FARMER PARTICIPATION IN THE DEVELOPMENT OF SPATE
IRRIGATION FED AGRICULTURE IN THE EASTERN LOWLANDS OF
ERITREA

A case study of present and historical factors influencing beneficiary participation in
the development of Wadi Laba, Eastern Lowlands Wadi Development Project

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December 2001
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A dissertation submitted in partial fulfilment of the degree of MSc in Engineering for Development by instructional course

December 2001
EXECUTIVE SUMMARY

Many historical factors play a significant part in the willingness and ability of the farming community to fully involve themselves in the operation and maintenance (O&M) of the irrigation system. Though there is a strong sense of communal duty to the current irrigation O&M it is being significantly undermined by continued government assistance.

Similarly, there are many other socio-cultural and economic constraints that hinder the communities ability for self development. The families within the Project area practice a nomadic existence. They will not change their migratory practices, to the adjacent highlands, irrespective of improvements to the irrigation system.

There are few risk coping strategies in place to protect the farmers survival in a bad irrigation year, though there is a strong network of mutual support.

There are a number of Project design constraints of which the communities are unaware that could hinder future successes in development. These range from lack of understanding of the Project design itself to misinformation from a hierarch, itself ignorant of the Projects capacities.

The farming community already have an informal farmer organisation that has a strong tradition of mutual support. To fully participate in the future O&M of the Project and the changing roles required of it, this organisation requires an improved leadership, specialist staff and formalising of its autonomous status.

In its infancy the new farmer organisation requires considerable support to ensure that those farmers leading it develop the capacity to self organise and prioritise. This capacity is only partially present at the moment because of the communities heavily reliance on the administrative skills of the local government administration.

There are very few women involved in farming the land of the Project area. Though they do undertake specific tasks during the harvesting season. The community is predominantly of the Muslim faith and believe strongly in the segregation of men and women. The lack of a Baito at area level means women have very little representation in the Project area. This has significantly hindered women’s further participation in the agricultural development though female education is slowly improving.
ACKNOWLEDGEMENTS

I would like to thank the following people and organisations, without whose support this project would not have been possible:

Ben Fawcett, Course Co-ordinator of Engineering for Development, for his guidance and support throughout the year. It has been an enlighthening process.

Arif Anwar, Placement Supervisor and Course Lecturer on Irrigation, who first introduced me to the principles of irrigation and has provided much guidance in the writing of this dissertation.

David Birch and Richard Trimble, Halcrow Consultants to the Eastern Lowlands Wadi Development Project, Eritrea, who have both given me the opportunity to participate in a major Development Project and provided considerable backup in the way of living arrangements, facilitating travel and, not least, their professional expertise.

Birhane Hailie, The Eritrean Ministry of Agriculture Project Manager and my project advisor in Eritrea, who has provided much background material. Also, the many other members of the Ministry who have provided assistance in accessing places, people, literature and statistics.

The many Local Government Officials, who administer the Eastern Lowlands Farming Community, for their considerable assistance in interpreting during my interviews and again providing much background information.

The Farming Community of the Eastern Lowlands of Eritrea who have put up with my persistent questioning of every aspect of their lives.

Finally, The Department for International Development, The Charles Rayner Fund, The Douglas Bournford Trust and not least of all my family, for easing the financial burden inherent in studying abroad.
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ACRONYMS AND DEFINITIONS

Agim ........................................ A diversion bund across a wadi
Baito ........................................ Provincial Judiciary within a Zoba (old meaning was ‘Council’)
ELM ........................................... Eritrean Liberation Movement
ELWDP (the Project) ........................ Eastern Lowlands Wadi Development Programme
EPLF .......................................... Eritrean Peoples’ Liberation Front
EN ............................................. Eritrean Nakfa
Government (GoE) ............................. Government of Eritrea
IFAD ........................................... International Fund for Agricultural Development
Kebabi ......................................... Lowest level of Government administration
Megabaaya .................................... village / area council (in place of provincial Baito)
Mesgha ......................................... A secondary canal leading from the wadi
The Ministry (MoA) ........................... Ministry of Agriculture
PRA ............................................ Participatory Rapid Appraisal
RAD (Regional Ministry) ..................... Rural Agricultural Department
Sowra ......................................... A chieftain within the EPLF
Sub-zoba ....................................... Area Government
Tenna/Tashkil ................................. Farmers who manage the irrigation system & other farmers
Zoba ........................................... Provincial Government

Exchange Rate USD $1 = 10.1 Eritrean Nakfa (though the exchange rate is unstable)
1 INTRODUCTION

1.1 Context

To understand the current day farming practices of Eritrea as exhibited in the spate irrigation management of the Eastern Lowlands, it is vitally important to address its historic roots. Eritrea is a country born out of cultural diversity and centuries of conflict with many other nations who have sought to exploit its resources. To name but a few, Arabia, Britain, Egypt, Ethiopia, Italy and Turkey, have all influenced the way in which modern day Eritrea functions through socio-cultural and religious interventions. Indeed Eritrea itself did not become a unified body until after its colonisation by the Italians in the early 1880s. The practices of the various native fieldmuns prior to this has also played a significant and diversifying role on agricultural practice above and beyond those outside influences.

In the agricultural sector, specifically the area of interest – the agricultural communities around Wadi Laba, in the Eastern Lowlands, many such interventions from the various Arabic, Ethiopian and Italian periods of rule still have strong residual effects on the way farming is practiced and on the degree of participation that can be effected in developing the land and water management practices further. The indigenous and naturalised peoples of the Eastern Lowlands have adapted many of these historical interventions to better suit their needs, yet the environment is a harsh one and recent conflicts have imposed further limitations upon the ability of the agricultural communities to function cohesively without Government intervention.

With over 80% of the Eritrean population still involved in the rural sector, the present day Government of Eritrea (Government) has sought to address the multifarious issues that have arisen, post conflict, through the bringing together of such a diverse people under a single constitution. Even though the people of Eritrea were eventually united in their struggle for freedom, the post conflict task of administering the needs of the various socio-cultural and religious groups within the agricultural sector has not been an easy task to achieve. It has had to address issues that have been complicated over time, endeavouring for equality through participation of the people, as stated in the constitution, whilst being culturally sensitive to the various factions therein.

Rationalisation of the agricultural sector is fraught with considerable impositions, over and above the difficulties inherent in crop production in such an inhospitable climate. With a population increasing at 2.9% p.a., food security will become an even more important issue in the coming years, as will reversing/reducing the intensification of urban migration resultant of a hard rural life. The Government, through its Ministry of Agriculture (the Ministry), and in partnership with various International Aid Organisations has therefore focussed on improving the potential of the agricultural communities through ensuring the capacity of the Ministry to develop such. The Eastern Lowlands Wadi Development Project (the Project) is just such an initiative and aims to be a flagship project on which to base the development of similar agricultural communities throughout Eritrea.
1.2 Rationale

Where international aid has assisted agricultural development projects in the past, it has been found, on innumerable occasions, that a lack of involvement of the beneficiaries of the development process has resulted in poor performance of the development being undertaken (IFAD, 1995). Theoretically, a fundamental shift has occurred, entailing the greater involvement of the beneficiaries in all stages of the development process, from design through construction to operation and maintenance and post evaluation.

The underlying reason for conducting the research into farmer participation is to evaluate to what degree such a shift in focus in development attitudes is in actual fact being practiced, with specific reference to the development of the spate irrigation system at Wadi Laab in the eastern lowlands of Eritrea. This dissertation focuses mainly on the farmer needs, through assessment of their past and present farming organisation practices and procedures. Also considering how governmental intervention proposes to involve them and provide solutions to the uncertainty they face, inherent in their spate diversion agriculture. It also considers the other primary objective of the Project; to equip the Ministry with the tools necessary to undertake such ventures independently in the future i.e. participation as practiced at the National/International level.

1.3 Objectives and Scope of Study

To assess the farming communities’ capacity to fully participate in the Project, this study will carry out a qualitative investigation by:

- Researching the history of spate irrigation in the region.
- Studying technical factors of the Project impacting on farmer’s ability to participate.
- Addressing physical and socio-cultural issues affecting willingness and ability of the Project’s community to participate.
- Researching past, present and proposed future farmer organisational structure and its impacts on development.
- Researching the Ministry of Agriculture’s interventions and capacity to undertake similar future ventures.

This study is limited to factors that affect the ability and willingness of the farming communities and the Ministry to participate and benefit from the development of the Project. Due to the nature of the Project a number of wider issues, of national interest, are also discussed. The findings of the study are limited in their application to similar projects, even within Eritrea, given the diverse socio-cultural nature of the rural communities and variation in other historical factors that have shaped their communities.

The study has not delved exhaustively into many of the cultural practices that affect the way the farming communities as to do so would have introduced too many variables given the timeframe
of the study. Further reference to such aspects are, however, available in Marer’s (1997) socio-cultural appraisal. Neither has it gone into an analysis of the communities of the other proposed developments at Mai-Ule and Wadi Labka, though the findings may be pertinent to the communities receiving irrigation water from Mai-Ule as they are immediately adjacent to Wadi Laba, and indeed, some of their community are expected to come under the umbrella of Wadi Laba’s proposed new farmer organisational infrastructure.

1.4 Structure of Dissertation:

Chapter 2 aims to provide enough information that the reader can appreciate the demographics, socio-cultural and geographic diversity of the country and the implications this has for trying to create ‘broadbrush’ policy for the development of spate irrigation throughout Eritrea. The literature review concerns itself with some information about spate irrigation globally then addresses the issue of beneficiary participation in irrigation development and factors limiting their capacity to do so.

Chapter 3 addresses the methodology used in assessing the community involvement in the Project. The processes are outlined in order that the reader appreciates that the study is qualitative in nature.

Chapter 4 covers the historical aspects of the region that still influence the farming practices, creating a background understanding of how these factors still influence the farmers lives.

Chapter 5 assesses the criteria for the engineering design and construction for the given development under the given circumstances, the aim being to address the timely involvement of the beneficiary community in the various stages of development and so avoid alienating that community from its ownership of the Project.

Chapter 6 expands on the multifarious factors that determine the degree of willingness and ability of the beneficiary community to fully participate in any form of development. More specifically, the customary laws governing land and water rights are discussed in the light of relatively recent changes brought about by Government. Further discussed are the impacts of conflict on subsequent government policy concerning ‘cash or food for work programmes’. Finally, the factors governing the potential of female participation and the difficult issues therein are considered.

Chapter 8 gives the author’s recommendations concerning possibilities for improvements in the process of participation in developments of this nature.
2 BACKGROUND

2.1 Country Profile

Eritrea is located along the eastern shores of NE Africa, abutting the Red Sea. It extends from 12.42° North to 18.2° North, the coastline being approximately 1000km long. The country is bordered by Ethiopia, to the South; Sudan, to the North West; and; Djibouti in the South East.

The country covers an area of approximately 122 000 km². The provincial boundaries within Eritrea were recently reconfigured, reducing the number of provinces from ten to six administrative areas as outlined in Map 2-1.

Map 2-1: The recently realigned six administrative zones of Eritrea.

However, given that the older system of ten provinces is still much referred to both in literature and by the indigenous population, Map 2-2 shows the old regions.
Map 2-2: The old 10 administrative areas of Eritrea.

