industries or irrigation would require further investigations to find out the

quantity of water that could be abstracted without provoking a rise in saline or brackish water in the Incomati Valley.

Chemically the quality of groundwater is reasonable, while the quality of individual borehole construction appears to be variable, and has the potential of lowering the quality of water produced. In terms of bacteriology, aside from external pollution from the surface, the groundwater does not present any contamination.

Boreholes with Afridev hand pumps are only likely to present problems due to the lack of involvement of user communities in their operation, maintenance and management. Hand pump repairs carried out by the government and that did not involve communities creates problems in relation to maintenance and repairs of these water points. The community tends to remain with negative attitudes of waiting to be donated what they need. Technical problems are isolated and usually due to poor construction of the borehole, possibly a result of poor supervision at the time.

Major problems identified in relation to hand-dug wells are:

1) Water point siting:

Water points are often located distant from the users and many are located close to one another in small areas.

2) Water quality:

Wells lined with 200 liter drums tend to adulterate the quality of the water turning it a rusty colour with a suspiciously bad taste due to their corrosion.

3) Infiltration of contaminated water:

Due to lack of aprons and drains on hand dug wells, the risk of contamination by contaminated water is high.

It is concluded that hand-dug traditional wells cave-in as a result of not having lids and only being partially lined. That is the lining is only at the surface and then at the bottom, often in the aquifer itself at depths of around 13 to 20 meters.

Bairros 4 and 5 in Munguine, the interior of Xirindza and part of Maluana, Barriga and Pateque village suffer from a scarcity of water, water carriers spending 30 – 40% of their time in a day collecting water. This is the result of bad site location in relation to the users. It is also the result of the small number of water points and their concentration in a small area with sometimes much less than one kilometer separating each.

At all water points where contributions are made, none were able to reveal the quantity of funds held and the people receiving the money, only mention the amount to be contributed, so that the accumulated values become a local secret. It was ascertained during the study that the secretaries and other influential people in these areas are the ones who keep the funds, and who do not demonstrate transparency in any of their activities, and no meetings are held to publicly verify and justify expenditures.

At all private hand-dug wells contributions are made, ranging from monthly payments to payments by the bucket (150 MT for approximately 20 liters in a bucket) at each visit to the well. Users are responsible for maintenance and repairs of the wells due to normal wear and tear, while the owner of the well is responsible for its initial construction.

It is concluded that the majority of boreholes are not very deep. As such, boreholes may operate for many years without breaking down. Consequently the operation, maintenance and repair groups (OMR) forget how to carry out the tasks of routine maintenance (o- and u- ring, and bush changes for example) and repairs.

5.3 Planning for the Future (Recommendations)

(1) Hydrogeological Potential

- Even if the phreatic fine sand aquifer in the dunes, can provide enough water for a hand pump, in order to avoid the sanding up of the borehole or turbidity of the water, it is recommended to drill a few meters into the deep aquifer and to tap only this deep aquifer.
- In the Incomati and its tributary valleys the hand-dug well is an appropriate technology, the water level being shallow. Nonetheless, in this area the groundwater presents a risk of contamination through direct infiltration, and therefore is not recommended without improvements in lining and headwork construction as well as sanitary and hygiene education
- To drill successful boreholes in the Incomati alluvial aquifer a geophysical survey is recommended in order to locate them correctly, the alluvial deposits being very heterogeneous.

(2) Water Supply and Sanitation

It is recommended that community participation and education facilitators (PEC) encourage people to take on the commitment and responsibility for their water points. For funds should be collected by OMR groups and kept in safe places such as in a bank account, and that all hand pumps have sets of spare parts for when these are needed (glue, a tube, washers and bushes). Communities should be made aware of the current costs of spare parts and the location of establishments selling these.

- A participatory appraisal is recommended prior to starting up any water supply project. This should include observations concerning local habits and customs as well as defining priorities in the area.

- Forming and training OMR groups at all community water points that do not have them is recommended, and at the same time refresher training carried out for existing groups with practical experience obtained from repairs and maintenance made at their own hand pumps.
- It is recommended that six new boreholes be constructed in the following locations:
  - One in Pateque old village,
  - One in Munguine Bairro 4,
  - One in Munguine Bairo 5,
  - Two in the interior of Xirindza near the boundary with Maluana and,
  - One in Barriga despite there being no co-operative members resident there, because the water points are not sufficient nor are they well located.
- It is recommended that project interventions should address the health risks of not having latrines, dish racks and effective solid waste disposal. Training for water and sanitation/hygiene promoters is recommended so that these are spread locally to carry out work among approximately fifteen neighbours, and expanding to others over time.
- To carry out interventions in an area it is necessary to involve the whole community, so that they participate in the identification of a location for a new water point, and strategies should be outlined that follow the criteria presented by the water policy.
  - Contributed resources should be pooled and managed transparently,
  - An official letter of agreement should be signed by all parties and honoured. This should show details of the obligations of the community and those of the project.
  - It would be an additional dynamic to include theatrical simulations in community training addressing the issues of accountability and pump repair, and the dangers of the lack of maintenance. If poorly maintained boreholes exist nearby, these should be visited.
  - Payment for water at all water points whether private of community / improved ones should be encouraged.
- It is recommended to line deep hand-dug wells with 200-liter drums or other resources to avoid caving in of the walls when the water level rises in the rainy seasons, to install lids and use the system for collecting water via a single bucket in order to minimise contamination.
- For the very shallow wells (0.5 to 2.5 meters deep) where the height of the top ring is less than 40 cm above the ground, the installation of lids is not recommended, since these are located in flood areas and at any moment may be threatened with total inundation.
- To improve water quality the 200-liter drum used to line the base of hand-dug wells may be painted with anti-corrosive paint. Lids may be installed as long as they are light and do not put unnecessary pressure on the precarious top lining.
- Community members using water from boreholes and shallow wells that currently produce water that is turbid and slightly organically contaminated should be encouraged to boil their water and filter it before drinking. They should also be urged to decant all water for other domestic uses.
- All investigations into causes of water point contamination, and actions to be taken as a result should be carried out with full consultation and joint decision-making with community members using the water points.

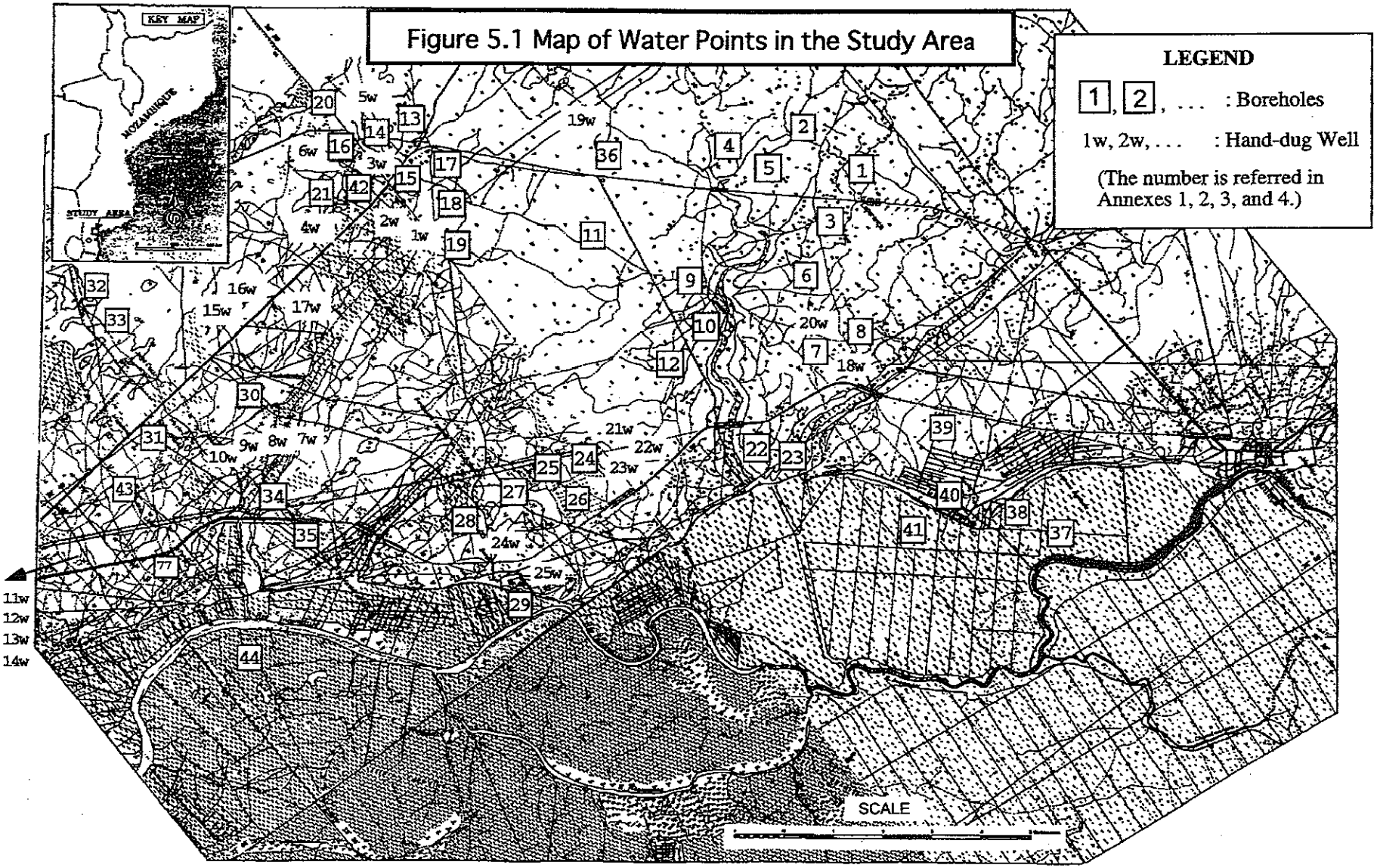


Figure 5.1 Map of Water Points in the Study Area
KEY MAP
MOZAMBIQUE
STUDY AREA
LEGEND
1, 2, . . . : Boreholes
1w, 2w, . . . : Hand-dug Well
(The number is referred in Annexes 1, 2, 3, and 4.)
SCALE

Table 5.1

Technical Data: Compilation of all boreholes studied in Maluana Administrative Post (field visits and/or secondary references)