Eritrea can be categorised into three main agro-ecological zones:

The eastern lowlands, in the south, are in places below sea level. Whilst in the northern sector altitudes reach 600m. The whole eastern region having a desert climate. The average annual rainfall is 200mm whilst the average evapotranspiration is of the order of 2,000mm per annum. Temperatures range from 30°C for the period October to May, to in excess of 45°C during the period of June to September. The central highlands and adjacent escarpments, which in places are in excess of 2,400m altitude, have a climate ranging from cool sub humid to semi-arid. The western lowlands have a hot semi-arid climate.

The traditional agricultural regions have in the majority focussed on the high plateaux, however, Italian land policies in the late 19th and early 20th centuries forced many of the native peoples to seek opportunities in the arid lowland regions. Not withstanding the above, pastoralism and agro-pastoralism has long been practiced, exploiting the seasonally lush fertile lowlands through seasonal migrations from the adjacent highlands.

The FAO (FAO, 1994) estimated that cultivated rain-fed area in the Highlands is approximately 417,000 ha, with a further 22,000 ha under irrigation. Over 70% of the total surface area of Eritrea lies in the hot arid lowlands. The Ministry estimates that the potential for improving irrigation is about 60,000 ha, with the majority of this based on the river systems in the Western
Lowlands, where agricultural practices are similar to those in the adjacent highlands. In the Eastern Lowlands agriculture is entirely based on floodwater management (spate irrigation).

2.1.1 Population and Social Indicators:

The population is estimated at 3.5 million, with a density of 18 people/km². However, there are significant variations in density between regions. One estimate putting two thirds of the population into one sixth of the highland area, where densities are believed to be 75 people/km², whilst in the lowlands this decreases to 10 people/km². Plaice (1996) determined a number of culturally distinct groups in Eritrea, summarised in Table 2-1.

Table 2-1: Ethnic and cultural groups (source: Plaice 1996)

<table>
<thead>
<tr>
<th>Ethnic Group</th>
<th>Cultural sub groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nilotic</td>
<td>Nara</td>
</tr>
<tr>
<td></td>
<td>Kunama</td>
</tr>
<tr>
<td>Kushitic</td>
<td>Beja</td>
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<td>Bilen</td>
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<td></td>
<td>Afar</td>
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<tr>
<td></td>
<td>Saho</td>
</tr>
<tr>
<td>Semitic</td>
<td>Tigrinya</td>
</tr>
<tr>
<td></td>
<td>Tigre</td>
</tr>
</tbody>
</table>

The communities in and around the Project area are mainly of Tigre and Tigrinya origin, which are further subdivided along familial tribal lines such as the Mensae. Though there are two major religious practices; Christianity and Islam, the community is predominantly of Muslim faith.

Marnier (1997) estimated that GDP is less than USD 150, however, there is a considerable gap between the urban and rural sectors, with gross income in the rural sector, after expenditure, being negative. Given that 80% of the population is still dependent upon subsistence agriculture and livestock activities, this is a very serious issue.

Life expectancy for the average male is 46 years. Infant mortality is 135 per 1000, with many women dying in childbirth. Eritrea has one doctor per 48 000 people and one nurse per 1 750 people. Literacy is 20% and 80% of people are not believed to have access to safe drinking water.

2.1.2 Conflict

Eritrea is still emerging from a 30-year struggle for independence with its neighbour, Ethiopia. Independence was ratified by the people in 1993. More recently it has undergone a border conflict with Ethiopia, hostilities only being concluded in early 2001 due to intervention by UN, who are currently policing the border. Given the degree of disruption to the agricultural sector, much of the rural population has become dependent upon food aid. However, recent
discussions with the World Food Programme in Eritrea indicated that food aid would shortly terminate, giving potential for the agricultural sector to again find a market for its produce.

2.1.3 Agricultural Development

Given that the Government is still undergoing a transition period from coping with relief work, resultant of the second bout of conflict with Ethiopia, their longer-term aims of sustainable development are considerably hampered. What the Government stated on its policy in the Staff Appraisal Report (IFAD, 1995), post independence, still holds true; ‘public policy will involve a mix of pragmatic “nee to” actions with a gradual shift towards more sustainable forms of operation as the most urgent and unavoidable demands are met’. The Government view on a wide range of public services [including Agriculture] is that cost recovery is impossible among large groups of the population because of their current inability to pay. However, what also still holds true is that such intervention by the Government is likely to hinder any attempts at sustainable development undertaken.

- Spate Irrigation Development

Haile (2000) stated that along the Eastern Lowlands 11 sites have been identified where development would be economically viable. The Eastern Lowlands Development Project (the Project) is considered a pilot scheme on which to determine the viability of such development through improving the Ministry’s capacity to plan, organise and execute such works.

2.2 The Study Area - Wadis Laba and Mai Ule (the Project area)

2.2.1 Population

Contrary to Eritrea’s general cultural diversity, the agricultural communities under the Project are predominantly of Muslim faith. Consisting of members of the Mensae tribe and a number of smaller familial tribes. According to Tesfai (2001) and the Ministry of Local Government, the total area of the She’eb district is about 1,321 km², with a density of 18 people per km². However, the She’eb area, consisting of the Men-She’eb and Tiluk administrations, is only of the order of 10km², harbouring six villages, with an approximate population of 18,454 during the cropping season, though this dropped significantly, due to migration to the adjacent highlands, during the study period.

2.2.2 Administration

The development area lies in what was previously termed the Sahel Region, now subsumed into The Northern Red Sea Region (Zoba Semenawi Keith Behr) for administrative purposes. More specifically, Sub-zoba She’eb, one of the sub-regional administrative centres of The Northern Red Sea Region, oversees the Project area, as shown in Map 2-3.
Map 2-3: Enlargement of the Northern Red Sea Zone.

Local administration of the Agricultural Communities is further devolved to smaller units called Kebabi (local council). The two Councils that administer the Project area are She'eb and Tiluk Councils. Map 2-4 gives a simplified summary of the main towns and the Project development site.

Map 2-4: Simple schematic of command area

1 A more detailed plan of the command areas of Wadi Laba and Mai Ule is at appendix 2.1, (reproduced from the Mai Ule Bidding Document).
She‘eb Council administers the communities of She‘eb, She‘eb Khethin, Demine Dige (the village of Dige, as distinct from Demine Dige, is where the community of She‘eb was previously located prior to its wholesale translocation to She‘eb). Tiluk Council administers the communities of Tiluk, Bisses and Geneb.

2.2.3 An Historical Perspective of Spate Irrigation in the Study Area

Spate Irrigation in Eritrea is reputed to have been introduced from the Yemen 80 years ago (IFAD, 1994; Mamer, 1997). However, Tesfai (2001) indicated that its introduction predated these estimations to approximately 1906 in the Project area. Studies by Longrigg (1945), Neadel (1945), and Hailie (2000) suggest that early spate irrigation spread from the coastal regions inland. Longrigg (1945), posted here during the British Military Administration (1941 – 1952), stated of the Wekriro tribes: ‘they cultivate precarious crops during winter, crudely damming the mountain torrents which traverse their territory...[whilst] ...in summer, they seek the highland pastures with their herds’.

2.2.4 Modern day Spate Irrigation in the Study area

In the villages in and around the Project though there are no longer any traces of these Yemeni forebears the village of Bisses is said to be named after their tribe; ‘The Bessisians’. Tesfai (2001) suggested that there were two reasons for their leaving. First, that there were conflicts between the local people and the Yemenis and second, that they left in about 1964, during the initial period of conflict between Eritrea and Ethiopia. In the eastern lowlands, however, the fundamental irrigation practices introduced by the Yemenis have remained, with only the management practices being adjusted, again partly as a result of the conflict with Ethiopia.

2.3 Literature Review

2.3.1 Spate irrigation, an overview

In many areas of the developing world (South Asia, the Middle East, Africa and Central America) rain-fed crop production or perennial irrigation are not options open to the communities due to the arid climate and lack of rainfall (van Steenbergen, 1997). However, such regions have the ability to agriculturally exploit the land by utilising floodwaters, issuing from adjacent rain-fed highlands, for the irrigation of crops in the arid lowland plains, and have in some cases done so for centuries. van Steenbergen (1997) highlighted that such irrigation practices are estimated to be 165,000 ha in Morocco, 1,000,000 ha in Nigeria, 155,000 ha in Yemen and 1,450,000 ha in Pakistan. However, only in the last decade has attention focussed on the possibilities of flood irrigation as a potential source of increased crop yield for national food security, rather than providing only a subsistence level of production to its immediate farming communities. Three categories of flood irrigation are outlined by van Steenbergen (1997), namely:

1. Spate Diversion, where seasonal flood flows are diverted from ephemeral riverbeds;
2. Inundation canals that start to flow when a perennial river reaches a certain level; and
3. Flood rise or recession irrigation, where a perennial river overtops and irrigates the areas adjacent to the river.

According to the FAO (FAO, 1987), it is spate irrigation that has received the greater attention in recent years, having been assessed as the most important of the three categories, in terms of area cultivated.

2.3.2 Beneficiary Participation

On participatory development, the World Bank (WB), as cited by Halcrow (Halcrow, 1997a), defines participation as:

"...a process by which people, especially disadvantaged people, can exercise influence over policy formulation, design, alternatives, investment choices, management and monitoring of development interventions in their communities"

However, as concerns the Project, IFAD's reports (IFAD, 1995) have adopted a different approach to participation in the design and construction phases, given that much of this stage of wadi development is technically orientated and therefore unlikely that farmers would be able to deal with such. However, subsequent participation in the O&M will aim to:

"...be firmly based on participatory approaches and on an appropriate level of technology which encourage farmer responsibility for the developments and promote a sense of ownership and self reliance among the farmers. It is therefore intended that farmers make a real contribution, in cash or in kind, towards the cost of the improvements, and that they will on completion of the schemes assure full responsibility for the subsequent operation and maintenance of the irrigation systems".

However, the Consultants have apparently "explicitly" opted for the World Bank (WB) much broader definition, stating that:

"...the participation of the farming community must be ensured from the beginning...the key to enhancing ...[the Project]...lies in a continuous participatory process throughout the planning, design and implementation of the Project".

2.3.3 Current thought on farmer participation in irrigation.

The Economic Development Institute of the World Bank (EDI, 1996) has forged ahead with its programme of Participatory Irrigation Management (PIM) in many developing countries such as Egypt, India and Pakistan. The concept of Water User Associations (WUA) has gained significant authority from the successes that have been achieved. However, some question the introduction of 'a developed world' concept into a developing country scenario, where literacy levels are low and support services are not necessarily very reliable (EDI, 1996). This could
possibly be the case in Eritrea where at present the institutional infrastructure does not exist to
give a farmer organisation formal autonomy. The likelihood of post construction support
services could also be questioned given the significant shortage in trained engineers during the
construction phase. However, the EDI (1996) are strongly in favour of PIM which is classified as
involvement of irrigation users in all aspects of irrigation determination; from planning through
design to future policy matters.

The EDI (1996) are also of the opinion that government does have a role to play in the issue of
participation given that the government frequently has capacities unavailable to smaller groups
of individuals, such as training facilities, specialist advisory agencies, etc. This was
corroborated by Bottrall (1985) who concluded that there is a certain point along the spectrum of
size above which the level of performance can be expected to decline if executive responsibility
for operating and maintaining (O&M) the system is left exclusively in the hands of the farmers
themselves.

In dealing with extension services Moris (1991) addresses 'involving farmers' by suggesting that
an individual (extension worker) effectiveness when working at the agency/farmer interface is
dependent upon the nature of the contact he or she establishes with the 'clients'. Moris (1991)
implied that the worker, in this context, must find ways of exerting leverage on the people
whose participation he desired whether it be through intellectual stimulation, sociability, timely
advice, conveying valued information or services offered.

Chambers (1988) raised some interesting perspectives on irrigation managers in the forerunner
of PIM which was 'Farmer Joint Management', suggesting that their environment, motivation
and behaviour all play a significant role in the success or failure of irrigation programmes. I.e.
that canal irrigation systems are all too easily thought of as delimited by the 'physical domain' of
capture, distribution and application of water, '....but the human domain so dominates in
operating the system that to limit analysis to physical domains...[is misleading and
unscientific]....' This was further explored by Kimani (1990) through analysis of the link between
the technical characteristics of an irrigation system and the social structure of the local
community, concluding that particular technical choices make demands on the organisation of
an irrigation system, but the same organisation may also be limited by the wider social
relationships within the local community.

Furthermore, Kimani (1990) asked the question, how can technical specification of the irrigation
infrastructure be related to the organisation and management capabilities of the beneficiary
farmers so that the resultant smallholder irrigation scheme is effectively managed by the farmers
themselves, with only token support from the Government. In his review of the technical
experiences encountered in Kenyan farmer organisations Kimani (1990) concluded that the
performance of WUA was mixed. Poor results had included high levels of donor or government
intervention and technical designs that failed to adequately anticipate organisation and
management implications. Whilst well performing WUA were frequently resultant of the
introduction of ‘community organisers’ who were independent to government bodies, increasing farmer willingness to take initiative in system maintenance and water management.

Smith and Sohani (1997) offered a different perspective of farmer organisation being implemented in three pilot projects by the International Irrigation Management Institute, in which Water User Organisations (WUO) were being established to operate and maintain irrigation and drainage facilities in distributary canal command areas. The WUO consisted of associations of all water users on each watercourse, and federations of these associations managing irrigation at the distributary level, with a hierarchy, autonomous of government, all being accountable to the people of the area served. The pilot projects being based on a participatory learning process for all levels of such an organisation. Rivera and Elkalla (1997) also promoted the concept of farmer associations in their paper on restructuring of agricultural extension in Egypt. Vermillion and Garces-Restrepo (1996) agreed with the philosophy of WUA, from their experiences gained in Colombia. They stated that “The total cost of irrigation has declined relative to both cost of production and gross value output”. However, Svendsen and Vermillion (1996) were more conservative, stating of a transition to farmer management in a large United States irrigation system that: “Although O&M expenditures held constant after the transfer, maintenance problems appear to be increasing as the system ages. The most notable change in performance is the 22% reduction in irrigation fee levels paid by farmers straight after transfer”.

2.3.4 Factors influencing farmer willingness and ability to participate

Land Tenure

Many of the practices instituted during the Italian Colonial Period and subsequent British Military Administration and Ethiopian Rule still influence land tenure. An understanding of the various land tenure systems is fundamental to gaining a perspective of the farmer relationship with his land, even though officialdom has laid down a national policy on land tenure. Land tenure is important because it influences the farmer’s willingness to participate in the land’s development. If tenure agreements do not favour the farmer there will be little grounds for him to give of his time and effort to improve its attributes. This is highlighted in Hailis’s (2000) study whereby land below 350 metres in the Eastern Lowlands and below 800 metres in the Western Lowlands was declared state land (Terre Dominale) and as previously stated, much expropriation of land occurred.

In the highlands two systems of land tenure are still apparent: Diesa and Risti. Diesa entails rotation of land rights every seven years, thus reducing investment likelihood. Similarly, inheritance rules dictate that all males members, whether a member of the community or not, who have a legitimate claim have equal right to a parcel of the property. Whilst equitable, this results in fragmentation of the land.

The second system in operation in the highlands is Risti or private tenure. This system is one of inheritance from father to son. Though Risti provides the security to be able to invest in the land.
it is unsure whether land holding is reduced by inheritance or whether it is only the eldest son who gains the right to the land. Interestingly, Haile (2000) highlighted that Risti land cannot be sold but that, in times of difficulty, the land can be used as security for a loan. The creditor gaining rights to exploit the land so long as the farmer defaults. Risti tenure as described here is of the same nature as that found in Ethiopia under the old agrarian regime (Rahmato, 1985), but in this case land was equally split between all those who could provide proof of their hereditary links, whether they be a member of the village or not, regardless of gender.

Furthermore, over time the community has consisted of sub sectors that utilize the land in different ways, albeit not for arable crops, they may use land for grazing their animals and so must surely have a say in how land is to be developed. IFAD (1994) determined that approximately 50% of the community are agro-pastoral and 10% pastoral in the Semenawi Keih Bahri area.
3 METHODOLOGY

3.1 Theory of Participatory Rapid Appraisal

The method and tools used to determine the degree of involvement of the beneficiary farming community is known as Participatory Rapid Appraisal (PRA). This concept has undergone a number of evolutions, through Rapid Rural Appraisal; which was first used in the early 1980s as a fast means of extracting information, into its current form; whereby the participants not only become directly involved in the analyses, but evaluate their own ideas and come up with solutions to their own difficulties. The concept was first used by Byerlee and Collinson (1980) in order to reduce the time, effort and expenditure required of more formal analytical methods. It is looser than the more formal statistical survey, supplying qualitative rather than quantitative data, though to a degree it is still based on farmer interviews, direct observations and measurements that allows the constraints and benefits to the farming community to be considered. The results, however, cannot be said to be statistically rigorous. Rather, the process is two fold; giving the community the facility to address and prioritise their own wants and needs and Secondly to produce information to a hierarchy in order to facilitate action plans of development.

There are two types of PRA tool, those for collecting and those for analysing information:

Information Collection

- Secondary source review
- Observation
- Semi-structured Interview
- Mapping/Diagrams
- Transects
- Photography

Information Analysis

- Group Discussion
- Mapping/diagrams
- Innovative assessment

The information from semi-structured interviews may provide a baseline against which to verify other sources.

3.2 Application of Rapid Appraisal

Development issues frequently require the pragmatic application of the tools of PRA. That is to say, administrative hierarchies within development programmes have agendas and targets of their own to achieve. Such does not allow for the farming/other communities to dictate policy through understanding their own priorities. Rather, the results of PRA enable such authorities to
take into consideration the beneficiaries’ views. Given that the process has been one of extraction of information, it was felt that it was more akin to the earlier form of PRA known as Rapid Rural Appraisal. Thus the tools of PRA have been applied, but only insofar as it will enable future similar developments to consider how better to involve the beneficiary community in the development process.

Rapid Appraisal was undertaken in the She'eb and Tiluk Council administrative areas during the year 2001 dry season; from late June to late September. The PRA team composed the author of this work and the other a community member. Cultural restrictions within the community prevented women being incorporated into the PRA team. The second member of the team was given a period of two days training in the principles of PRA, which was supplemented by in the field learning and regular appraisals of difficulties encountered. An account of those techniques employed follows.

3.3 Rapid Rural Appraisal Techniques

The semi-structured interviews were held with a range of participants, ranging from key informants within the national and sub-zoba Ministry, sub-zoba Administration, Council administration, Temafi and Tashkil and the farmers themselves. Historical profiling was used amongst some of the elders of the community. In order to aid their recollection the use of simple tools, like timelines; where key historical dates are used as prompts to their memory, were used. In addition, samples of rich and poor farmers were chosen for interview from each of the six villages within the command area. However, it proved more difficult to access female heads of household and it was therefore only by indirect sources that information about this sector of the population could be gathered.

The basic tool developed for the semi-structured interviews has been the questionnaire. This was developed through several pilot surveys trialled on random samples of the available population. The results of this early pilot enabled various aspects of the questionnaire to be critically appraised and where necessary approached differently. It must be stressed that the questionnaire is a compounded version of a number of questionnaires used. In certain cases particular sections of the questionnaire were not pertinent to the target audience and so were omitted. Subsequently, advice was taken from the second team member who had become involved to a greater extent in the gathering of information. Where deemed suitable the conversation was allowed to move away from the questionnaire if it was thought new

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2 Historical profiling is a simple tool that uses key points in country (or regional) history to aid the interviewees in remembering the periods in question.

3 A compilation of all questionnaires used is at appendix 3.1. Where appropriate some parts were used and others not, such as in the case of interview with key informants on historical aspects of village land distribution.
information might be brought to light, as is demonstrated in Plate 3-1 where the farmers are using graphic methods of drawing in the dirt to explain how the current irrigation system is operated.

Plate 3-1: Farmers explaining how the current irrigation system works

Discussion groups/focus group discussions: In such forums groups of between 5 and 10 people gather together and discussion is based upon information from the semi-structured interviews. Although, the PRA team attends, it is more in the capacity of chairing the meeting and making notes on the observations/ conclusions of the group themselves and secondly, to ensure that the direction of the discussion remains focussed. Plate 3-2 shows a focus group of Ternafi under the guidance of an IFAD consultant.

Plate 3-2: A focus group of Ternafi and Tashkil on Farmer Organisation

Secondary Data Review: Data is gathered from previous studies that have been undertaken in the Region such as by Tesfai (2001) and Haille(2000). Further to this, other sources of information are extracted from sources like the Ministry, the consultant engineers; Halcrow, and
through public and private library collections. It became apparent that bias was a significant problem as some of the history held to be true by certain sectors of the population had been affected by past studies that had been undertaken in the region and that there were discrepancies in some of the personal accounts. A second factor influencing data interpretation was resultant of a significant language deficit on the part of the author, given that a number of historical accounts, when spate irrigation is presumed to have been introduced from Yemen, is written in Italian.

Observation: Observations were undertaken on the micro and macro scales. Using vehicles allowed greater distances to be covered to the outlying villages and thus to determine variation relative to proximity to resources, believed to be pertinent to farmer participation. Similarly, access to the migration routes and destinations enabled comparison between highland and lowland communities. On the micro scale, observation of farming practices and methods was a good tool to confirm information established in semi-structured interview. A substantial aid to observation has been the use of photography, as depicted throughout.

Mapping

- Transects: The use of transect mapping, similar to observation, enabled more detailed study of how certain factors vary between stipulated points. In this case its application was useful in determining changing circumstances relative to the availability/quality of resources. It was again a useful tool in corroborated or questioning information extracted in interviews and discussions.

- Time Lines: As used in the semi-structured interviews, key historical dates were used from over the period of the last one hundred years to assist the community to recall the conditions in the Project region at that time. These included; the Italian colonial period; the British Military Administration; Annexation and Federation to Ethiopia; Haile Sellassie and the Dergue and the end of conflict/independence.

3.4 Strengths and Weaknesses of Rapid Rural Appraisal Techniques

Discussions with Tesfai, who has carried out similar studies, suggest that PRA should only be carried out during the cropping season, prior to familial migration to the highlands. It must be said that familial migration has been a hindrance to the PRA process during this study, reducing access to the community. In fact, many of the meetings ended up inadvertently targeting the wrong groups, without the knowledge of the interviewer (Farmers attended meetings in place of Temafi and thus frequently lacked the knowledge being sought by the interviewer, resulting in nonparticipation in the talks). Similarly, the information gained at these meetings by the farmer representatives has proven to be quickly forgotten by those involved and, significantly, not passed on to the rest of the farming community.
Even though Tesfai (2001) stated that approximately a quarter of household heads are women, access to this sector has been distinctly difficult without the aid of a female member on the PRA team.