Borehole code N°	Bairro	Exact Location	Community name	Coordinates		Means of verification	Year Const	Water point type	Means of raising water	Pump operation	Conserv apron	Owner b'hole	PH	CE (micS/cm)	Observations
				Long.	Latitude										
1	Pafeni	Esperan_a shops	Xerindza	32°43'.63	25 25' 79	Field visit	1994	borehole	Afridev hand pump	operational	good	state	6.3	328	Rehabilit. in 1999 - Geomoc (drilling company)
2			Pafeni	32°42'.18	25°26'00.	Field visit	1994	borehole	Afridev hand pump	operational	good	state	7.4	347	Rehabilitated in 1999 by Geomoc
3	Pafeni	Cuanine school	Xerindza	32°42'.66	25°26'.19	Field visit	1994	borehole	Afridev hand pump	operational	good	state	6.1	189	Rehabilitated in 1999 by Geomoc
4		Pafeni Km 64	Pafeni	32°41 55	25°26 55	DNA									
5	Pafeni		Xerindza	32°42'.19	25 26'.52	Field visit	1994	borehole	Afridev hand pump	*inoperational*	good	state			Rehabilitated in 1999 by Geomoc
6		Pafeni	Pafeni			Msc thesis L.C.									
7	Pfuxane	Cerra school	Xerindza	32°44'.47	25°27'.55	Field visit	1999	borehole	Afridev hand pump	operational	good	school	5.3	348	
8	Pfuxane	Catholic church	Xerindza	32°44'.65	25°27'.10	Field visit	2000	borehole	Afridev hand pump	not finished	good	church			Pump head still to be installed
9		Xerindza	Xerindza			Msc thesis L.C.									
10	Machichi	Xerindza shops	Xerindza	32°42'.91	25°27'.33	Field visit	1997	borehole	Afridev hand pump	operational	good	state	6.3	388	Rehabilitated in 1999 by Geomoc
11	Machichi		Xerindza	32°41'.61	25°28'50	Field visit	1994	borehole	Afridev hand pump	operational	good	state	5.9	251	Rehabilitated in 1999 by Geomoc
12	Machichi		Xerindza	32°43'.11	25°28'.64	Field visit	1996	borehole	Afridev hand pump	operational	good	state	6.1	325	Rehabilitated in 1999 by Geomoc
13		Maluana		32°39 00	25°29 50	DNA									
14	1_Bairro		Maluana	32°38'.99	25°29'.65	Field visit	1996	borehole	Afridev hand pump	operational	good	state	6.3	238	Never functioned, silted up
15		School	Maluana-vila	32°39'.13	25°29'.68	Field visit	1996	borehole	Afridev hand pump	operational	good	school	6.1	200	Rehabilitated in 1999 by Geomoc
16		Maluana	Maluana	32°38 93	25°29 75	DNA									
17		Maluana	Maluana			CES/Geomoc									Old India Mark II pump, broken
18	2_Bairro		Maluana	32°39'.45	25°29'.71	Field visit	1994	borehole	Afridev hand pump	operational	good	state	6.1	300	Rehabilitated in 1999 by Geomoc
19	2_Bairro		Maluana	32°40'.34	25°29'.60	Field visit	1994	borehole	Afridev hand pump	operational	good	state	5.5	156	Rehabilitated in 1999 by Geomoc
20	1_Bairro		Maluana-vila	32°38'.43	25°29'.83	Field visit	1994	borehole	Afridev hand pump	operational	good	state	7.2	337	Rehabilitated in 1999 by Geomoc
21		3 Bairro	Maluana	32°38'.44	25°29'.83	Field visit	1994	borehole	Afridev hand pump	operational	good	state	7.2	377	Rehabilitated in 1999 by Geomoc
22		Refugee camp	Munguine	32°44 83	25°28 60	Field visit									
23		Refugee camp	Munguine	32°44 98	25°28 63	Field visit									
24	2° Bairro	School	Munguine	32°43'.01	25°30'.62	Field visit	1996	borehole	Afridev hand pump	*inoperational*	good	school		-	Broken down one week prior to visit
25		Hospital	Munguine	32°43'.58	25°30'.59	Field visit	1996	borehole	Afridev hand pump	operational	good	health post	6	248	Rehabilitated in 1999 by Geomoc
26	1° Bairro		Munguine	32°43'.93	25°30'.86	Field visit	1996	borehole	Afridev hand pump	operational	good	state	5.5	263	Rehabilitated in 1999 by Geomoc
27	2°Bairro		Munguine	32°43'.54	25°31'.04	Field visit	1997	borehole	Afridev hand pump	*inoperational*	good	state			Silted up, removed pump head
28		Munguine	Munguine	32°43 47	25°31 48	DNA									Dry, hand pump removed
29		Munguine	Munguine	32°44 35	25°31 72	DNA									Very high discharge requires checking)
30			Musutho	32°38'.20	25°33'.41	Field visit	1994	borehole	Afridev hand pump	operational	good	state	6.8	218	One repair by community
31		School	Pateque	32°38'.35	25°33'.48	Field visit	2000	borehole	Afridev hand pump	operational	good	school	7.2	188	Operated 4 days, & broke down. Community repaired.
32		Sr Cossa camp	Barriga	32°41'.97	25°33'.15	Field visit	1997	borehole	windmill	operational	no apron	private	6.1	327	Private for cattle
33		Sr Cossa camp	Barriga	32°42'.23	25°32'.95	Field visit	1996	borehole	Afridev hand pump	operational	good	private	8	311	Private for drinking and domestic use
34		Catholic church	Matchovane	32°40'.86	25°28'.04	Field visit	2000	borehole	Afridev hand pump	not finished	good	church			Hand pump to be installed
35		School	Matchovane	32°41'57	25°33'15	Field visit	2000	borehole	Afridev hand pump	operational	good	school	7.3	192	Rehabilitated in 1999 by Geomoc
36	Machichi	Tavira school	Xirindza	32°42'58	25°27'01	Field visit	1999	borehole	Afridev hand pump	operational	good	school	6.6	182	Rehabilitated in 1999 by Geomoc
77		Catholic church	Pateque Aldeia	32°42'.94	25°33'.36	Field visit	2000	borehole	Afridev hand pump	operational	good	church			Installed and locked until hand over by bishop
99		Pafeni	Pafeni			Field visit	1994	borehole	Afridev hand pump	*inoperational*	good	state			Broken rods

Table 5.2

Management Data: Compilation of all boreholes studied in Maluana Administrative Post (field visits and/or secondary references)

Borehole code N°	Bairro	Exact Location	Community name	Coordinates		Means of verification	Year Const	Pop:source Average dist. (m)	Type pump	OMR group op.	Contribution / month	Funds existing/Mts	Observations
				Long.	Latitude								
1	Pafeni	Esperan_a shops	Xerindza	32°43'.63	25 25' 79	Field visit	1994	500	Afridev	yes	3,000.00		Rehabilitated in 1999 by Geomoc
2			Pafeni	32°42'.18	25°26'00.	Field visit	1994	800	Afridev	yes	3,000.00	50,000.00	Rehabilitated in 1999 by Geomoc
3	Pafeni	Cuanine school	Xerindza	32°42'.66	25°26'.19	Field visit	1994	1,000	Afridev	yes	1,000.00		Rehabilitated in 1999 by Geomoc
4		Pafeni Km 64	Pafeni	32°41 55	25°26 55	DNA							
5	Pafeni		Xerindza	32°42'.19	25 26'.52	Field visit	1994	1,000	Afridev	yes			Rehabilitated in 1999 by Geomoc
6		Pafeni	Pafeni			Msc thesis L.C.							
7	Pfuxane	Cerra school	Xerindza	32°44'.47	25°27'.55	Field visit	1999	1,000	Afridev	yes	5,000.00		
8	Pfuxane	Catholic church	Xerindza	32°44'.65	25°27'.10	Field visit	2000	1,000	Afridev	yes	-		Hand pump to be installed
9		Xerindza	Xerindza			Msc thesis L.C.							
10	Machichi	Xerindza shops	Xerindza	32°42'.91	25°27'.33	Field visit	1997	500	Afridev	yes	3,000.00		Rehabilitated in 1999 by Geomoc
11	Machichi		Xerindza	32°41'.61	25°28'50	Field visit	1994	1,500	Afridev	yes	5,000.00		Rehabilitated in 1999 by Geomoc
12	Machichi		Xerindza	32°43'.11	25°28'.64	Field visit	1996	1,500	Afridev	yes	5,000.00	500,000.00	Rehabilitated in 1999 by Geomoc
13		Maluana		32°39 00	25°29 50	DNA							
14	1° Bairro		Maluana	32°38'.99	25°29'.65	Field visit	1996	0	Afridev	none	none		Never operational, silted up
15		School	Maluana-vila	32°39'.13	25°29'.68	Field visit	1996	500	Afridev	none	none		Rehabilitated in 1999 by Geomoc
16		Maluana	Maluana	32°38 93	25°29 75	DNA							
17		Maluana	Maluana			CES/Geomoc							Old India Mark II pump, broken
18	2° Bairro		Maluana	32°39'.45	25°29'.71	Field visit	1994	500	Afridev	none	none		Rehabilitated in 1999 by Geomoc
19	2° Bairro		Maluana	32°40'.34	25°29'.60	Field visit	1994	500	Afridev	yes	none		Rehabilitated in 1999 by Geomoc
20	1° Bairro		Maluana-vila	32°38'.43	25°29'.83	Field visit	1994	500	Afridev	none	none		Rehabilitated in 1999 by Geomoc
21		3° Bairro	Maluana	32°38'.44	25°29'.83	Field visit	1994	1,000	Afridev	yes	2,000.00		Rehabilitated in 1999 by Geomoc
22		Refugee camp	Munguine	32°44 83	25°28 60	Field visit							
23		Refugee camp	Munguine	32°44 98	25°28 63	Field visit							
24	2° Bairro	School	Munguine	32°43'.01	25°30'.62	Field visit	1996	500	Afridev	yes	5,000.00		Broken down for one week
25		Health centre	Munguine	32°43'.58	25°30'.59	Field visit	1996	500	Afridev	yes	5,000.00		Rehabilitated in 1999 by Geomoc
26	1° Bairro		Munguine	32°43'.93	25°30'.86	Field visit	1996	1,000	Afridev	yes	5,000.00	760,000.00	Rehabilitated in 1999 by Geomoc
27	2° Bairro		Munguine	32°43'.54	25°31'.04	Field visit	1997	0	Afridev		-		Silted up, removed pump head
28		Munguine	Munguine	32°43 47	25°31 48	DNA							Dry, hand pump removed
29		Munguine	Munguine	32°44 35	25°31 72	DNA							Very high discharge requires checking)
30			Musutho	32°38'.20	25°33'.41	Field visit	1994	2,000	Afridev	yes	3,000.00		One repair by community
31		School	Pateque	32°38'.35	25°33'.48	Field visit	2000	1,500	Afridev	none	5,000.00	300,000.00	Operated 4 days, & broke down. Community repaired.
32		Sr Cossa camp	Barriga	32°41'.97	25°33'.15	Field visit	1997	4,000	Wind pump	none	-		Private for cattle
33		Sr Cossa camp	Barriga	32°42'.23	25°32'.95	Field visit	1996	4,000	Afridev	none	-		Private for drinking and domestic use
34		Catholic church	Matchovane	32°40'.86	25°28'.04	Field visit	2000	1,000	Afridev	yes	-		Hand pump to be installed
35		School	Matchovane	32°41'97	25°33'.15	Field visit	2000	2,000	Afridev	yes	2,000.00		Rehabilitated in 1999 by Geomoc
36	Machichi	Tavira school	Xirindza	32°42'58	25°27'01	Field visit	1999	1,500	Afridev	yes	-		Rehabilitated in 1999 by Geomoc
77		Catholic church	Pateque Aldeia	32°42'.94	25°33'.36	Field visit	2000		Afridev	none			Installed and locked until hand over by bishop
99		Pafeni	Pafeni			Field visit	1994		Afridev	none			Broken rods

Table 5.3

Locations where Water Samples were collected - Maluana / Munguine Water Point Inventory and tested at the Aguas de Moçambique Laboratory (Full Chemical Analysis - September 2000)

Borehole / h-dug well No	Location	Coordinates Locality	Water point type	Sample Code	Potability and chemical analysis results
11	Xerindza on the Munguine road	32°41'.61 25°28'.50	Borehole	0.10	Low mineralization and very soft. Acid. Requires neutralization and bacteriological testing.
12	Xerindza on the Malunguine road	32°43'.11 25°28'64	Borehole	0.09	Slightly mineralised and very soft. Turbid, acid, high ammonia content and much organic material. Not Potable.
15	Maluana - School	32°39'.13 25°29'.68	Borehole	0.13	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
18	Maluana - behind the charcoal market	32°39'.45 25°29'.71	Borehole	0.18	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
25	Munguine - Hospital	32°43'.58 25°30'.59	Borehole	0.01	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
26	Munguine 1° Bairro boundary with 4° Bairro	32°43'.93 25°30'.86	Borehole	0.02	Slightly mineralised and very soft. Very high turbidity. Requires chemical treatment and bacteriological exam.
31	Pateque primary school	32°39'.95 25°33'.74	Borehole	0.24	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
30	Musutho	32°40'.19 25°32'.82	Borehole	0.22	Slightly mineralised and very soft. Turbid with sediment. Requires decanting / filtration. Requires bacteriological exam.
35	Matchovane school	32°41'97 25°33'15	Borehole	-	Slightly mineralised and very soft. Indication of organic contamination. Recommend bacteriological analysis.
77	Pateque church	32°40'.86 25°28'.04	Borehole	0.35	Slightly mineralised and very soft. High turbidity and indication of organic contamination. Recommend chemical treatment.
4w	Maluana - D° Augusta bus stop	32°39'.43 25°30'.94	Hand dug well	0.16	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
10w	Pateque mosque	32°41'.55 25°34'.07	Hand dug well	-	Slightly mineralised and very soft. High turbidity and indication of organic contamination. Recommend chemical treatment.
15w	Musutho: Close to the highway EN1 at Oliveira bus control point	32°39'.74 25°33'.74	Hand dug well	0.20	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
21w	Munguine: From the station in the direction of Chinese camp	32°44'.46 25°29'.00	Hand dug well	0.19	Slightly mineralised and very soft. Chemically potable with a little organic contamination.
23w	Munguine	32°44'.81 25°30'.03	Hand dug well	0.08	Slightly mineralised and very soft. Chemically potable with a little organic contamination.

Table 5.4

Water Sample Results - Maluana / Munguine Water Point Inventory Tested at the Aguas de Moçambique Laboratory

(Full Chemical Analysis - September 2000)

Borehole / h-dug well No	Water point type	Sample Code	Turbidity NTU	Temperature ° C	pH	Electrical resistivity OHMxCM	Electrical conductivity Micro-MHO/CM	Chlorate mg/dm³	Sulphate mg/dm³	Carbonate mg/dm³	Bicarbonate mg/dm³	Nitrate mg/dm³	Nitrite mg/dm³	Ammonium mg/dm³	Calcium mg/dm³	Magnesium mg/dm³	Iron mg/dm³	Sodium + Potassium mg/dm³	Organic material mg/l	Silica mg/l	Total Hardness	Alkalinity mg/l Ca CO^3	Mineralisation mg/l
11	Borehole	0.10	0.46	22.30	5.60	3484.32	287.00	101.42	2.60	0.00	6.10	0.00	0.00	0.00	1.20	11.47	0.00	46.25	1.04	15.50	5.02	5.00	184.54
12	Borehole	0.09	10.70	22.30	4.40	2481.39	403.00	124.11	7.60	0.00	0.00	0.00	0.00	4.25	8.02	11.22	0.04	48.26	86.00	16.00	6.61	0.00	219.50
15	Borehole	0.13	4.19	20.40	6.40	3846.15	260.00	67.37	15.00	0.00	26.85	0.80	0.00	0.02	2.40	3.90	0.10	51.06	1.44	53.00	2.20	22.00	220.00
18	Borehole	0.18	1.93	20.40	6.80	2590.67	386.00	127.66	15.00	0.00	139.13	0.00	0.00	0.00	3.21	18.06	0.20	104.41	0.64	14.50	8.23	114.00	422.17
25	Borehole	0.01	0.53	20.40	6.40	3215.43	311.00	56.74	2.50	0.00	12.20	1.70	0.00	0.05	2.81	6.10	0.00	28.40	0.64	40.00	3.21	10.00	150.50
26	Borehole	0.02	0.32	22.30	6.00	3012.05	332.00	101.42	2.00	0.00	6.10	5.52	0.00	0.00	3.05	10.35	0.00	48.01	0.80	16.50	5.02	5.00	192.95
30	Borehole	0.22	12.20	20.40	6.10	3745.00	267.00	85.10	11.50	0.00	13.42	0.00	0.00	0.02	3.21	7.81	0.20	47.12	0.96	14.50	4.01	11.00	182.88
31	Borehole	0.24	199.00	22.30	6.10	5714.29	175.00	55.32	4.40	0.00	8.54	1.12	0.00	0.18	2.65	6.69	0.15	25.57	1.36	13.00	3.41	7.00	117.62
35	Borehole	-	2.64	24.30	7.40	4366.81	229.00	42.55	11.60	0.00	63.46	1.55	0.03	0.06	4.81	7.32	0.00	38.22	0.88	50.00	4.21	52.00	219.60
77	Borehole	0.35	75.70	24.30	7.30	4347.83	230.00	39.01	20.00	0.00	63.46	1.50	0.03	0.09	4.81	14.64	0.11	24.92	0.96	65.00	7.22	52.00	233.51
4w	Hand dug well	0.16	6.18	20.40	6.95	2207.51	453.00	120.56	13.00	0.00	35.39	6.08	0.03	0.00	11.62	5.37	0.02	76.53	1.44	12.50	5.11	29.00	291.10
10w	Hand dug well	-	15.70	24.30	7.40	5649.72	177.00	47.87	18.60	0.00	19.53	1.30	0.03	0.06	0.80	8.30	0.03	31.10	2.00	20.75	3.61	16.00	148.57
15w	Hand dug well	0.20	8.20	20.40	7.00	2840.91	352.00	95.74	17.00	0.00	24.90	1.60	0.00	0.00	10.02	6.10	0.20	57.01	1.20	15.00	5.01	20.40	227.57
21w	Hand dug well	0.19	6.24	22.30	7.40	2525.25	396.00	92.20	5.60	0.00	58.58	4.00	0.01	0.00	27.25	7.81	0.00	40.00	1.28	14.00	10.01	48.00	249.45
23w	Hand dug well	0.08	5.14	22.30	6.75	3412.97	293.00	60.28	7.00	0.00	41.49	5.40	0.03	0.00	16.30	5.86	0.00	30.63	1.04	13.00	6.41	34.00	179.72

6. Agricultural Production and Marketing

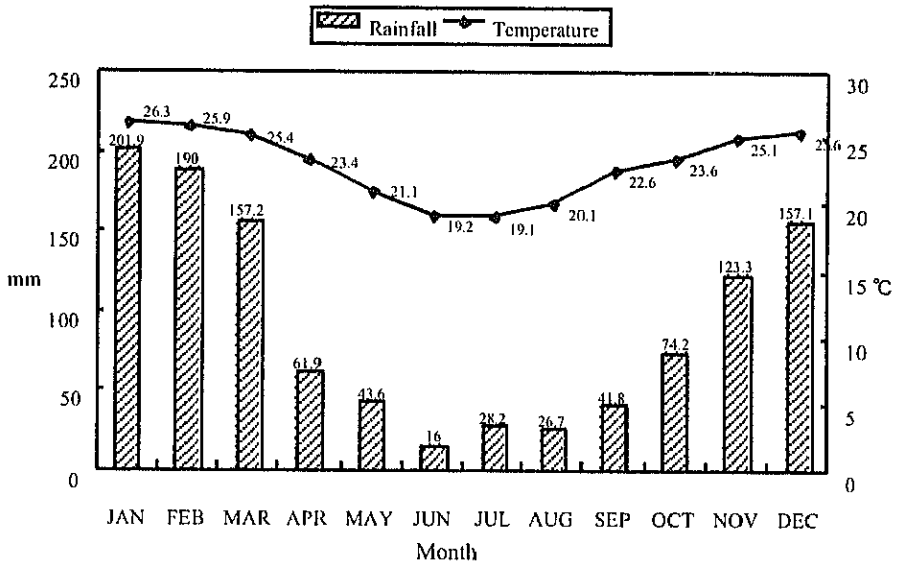
6.1 Current Situation in the Study Area

6.1.1 Agricultural Production

(1) Meteorological Condition

Meteorology of the southern part of Mozambique including the Study Area is classified as semi-arid. As shown in Figure 6.1, climate is temperate throughout the year, and there are clearly two seasons based on the rainfall. Annual mean temperature is 23.1℃: July is the coolest at 19.1℃; and January is the warmest at 26.3℃. The dry season usualy lasts for five months from June to October, while the rainy season is from November to May. Annual mean rainfall from 1990 to 1999 ranged from 543.0 mm to 1,835.9 mm. Its erratic rainfall causes unstable agricultural production in the Study Area.

Figure 6.1 Meteorological Data (Manhiça Station, 1990-1999)



(2) Soil

There are obvious differences in soil condition between the highland and the lowland. The highland with 30 to 40 m above sea level is composed of sandstone deposited in the Cenozoic era. Topsoil is covered with sandy loam which contains few organic matters. On the other hand, the lowland along the Incomati River is covered with alluvium which is suitable for agriculture. Soil is so clayey that it is difficult to plow in the dry season because of the hardness of soil.

(3) Land Use

The lowland has been cultivated for crops such as maize, root crops, beans and so on. During Portuguese colonial era, some Chinese grew paddy rice in the lowland, but now nobody grows it due to breakdown of irrigation facilities. Village organizatiuons manage the lowland fields, except some private land owned by one Chinese and a few Mozambicans. Small farmers acquire a right to cultivate a piece of lowland through village organizations. The average farm size for small farmers is around 0.5 ha. Although all fields managed by village organizations are distributed to the members, only 30 to 40 % of the farmland is under cultivation.

The most part of highland is covered with bush which is a source of firewood. The villagers' residences and public facilities are located in the highland. Farmers usually cultivate about 0.1 to 1.0 ha of the highland field around their residence. These highland fields including the residencial area are distributed to the villagers based on the traditional law.

(4) Agricultural production

Farming in the Study Area is mainly subsistence farming. Major food crops cultivated are maize, cassava, sweet potato, beans (cowpea, groundnut), vegetables (leafy cabbage, onion, tomato, squash). As to cash crops, banana and sugarcane are main crops, but these perennial crops were destroyed in 2000 due to the flood of the Incomati River. Banana was replanted with the assistance of ActionAid UK.

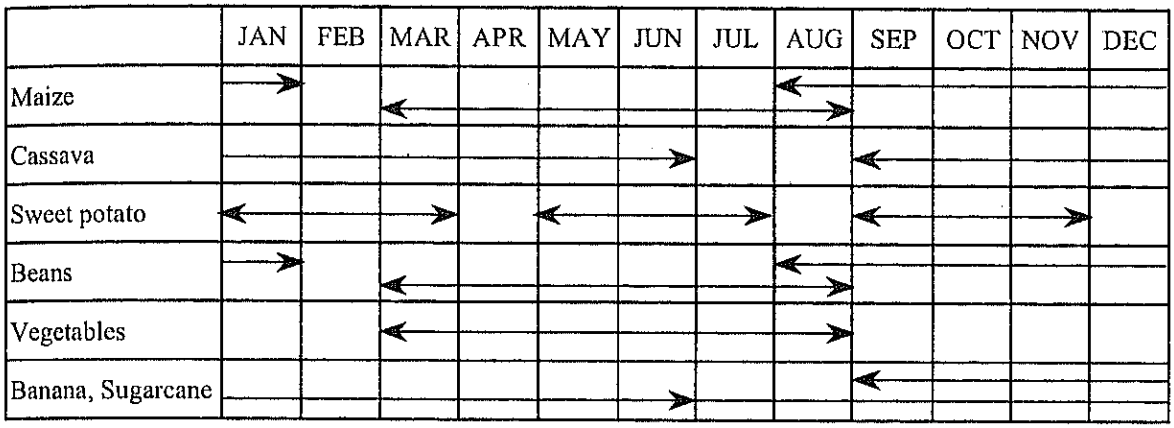
1) Cropping pattern

Although agricultural production is principally based on rainfall, two harvests a year is available in the lowland due to its high contents of soil mositure fed with shallow groundwater. If rainwater is enough, it is possible to cultivate some crops with short grown period, such as sweet potato, three times a year. On the other hand, in the highland, cultivation is limited to once a year during the rainy season.

Farmers generally prefer intercropping to single cropping. Beans are planted with maize or cassava. Sweet potato and vegetables are planted in a small plot. Banana and sugarcane which are perennial crops are planted on the boundary of the filed in order to prevent root competition with other crops. They can be harvested eight to ten months after planting. As to banana, it is possible to harvest every month after maturity. Although sugarcane can also be harvested anytime after maturity, the best harvesting time is June or July in order to enjoy the high sugar contents.

Typical cropping pattern is shown in Figure 6.2. Farmers can start cultivation by sowing in the lowland fields whenever they want, because of the moderate climate and high moisture contents of the soil. In other words, this fact shows that they often cultivate at inappropriate time with regardless of plant physiology, thus, resulting in low productivity.

Figure 6.2 Cropping Pattern of the Major Crops



2) Farming practice

Farming in the Study Area is extensive; main farming practices are land preparation, planting, weeding and harvesting. Input materials for production, such as fertilizer, chemicals and certified seeds except vegetables, are rarely used; this is due to lack of knowledge and capital as well as inaccessibility to the agent to sell them.

Among farming practices, land preparation is the heaviest burden for farmers, especially women, because they plow their fields by using a hoe with a small edge. Farmers can also rent a tractor from the Union or an agent in Manhiça town, but it costs 60,000 to 80,000 MT for plowing one block (around 0.1 ha) of the land. Tractors owned by the Union are out of order and unavailable now.

Although no fertilizers including manure are applied, the soil in the lowland is kept fertile because of organic matters delivered from upstream of the Incomati River, practice of mixed culture with leguminous crops and plowing residues of crops into soils after harvesting. In the highland, farmers burn their fields before plowing in order not only to save the labor for land preparation but also to supply some nutrients; however, this practice is prohibited strictly by the law.

During the growing period, weeding by hand is a main farming practice. Pests and diseases control is seldom conducted, although there are some damages caused by the corn borer, armyworm and rat.

3) Yield

There is no official nor farmers' record of the yield of subsistence farming. For this reason, it is difficult to grasp actual yields in the Study Area, so the provincial statistics are referred in Table 6.1.

Table 6.1 Yield of the Major Crops

Unit: ton/ha/cropping

Crop	Current Yield	Potential Yield
Maize	0.5	5.0
Cowpea	0.1	1.0
Groundnut	0.2	1.5
Cassava	3.2	10.0
Sweet potato	2.3	7.0
Tomato	8.4	15.0
Onion	2.7	20.0
Other vegetables	7.3	12.0

Source: Provincial Directorate of Agriculture, Maputo (1997-98)

Current yields are very low as compared to the genetic potential of the varieties small farmers use, which may be due to lack of appropriate infrastructure, heavy soils in the lowland, poor soils in the highland, erratic rainfalls, limited labor for farming, lack of capital to buy inputs, poor quality of seeds and pests and diseases. However, farmers can maintain their food for household which consists of five to eight members on average, if there is no calamity such as floods or droughts.

4) Post harvest

Grains of maize and beans for home consumption are stored in the warehouse, the floor of which is 1.0 to 1.5 m high above the ground. Cassava, sweet potato and vegetables are kept in the field and harvested only when there is a need for consumption or marketing.

Banana and sugarcane which are perishable crops are sold to middlemen or brought to markets immediately after harvesting. These cash crops are not selected, stored nor processed for selling. However, some sugarcane whose size and quality is not suitable for selling is used as ingredient for a local wine, which is called "Simowane".

(5) Extension Services

National Directorate for Rural Extension in the Ministry of Agriculture and Rural Development has a national responsibility for extension services to farmers. They place Provincial Agricultural Services (SPERs) in all ten provinces and employ approximately 700 extension workers nationwide. However, 80 % of all extension workers are temporary employees. Manhiça District Office once employed 15 extension workers when implementing a rural development project funded by the Italian government (1986-1988), but now only five extension workers cover the whole district. There are seven farmers in the Study Area who attended a training course for extensioninsts in Boane Agricultural Institute, an educational organization under the Ministry of Education. However, they could not play a role as extensionist, nor they ever practiced what they learned during the training, due to the inapproapriate training contents using modern agricultural inputs which are often inaccessuble for small farmers in

the rural area, and the lack of the follow-up after the training. For these reasons, farmers in the Study Area have not receive sufficient and continuous extension services from the government.