A major factor prejudicing the PRA exercises is the language barrier. In the early stages translation, which frequently underwent three language transitions (each way), was undertaken by members of The Regional Ministry. Though the exercise could not have been undertaken without them, it is difficult to say what latent bias may have been introduced by utilizing a major stakeholder in the development rather than an impartial assistant.

Similar to the above was the small size of the PRA team. Results could possibly have been improved through greater diversity in team members attitudes and post exercise discussions.

However, the PRA did highlight the temporal and spatial changes in priorities concerning participation in the spate irrigation development. It has the ability to strengthen communication with the beneficiary communities. The qualitative nature of the study should be seen as complementing the more formal statistical analyses undertaken in the Project sociology report (Mamer, 1997).

The development of the questionnaire used to give direction to the semi-structured interviews was hampered through a lack of a truly representative cross section of the community within the Project area. This issue was partially addressed by visiting a number of the highland locations, though the community migrate over a considerable area of the highlands so it was not exhaustive.
Discussion with the local community, using timelines with key historical dates as prompts, has shown that the community in and around She'eb are very aware of their history and of the impacts on the way they lead their life. The dates and times have been corroborated against a synopsis of recent history by Plaice (1996) which shows Eritrea to have sequentially; been federated to Ethiopia (1961 – 1991); annexed to Ethiopia (1952 – 1951); under British Military Administration (1941 – 1952) and; an Italian Colony (1882 – 1941). All periods have been accented with conflict through the Eritrean will for independence. The implications of most recent period of conflict on the country’s infrastructure cannot be overstated. During the latter half of the Ethiopian period, when the Dergue were in power, nationalisation policies also considerably affected production capacity.

Research downstream of the Project area, at Emberame, has provided a significant link in the oral history of spate irrigation development. A village elder with considerable knowledge of the area suggested that in the early 1920s a marriage between an Arabian local landowner, Sheik Alamin, and the daughter of a Yemeni trader, Bahamdon, led to a strong alliance between the two and the subsequent introduction of spate irrigation along Wadi Laba. Oral history holds that Sheik Alamin had been farming the land at Emberame from approximately 1890. Around 1920 the two men set out on a joint venture that required importation of Yemeni expertise in spate irrigation. Yemeni workers from the tribes of Batook, Safee, Ma’aeshe and Bessians were therefore brought to work for Sheik Alamin and Bahamdon. The tribes started to develop the spate irrigation and in time the Batook and Safee tribes came to dominate Wekiro, the Ma’aeshians Wekiro and the Bessians moved upstream, to Mai Ule⁴, the wadi head, at Bisses, named after the tribe (interestingly, Mai-Ule means ‘first water’ in Arabic). These tribes integrated to a certain degree with the local populations, passing on their knowledge to the indigenous people. The oral history further holds that these Yemenis departed the region in the late 1970s. The presence of a mausoleum, next to a Mosque in Emberame, built for the man Bahamdon suggests that he was a significant member of the community in that region at that time. The migration inland from Wekiro has also been confirmed with village elders from She’eb, though not in as great a detail as from Emberame. Though in some interviews the suggestion was that migration also occurred from Zula, further south along the coast.

However, within the She’eb community the older members of the community, some of whom were in their late sixties, having received the traditional oral history from their fathers (who were young men at the time in question), suggest that even before the Yemeni farmers arrived a limited form of spate irrigation was practiced, though they could not expand on the matter further. Subsequently several interviewees in She’eb suggested that Yemenis first became

⁴ Mai-Ule is the wadi adjacent to Wadi Laba, and is the next wadi to be developed in the Eastern Lowlands Wadi Development Project.
interested in crop production in Eritrea as a result of meeting Eritrean Muslims on pilgrimage to Mecca, the pilgrims having brought supplies of grain to sustain them on their travels. This could lie in with the landowner Sheik Alamin and the trader Bahamdon's interest in introducing spate irrigation, but this was not corroborated.

A review of secondary sources of information was undertaken at the Pavoni historical records centre in Asmara. Research showed that the introduction / advancement of Yemeni expertise\(^5\) in spate irrigation into Eritrea and the switch in policy by the Colonial Italians in 1895 from creating Eritrea as an agricultural colony for Italian emigrant workers, to using indigenous labour and imported capital to exploit the land (Mesghenna, 1989), fits in well with aforementioned studies and interviews. Many of the farmers interviewed said that the colonial misunderstanding of the relationship between man and land had not been restricted to the Italians. The farmers stated that the British adopted a similar attitude, post WWII, of expropriating land if it were not farmed.

An informal interview with a visiting historian generally corroborated the findings of Taddia (1986) concerning the change in Italian Policy. In that the indigenous populations working the land for themselves is believed to have created an indigenous labour crisis for the now Italian Estate owners in the Eastern Lowlands - one of which was Mai Laba (equates to Wadi Laba?), seized from the Bizen Monastery on 12th June 1894. However, further research through the archives of an Italian library, a remnant of the colonial period, would give credence to Mesghenna (1989) who stated that they (the Italian land owners) did not find this a problem though as they could readily 'recruit immigrant workers on a large scale from Yemen, the Sudan and even from regions in Central and western Africa'. The relationship with adjacent countries within the Project area is still apparent in that a number of fighters (for the war of independence) still in the community are heavily involved in the country's development. Not least of all is a Sudanese woman who it is said has gained honorary male status because she was a 'fighter' and who sits on the sub-zoba Baito, representing the community.

In general, these accounts corroborate the Staff Appraisal Report (IFAD, 1995) findings but refute Tesfaï's (2001) of an earlier introduction of spate irrigation in 1906.

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\(^5\) The introduction of agricultural practices from the Arabic Peninsula into Eritrea is not a recent phenomenon. Whilst Haile (2000) statement that there is no historical evidence of extensive irrigation in Eritrea might be true of recent history, long before the brief Italian Colonial Period, in the Sabean Era of migration (1000 – 400 BC), there is evidence of irrigation schemes (Pilcse, 1996). The Sabeans (Semites who had crossed the red sea and settled in the highlands of current day Eritrea) brought social institutions with them, also bringing camels, ...new plants and cultivation techniques (Bereketeab, 2000). Indeed, even before this, one theory speculates that the Abyssinian forefathers of the peoples of the Horn of Africa originate from a tribal group in Yemen called Habashat (Bereketeab, 2000), thus possibly explaining the long-term agricultural inter-relationship between the two countries.
When asked about the current tribal makeup of the community, many of the families said there had been considerable intermarrying between the various groups over generations and that though they still migrated to different areas in the highlands, as a result of historical links, during the hot season, they thought of the lowland area as their true home. That is not to say that migratory practices have reduced as a result, for the contrary, the recent conflict increased such practice and anyway, the inhospitable climate during the summer months is stated as a strong reason for such migration and improvements to the irrigation system will not, it is stated, change such practice.
5.1 Feasibility of Beneficiary Participation in Design, Construction and Operation of Diversion and Division Structures

In view of the author’s findings within the Project area, the IFAD participation statement outlined in chapter 2 would not seem to take into account the specific circumstances of the farmers. Whilst there can be little doubt that the system design has been proven (through experience in Yemen and Pakistan) to provide a means of ensuring a more secure and adequate supply of irrigation water, when flash floods are available, the process of inclusion of the beneficiary farming community has been considerably hindered by conflict. Notwithstanding this, it is believed that by assessing the various aspects of the ‘system’ that such difficulties could be addressed in subsequent wadi development programmes, although individual circumstance will continue to have a significant impact on the approaches adopted to participation.

5.2 System Rationale

The two principal objectives of the Project according to Halcrow (1998a), Draft Design Report, are to:

- Improve food production and food security
- Strengthen the Ministry’s capacity in spate development and rehabilitation projects

The rationale, as understood from discussions with various engineers, draws extensively from the experiences of spate irrigation planning, design and operation principally within Yemen and tripartite meetings of the Ministry, WB Technical Review Team and the Consultants. This has translated into the construction of a permanent diversion weir at the head of each wadi. Further discussions with the consultant engineer suggest such development would increase the magnitude and duration, within the existing canal system, of the diverted floodwater flows by controlling the rate of floodwater extraction from the wadi during a flood event. Research (IFAD, 1994) suggests that within the command area the three wadis originally earmarked for development, have a combined potential irrigable area of 6000ha, yet on average less than half of this is irrigated annually. The improved diversion facilities at the head of the wadis would be expected to enable a greater percentage of the command area to be irrigated. However, it is apparent from observation and discussion that this is co-reliant on the recommended improvements to be made to the canal system with the construction of secondary canal head regulators at the main canal branch heads.

Further informal discussion with the regional engineer and referral back to the Project literature highlights that the Project is aimed at extensification of irrigation stability to a greater area of land—land which previously had a low probability of irrigation (i.e. a greater number of farmers within the command area would receive a regular water supply). Rather than an intensification
of irrigation capacity (and hence cropping intensification) over either the existing stable area or indeed to land further afield. Indeed, this is borne out in the data on changes to cropping intensity, which only increases from 145% to 165% (Halcrow, 1998) from the 'without' to 'with' project scenario, as is summarised Table 5-1 i.e. there is only a small increase in cropping intensity.

Table 5-1: Project area sample of cropping patterns and Intensities; 'with' and 'without' project

<table>
<thead>
<tr>
<th>CROP</th>
<th>WITHOUT PROJECT Crop area (Hectares)</th>
<th>WITH PROJECT Crop area (Hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum Plant</td>
<td>0.60</td>
<td>0.65</td>
</tr>
<tr>
<td>Sorghum Ratoon</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>Maize</td>
<td>0.10</td>
<td>0.25</td>
</tr>
<tr>
<td>Sesame</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>0.05</td>
<td>0.15</td>
</tr>
<tr>
<td>Millet</td>
<td>0.15</td>
<td>0.0</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1.40</td>
<td>1.65</td>
</tr>
<tr>
<td>CROPPING INTENSITY (%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, it is apparent from discussion groups, with both farmers and administrators, at the sub-zoba level and below, that the community are under the illusion that the development of the irrigation system will increase the overall magnitude of floodwater to such a degree that they will be able to irrigate land adjacent to the command area, land that has never previously been irrigated. Such misinformation has potential to disillusion the agricultural community and so reduce willingness to participate.

5.3 System Engineering Design

In assessing the community irrigation water expectations against the design crop water requirements, discussion and research (IFAD, 1995) suggests that though design figures are required to enable engineering design to progress, the data depicted in Table 5-2 is averaged out. Referral back to the design reports shows that only 27 years of climate data was available from [distant] Masaawa, which has been analysed using CLIMWAT to determine crop water requirements with and without project implementation (IFAD, 1995). Irrigation efficiencies were produced in the Engineering Feasibility Report and the Staff Appraisal Report (IFAD, 1995), resulting in two efficiency values for conveyance and field application.
Table 5-2: Estimated irrigation efficiencies with and without project.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>Conveyance (%)</th>
<th>Field Application (</th>
<th>OVERALL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without Project</td>
<td>With Project</td>
<td>Without Project</td>
</tr>
<tr>
<td>SAR</td>
<td>25 – 30</td>
<td>35 – 40</td>
<td>50</td>
</tr>
<tr>
<td>ELWDP</td>
<td>30 – 40</td>
<td>40 – 50</td>
<td>50</td>
</tr>
</tbody>
</table>

It is difficult to assess such averaged conveyance efficiencies, as there is significant variation throughout the command area in the canal profiles. Some canal systems resemble floodplains, to such a degree that it is difficult to determine where the water will flow until a flood event occurs, whilst in another area, Ide Abey (that discussion suggests accounts for 36% of the left bank of the command area of Wadi Labaj), a new dedicated channel has to be constructed that will presumably have a far better channel profile. This is well represented by a comparison of two branch canals depicted in Plate 5-1.

a; poor canal profile  
b; improved canal profile

Plate 5-1: Canal profiles.

The land distribution, as determined from aerial photography, and the proposed irrigation distribution (Halcrow 1998a) is summarised in Figure 5-1.
Figure 5-1: Schematic of Wadi Laba canal system showing hectarage and design irrigation requirements. (source: Halcrow, 1998)
It is believed that such variability in conveyance efficiency becomes important subsequent to the construction phase, when one of the criterion of distribution is visible equity of distribution. Similarly, the ‘with project’ design application rates are significantly controlled by the subsequent construction of downstream division structures within the command area. Even though the overall magnitude and duration of water diverted is expected to increase from the diversion weir at the head, the actual rate at which water will be diverted will be significantly reduced. Though this reduces the likelihood of damage to the farmers’ rudimentary ‘in field’ division structures, it also means that without the construction of the secondary canal head regulators it is unlikely that there will be enough head to actually get the water onto the land downstream. The Ministry / farmer led construction of these downstream structures has not been given enough consideration early on in the implementation phase. The longer term implications, post completion of the head weir and complementary structures, are that the farmers will see that the water is not getting onto their fields and this will significantly affect their willingness to participate in the subsequent O&M of the development. It may have been advisable to ensure that such structures were built prior to the headworks, thus sorting out two problems at the same time, namely;

- Ensuring, farmers see the floodwaters reach the fields on completion of the headworks rather than being disillusioned by the capacity of the headworks and the need to undertake further works themselves.
- Reducing conflict in beneficiary participation whilst local workers are also involved, and being paid, in main headworks construction.

An example of such can be explained in Wadi Laba. The irrigation water requirements for the assumed cropping pattern at Table 5-1, has been calculated as 3,550m³/ha p.a. Given an assumed best case distribution/application efficiency of 25%, as summarised in Table 5-2, a gross irrigation requirement of 14,200m³/ha p.a. would be required (Halcrow, 1998) to irrigate the 2,800ha estimated as irrigable by the Staff Appraisal Report (IFAD, 1995) it has been determined that in the average flood event year an amount equivalent to a rate of 35m³/s would need to be diverted from the wadi to the fields to supply such a demand. This is the value that has been selected in determining the size and design of the diversion weir, primary and secondary canal head regulators and division structures. However, given the expected operational efficiency losses, it has been assessed that the system would only be capable of irrigating some 2,650ha in an average year.

Discussions with the regional engineer have determined that the system design value of 35m³/s approximates to the average rate of water supply to a particular sector of Wadi Laba, Sh'eb Khethin (see Figure 5-1) – this has been determined from the profile of the secondary canal feeding Sh'eb Khethin. For comparison Sh'eb Khethin is approximately 600ha in size and the

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6 It is useful to cross reference this with appendix 2.1 of the command area for Wadi Laba to gain perspective.
total command area is 2,800 ha. Interviews suggest that such a visible reduction in the rate of flow to this sector could significantly affect the farmers' perception of the ability of the Project to provide the water required.

5.3.1 The Headworks

The farmer participation report (Halcrow, 1997b) highlights concern over a lack of farmer participation in the design stage of the development programme, stating that even though such participation may be limited due to financial constraints, the consequent performance of irrigation systems in many countries is poor and their sustainability low. From informal interviews with those farmers working on the headworks it is apparent that such lack of participation during the design phase of the scheme means the farmers miss out on the most important decisions that tend to be made during this stage. i.e. the farmers end up taking what they are offered rather than what they want or perceive they need. To achieve such involvement during the design phase requires that the design is elaborated on in stages so that the farmers' priorities and preferences are considered at the same time as the technical and financial possibilities are explored.

The design of the headworks is such that the operation and maintenance (O&M) has been kept simple. However, there is considerable potential for the system to be mismanaged, if farmers are not correctly trained, resulting in potential damage to the land within the command area. Discussions with the regional engineer suggest that the primary canal head regulator, adjacent to the diversion weir, has the potential to accept up to 2.5 times the design flow of 35 m³/s (Halcrow 1998a). Although there is a rejection weir downstream of the primary canal head regulator and coarse material sediment traps, the flow rate relies on both the correct maintenance of the sediment traps and operation of the various gates. There is thus potential for excess floodwater to enter the downstream canal system that could lead to damage to the field level control structures. It therefore seems imperative that the farmers have a solid understanding of how the system as a whole works, and the implications of neglect, on their part, of O&M. Discussions have shown that at present the community, and some of the seconded Ministry engineers, have no comprehension of the system operation and therefore little or no idea of what O&M entails.

5.3.2 Secondary Canal Head Regulators and Division Structures

In discussion with the Ternafi and Tashkil they have indicated that their current system of distribution aims to be equitable. However, it is apparent that such a rudimentary method of distribution is going to be fraught with difficulty and that, as interview has shown, it may often lead to conflict. Given that interview also suggests farmers have little technical understanding of the Project, preferring to have faith in ‘Allah’ than in the Project design, it is believed that the aspects of ‘visible equity’ and simplicity of construction are fundamental to their ongoing faith in the Project. Therefore, division structures should be constructed of simple and readily available material, in order that the farmers feel they can easily repair and replace them, that they are
relatively cheap to repair and replace and that construction gives a visual sense of equitable distribution. Such equity of distribution should occur not only at the main canal branches, but at all the division structures throughout the command area.

5.4 Appropriacy of Design

The design has given due consideration to improvements in irrigation relative to changes in floodwater potential, as described earlier. The diversion weir has been designed to cope with flood events up to those of 1 in 5 year (Halcrow, 1998). Given that significant climate and rainfall data within the command area is not available to advance any theories concerning relationships between rainfall to flood events (such as the ‘England and Wales’ Flood Studies Report) a linear relationship has been applied to determine the likelihood of a flood event occurring in any one year, which with a 1 in 5 year flood is 20%.

At the time of writing the Ministry engineers, let alone the farmers, were not aware of these fundamental restrictions within the design, just as they were not aware of how the design would only take a proportion of any one given flood (35m³/s). They were therefore not aware of how the programme of O&M would work (such as flaws in expected flood return probability), or who would do the work. Such basic concepts need to be addressed before the farmers are told how much they must contribute towards the O&M programme. This would ensure they have an understanding of where their money is being spent i.e. on the hardware (bulldozer) and specialists required to run the headworks.

As discussed briefly, the programme is one of extensification of irrigation security, rather than intensification. However, conversation with farmers suggests many have 2 – 3 crops per year (i.e. 200% - 300% cropping intensity). Whilst the Staff Appraisal Report (IFAD, 1995) has assessed the average cropping intensity as 145% - ‘without project’, increasing to 165% - ‘with project’; it is believed that there will be a significant drop in production for many farms on the greater cropping intensities (who are presumed as immediately adjacent to the wadi, and so have good irrigation security). Study suggests these farmers have not been made fully aware of the implications of improved irrigation equity on their cropping intensity/yield. Such an oversight could result in reduced willingness to participate, even hostility towards the Project.

However, over and above those factors directly concerning the current development of the irrigation system there are a considerable number of other factors influencing the farmers ability and willingness to participate in the longer term requirements of the development to ensure that it improves the livelihood of the recipient communities. These factors are considered in the next chapter.

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7 The variation in cropping patterns and intensities ‘with’ and ‘without’ project are outlined at Table 5-1.
6 FARMER PRACTICE, PROCEDURE AND ORGANISATION: THE FACTORS INFLUENCING PARTICIPATION AND THEIR PROPOSED CHANGE

Research within the community shows the farmers of the eastern lowlands practice spate irrigation, as defined by Peter (1987), i.e. as a pre-planting method of irrigation. They use floodwaters from adjacent highland areas to irrigate their lowlands agricultural lands. This is achieved through diverting the flows from the ephemeral streams (wadi's), resultant of highland rainstorms, by building diversion bunds (agim) across the wadi bed and diverting the flow into secondary canals (mesgha) and subsequently into agricultural fields. Given that predicting the size and number of spates in any one year is an inexact science, such agricultural practice is hazardous, even at the best of times when floodwaters are plentiful. It is frequently the case that at the worst of times there is no floodwater at all and no degree of engineering can cater for such a scenario.

Study shows that restrictions on time and availability of materials has led, to date, to the use of local materials in the construction of irrigation structures. This has resulted in the diversion bunds (agim) and secondary canals being temporary structures only, frequently washed away by the severity of the flood. In the past such has necessitated farmers to spend considerable time replacing and repairing breached, or washed away, structures. Indeed, individual farmers have an obligation to participate in rebuilding not only of communal structures but, given the nature of the irrigation management, rules require them to maintain the bunds around their own fields (as not to do so would affect irrigation potential of adjacent properties). However, the degree to which farmers are willing and able to become involved in such tasks is considerably influenced by a number of other factors.

6.1 Land

From discussions with Council executives it has been determined that in the past many factors have been taken into consideration when land allocation took place. The matter has been further complicated by the fact that the Government has instituted new regulations governing land tenure and distribution, though many of the customary rules appear to still in place. Furthermore, the people of the eastern lowlands are semi nomadic, many having historical ties, and some having land, in different areas of the adjacent highlands that in their own right have different customary rules governing land ownership, coming as they do under the administrative control of different zoba. In places, the current distribution of land is still governed by decisions made during the Italian and British colonial periods as outlined in chapter 2.

Interviews with a number of village elders suggests that during the period of the British Military Administration (with the eastern lowlands under the regional control of Menghesha) the seasonal migration of farmers, led to some being 'disinherited' from their traditional farming lands. The Mensae peoples stating they were given an ultimatum by Menghesha (regional coordinator at the time) that they must not migrate to the highlands, or risk losing their land as a consequence. On their return they were thus allocated new land (such is the case of the
farmers of She'eb Kheitn). Menghesha further instituted the allocation of plots of land to those who would farm it, up to 10ha. Further discussion with Council officials revealed that later, in 1966, after federation to Ethiopia and the subsequent conflict, land was controlled by the ELM (a Muslim forerunner of the EPLF) whose commanders (Sowra) put in place Tashkil to manage/administer the farmers whilst many of the farmers were involved in national service. Only some of the above facts could be corroborated through secondary sources of information, such as Plaice (1996), concerning dates of ELM and EPLF involvement. However, given that information received was consistent from a number of local sources it would seem reasonable to accept it. The Council interviews (backed up through their referral to administrative records) showed that in 1977 administration reverted to the local community. Also, in 1980, the land was redistributed according to a lottery system, giving all farmers an equal share of land. The results of this distribution system are still in place today. However, it wasn't until 1992 that a further layer of 'peasant farmer organisation', by way of the Temafi, was introduced.

The importance of this land distribution in the ability of the farmers to more fully participate in development cannot be overstated. The land tenure arrangements, its position relative to the head of the wadi, the quality and quantity of land affect the individual farmers economic standing relative to his peers. In turn this appears to have a controlling influence on his capacity to contribute to the communal work required to maintain and develop the spate irrigation system, whether it be financially or in kind. An example of which is a farmers capacity to invest the profits of his land produce into purchase of oxen, which may then be used for the communities benefit as well as his own.