6.1.2 Agricultural Marketing

(1) General

Manhiça town is the capital of Manhiça District, and located around 13 km north from the center of Munguine. Although there is a public market in Manhiça town, agricultural produces in the Study Area are seldom sold in this market, because the scale of the market is small and most produces in the Study Area are brought to Maputo City, Xai Xai or Chokwé. Among them, Maputo City, being the biggest capital city, is the main target for marketing agricultural produces of the Study Area.

In spite of advantage of the location that the Study Area is situated within the rage of 60 km from Maputo, agricultural produces in the Study Area are distributed mainly through middlemen who come from Maputo City, because farmers in the Study Area do not have transportation means. Some farmers transport their produces by train, which operates to Maputo City twice a day, and sell the produces directly to merchants in the market in Maputo City.

Farmers trade with middlemen without any contract and do not have any appointed middlemen. Farm-gate prices are 50 to 80 % lower than the retail prices. Farm-gate prices of the major crops for selling in the Study Area are shownin Table 6.2.

Table 6.2 Farm-gate Prices of the Major Crops

Unit; MT

Crop	Farm-gate price	
Cassava	80,000~150,000	/sack*
Sweet potato	50,000~80,000	/sack
Banana	3,000~5,000	/bunch
Sugarcane	500~1,000	/shoot

Source: Interviews with farmers

*1 sack = 100 cm length × 50 cm width

(2) Marketing Survey

In order to clarify the current distribution system of agricultural produces in Maputo City, a marketing survey was conducted through the collection and analysis of information from available documents, and interviews with official staff, trading agencies and farmers.

1) Distribution system in Maputo City

a. Perishable Crops (vegetables and banana)

Perishable crops, such as vegetables and banana, in the Maputo markets are supplied from different domestic production areas: mainly from the districts of Manhiça, Moamba, Matutuine and Marracuene (Maputo Province), from Chokwé (Gaza Province), and imported from South Africa.

Before the liberalisation of the economy in the late 1980's, all vegetables brought to Maputo market from both internal and external sources were centralized in a big company called Hotofruticola located near the central market. This company was responsible for making the distribution to retailers such as individual traders in markets or to boarding schools, hospitals and military centers.

Mozambique exported banana to South Africa before the independence. However, it is difficult to resume export of banana at present, because the commercial production which was done by the private sector has been discontinued. Additionally, South Africa now seems to be producing enough banana to meet its domestic demand.

After the liberalization, current distribution system basically consists of the following three mechanisms:

- Producers bring their produces to Maputo City mainly to the central market or to Fajardo market, where they sell directly to retailers or by consignment to permanent traders.
- The retailers go to production zones and buy at farm gate with relatively low prices and bring them to different markets for retail or on consignment basis.
- Vegetables, specially tomato, onion and cabbage, are often brought from South Africa to Maputo City, especially Fajardo market, and sold directly either to the consumers or to retailers.

b. Green maize

Almost all the maize produced in Marracuene, Boane, Manhiça, Moamba including Chokwé is sold in Maputo City as green maize for roasting or boiling at fresh. Green maize is sold to the consumers directly or by consignment. There is no import of green maize from South Africa or Swaziland.

c. Maize flour

Maize flour is mainly imported from South Africa although some are milled at Socimol factory (in Maputo City) and Inácio de Sousa factory (in Palmeira, Manhiça District). Little maize flour is produced from the nationally produced maize for three reasons: i) the production of maize around Maputo City has not been enough to feed the industry; ii) it is not economically viable to bring surplus maize from the central and the northern provinces of the country to meet the needs of Maputo industry due to the high transportation cost; and iii) the quality of maize produced around Maputo City is low.

d. Cassava and sweet potato

Cassava and sweet potato are generally sold as fresh produces in the Maputo markets. Cassava can also be found in a form of flour or roasted coarse flour locally known as "rale" mainly brought from the Inhambane province. Farmers harvest these produces and they sell them directly to the consumers in Maputo City or to retailers who transport to different markets in Maputo City where the produces are sold either directly to the consumers or on a consignment basis.

e. Sugarcane

Sugarcane distribution system comprises two major categories. The first system is that the big to medium private farmers sell the sugarcane to the sugar factory in Maragra on a contract basis. The second system is that small-scale farmers sell their produces directly to the consumers, just for chewing, making soft and fermented drinks, distillating liquor for their own consumption, or for hiring labor for some agricultural operations or for social ceremonies.

f. Livestock

The distribution of livestock is mostly done by the private sector whose transportation and slaughterhouse are subject to inspection and licensing by the government. Beef meat is sent to slaughterhouses, while the other kinds of livestock such as chickens, goats and pigs are generally slaughtered by the consumers.

Families traditionally sell their cattle when there is a specific need in the family or they have to organize an important ceremony such as a marriage and a funeral. The prices of animals are often determined by current needs of the seller and not based on the value of the animal sold. Sometimes prices are also affected by the pressure which occurs from an explosion of endemic diseases, especially in the rural areas where veterinary treatment is scarce. In this case, the farmer wants to minimize the loss by selling the animals as qucikly as possible, even the prices of animals are quite low.

2) Price fluctuation

According to Table 6.3, seasonal price fluctuation of selected vegetables can be grouped in two main periods: a dry season from June to October, and a rainy season from November to May. However, the figures in Table 6.3 have to be taken with caution and considered just as indicative, because it was not possible to get accurate prices throughout the year.

a. Dry season (June to October)

This is a period when the supply tends to exceed the demand. Generally, heavy rainfall tends to cease from March to April and temperature begins to be relatively cooler which favour the production of most of vegetables and maize. Therefore, most farmers can produce at relatively lower costs. As a result, prices tend to be low due to higher competition. During this period, very little produces are

imported from South Africa, unless there are commitments with a specific market/organisation such as Shoprite.

b. Rainy season (November to May)

If the rain is intense or temperature is high, vegetables can be severely damaged or completely lost. Therefore, farmers have a risk to cultivate vegetable in this period, unless they have a good land location, a good source of water as well as a good control of pests and diseases. Only few farmers are prepared and willing to take this risk. As a result, the domestic supply of the produces is weak, and, therefore, inflow of produces from neighboring countries, especially South Africa, tends to increase.

Table 6.3 Price Fluctuation for Selected Vegetables in 1998-2000*

Unit: MT/kg

	Tomato			Onion			Cabbage		
Month	F-G	M-M	RL	F-G	M-M	RL	F-G	M-M	RL
JAN	SA	6,500	10,000	2,500	3,000	4,000	3,000	4,000	6,000
FEB	SA	6,500	10,000	2,500	3,000	4,000	3,000	4,000	6,000
MAR	5,000	5,500	7,000	2,500	3,000	3,500	1,500	2,000	4,000
APR	5,000	5,500	7,000	2,500	3,000	3,500	1,500	2,000	4,000
MAY	5,000	5,500	7,000	2,500	3,000	3,500	1,500	2,000	4,000
JUN	2,500	2,500	3,000	1,500	2,000	2,500	1,000	1,500	2,000
JUL	2,500	2,500	3,000	1,500	2,000	2,500	1,000	1,500	2,000
AUG	2,500	2,500	3,000	1,500	2,000	2,500	1,000	1,500	2,000
SEP	2,500	2,500	3,000	1,500	2,000	2,500	1,000	1,500	2,000
OCT	2,500	2,500	3,000	1,500	2,000	2,500	1,000	1,500	2,000
NOV	SA	6,500	10,000	2,500	3,000	4,000	3,000	4,000	6,000
DEC	SA	6,500	10,000	2,500	3,000	4,000	3,000	4,000	6,000

Source: traders in the Central and Fajardo markets (August 2000)
*: Period of flooding in early 2000 is not included
Note: F-G: Farm-gate; M-M: Middleman; RL: Retailer; SA: South Africa (import).

6.2 Potentials and Constrains

Food security in the Study Area has been barely achieved under the situation that production is influenced by erratic rainfalls. This is because there are some suitable conditions for agricultural production; moderate climate, plenty of land resources with fertile soil and so on. Farmers, especially women, are also diligent with a desire to improve productivity and their livelihood. Additionally, the Study Area is located around 60 km north of Maputo City which has a large number of consumers, and there are a high opportunity to sell their produces in Maputo City. Despite the high potential for agricultural production and marketing, their advantages are not fully utilized so far. Problems and constrains related to agricultural production and marketing can be considered as follows:

1) Agricultural production

- Lack of cattle or tractors for land preparation which causes a low cropping rate of fields
- Lack of knowledge for appropriate low external input agricultural techniques which can be implemented without buying any external inputs

- Poor drainage in some part of the lowland, and low soil fertility in the highland
- Mismanagement of farming practices leading to low productivity
- Insufficient network of extension service

2) Agricultural marketing

- Inaccessibility to market due to lack of transportation
- Irregular collection by middlemen
- Lack of mind and strategy for marketing
- Low competitive power against both domestic and foreign production areas regarding the quality and the price
- Lack of storage facilities, lack of experience and skills for grading and processing

6.3 Planning for the Future

Based on the analysis of the result of PRA and supplementary survey, the following are recommended to develop agriculture and marketing in the Study Area:

Flood in early 2000 damaged the production system seriously. Banana and sugarcane, which are the major income sources for the local pouplation, were destroyed completely. The floods also influenced production of food crops, because seed grains of some food crops, which need to be stored for the next cropping season, were consumed as food. Efforts should be concentrated on the recovery from damages made by the flood and the establishment of stable production and marketing system with the following strategies:

- To increase the agricultural productivity by using appropriate low external input agriculture techniques which do not need expensive inputs.
- To cultivate more land using animal traction.
- To secure the seeds for the next cropping season by establishing a seed bank in the community.
- To establish a regular marketing channel with middlemen on the contract basis.

7. Agricultural Infrastructure

7.1 General

The Study Area could geographically be divided into two areas, namely lowland area and highland area. The lowland area spreads on the right bank flood plain of the Incomati River. The topography of the lowland area is flat with the ground elevations of around 3 to 7 meters (m) above mean sea level (MSL). The lowland area is further divided into two sub-areas for the Study purpose: the upstream lowland and the downstream lowland.

The highland area is situated in the western part of the Study Area being covered with clear forests and shrubs, and the area is used mainly as residential lots and small- scale farmland, scattering over the highland area of about 86 square kilometers (km^2). Being located on the inland dunes, the ground elevations of the highland vary from 20 to 40 m above MSL, excepting hills (referred to as Munguine hill) having a top elevation of 82 m above MSL, foot hills of which divide the lowland area into 2 sub areas as mentioned above.

Most of the lowland area is being utilized for farming purpose by the villagers resident in Munguine and Pateque localities. Main crops include maize, banana, cassava, sugarcane, beans, and groundnuts and so on. Gross land area of the lowland approximated to 1,920 hectares (ha), 1,250 ha for the upstream lowland area and 670 ha for the downstream lowland area.

The topographic maps reproduced in 1965 and 1998 with the scale of 1/50,000 and the contour intervals of 20 meters are available for the Study. Aerial photographs used to prepare the topographic maps were taken in 1989 and 1958 for the upstream lowland area and in 1989 for the downstream lowland area.

7.2 Existing Agricultural Infrastructure

Main agricultural infrastructure in the Study Area includes dikes, canals and drainage outlets to the Incomati River and roads. The present situation of the existing agricultural infrastructure is presented below.

7.2.1 Dike

(1) General

The dike construction was initiated during the colonial period in order to protect plantations operated in the fertile lowland areas from flooding, main crops being sugarcane, banana and paddy. The existing flood protection dikes with a total length of 15.2 kilometers (km) could be divided into three sections: section 1 with a length of 4.4 km; section 2 with a length of 7.7 km; and section 3 with a length of 3.1 km. Outlines of the flood protection dikes are given in Table 7.1.

Table 7.1 Flood Protection Dike

Section	Length (km)	Top Width (m)	Height (m)
1	4.4	5-6	3-5
2	7.7	3-4	1-4
3	3.1	1-2	0.5-1
Total	15.2	-	-

With the dikes of section 1 and 2, about 1,010 ha of farmland in the upstream lowland area is protected from flooding of the Incomati River except for extreme high floods like in 2000. The remaining 910 ha of farmland in the upstream lowland is situated outside the dikes, being subject to frequent inundation of the river flooding. In the downstream lowland area, there is no flood dike system for flood protection along the Incomati River; thus, farmland of 670 ha suffers from flooding of the Incomati River.

(2) Dike section 1

The dike section 1 forms the northern boundary of the Study Area, starting from the foot of the highland and running in the eastern direction to reach the right bank of the Incomati River at the drainage pumping station of the Maragra sugarcane plantation. In the north of the dike section 1, vast sugarcane plantation is developed with irrigation and drainage systems. The embankment slopes of the dikes, near the drainage pumping station, were slid down for a length of about 50 meters by floods occurred in February and March 2000. The company undertook the rehabilitation works of the damaged dikes and the works were completed in September 2000.

The elevations of dike vary from 14 meter above MSL at the foot of the highland to 10 meters above MSL near the Incomati River. This dike section is well maintained, and the dike is being used as access roads to Maragra drainage pumping station. Four-wheel drive vehicles are passable even in the rainy season.

(3) Dike section 2

The dike section 2 was constructed approximately in parallel with the Incomati River for the reach between the end of the dike section 1 and the foot of the Munguine hill that faces the Incomati River. The total length of the section is 7.7 km and the dike widths are 3 to 4 meters. The elevations of the dike top vary between 10 to 7 m above MSL.

During the floods in February and March 2000, the dikes were collapsed at 11 locations with the total length of about 270 m, being compared with the total dike length of 7,700 m. During the Study period, emergency repair works for the collapsed dikes were carried out through mobilizing the villagers in the Study Area under the supervision of the Study Team. The works have been completed in November 2000. The villagers are maintaining the dike surface to use the dike as a main farm road. Four-wheel drive vehicles are passable even in the rainy season.

(4) Dike section 3

The dike section 3 constructed in the downstream lowland area departs from the foot of the Munguine hill, running towards the south closely along the Incomati River for a distance of only 3.1 km, which does not cover the whole downstream low land area. The structure of the dikes, however, is very poor: dike heights of 0.5 to 1 m; and dike widths of 1 to 2 m. This dike section cannot function as flood protection dike. Furthermore, the dike is not maintained by the villagers so that the dike is covered with shrubs or tall weeds.

7.2.2 Road

During the Study period, 12 road routes in the lowland area are identified that they are passable with 4WD vehicles in the dry season. The total length of roads is 18.4 km or 9.6 m/ha of farmland as summarized in Table 7.2.

Table 7.2 Road Length

Lowland	Nos. of Roads	Length (km)	Density (m/ha)
Upstream area	5	7.44	6.0
Downstream area	7	10.91	16.3
Total/Average	12	18.35	9.6

The road surface widths are around 3 m, and the road heights are not more than 0.5 m except for several roads in the upstream lowland area. Due to high groundwater levels prevailing in the lowland area and lack of drains, road conditions are poor. Besides the above-mentioned roads, embankments along the canals are used as footpaths for farming.

7.2.3 Irrigation and Drainage

(1) Water source for irrigation

1) Rainfall

The water needed to crop growth is obtained either from rains or subsurface sources or both. The average annual rainfall for last 10 years (1990-1999) recorded at Manhiça station is 1,118 mm ranging from 542 mm in 1992 to 1,837 mm in 1999 with the median of 900 mm. Eighty percent of rainfalls concentrate in 6 month-period from October to March and 20 % in 6-month period from April to September.

The rains falling during the rainy season may be enough to supplement the soil moisture in normal years, whereas the rains during the dry season are too small in quantity to contribute to the soil moisture. The average monthly rainfall at Manhiça station is given in Table 7.3.

Table 7.3 Average Monthly Rainfall (mm)

Month	Rainfall	Month	Rainfall
Jan.	210	Jul.	28
Feb.	176	Aug.	27
Mar.	146	Sep.	42
Apr.	62	Oct.	88
May	44	Nov.	123
Jun.	15	Dev.	157

2) Highland

The highland, which is characterized by flat topography, sandy soil and vegetated area, will permit a large portion of the rain to penetrate. Of the water that soaks into the ground, part is used by vegetation, and part sinks below root level through porous sandy soils until it reaches bedrock or other impermeable layer. The saturated soil layer containing groundwater is called aquifer. In the highland, two aquifers have been distinguishes. They are phreatic aquifer (or open aquifer) and deep aquifer.

There are about 100 of shallow wells and 23 of boreholes with pumps in use. The shallow wells with the depth of around 10 m exploit the groundwater from the open aquifer. The boreholes equipped with hand pumps with the depth of about 30 - 60 m exploit the groundwater from the deep aquifer. All wells are developed for drinking and domestic purposes; no well for irrigation use was observed.

Being covered with thick sandy soils, the highland allows the rain rapidly to infiltrate into the ground. It is reported that 100% of the rain infiltrate when rain does not exceed 100 mm for the time interval (IWACO, 1985). Under the situation, surface runoff of water is hardly observed in the highland area.

3) Lowland

Under the force of gravity, the groundwater of the open aquifer gradually finds it way downhill until it returns to the sea crossing the lowland area developed along the Incomati River.

The lowland is bounded on west by the cliffs with a height difference of more than 10 m, which indicates that the continuity of the open aquifer in the highland is broken to form the shallow groundwater in the lowland area. Another indication of the shallow groundwater is the presence of several shallow wells with depths of 1 to 2 m. These shallow wells were dug along the foot of cliffs for domestic use, and the water is available even in the dry season.

From the viewpoint of hydrogeology, the lowland is discharged area of groundwater from the open aquifer in the highland and the deep aquifer below the alluvial aquifer. The groundwater levels suggest that the vertical flow is upward. Two artesian wells were found, one in Pateque and one in Maragra.

(2) Irrigation practice

1) Lowland

During the dry season when the rainfall is not expected to be effective to crop growth, the villagers grow crops relying on the soil moisture maintained with the shallow groundwater. Canals were constructed along the foot of hills both in upstream and downstream lowland areas with the purpose of intercepting the groundwater discharged from the open aquifer formed in the inland dune. Although the water table of the open channel fluctuates, raising to its highest level after the rains and falling during the dry season, the canals seem to be able to intercept the shallow groundwater enough for supplementing the soil moisture for crop growth even in the dry season.

Surface irrigation methods are scarcely practiced by the villagers. The low external input agriculture program has been implemented as one of pilot action plans under the Study. The program has established three model farms in the lowland with the land areas of 0.15 to 0.3 ha. Target farmers dug ditches along the long sides of model farms to exploit the shallow groundwater for crop irrigation. The farmers draw water with buckets to drip water to crops grown on the raised ridges.

An enterprising irrigation project, the Manhiça Pilot Agricultural Project, was initiated in 1977 by the Department of Job Promotion (GPE) in the Ministry of Labor with the technical, financial assistance of the Government of the Republic of South Africa. The project with the land area of 8 ha was located near the Munguine hill in the upstream lowland area. The construction works included power supply lines, an irrigation pumping station, irrigation pipelines, drainage ditches and land preparation. The construction works were completed in 1998; however, during the severe floods took place in February, March in 2000, the pumping station was completely destroyed, and irrigation pipelines and other works were seriously damaged.

2) Highland

On the contrary, water sources are not available in the highland as mentioned above; therefore, crop production is being practiced under the rain fed condition.

(3) Drainage

Drainage problems take place in the lowland. The problems are caused by many factors, such as flat topography, heavy soils, shallow groundwater levels, depressions formed along the Incomati River and the dikes, high water levels of the river during the rainy season, and irrigation practices that make use of the soil moisture fed by the shallow groundwater.

The water intercepted with the canals running from north to south along the cliffs, is diverted to the east direction via several canals to drain into the Incomati River. Not all outlets installed underneath the dikes are functional, because they were aged and built without gates and mostly destroyed. Water logging occurs in the eastern part of the lowland area, particularly, along the dikes of section 1 and 2. The same drainage conditions are observed in the downstream lowland.

(4) Canal

All canals are being used for the dual purposes of irrigation and drainage with the exception of the interception canals built along the cliffs designed to catch groundwater. All canals and ditches in the lowland were damaged during the floods in February 2000. In early 2000, the World Food Program (WFP) Emergency Flood Support was implemented in the Study Area to rehabilitate the submerged farmland through improvement of drainage. It was reported that the villagers, under the supervision of GPE, rehabilitated canals and ditches with the total length of 56 km.

The field reconnaissance survey carried out so far identified 18 main canals with a total length of 33.6 km; all are of earth canals with widths of around 3 to 5 m and depths of 1 to 1.5 m. Farmers dug many ditches and drain to intake the water to their farm plots or drain surplus water into the canals. The summary of main canals is shown in Table 7.4.

Table 7.4 Main Canals

Lowland	Nos. of Canals	Length (km)	Density (m/ha)
Upstream Area	9	18.8	15.0
Downstream Area	9	14.8	22.1
Total/Average	18	33.6	17.5

7.3 Hydrograph of the Incomati River

The Study Area is bounded on east by the Incomati River, which is one of the largest international rivers running through the country. Therefore, the hydrograph of the river considerably affects land use for agriculture in the Study Area.

7.3.1 The River

There are 12 international rivers in the country; the biggest is the Zambezi River with a catchment area of 1.2 million km^2, being followed by the Limpopo River with a catchment area of 412,200 km^2. The Incomati River originates in the South Africa country, and flows down towards south to drain into the Indian Ocean near Maputo. The total catchment area of the river is 46,246 km^2, of which 14,925 km^2, or 33 % of the catchment area is shared by the South Africa. The Incomati River ranks fifth largest river in the country in terms of both the river length and size of catchment area.

7.3.2 River Stage Observation

The nearest river stage gauging station is located Manhiça about 13 km upstream from the Study Area, or 70 km upstream from the river mouth near Maputo, along the river courses. Water levels are recorded three times a day. The observation of water levels started in 1951; the water level data are available for the length of 51 years.

The water level reaches the highest mostly in February or March; then tends to decrease; and the lowest water level takes place in August or September.

7.3.3 Floods in 2000

In February 2000, Mozambique and Southern Africa were struck by torrential rains followed by cyclones, which led to severe flooding of extensive areas of the country. Cyclones Connie and Elaine hit southeastern Africa on 4-7 and 22-23 February respectively, producing heavy rains and strong winds throughout region, causing overflowing rivers, and resulting in widespread flooding in large areas of Mozambique, Swaziland, Botswana, Malawi, Zimbabwe and South Africa.

The rainfall in February observed at Manhiça amounted to 585 mm, or equivalent to 52 % of the average annual rainfall. Cyclone Gloria brought heavy rainfall in March raised water levels in the southern Mozambique flood plains, especially in the Limpopo and Incomati Rivers. Floods overflowed the flood protection dikes built along the Incomati River, and consequently resulted in all lowland in the Study Area being inundated for more than two months. Floods levels exceeding the flood protection dikes were assumed to be 2-3 m according to the flood marks left to the pumping house and trees and villagers' information, the highest flood levels ever recorded since 1951.

The Manhiça gauging station recorded the flood level of 6.88 m above MSL on February 12, 2000; after that, no water level record was available for several months, because the water gauges were destroyed by the floods in February.

7.3.4 Annual Maximum Flood Levels

The yearly maximum flood water levels of the Incomati River at Manhiça were collected for the period of 47 years (1952 to 1998) on the basis of the hydrological year, which starts in April to end in March of the next calendar year. It should be noted that the records of the highest level of the river in 2000 were not available for analyses of floods as mentioned above. The highest flood level is 8.4 m above MSL as far as water records are concerned. The highest five flood levels are given in Table 7.5.

Table 7.5 The Highest Five Flood Levels (m above MSL)

Order	Flood Level	Year of Occurrence
1	8.40	1983
2	6.79	1995
3	6.19	1980
4	6.16	1981
5	5.89	1978

The exceeding probability of annual maximum flood level is analyzed by applying the Thomas Plot method to the yearly maximum flood levels for the 47 years period. The result of analysis is summarized in Table 7.6.

Table 7.6 Probable Maximum Flood Levels

Return Period (year)	Flood Level (m above MSL)
2	3.0
5	4.5
10	5.5
20	6.7
30	7.3
50	8.0
100	9.5

The above table indicates that the flood level of 3.0 m above MSL may occur once in two years, and the flood level of 8.0 m above MSL may occur once in 50 years. According to the analysis, the return period of the flood level of 8.4 m above MSL may be around 60 years as far as the flood records of 47-year period are concerned.

7.4 Potentials and Constraints

7.4.1 Floods of Incomati River

One of the major constraints to the development of sustainable agriculture in the Study Area is flooding of the Incomati River as experienced in February 2000; all farmland in the lowland was inundated for several ten days, resulting in severe damage to crops, farmland, dikes, roads and canals.

The existing dikes built in the upstream lowland protect the farmland of about 1,010 ha from the flooding of the Incomati River in normal years. On the contrary, in the downstream lowland area, all farmland of 670 ha is subject to annual inundation of floodwater. At present, 990 ha, or 47 % of farmland is under the influence of the river floods. Improvement of the existing dikes and new construction of flood protection dikes are needed to alleviate flood damages; the flood protection dikes with drainage outlets also contribute to improvement of drainage conditions.

7.4.2 Drainage

Poor drainage conditions in the lowland are caused by many factors such as flat topography, shallow groundwater levels even in the dry season, high river stages of the Incomati River in the rainy season, lack of outlet structures to drain in the River, and current irrigation practices by the villagers to use soil moisture maintained with the shallow groundwater. Water logging takes place at several locations along the dikes, limiting the land use for dry season cropping.

Crop damage may occur if excess water accumulates and remains in the crop root zone too long. Some of the adverse effects of excess water are to reduce the aeration of the soil, to reduce soil temperature, to inhibit root growth, or to reduce the volume of soil available for root growth.