Transects, from the head of the wadi to the bottom of the command area and perpendicular to branch canals were undertaken to assess how the canal system is woven into land distribution, how spate irrigation operates in the field, to determine changes in geology throughout the command area and changes in patterns of water and land distribution. Transect routes were determined using the design engineering drawings. A more detailed account of land regulations outlined in Chapter two therefore follows.

6.1.1 Customary land distribution

Quality of Land:

Of considerable interest, highlighted in a number of PRA exercises was the discrepancy between the engineering perception of good quality land and the farmers views. Discussion with engineers and referral back to literature has suggested that farmers would perceive land adjacent to the head of the wadi to be the most favourable, given its relative stability of water supply. However, the farming community do not perceive the quality of their land relative to its position to the head of the wadi. The discussions and PRA practical exercises showed that, contrary to the belief held in the engineering community, the farmers frequently chose land that was further from the head. When asked the rationale behind this it became apparent that they believe this land to be more productive. The land nearer the head of the wadi was perceived to
be more prone to deposition of the larger particles of the sediment in the floodwater and was more prone to suffer from flood damage. The land further from the wadi head was believed to receive the better fertilizer (nutrients) contained in the floodwater (there was concern that the nutrients may be reduced by the sediment basins). Such arguments seem rational and are believed to take into consideration the lesser likelihood of receiving water from any one given flood, given their relative proximity to the water supply. However, Tesfai’s (2001) characterisation of the suitability of land for crop growth is counter to the farmers belief, holding that the lands at the head of the wadi and on the head of the right bank of Shëeb 'Khethin are the ‘highly to moderately’ suitable land. The land immediately adjacent to the wadi, along its entire length, being only moderately suitable land. Outside this area becoming only marginally to not at all suitable. Tesfai’s (2001) study was comprehensive, considering availability of floods, big flood hazards, nutrient status, oxygen and salinity profiles. This might be explained as a result of real agricultural knowledge over theory. The land may be more fertile towards the head of the wadi but it may not be as reliable for crop growth, given the likelihood of floodwater damage.

Quantity of Land:

The traditional distribution of land is based upon a unit area of 25m x 25m, called a Tsimidi. Customarily, farmers receive between two and four Tsimidi, based upon their familial needs, though it also varies between highland and lowland because of fertility and capacity for farm and between the Council administrative areas of Tiluk and Shëeb. The transect walks undertaken parallel and perpendicular to the canals show the average field to be of approximate multiples of 37m X 25m in and around the Shëeb district (stated as multiples of 12m X 15m by the Council) and 40m X 20m around the Bisses area (Tiluk Council administration). However, subsequent interviews with farmers showed how difficult it is to assess land holding without full community records, as one man may have several plots throughout the area to make up his total land allocation for his family whilst ensuring equity of land quality distribution. He may also have several wives in different areas for which he will receive a land allocation.

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8 The standard measure of length used by farmers is not in actual fact 1 metre, instead they use the forearm as a measure of length, that has subsequently been approximated to a metre.

9 Generally speaking, in the adjacent Highlands, two tsimidi are believed to be the land that can be worked by two oxen in one day. Conversely, in the Lowlands four tsimidi can be worked in the same period with the same draft power. This difference in allocation also accounts for the lands relative fertility.
Very significantly, the method used to describe land holding has become confused with the standard measure of a hectare, where 4 Tesimidi have been equated to 1 hectare\(^\text{10}\). Such a misrepresentation of area, when combined with the development programme's published figures for irrigation in hectares, has the potential to disillusion the beneficiary community concerning the Project's potential to supply floodwater and thus affect their willingness to participate.

6.1.2 Customary land tenure

Further to the literature review findings on traditional tenure outlined in chapter 2, Council interview suggests the system of land distribution enshrined in the constitution may be administered differently at the local level. The example being that all members of the community are entitled to land without bias towards age, gender or race. However, some farmers pointed out that they gain access to extra land through their wife's right, but without her benefiting significantly as he becomes the de facto proprietor, as social custom oblige women in many rural cultures to surrender property to their husbands. Comparing this issue with a study of Rehmato's (1985) work highlights that this is not a new phenomenon, as Rahmato (1985) also found it to have been an issue encountered in Ethiopia during their agrarian reform, post 1979, where it caused problems in ensuring correct and equitable land distribution.

Further research suggests that, further to the Dominale system of the Italians, in the lowlands the land still theoretically belongs to the state, whilst the owner gains usufructuary rights to the land.

In comparing the local practices with the background literature it would seem that the Project area community have also instigated some of the rules they use in the adjacent highlands, where a different land distribution system has previously been operated. Similar to the Dominale regime of the lowlands, under the highland Diesa all land is distributed equally between members of the community. However, contrary to the Dominale system, land is said to be redistributed every seven years among all eligible family members (invariably male members of family) under Diesa. However, to ensure the safety of female members of a family, a system is practiced known as share cropping, whereby widowed women are entitled to their share of the land but the land is invariably farmed by members of the extended family and the extended family are subsequently rewarded with a share in the harvest. Similar to Haile's (2000) findings, the study found that for divorced and single women within the Project area, an informal rule within the village entitles them to 'a half share' of the normal distribution of land.

\(^{10}\) When discussing the area of land owned they talk in terms of the circumference of a field; hence a 25m x 25m plot is referred to by the sum of its sides i.e. 100m. The local custom of referring to one 25mx 25m plot as 100m has meant that four 25mx25m plots (the standard allocation) has come to be termed 400m. Such an area would have four sides of 100m each hence the reason for it being equated to an area to 1 hectare when in actual fact it is only a ¼ hectare.
The fundamental difficulty with the highland Diesa system is not found in the lowlands as there is no policy of land redistribution under Dominale and thus investment in land improvement is seen as a worthwhile activity. It also benefits from not being broken up into increasingly small packets of land as is apparent under the hereditary rules of the Diesa system.

6.1.3 Government Policy on land distribution and tenure

Article 23: Right to Property of the constitutional declaration states:

"Subject to the provisions of sub-article 2 of this article, any citizen shall have the right, anywhere in Eritrea, to acquire land and dispose of property, individually or in association with others, and to bequeath the same to his heirs or legatees. All land and all natural resources below and above the surface of the territory of Eritrea belongs to the state. The interests of citizens shall have in land shall be determined by law". (GoE, May 1997).

The State may, in the national or public interest, take property, subject to the payment of just compensation and in accordance with due process of law.

Some Temi talked of using the Dominale system whilst the Council administration stated that the above land policy was being unilaterally applied. Given that the government's policy is quite similar to the Dominale system it could well be that the Government policy has been instituted. Discussion with Council members concerning difficulties with incorporating a national constitution, that in certain respects was counter to the communities religious and cultural teachings, suggested that the Government were sensitive to the needs of the communities like She'eib. Contrary then to popular belief, national policy was partially being instituted whilst maintaining local perception of a more traditional system.

Further, the new constitutional land tenure would seems to try to incorporate the best aspects of these various systems but is still prone to a number of difficulties. It would appear that some parts of the constitution are counter to the socio-cultural practices of certain sectors of the community and so there is great difficulty in reading the Constitution too literally. Discussions with local heads of Government administration within the development area implied that the Government, in writing the constitution, aimed to be sympathetic to such. However, it is apparent that certain regions still practice some of the more recent though now seen as traditional methods of land tenure.

6.2 Risk Management Strategies

Field observations made evident the fact that the Agro-pastoral and Pastoral communities are mutually supportive; the residual crops provide fodder for the oxen, sheep, goats and camels. In return the oxen are utilised to plough the land and the camels provide a means of transport to the highlands during the arid summer period and transport of the bushwood used to repair diversion bund. Contrary to Testai (2001) belief that there is no fertilizer other than that brought down from the highlands, considerable herds of these animals roam across the land, defecating
and providing by no means a small amount of manure. Though there is no observable evidence of the intricate relationship between the highland communities and the lowland communities concerning the cross breeding of animals during the migration period, interviews did suggest that such a relationship exists in terms of the provision of work to the highland communities in the lowlands during the harvesting season. Such a relationship serves as a good example of 'Risk Coping Strategy' found by van Steenbergen (1997), where the two communities are mutually supportive. The same is true of the intra-relationships of the Lowland Farming community. During dry years, farmers confirmed that when farmers in some parts of the command area are unable to cultivate, they are employed by those who have been able to do so, and usually paid in kind i.e. a predetermined quantity of sorghum per unit of work.

6.3 Irrigation system management and Water rights

By undertaking a review of the current system and how it has been managed to date one can gain a perspective of how the changes brought about by the development may alter / facilitate future participation i.e. during the operation and maintenance (O&M) of the headworks, head regulators and division structures.

6.3.1 Traditional Communal Participation:

The Council executive interviews confirmed that the farmers have an individual responsibility to the community to both participate in the repair and/or replacement of diversion bund within the wadi and the same for communal secondary canals. They also have a responsibility to their immediate neighbours to ensure that the adjoining field bunds remain in good order. Failure to participate in such necessary works may result in fines being imposed or orders to pay for the work to be done by another. However, it is frequently the case that farmers migrate to the highlands after the first bout of maintenance and repair work is finished. In such cases Tamafi pointed out that neighbouring farmers frequently have informal arrangements with their neighbours to ensure that their fields are watered and that if necessary the bunds are broken to ensure transmission onto the next field in sequence. Similarly, the Council stated that a communication network exists between the upland and lowland administrations in cases of large flooding when there is a likelihood of damage to the communal sections of the system. Comparison of interviews with the 2 Council executives shows both utilise the network to ensure that the farmers return from the highlands to assist in the rebuilding of such structures when appropriate. Again, for farmers who fail to turn up there is a formal system of determining fault and levying fines. Given that this system of organisation and control has become official (only recently having been committed to paper) any ambiguity has been removed concerning individual and group responsibilities.

6.3.2 Methods of Construction and Maintenance

Observation of the farmers at work confirms the findings of background research, in that the various diversion bund across the main wadi channel have been constructed mainly from
borders and earth raked up from the bed of the wadi. It has been the norm for a considerable number of years for The Regional Ministry to subsidise the farmers by carrying this work out for them, utilising a bulldozer. Plate 6-1 shows the simple nature of the repair of the walls of the secondary canals (mesgha) and partition walls that the farmers use to control the floodwater. The barricade is constructed of brushwood, frequently with a line of stones along the base to improve stability. All too often these structures are washed away by even medium level floods and the farmer spends considerable time finding new sources of brushwood. The environmental implications of this are quite considerable, as emphasised by the surrounding denuded countryside.

Plate 6-1: A rudimentary barrier of brushwood and stone.

In Plate 6-2 the basic methods still used by a considerable number of farmers was confirmed during one of a number of transect walks across the command area. Plate 6-2 depicts oxen being used to repair the inner and outer perimeter field bunds (Kefaf). The earth is simply pulled up to form a ridge from within the field. Farmers with oxen will repair their own bunds and those without oxen will rent oxen.

Plate 6-2: Repair work on a field bund
On monitoring the headworks construction it was determined that in more recent years a small amount of gabion construction has been undertaken on the banks of the wadi but this type of maintenance prior to the Project has been rare. The use of gabion mattressing within the development programme is considerable, and could be said to be the lowest level of technology within the development that the farmers would need to understand. Considerable experience has been gained, on their part, during the current construction phase as is depicted in Plate 6-3. Discussions with the construction engineers determined that currently the interwoven gabion mesh is partially pre-assembled prior to its arrival 'in field'. This could be an avenue of secondary industry within the She'eb area, reducing reliance on outside sources and excessive future expenditure.