With the basic objective of both surface and subsurface drainage, drainage improvement scheme should be implemented; surface drainage aims at increasing the surface runoff, and subsurface drainage aims at increasing the rate at which water will drain from the soil, and lowering the water table, thus increasing the depth of drier soil above the water table.

7.4.3 Irrigation

Irrigation practices in the Study Area are closely related to the operation of drainage system. If the current subsurface irrigation should continue, the effect of irrigation will be limited to some extent unless the subsurface drainage systems are effectively operated by means of provision of the engineering structures such as water table control facilities, drainage canals and outlet structures for disposal of drainage water.

In order to improve the effects of irrigation methods, the water table has to be controlled with control structures so that water table is maintained below the root zones. To this end, canals should be dug enough to lower the water table, but effective depths of canals are restricted by the river stage of the Incomati River when disposal by gravity into the river is considered.

7.5 Planning for the Future

7.5.1 General

An agricultural infrastructure improvement plan will be formulated with the following principles:

(1) Local tradition

The current irrigation and drainage in the Study Area are of traditional methods with which the villagers are familiar and have skills in operation under the situations. It might be better to continue the traditional method with some improvement than to introduce some quite new method, which is theoretically better but not understood by the people.

(2) Local skills

On the other hand, new methods can be acceptable when the villagers become aware of the necessity of improving the traditional methods in use. After completion of construction works, the villagers are responsible for operation and maintenance of the projects. Technical skills available for operating the irrigation and drainage system influence the type of system to be selected. Consideration must be given to the level of technical and managerial skills available to maintain and operate irrigation and drainage systems.

(3) Economic and financial feasibility

When an irrigation and drainage system is planned both economic and financial consideration should be given. The economic feasibility evaluation assesses the economic viability of the planned development and assists in selecting the irrigation and drainage system from among adaptable

alternatives. The beneficial villagers are responsible for the management of projects, and the projects should be guaranteed by their financial contribution. Financial feasibility studies evaluate the capability for the development to repay the continuing operational costs of the beneficial villagers.

7.5.2 Flood Protection Dikes

One of the major constraints to the development of agriculture in the Study Area is flooding of the Incomati River as experienced in February 2000; all farmland in the lowland area was inundated for several ten days, resulting in severe damages to crops, farmlands, roads and canals.

Of 1,250 ha of the land in the upstream lowland area, 240 ha of land is situated outside the flood protection dikes, and in the downstream lowland area where no flood protection dike is provided, all land of 670 ha is not protected from flooding of the river. At present, 910 ha, or 47 % of the gross land area, is under the influence of the river flooding.

It will be proposed to construct new dikes along the Incomati River for the purpose of converting the 910 ha land into cultivable land, and improve the structures of the existing dikes that directly face the Incomati River. With the implementation of the proposed dike construction and improvement, all lowland farmland of 1,920 ha will be protected from the flood of the river to reasonable extent.

The key engineering factor involved in planning of flood protection dikes is to determine a designed flood water level of the Incomati River, based on which the height of dikes is designed. The higher dikes that require the higher investments may guarantee the farmland against losses to be caused by floods. In any agricultural development planning, however, all of the costs and returns expected from the development should be considered. The construction of the dikes against the extreme high flood level like the floods in February 2000 may not be accepted from the viewpoint of project economy.

7.5.3 Drainage Improvement

Drainage improvement in the lowland area may be divided into two types: field drainage and land drainage. Field drainage is the removal from farmland of surplus water, which might otherwise restrict crop growth. Land drainage is large-scale drainage where the objective is to drain surplus water from the lowland area by such means as excavating main open drain, constructing dikes with outlets, and pumping.

(1) Field drainage

The practice of field drainage is directed towards accelerating or increasing the natural outflow, either on the surface by means of open ditches, or below the ground by a system of closed underdrains. For the improvement of field drainage, it is recommendable to implement the following works at an early stage of the development:

1) To construct drains to avoid surface water logging which often takes place at depressions situated along the dike,
2) To dig shallow farm ditches for all farm plots to improve surface drainage of fields; shallow ditches are dug and maintained by individual farmers,
3) To excavate deep open canals to lower the water table and to increase the natural outflow as well as to function as main canals with dual purposes of irrigation and drainage.

The canal scheme implemented by the GPE and WFP is effective to attain the drainage purpose mentioned in the above item 1) and 3). If a permanent lowering of the water table is desired, a system of underdrains is more effective, but the flat topography of the lowland area does not allow the natural disposal of the drainage water to the Incomati River without pumping.

(2) Land drainage

For improvement of land drainage in the lowland area, it is recommendable to implement the following works in conformity with the progress of the field drainage works as mentioned above:

1) To provide outlet structures with water gates at the crossing points with the flood protection dikes to protect the farmland from inundation of the river water when the river stage of the Incomati is high,
2) To provide sumps or ponds near the proposed outlets to store the excess water for a period when natural disposal of drainage water through the proposed outlets is impossible.

Drainage systems are to be sized to carry quantities of surface floodwater and groundwater. The size of a pumping station to dispose the water is extremely expensive. Accordingly, the installation of a drainage pumping station is not recommendable for the time being until intensive high-capital farming has been practiced.

7.5.4 Irrigation Improvement

(1) Canal system with dual purposes

The water source for irrigation in the lowland area is shallow groundwater intercepted with the canals along the hillsides, and the water is distributed by gravity to the lowland area through the canals and ditches with the dual purposes of irrigation and drainage. On the fields, the soil moisture that allows plant growth is maintained by means of subsurface irrigation or surface irrigation.

Irrigation in the lowland area is closely interrelated with drainage. It is necessary for the improvement of water management that the water table be controlled to be below the crop root zone.

(2) Pumping of river water

Another water source available for farm water supply is the water of the Incomati River, which is obtained by pumping. The water can be delivered to farmland by making provision of the pressured pipelines, and surface irrigation, which is more effective to crop growth than subsurface irrigation,

could be practicable. This type of irrigation system is found in Maragra sugarcane plantation where is protected from river floods with the dikes, bordering on the north of the Study Area.

Pumping irrigation projects might be technically feasible when the proposed dikes have been constructed. On the other hand, the pumping irrigation projects require high investments as well as high costs needed for operation, maintenance, repairs and replacement of the pumping stations and pipelines. Furthermore, successful management of the pumping irrigation projects requires technological and managerial skills to be provided by the beneficiary farmers.

8. Livestock

8.1 Current Situation

Livestock raising is one of the components which can contribute to poverty alleviation and food security at the household level in the rural areas. During the civil war, the number of animals was drastically decreased. The number of animals in Mozambique, however, indicates significant increase in the recent years due to the livestock restocking programs supported by NGOs or by the beneficiary's own effort.

The livestock production system in the Study Area is not different from the other rural areas of Mozambique. Livestock is characterized by an extensive production system with little use of improved inputs like supplementary food. In Maluana and Munguine, animals raised are cattle, goat, swine and poultry. Sheep raising is a minor importance.

Cattle raising can be one of the main income sources for rural households, although goat and poultry are gaining the popularity among them. Most households raise poultry and some families keep cattle for animal draft for land preparation and transportation of agricultural produces.

In order to achieve food security in the Study Area, it is necessary to expand the cultivated land and the cattle can work as "a live tractor" for land preparation as well as transportation of agricultural produces. In this sense, the cattle play important roles to achieve its food security in the rural areas, where the local population cannot afford to buy or rent a tractor. However, the draft cattle can be used just for two hours a day, because that the nutritive quality of grass in pasture for grazing is really natural and poor.

8.2 Potentials and Constraints

There is a potential to develop the livestock sector in the Study Area, because there are cattle breeders with technical know-how in Maputo, the possibility to develop good pasture in the Study Area, and the local population's strong interest in improving animal production. Farmers in the Study Area are also keen to increase the number of animals and gain knowledge of husbandry of various kinds of animals.

The expansion of land for cultivation is a serious issue in order to achieve food security at the household level in the Study Area. One of the reasons why they cannot expand land is the lack of labor power. In the rural areas, farmers in Mozambique commonly utilize cattle for animal traction, although the number of cattle decreased drastically during the civil war. So the increase of the number of cattle is regarded as the first priority for the rural households in the Study Area. The second priority is the pasture management or development for livestock in order to supply enough nutritious fodders. The use of appropriate by-products or biomass from agricultural activities as fodders can be experimented to increase the productivity of livestock. The third priority is a need for a fund to purchase livestock

and relevant materials. The fourth priority is technical support to farmers by the faculty of veterinary, extension workers or the members of NGOs such as ATAP or ORAM, in the areas such as disease control and breeding management. Disease control is important to reduce the possibility of economical loss of livestock, through appropriate sanitary management for livestock. Well-organized breeding management can contribute to increase productivity of livestock raising.

The constraints for livestock development are as follows:

(1) Lack of the fund to purchase livestock and materials needed

The lack of the fund to purchase livestock and materials needed is a serious constraint. Many poor farmers cannot afford to buy any livestock due to the shortage of the fund.

(2) Competition for land for cultivation and grazing

Ruminants, cattle and goat mainly, are raised on the natural pasture of poor nutritive grasses and farmland with agricultural residues. This extensive feeding system can cause conflicts between cultivating farmers and livestock grazing farmers.

(3) Inappropriate fodder for livestock

The pastureland for grazing livestock in the highland is covered with natural grasses and shrubs. Natural grasses have inadequate nutritive values as fodders for livestock. Since low nutritive fodders delay the sexual maturity on livestock and prolong birth intervals, the speed of increasing the number of livestock is slowed.

(4) Shortage of veterinary services, vaccines, and drugs to control diseases

On disease control, farmers are impossible to manage all livestock diseases by themselves without veterinary services and appropriate vaccines and drugs. As to cattle, control of tick and tick-borne diseases and gastro-intestine parasites in the Study Area are not efficient due to insufficient distribution of veterinary drugs by the government. And, due to the shortage of vaccine, all livestock are not given the required vaccination. The existing dip tank in Pateque, which aims at preventing cattle's tick-borne diseases, has not been utilized well, due to the lack of fund to purchase the drug. The diagnostic capacity of veterinary faculty of the University of Eduardo Mondlane is also rather weak because of lack of financial support from the government and the donors.

(5) Lack of livestock extension services

During the civil war, the number of livestock decreased significantly, and now farmers are keen to increase the number of livestock and to gain knowledge of husbandry of various kinds of livestock, but there is a shortage of livestock extension services. In this field, the veterinary faculty of the University of Eduardo Mondlane has a potential to support farmers to satisfy their needs, but the opportunity for farmers to learn the necessary knowledge, practice, and techniques from the faculty is still rare, due to the high cost of transportation and consultation.

(6) Limited knowledge and experiences on livestock among the villagers

The knowledge and experiences of livestock among the villagers are not enough in the areas such as soil management for pasture, fodder management, breeding, animal health care, disease control, animal traction, accounting, etc.

(7) Absence of breeding stock

Absence of breeding stock causes inter-crossing and the inter-crossed livestock have inferior offspring with a low productivity and a low potential. Also the rate of male and female group component of livestock is not appropriate. An artificial insemination to improve livestock, especially in cattle, is not common in the Study Area, and introduction of capable male animals as breeding stock in the Study Area has never conducted.

8.3 Planning for the Future

To erase the above-mentioned constraints and to accelerate agricultural productivities through livestock raising, the following activities can be planned for the future.

1) Livestock revolving scheme to increase the number of livestock

- Establishment of a livestock revolving scheme
  (The livestock revolving system brings significant benefits for the poorest farmers. In this system, even the poorest farmers can get livestock, especially about cattle for traction and transportation, without any payment although they cannot get any livestock from lacks of money.)