![Plate 6-3: Construction of gabion mattressing](image)

Study of local practice confirmed that, traditionally the raw materials of brushwood and stone are collected by those who possess pack animals. However, the Ministry support has significantly undermined, albeit with good intent, this activity, as the traditional practice has superseded by the use of lorries, funded by the Ministry. However, given the current degree of development being undertaken it is possible that the normal practices are being masked by so much activity. Generally speaking it is those without animal power that take on the responsibility of the traditional construction and repair, usually under the supervision of the sector Ternaf / Yashki. What can be said is that prior to the development programme considerable time and effort was given over to the maintenance and repair of the irrigation system. The community therefore have a solid history of integrated participation for the common good.

6.3.3 Water Distribution

Reference to Figure 6-1 shows how water is controlled by means of earthen weirs (Gurat) between fields. In theory, the water flows from the canal into the field at the head of that particular channel. The weir is a square patch of earth conjoining two adjacent fields surrounded by a bund less high than the field bund. The water therefore overtops at the weir
first, whilst retaining water in the field. In practice, however, it is frequently the case that the force of water entering the upper field is such that the bund between upper and lower fields is breached before the weir becomes operational. Frequently only a little water is actually retained in the upper field for any length of time.

Figure 6-1: Schematic of present irrigation system

An interview with the area magistrate determined that the breaching of bunds is one of the main areas of tension between adjacent farmers as, even though it can occur naturally, it may be the case that the lower down farmer deliberately breaches the upper field bund to ensure he gets water into his field. Again, a set of fines is available to deter such action. It is the responsibility of the sub group farmer representatives (Tashkil) to give guidance when field bunds can be breached. Farmers indicated, through schematics drawn on the ground, that non irrigated downstream land was given priority water rights on occasions when not all the fields of one sector will be inundated by the floodwaters of one event. In such a situation the bunds of fields that have received a 'first watering' are breached so that the water may flow straight on to those who, as yet, have not received any irrigation.

On the macro scale of water distribution responsibility for equity lies with the Termanfi. Referral to Figure 6-1 shows two diversion bunds (agim) stretching part way into the wadi bed. The Termanfi, by liaising with the Tashkil in their jurisdiction, discuss between themselves their requirements. Compromise is reached and the diversion bund may be lengthened or shortened to alter the distribution of any available floodwater. The diversion bund may in fact span the whole width of the wadi dependent upon the needs / shortfalls of a particular sector of farmers. In the reconstruction of washed away diversion bund or collapsing secondary canals the farmers
within that sector supplied by the structures must assist. However, there would appear to be discrepancies between the levels of participation of various members. The basic principle would appear to be that a farmer must participate in reconstruction to his fullest ability. If a farmer has oxen he must therefore utilise them in such work, irrespective of another's inability to do as much. Such action, though laudable, might suggest the likelihood of latent disgruntlement on the part of some farmers, though this has not been found to be the case during the study period.

6.4 Farmer Organisation

Contrary to the Staff Appraisal Report (IFAD, 1995) findings on farmer organisation, discussions with the Council and Temafi suggest that the terms of Awraja and Woreda, have never been applied in describing the hierarchy. Further research has revealed that these terms are valid but not in Eritrea, they were only commonly used to describe the various levels of peasant organisation in Ethiopia, under the Dergue. Instead, interviews show that in 1980 the EPLF, under their leaders (Sowra), instigated a similar cell like organisational structure to that in Ethiopia, that may well be based on the Dergue's Peasant Associations, though this was not corroborated. Farmers state that this EPLF organisation resulted in small areas of land being controlled by men titled Tashkil. At the village / area level the Sowra formed organisations called Baita (councils) which dealt with general administration. It is here that much of the current confusion abounds in project literature, as the village level Baito are no longer part of the farmer hierarchy. The study therefore aims to clarify the present organisational structure of the farming community and the terms used for it's administrative bodies as it is fundamental to understanding the conspicuous lack of female participation, discussed later. However, interview with the Project Manager underlines why the subject is difficult to address, as virtually all reports pertaining to the Project still utilise the term Baito when referring to the administrative structure. The current structure by which the farmers deal with the governmental hierarchy is summarised in Figure 6-2. The large black 2-way arrow indicates the informal association at present.
A period of secondary data review at the Pavoni centre of Asmara (GoE,86/1996) and
discussions with project consultants clears up the formal classification of the term *Baito*. It does
not refer to village level councils. However, even though the term specifically refers to the state
and regional level legislative bodies, many indigenous people still use the term to refer to the
village councils (e.g. *Kebabi Baito* is often quoted). The information provided from the area
magistrate's interview shows that, at the village/area level, the *Baito* is replaced by the
*Megabaaya*, a body consisting of all the members of the community over the age of 18 years
(this is pertinent also in the context of female participation, which is discussed further below).
However, the *Megabaaya* is only convened to deal with issues that cannot be resolved by the
Local Government Administration (*Kebabi*).

It is the council (*Kebabi*) that administer the people, collect land taxes and resolve disputes.
Talks with the area magistrate, indicates that he presides over disputes and imposes penalties
on farmers breaching the rules governing irrigation. Contrary to Hailie's (2000) findings that in
the Bada Spate Irrigation System, Eritrea, there are *Kebabi* administrators overseeing
agricultural and irrigation committees, in the Project no such organisational structure formally
exists under the Council. The farmers are immediately managed by *Tashkil*, who report to
*Tamafl* (all of whom are farmers themselves). However, when problems arise the *Tamafl* state
that they liaise with the Council and The Regional Ministry.

The informally appointed farmers' spokesman, one of the *Tamafl*, pointed out that each *Tashkil*
controls a subgroup of between 20 - 50 farmers. These, *Tashkil* led, subgroups of a particular
main branch canal or geographic area come together under the control of the *Tamafl*. However,
given that such areas vary in size, there are varying numbers of *Tamafl* in each area, dependent
upon the numbers of farmers within that area. Interestingly, paperwork provided by the Council
administration outlining the number of *Tamafl*, *Tashkil* and farmers is not quite the same as
found through subsequent study\(^1\). For the Wadi Laba command area there are 6 areas; She'eb
Kheethin, Debret, Ide-Abey, Endena, Erram and Bisses. The first five are currently under the
jurisdiction of the She'eb Council, each having 3 *Tamafl* except Endena which has 2. Bisses
comes under the authority of Tiluk Council, having 4 *Tamafl*. As is suggested in the IDA
Consultants Mission (IDA, 2001) there are basically 6 farmer organisations competing for a
common resource, albeit that the *Tamafl* of each do liaise with one another to settle disputes.

Given that the new headworks requires considerable organisation and management it is
fundamental that these groups of *Tamafl* come together rather than work against one another.
Both the IDA Consultants Mission (IDA, 2001) and the training plan (Halcrow, 1997c) concur

\(^1\) The outline of the current farmer organisation, from *Kebabi* records, is reproduced at appendix B.1.
The discrepancies between this and the figures quoted in the text suggests that the system of
management is in a continual state of flux, and not heavily monitored by the *Kebabi*. Such changes
may result from reduction in irrigable land due to changes in physical geography to changes in
demographics of the sub communities.
that the proposed farmer organisation requires to be independent of the Council administration whereas the Staff Appraisal Report (IFAD, 1995) was of the opinion that future O&M should still come under the local administration. The latter would be a difficult proposition given that the farmers supplied by Wadi Laba fall under the jurisdiction of 2 separate administrative bodies; She'eb and Tiluk Council's. All, however, agree that the basic root of the current farmer organisation does not need to be tampered with, as it serves its purpose well12. What has concerned those that have addressed this issue is that the hierarchy of the farmer organisation are ill equipped to cope with the changes in practices and that, therefore, a central co-ordinating body is required to ensure the efficient management and maintenance of the system given that the nature of the maintenance work will be different.

It is understandable that confusion concerning the Council role in the hierarchy has been misinterpreted, given that up until a few years ago it was the Council administrator who appointed the Ternafi. However, the Council state that Ternafi are now appointed to permanent positions, albeit that they and the Tashkil are not remunerated for their efforts. The study has determined that this informal relationship between the Council and farmer organisation has led to the assumption that management of the irrigation system lies with the Council. In this respect there is agreement with the IDA Supervision Mission (IDA 2001a) findings.

Discussion with the Ternafi has shown that in trying to formalise the role of the Ternafi and Tashkil, past efforts have been made to rectify the issue of pay, however, the Ternafi stated they would not accept payment if the farmers did not put forward the idea and so previously, when governmental bodies had tabled the idea, it has been turned down. The reason for addressing this issue is that both the IDA Supervision Mission (IDA, 2001a) and the training plan (Halcrow 1997c) on farmer participation differ in appraising the required size of any future committee at the head of the farmer organisation. IDA Supervision Mission (IDA, 2001a) recommends a reduction whilst the training plan (Halcrow 1997c) recommends an increase. Given the changes required of the management structure and of putting the farmer organisation on a legal footing it would seem necessary to ensure the incumbents are duly remunerated for their services. With a reduction in the need for direct management of floodwaters by so many Ternafi it would seem advisable that such a farmer committee, overseeing the organisation, is indeed reduced in size. Such an action would reduce any divisiveness of Ternafi and also the remuneration the farmers must cover.

Observation highlights that it is frequently The Regional Ministry, having been approached by the Council, that supply goods and services to the farmers. It appears that, though the reasons for such subsidy are understood, the impact is having a twofold negative effect in undermining the farmers way of life. Both through a reduction in the capacity to mobilise labour, resultant of

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12 The basic farmer organisation structure consists of the farmers, Tashkil and Ternafi, as summarised in the lower half of Figure 6.2.
the expectation of payment for routine maintenance and through reducing the ability of the organisation to self organise maintenance programmes. The findings of the IDA Mission Report (IDA, 2001b) were found to have achieved a similar conclusion.

This research has concluded that to ensure farmer participation the following factors should be considered. This agrees with earlier findings of the Halcrow (1997b) report.

- Clarity and concurrence about participation
- Realistic Objectives
- Introducing and monitoring Participation
- Investing in participation
- Creating appropriate expectations

6.5 **Government Interventions**

Discussion with The Regional Ministry has determined that, post conflict, the Ministry has for a number of years aimed to rebuild the agricultural sector. This has been evident through the activities observed in the creation of the fledgling 'agricultural research station'. Further research shows that aid takes the following forms:

- Introduction of Mechanisation: Tractors
- Credit for purchase and hire of agricultural implements and animals
- New Crop variety research and introduction
- Pesticide programmes

In the majority of cases these measures have brought about considerable improvements to production. However, the programme of mechanisation, whilst popular, when taken in conjunction with the credit facilities has led to a number of difficulties for the farming community. The responsibility for the cost of tractor hire, which was initially borne by the government, has been placed back onto the shoulders of the farmer. Indeed, many farmers in the past have taken credit to pay for the hire but have found they cannot repay. Not withstanding the above, the credit facilities have been useful in reintroducing much needed oxen, the traditional 'tractor' of the lowlands (see Plate 6-4) that were significantly depleted during the time of conflict, and in reality still are.
Plate 6.4: A contractor uses his oxen to prepare the ground before planting.