2) Land for cultivation and grazing pasture

- Promotion of land expansion through animal traction
- Expansion of grazing pasture
- Investigation and trials to grow nutritive grasses in pastureland

3) Fodders for livestock

- Fodder preparation (silage, hey, fodders from crop residues)
- Feeding management
- Reproductive management

4) Veterinary services, vaccine, drugs, and animal health care infrastructures to control diseases

- Rehabilitation of dip tanks or expansion of the spray method
- Purchase of vaccine and drugs by the beneficiaries (in the future)
- Technical cooperation between the veterinary faculty of the University of Eduardo Mondlane and foreign universities or organizations in the field of disease control

5) Livestock extension workers

- Increasing the number of livestock extension workers
- Assisting transportation of livestock extension workers
- Observation tours to the veterinary faculty to improve the knowledge of livestock extension workers
- Training of livestock extension workers at the veterinary faculty of the University of Eduardo Mondlane or other organizations such ATAP or ORAM

6) Farmers' knowledge on livestock

- Seminars on livestock for farmers
- Observation tours to learn more about livestock development

7) Breeding stock

- Introduction of male animals with preferable capacity
- Increase of reproducers around the Study Area
- Promotion of a livestock restocking program
- Introduction of various species of livestock at family levels

9. Land-mine Situation

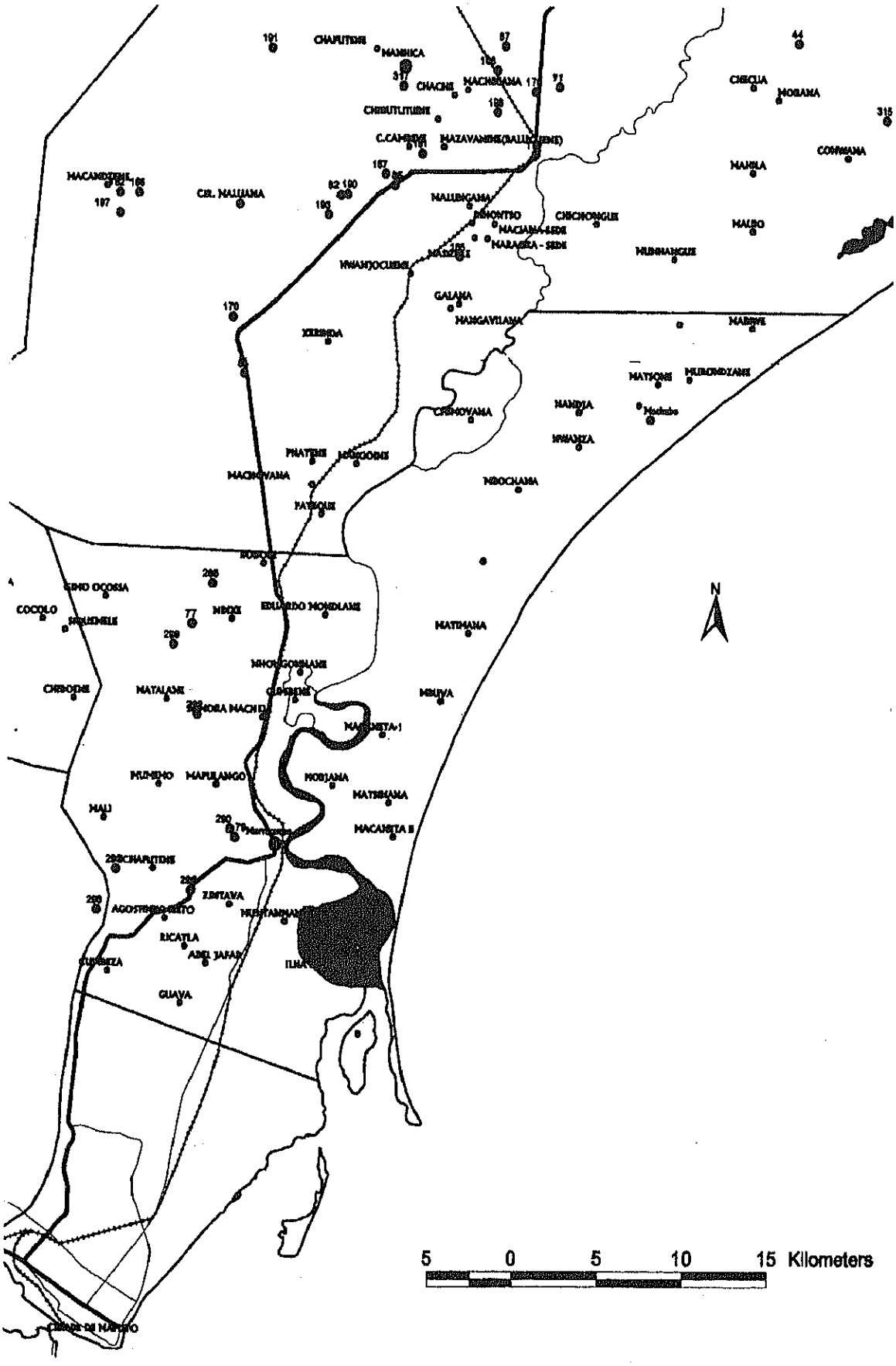
Before starting the survey in the Stduy Area, latest information on land-mine situation in the Study Area was obtained from National Institute of Demining (IND), which coordinates all demining activities and holds GIS database on land-mines in Mozambique. As of May 18, 2000, the following three land-mines have been found and not yet cleared in Maluana Locality. But they are clearly fenced or marked, so there is little possibility of danger to the local population. (The locations of these land-mines are marked in the Figure 9.1.)

ID No.	Place	Longitude	Latitude	Date of Report
80	about 2 km south of Maluana town., near EN1 road (west side of the road)	32.66	-25.51	August 5, 1996
170	about 500 m north of Maluana town (north side of EN1 road)	32.65	-25.48	April 19, 1996
193	in Pafeni between Maluana town and Esparança (north of EN1 road)	32.70	-25.43	August 17, 1994

In Munguine Locality, there has been no land-mine reported to IND. Since the battlefield during the civil war between FRELIMO and RENAMO was along the national road EN1 and many people escaped from the road side (Maluana Locality) to the eastward (Munguine and Pateque area), there is very little possibility of land-mine in Munguine and Pateque area.

As for the possibility of land-mines which may be flushed away from the upstream of the Incomati River by the flood in February and March 2000, no such case has been reported in Incomati River area, according to IND (although one case was reported in Limpopo River area). So IND staff assured the Study Team that there is very little possibility of land-mine in the Study Area along the Incomati River.

Figure 9.1 Location of Uncleared Land-mines around Manhiąa District, Maputo Province



10. Assistance to Flood Victims

10.1 Introduction

An emergency assistance program to flood victims was planned and implemented with the following basic approaches:

1) The local population should participate in all phases of the program cycles: namely, survey, planning, and implementation of emergency assistance to flood victims.
2) It is important to avoid negative impacts on the population such as increasing their dependency on the donor's contribution and instead it is necessary to promote local population's self-help efforts.

10.2 Flood Damages

The lowland areas of the Incomati basin in Munguine and the neighboring areas of Maragra to north, Pateque to south and Chilembene to east were completely inundated in February and March, 2000 due to the flood of the Incomati river. There was no death case in the villages, however village economy was completely damaged as follows:

1) Loss of planted crops such as sugarcane, maize, banana, mango, cassava and sweet potato for about 500 ha in Munguine and 50 ha in Pateque.
2) Dike destruction, soil sedimentation in canals, and loss of cropping opportunities, due to long-term inundation especially in parts along the main dike and dikes between Maragra and Munguine.

10.3 Survey for Assistance to Flood Victims

The Study Team conducted a survey on flood victims' urgent needs regarding foodstuff, agricultural infrastructure, agricultural production, drinking water, housing, medicine and education. The following findings were obtained through interviews, PRA training, reconnaissance, and meetings with 300 villagers.

(1) Foodstuff

After the flood, supply and demand of foodstuff in the Study Area were unbalanced, and the population of the villages faced with rising price of foods and consumable goods. Most of foodstuff, such as maize, rice, dry beans, onions, tomatoes, potatoes and processed foods, is originally distributed from Maputo and South Africa by merchants and the Union. In some cases, the villagers purchased foodstuff in Maputo and in Manhiça. World Food Programme (WFP) provided the Munguine villagers with foodstuff through implementation of a Food-for-Work program started in May 2000 after the flood, but only limited number of villagers, 250 persons, received foodstuff. Majority of villagers survived by harvesting such crops as maize, cassava and sweet potatoes cropped in the highland, cash incomes of husbands, borrowing foodstuff from neighbors, and eating wild crops/insects/fishes from

the Incomati River and canals. At the end of August 2000, the villagers had started cultivation in the lowland. In this recovering period, free food supply may have negatively affected villagers' capacity building for development. Therefore, the Study Team decided not to implement free food supply scheme as an emergency relief.

(2) Agricultural infrastructure

In the lowland, the flood water level exceeded about 2 m over the top level of dikes during the flood. The increase of river water level was mainly caused by Cyclone Eline crossing from east of Maputo to Zimbabwe, and emergency discharges from dams in upper streams of the Incomati basin. The flood damaged dikes in Munguine. Soil sedimentation on farmlands by inundation resulted in heavy works to cultivate the farmlands by women working as main agricultural labor input. The villagers were expanding cultivating areas in the lowland for second crop season. It is required to rehabilitate the dikes in order to protect villagers' properties from inundation. Urgent necessity of the rehabilitation works for broken dikes was confirmed by the villagers and the Study Team through PRA training. For canal segment in the lowland, WFP and Ministry of Labor implemented rehabilitation works under the Food-for-Work program.

(3) Agricultural production

After the flood, agricultural production was decreased. In the problem analysis of the PRA training course, it was pointed out that major problems were shortage of tractors, lack of seeds and plant diseases. These issues are closely related to farming, agricultural product marketing, agricultural extensions, and management skills of machinery to secure sustainability. ActionAid UK provided seedlings of banana and cassava mainly for evacuators in September 2000, but free delivery might give negative impacts on the villagers in terms of self-reliant development. Terre des Hommes Germany provided vegetable seeds for the union charging half of a market price.

(4) Safe drinking water

In the foothills where shallow groundwater is available, shallow wells are used to fetch water for domestic use, but there is a possibility of contamination of some wells with organic matters. There are increasing demands to construct boreholes in the highland instead of shallow wells located in the lowland. This program should be separately planned from this emergency relief, because implementation of water supply schemes requires many process such as a geographical survey, site selection of water sources by agreement with villagers, cost estimate, selection of a contractor, drilling works, establishment of water committees, and agreement of water fees.

(5) Housing

All villagers are residing in the highland, and their houses were not affected by the flood. About 200 people migrated to the Munguine village from the neighboring Ilha Chilembene, Marracuene District located east of the lowland across the Incomati River. ActionAid UK implemented the emergent relief program for the evacuators in association with Terre de Hommes. They provided one borehole and

materials for 50 traditional types of houses: namely, wooden pillars, wall galvanized iron sheets, and door/window kits.

(6) Disease

According to the statistics of Ministry of Health, the number of patients caused by drinking water has increased after the flood, compared with the figures before the flood (January -February, 1999) as shown in Table 10.1. There are two health posts in Maluana and Munguine, and UNICEF provided medicines for the health posts. Medical staff in Munguine Health Post insisted on the increase of diarrhea case after the flood, and shortages of medical and supporting staff, vermicide and beds were verified.

Table 10.1 Numbers of Patients in Manhiça District

Period	Malaria	Diarrhea	Cholera	Dysentery	Meningitis
Jan-Jun, 1999	38,983	2,710	116	454	19
Jul-Dec, 1999	21,872	2,237	-	300	3
Jan-Jun, 2000	42,192	5,830	132	1,174	7

(7) School

After the flood, the school enrollment rate became lower due to decreasing cash incomes of parents and evacuation of the villagers. The Munguine primary school located near the health post was improved by 'Terre des Hommes.'

10.4 Participation of Villagers

The Study Team has applied the participatory approach to the implementation of this program of emergency assistance to flood victims. Prior to the commencement of the program, several interviews and meetings with the villagers, and surveys were carried out as summarized in Table 10.2.

10.5 Design and Implementation of Dike Rehabilitation Program

(1) Strategy and work method

In order to raise the villagers' awareness about ownership of the dikes and to allow them to learn the method to repair the damaged dikes or other damaged areas by the flood, the rehabilitation works were planned to use the local human resources in the villages without using construction machinery. Basically, breaks of dikes were refilled by using soils along the dikes, and compacted with foot or hoes. The participants were compensated for their labor work with foodstuff, seeds or consumable goods depending on their requests.

Table 10.2 Participatory Approaches in the Study

Survey	Contents	Main Findings / Outputs
Interviews with villagers	Changes after the flood and current demands	1. About 50-80 % down in small shops sales 2. Increase of prices of all goods 3. Shortage of foods for households: a large number of family members (eight or more) and single-mother cases 4. Lack of seeds: maize, peanut, bean, cassava, sweet potato, kale, etc. 5. Lack of cash to purchase consumable goods: blanket, soap, cloth, etc.
PRA	Need assessment	6. Dike rehabilitation as urgent issues
Study on on-going Food-for-Work programs	Study on working system	7. Selection of 'partners' on employing base for supervisors and distribution staff 8. Kind of work: cleaning canals 9. Working time: 7:00-11:00 10. Tools provided; hoes, shovels, wheelbarrows, rakes, etc 11. Food distribution rate 12. Registration method 13. Rotation working system among workers 14. 90 % of participants are women
Meetings with Presidents of Union, Associations and Co-operatives	Planning of implementation method	15. Rates of foods, seeds and consumable goods 16. Explanation of target works 17. Contribution from the side of union 18. Confirmation of work sites
Earth work performance test	Digging, carrying, piling & compacting soils by selected villagers	19. Under the assumption of 90 % of women's participation and 4-hour work, the earth works including digging, soil carry, leveling and compaction are estimated at 0.4 m^3/person/day. 20. Preferring tools; hoes for women and shovels for men
Meeting with villagers	Explanation of the work program	21. Survey results for emergency relief 22. Work description 23. Rate of foodstuff, seeds and consumable goods 24. Confirmation of contribution on the side of union specially usage of 1 set of tractor with trailer 25. Registration
Meeting with stakeholders	Exchange of information	26. Explanation to stakeholders including NGOs, District Agricultural Office and Ministry of Labor
Civil works	Dike rehabilitation	27. Ownership creation for dikes through working experiences themselves 28. Importance of work target instruction by group and incentives for hard workers (incentives; 10 % up of maize, paid holidays and continuous work opportunities for the 1st registration group) 29. Arrangement of daily routine works; transport of water & wheelbarrows and work performance records, discussing with supporting staff selected from villagers 30. Motivating women singing Changana songs 31. Formation of supervisory team and supporting staff conscripting only villagers 32. Designation of baby-sitters from aged women.

(2) Working volume for damaged dikes

As shown in Table 10.3, on the dikes in northern Munguine, 11 sites were completely slashed out or partly slid. On the dikes in southern Munguine located near a military training center and two village organizations' farms, one site, controlled by the military training center, was broken. In the further southern areas in Pateque, there are no constructed dike. The total earthwork volume for damaged dikes is estimated at 2,600 m^3 and the total length is 267 m.

Table 10.3 Working Volume for Damages of Dikes

No.	Works	Soil Volume (m^3)	Length (m)
01	Refill of soil for broken dike and side protection by wooden pillars and sandbags	128	9
02	Refill of soil for broken dike	79	5
03	Refill of soil for broken dike	99	6
04	Refill of soil for broken dike	440	35
05	Refill of soil for broken dike	660	150
06	Refill of soil for broken dike and side protection with wooden pillars and sandbags	300	10
07	Refill of soil for broken dike and side protection with wooden pillars and sandbags	330	11
08	Refill of soil for broken dike, side protection with wooden pillars and sandbags, lower part protection with crush stones with sandbags and installment of steel pipe	248	15
09	Refill of soil for broken dike	138	10
10	Refill of soil for broken dike and installment of steel pipe	138	10
11	Refill of soil for broken dike	60	6
Total		2,620	267

(3) Earthwork performance

For the preparation of implementation of the dike rehabilitation program, the earthwork performance for dike rehabilitation by villagers needed to be identified. About 85 % of participants were women in WFP's canal cleaning work, and heavy work to carry soils on dike slopes needed the men's labor. Therefore, the Study Team organized several groups of ten workers, each of which consist of nine women and one man in order to carry out a field test for earthwork performance. As a result of the test, earthwork performance was estimated to be 0.4 m^3/day/person. The earthwork included excavation, carrying soils and compaction, and working time was 4 hours a day. Necessary tools and materials were supplied by the Study Team, such as hoes, steel-made shovels, wheelbarrows, ropes, bush knives, ropes, sandbags, etc.

(4) Delivery of foodstuff, seeds and consumable goods

The Study Team provided three ways of compensatiuon for workers depending on their needs: namely; the foodstuff course, the seed course and the consumable goods course as shown in Table 10.4. Each course required the workers to complete 20 working days. The contents of the foodstuff course was set the same as in WFP's Food-for-Work program implemented in Manhiça District. The contents of the other two courses were decided with the same economic value as the foodstuff course.

Table 10.4 Compensation for Workers (20 net working days)

Foodstuff Course		Seed Course		Consumable Goods Course	
Dry Maize	50 kg	Peanut Seed	20 kg	Blanket	1 pc
Cowpea	5 kg	Maize Seed	10 kg	Soap	10 pcs
Cooking Oil	1.5 lit	Banana nursery	5 pcs		
Sugar	2.5 kg				
Salt	500 g				

(5) Mobilization of workers

In the dike rehabilitation program, a total of 349 villagers participated as shown in Table 10.5. The first group consisted of 12 village organizations which use the upstream lowland of Munguine. There are two village organizations whose farms are located in the downstream lowland of Munguine near the military training center, and they did not participate in this program, because the program was planned only for dike rehabilitation in the upstream lowland in Munguine, and there was no existing dike in the downstream lowland of Munguine.

Table 10.5 Participants and Working Period

Group	No. of persons	No. of women	Starting Day	Ending Day (Work Duration)	Promoter
First group	125	99	29 Sep 2000	30 Oct (20 days)	Representatives of village org.
Additional group	50	45	06 Oct 2000	3 Nov (20 days)	President of Union
Second group	125	98	01 Nov 2000	01 Dec (23 days)	Representatives of village org.
(Hard workers selected from the first group)	(50)	(42)	01 Nov 2000	01 Dec (23 days)	Supervisors
(Hard workers selected from the additional group)	(10)	(10)	10 Nov 2000	07 Dec (20 days)	Supervisors
Supervisor group	6	1	29 Sep 2000	01 Dec (2 months)	PRA trainees
Concrete block work group	11	0	06 Oct 2000	08 Dec (2 months)	Representatives of Bairro
Carpenter work group	7	0	29 Sep 2000	01 Dec (2 months)	Representatives of Bairro
Tractor management and maintenance group	4	0	29 Sep 2000	01 Dec (2 months)	President of Union
Medical treatment group	4	2	29 Sep 2000	01 Dec (2 months)	Medical Health Post
Representatives of association	12	6	29 Sep 2000	01 Dec (2 months)	-
Watchman	2	0	29 Sep 2000	01 Dec (2 months)	President of Union
Supporting staff	3	2	29 Sep 2000	01 Dec (2 months)	President of Union
Maintenance group	(20)	(0)	04 Dec 2000	29 Dec (2 0days)	Supervisors
No. of participants (net)	349	246			

Note: The numbers shown in ( ) are repeated.

The first and second groups consist of 125 workers each: 10 workers from each of 11 village organizations in Munguine and 15 workers from the largest village organization in Munguine, that is,

Association Khokholwele. In the middle of the first group's work, additional 50 workers were employed, in order to accelerate the rehabilitation work to finish before the rainy season starts. There were five days not available for the program due to the rains in October 2000. There were some villagers who complained to the Union about how to select the workers, but other villagers did not support them, because the criteria of the selection was very clear and fair to them.

The supervisory group consisted of one extension staff from the Ministry of Labor and five young villagers including one woman who received PRA training during the Study. The commanding power of the program was transferred from a Study Team member to the extension staff of the Ministry of Labor after two weeks of the program, then from the extension staff to the young villagers after six weeks. One of the young villagers showed a good capability to handle women, so he was promoted to a chief supervisor.

There were several other groups who participated in the program. Groups of concrete and carpentry workers were selected by three Bairro leaders in Munguine, and they constructed a temporary office and warehouse. There are two tractors belonging to the Union which used to carry heavy soils and workers, and the tractors were operated by a tractor management and maintenance group consisting of one tractor manager, one mechanic and two operators. Two medical staff and two assistants of Munguine Health Post were also involved in the program, because there are some workers who were injured or became sick during the work. The representatives of village organizations had the function to select, arrange and secure the workers every day. For minor treatments like protecting the dike's slope and repairing tractor tires, 20 maintenace workers were employed after the second group's work.

(6) Registration card

For management of this program including the distribution of foodstuff, seeds and goods, registration cards designed by the Study Team were used. The supervisors checked the workers' daily attendance and tool rental by ticking the cards. When the workers received goods, they gave their signatures or thumbprints on the card.

(7) Work period

The program was inplemented through several steps: identification of problems of the dike in August 2000, preparation of the dike rehabilitation in September 2000, and the implementation in October and November 2000 as shown in Table 10.6.

10.6 Topics on Dike Rehabilitation

(1) Soil compaction

Mounded soils were always compacted by foot and hoes at the end of daily work. But after one week of soil compaction by manual, the dike levels sank at 5 - 10 cm lower, because the natural gravity of soils gave more depression. Refilling of soils was repeated, especially in 2 large breaks.

Table 10.6 Work Period (Year: 2000)

Process	September	October	November	December
Preparation of proposal of work	▨			
Meeting with villagers	▲ 9/7			
Participatory implementing method	▨			
Working group meeting	▲ 9/20			
Preparatory works	▨			
Meeting with participants	9/28▲			
Implementation of Works	9/29	■	■	12/01
Delivery of Goods			▲ 11/01	▲ 12/04
Inspection and reporting				▲ 12/07-10

(2) Usage of tractors

Munguine Union possesses two units of working tractors. They were used for transportation of materials, wheelbarrows, drinking water, and soils from the Union to working sites. They were also used as transportation to purchase available materials in Manhiça. Although the both tractors had some problems with the engines and chassis, some parts were available at low costs from truck scraps of the military training center. A mechanic of the Union has a skill even to replace bearing balls using secondhand parts. While these two tractors are the very important source of cash income for the Union, the Union agreed to provide two tractors for the use in the program.

(3) Distribution result

The number of goods for distribution was 439 sets in total: 194 sets for foodstuff course, eight sets for seed course, and 237 sets for consumable goods (blanket and soap) course. The low number in seed course was caused by the recent free distribution of cowpea, peanuts, banana and cassava seeds by ActionAid UK and ATAP. The reason for the high demand for the consumable goods is that the local people needed blankets in order to sleep well in the low temperature which was caused by their poor housing structure. In Maputo province, a typical rural house has galvanized iron sheet roof, wooden pillars, reed wall and compacted soil floor. Since most of the villagers do not have beds and sleep on the ground with cloths or sandbags, rain water and wind easily enter their house and make the villagers feel sick.

(4) Target setting system as an incentive

After one week of the work, the workers and supervisors were able to estimate an amount of work per day, and make a elaborate schedule for the rehabilitation of the dike. Then, to make the construction faster, the supervisors set a payment mechanism that was based not on how many days the workers

worked, but on ow much of work the workers have finished. This is called 'Target Setting System,' and it gave the workers a good incentive to work harder, and this system accelerated the rehabilitation work. As a result, there were some groups that extended the length of one continuous unit from 30 minutes to one hour.

(5) Working time and the attendance call

The working time was set from 6:00 a.m. to 10:00 a.m. (This working time did not include the time for walking from their homes to the sites.) The attendance call was essential on the management of the workers, and initially the attendance call was started at 6:00 a.m. to avoid the late coming workers. But it took for 20 minutes or more to complete it. After introducing the target setting system, the attendance call was shifted to 10:00 a.m.

(6) Safety management and sickness

In the early stage, four cases of injury were found. Three cases were caused by one person's hoe hitting another person's heel, and the other case was caused by stepping on a stalk under water. In order to protect workers against the similar injuries, pairs of rubber boots were provided on a rental base from the second week. The supervisors also made workers spread around. By these countermeasures, injury cases were not found any more.

Since mid-November 2000, the low pressure stayed in the central region of Mozambique, which blocked the cold front coming from South Africa. As a result, the cold front brought rains frequently in the southern region of Mozambique. Under this weather condition, the workers showed their big efforts even during the rain, but some workers got sick due to the cold rain, the strong wind and the drastic temperature changes. The transportation of the workers to the medical post increased up to four patients per day and the total number of the patients became 19: 12 cases of malaria, three cases of rheumatism, two cases of diarrhea, and two cases of conjunctivitis.

(7) Malaria

The prevalence of malaria was observed in all over Maputo Province from November 2000. Shortage of medicine for malaria was critical in all medical posts in the rural area due to the imbalance of supply and demand. In Munguine, Choroquine-resistant Plasmodium falciparum was common. In order to cure this type of malaria, Sulfadoxine+Pyrimethamine (Fansidar) works effectively, but it is not easy to purchase this medicine in the rural areas. It is possible to purchase the medicine at a drugstore in Maputo, and it costs 18,000 MT per three tablets. The supervisors and the president of the Union discussed this problem, and decided to send the patients to the medical post for treatments. In the future, it is recommended that the Union had better have a function of a pharmacy for specific diseases such as malaria.

(8) Sick leave

The patients were paid even during their absence of their work, because they became ill during their duty.

(9) Lazy workers

In the beginning of the program, some criticism against lazy men was frequently reported to the supervisors. Accordingly, these men were collected to form as a different group by the supervisors, and the representatives of illage organizations also warned them directly. After three weeks of the work, the special group of these lazy men started to work hard, and this problem was gradually solved.

(10) Increase of the water level

Since mid-September 2000, the cold front was crossing the eastern part of South Africa and the southern part of Mozambique. Because of this cold front, the Study Area had heavy rains, and Patquenos Libombos Dam located in the upper stream of the Incomati River in South Africa discharged the dam water at the rate of 50-125 m^3/sec on 19 November 2000. Three days after the discharge, the water level of the river rose 60 cm in Munguine. ARA-sul announced people to withdraw the lowland properties such as animals, crops, tools and facilities. The dike rehabilitation work was also affected by this incident, and it caused the delay in the schedule. Therefore, it was necessary to put further effort and labor in order to complete the rehabilitation of the dike as early as possible.

10.7 Impacts of the Program

The program of participatory dike rehabilitation work has enhanced the capacity of the villagers as well as the relationship between the villagers and the Study Team in the following ways:

- The capacity of younger villagers, who worked as supervisors in this program, to tackle public issues of the villages, has been strengthened through implementing this program.
- Collaborative and participatory work experiences in the dike rehabilitation program has contributed in creating the sense of ownership of the dikes among the villagers.
- Local people has become proud of their accomplishment of the program, in spite of the hard working condition including injuries, sickness, and heavy rain.
- Reliable relationship between the villagers and the Study Team was established through the face-to-face daily discussions responding to the villagers' requests such as delivery of drinking water, introduction of rubber boots rental system, and introduction of an incentive system.

Furthermore, the villagers' experiences of working together to construct the public infrastructure can be a good basis for collaborative village development activities in the future.