In general, the other interventions of the government have not been considered in too great a depth as, though they are believed to have a considerable impact on the development, they move away from the participatory aspect of this report. It is worth highlighting that no consideration has been given to the water requirements of the Regional Ministry’s proposed ‘agricultural research station’ and it is therefore competing for access to a restricted water budget. It also seems strange that the Regional Ministry did not opt to rent land from the farmers throughout the command area rather than build a station that is not truly representative of the majority of the farmers’ lands.

A point of worth is the implications for downstream users of the wadi resultant of the upstream development. Discussion with the downstream users at Weikiro and Embaram highlights that they have not been consulted about the development and that no agenda had been tabled to consider the impacts of the development on their livelihood. Such practice does not create an atmosphere of inclusion amongst communities that are, albeit indirectly, stakeholders, and will be affected by the development. Indeed, on another front the Regional Ministry are involved in provision of direct assistance to the downstream communities concerning diversion bund and secondary canal reconstruction work so the opportunity already presents itself to involve them. Though this is a specific case, the principle is general; inclusion of all stakeholders.

6.6 Gender Issues

It can be seen that all literature pertaining to female participation in the Project is conspicuous by its absence, given that women are meant to constitute at least 30% of the Baito. However, as discussed in section 6.4, there is no Baito at the village/area level, but rather a Megabaaya. Given the cultural practice of the predominantly Muslim community to segregate women from men, it is not surprising that the female members of community do not participate in the Megabaaya, and so are under represented in community decisions that affect them and their ability to participate more fully in community activity.
The Government has, however, made equality of all members of society a founding principle of its constitution (GoE 86/1996). Emphasising the full participation of the women in all walks of life. It has also, though, to be culturally sensitive to those of Muslim faith and their adherence to Sharia law. To achieve full participation is a slow process that will take many years to fully accomplish. Discussion has shown that education of the girls within the community has increased from one child four years ago to over 800 today. Older women do participate to a limited degree in agricultural practice, usually threshing the corn at harvest time, though the tasks are still mainly domestic, as shown in Plate 6-5. Generally, women have also become involved on a small scale, through the National Union of Eritrean Women (NUEW), with programmes of learning geared towards cottage industry, although this is not evident in the development area. The NUEW have focussed on improving domestic abilities. Further emancipation is more likely to come through the younger generation and through those women that were fighters during the conflict with Ethiopia and earned 'honorary male status'.

Plate 6-5: Women and children carrying out daily domestic chores.
CONCLUSIONS

This work set out to investigate participation through:

- Researching the history of spate irrigation in the region.

In addressing the historical aspects of the Project communities, it is apparent that there are a number of different histories being told. It is not believed that the different accounts are necessarily conflicting, as there are most likely truths in all of them, though some accounts may have been biased by past research. There is very little literature dealing with the migratory patterns of the eastern lowlands communities and the specific introduction of Yemeni expertise to the area, however, the oral accounts have provided an interesting range of reasons for the Yemeni presence.

Reason suggests there is some truth in the oral history of Moslem Africans migrating to Mecca on pilgrimage with a supply of grain for food and the subsequent interest of the Yemenis on hearing of the regional geography and climate, which matched their own. The strongest physical corroborating evidence for the introduction of spate irrigation from the Yemen to Eritrea would seem to be the presence of a mausoleum for the Yemeni trader, Bahamdon, near Embarama. The oral account, from the geographically distant, downstream community of Embarama; of Bahamdon’s activity, lies in well with the separate accounts of the Project communities; of tribes migrating up from the coastal regions in the 1920s.

- Studying technical factors of the Project impacting on farmer’s ability to participate.

The main problem concerning the level of participation experienced in the design and construction phase seems to be that the majority of consultation with the farming community took place prior to the border conflict with Ethiopia i.e. over 3 years before hand. Although some farmer involvement occurred at a higher level, prior to the recent conflict, this would appear to have been superficial. The farmers, some 3-years after the last direct involvement in the development, have become quite ignorant of their roles and responsibilities within the Project. The farmers have tended, in the main, to be employed as labour by the Ministry, paid therefore, to undertake the work they were meant to be providing as their ‘part of the deal’ i.e. participating for free to improve their sense of ownership. It is surprising that such issues have not been comprehensively re-addressed. It is apparent that there is also considerable difficulty in trying to develop a sense of participation in the farmers, when their commitment to such an ethos is undermined by the presence of their fellow farmers, who are simultaneously being paid (as local labour) by the headwork contractors.

Participation in the early stages of the design has been restricted due to the predetermined application of engineering concepts found to work in Yemen and Baluchistan in Pakistan. Research shows that the Ministry of Agriculture (the Ministry) approached the farming community to determine whether they wanted the system developed. However, the community
were not asked what they actually wanted, rather, they were told what they were going to get. The concept of development of the spate irrigation system is accepted. Future irrigation practices.

The new distribution system aims to be truly equitable. However, the redistribution of water that will occur will negatively impact on those farmers who have been used to a greater water supply. These farmers have not been kept fully informed of the greater benefits to the wider community, which could affect their willingness to participants in future O&M.

The annual migration of the farmers to the highlands, combined with infrequent involvement of the Temafi/Tashkil in development planning has produced a 'laissez faire' attitude amongst the Temafi/Tashkil. This has resulted in the farmers learning very little about the progress of the development at all.

- Addressing physical and socio-cultural issues affecting willingness and ability of the Project's community to participate.

The farming communities of Wadi Laba and Mai Ule are poor by any standards, having evolved only a few risk management strategies to reduce the impacts of falling harvests. The environment of the eastern lowlands cannot guarantee the irrigation required to ensure food security, however, development can go a considerable way to improve the irrigation management and reduce the likelihood of instability.

The relative quality and quantity of land held by farmers is believed to be a significant influence on the level of participation displayed by individual farmers.

The current water distribution system aims to be equitable, however, this is not often the case. It is believed that within the Project area the users farthest removed from the source have a reduced capacity to participate, given that they have fewer resources to call on. The explanation being they are possibly poorer than those closer to the water supply.

The current level of female participation is hampered by the socio-cultural practices of the farming community, which is totally of Muslim faith. However, the last five years have seen considerable improvements in female education. This education has not extended to greater participation of women in the agricultural sector. Elsewhere, women are participating to a greater extent, indeed, many are driving tractors during their statutory national service. Whether such practices will be taken up by the wider female communities of the rural poor has yet to be seen.

- Researching past, present and proposed future farmer organisational structure and its impacts on development.

The implementation of an autonomous hierarchy for the current informal farmer organisation requires considerable advisory input to ensure that it does not flounder or revert back to control.
by the Council administration. A situation the Council administration are keen to avoid. The farming community are keen to embrace the new development and have long wanted greater autonomy. Similarly, however, the success of the new farmers organisation will also, in the early stages, depend on comprehensive training and technical advice from the Ministry.

Whilst, the success of the development, post construction, lies within the proposed new farmer organisation hierarchy, and its ability to manage its own affairs through competent organisation of the farming community (which is a skill already in hand), it is believed that there is a strong potential for project failure if the farming community do not move away from the level of Government subsidy that is currently implemented.

- Researching the Ministry of Agriculture's interventions and capacity to undertake similar future ventures.

Government interventions aimed at lessening the difficulties the farmers have faced have on the one hand helped the farmers through those crises but, on the other, has created a culture of semi-dependence on the Government. The Ministry and Regional Ministry do not have the long term capacity to continue supporting such activity.

The requirements of national service have placed a heavy burden on the Ministry in terms of its available manpower. The requisite number of Ministry engineers, as required by the World Bank, has not been achieved. This has impacted significantly on the capacity, at all levels of the Ministry of Agriculture, to independently undertake such development ventures in future.

The structure of the Ministry and therefore its capacity to undertake the proposed future role of technical advisory service needs to be addressed to ensure it has the ability to undertake such a role. In places there are strong channels of communication between the lowest level of government to ensure farmer participation. However, there are poor channels of communication at present between the farmers and the hierarchy, reducing the capacity of the farmers to fully participate in the Project. Although this is not helped by the various communities annual migration, it is fundamental to future participation in the O&M and post Project evaluation.
RECOMMENDATIONS

- There is a strong case for following the concept of 'mechanistic training', given the high level of illiteracy in the Project community. The swift introduction of a new farmer organisation could be 'move too quickly' to ensure that the hierarchy of the farming community are able to cope with the subsequent rigours required of its 'management team'.

- In order to avoid the lack of farmer participation in the Project, consideration should be given to the implementation of the farmer participation aspects of the Project at an earlier stage to the headworks development. i.e. construction of the downstream division structures, prior to construction of the main headworks. This would reduce the conflict in farmer interests that arises for the farmers when the two stages of development are undertaken simultaneously. i.e. whether to participate in the Project for no pay or to work for the headworks contractors and be paid.

- The Ministry should aim to reduce the cash for work programme that has been seen thus far in the project, in conjunction with an integrated programme of reduction in food aid. If correctly managed and explained to the farming community they could realise the positive side of such action, in that it will create a market for their surplus foodstuffs. However, such an action plan would be foolhardy to implement all in one go, and it would advisable over the medium term to stop the cash for work first, redirecting such capital saved into ensuring that the Grain Marketing Board is in a position to ensure a market for the surplus crops the Project hopes to realise. This then would tie in with the development plan of the farmer organisation and of the new irrigation management system.

- In order to fully address the issue of The Regional and National Ministries capacities to participate, and comply with the World Bank personnel stipulations for such development, the Ministry must ensure that the staff are ready and able to partake of the short-term availability of the expertise of the international consultants, whether that be engineering or farmer organisation advice on technical or social issues.

- Tesfai (2001), when he recommended improvement to the canal distribution system by concrete lining of the canals, was not being mindful of the cost implications of such action. However, the efficiency of the distribution system could be improved considerably by simply improving many of the canal profiles. There would be less likelihood of damage to the canals with the new water flow and management regime and conveyance / distribution efficiencies would improve considerably.

- The potential of secondary industry to support the irrigation system would also be a potential means of incorporating the women of the community into agriculture to a greater degree. Such industry as the 'weaving' of gabion mattresses would not be counter to the stipulations of segregation inherent in the Muslim community but would also, possibly improve the number of women's groups within the community, which are apparently lacking.
REFERENCES


10 BIBLIOGRAPHY


HOUSEHOLD QUESTIONNAIRE

A. Personal Information
   1. Name of household head.
   2. Gender
   3. Marital Status
   4. Ethnic origin
   5. Position

B. Location
   6. Village Name
   7. Which Kebabi administers you
   8. Who is your Temafi
   9. Who is your Tashkil
   10. What canal are you supplied by
   11. Family Information
   12. How many members are there in your household

<table>
<thead>
<tr>
<th>Family size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<th>Sex</th>
<th>Age</th>
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13. How many family members are involved in agricultural activity
14. What activities do each member undertake

C. Land Tenure/Management
   15. Are the rules governing land distribution written down
   16. Who decides on land distribution
   17. Has land tenure changed in your time
   18. Do you believe the land distribution system is fair, if no
   19. How would you change the land tenure/distribution system
   20. Are you involved in agricultural activity, if yes
   21. Do you farm the land, if yes go to 22. If no go to 23.
   22. How much land do you farm
   23. Have you ever owned land
   24. How long has your family farmed the land here
25. What is the main reason for not owning land
26. Where is your land situated relative to the head of the wadi
27. Which land do you think is the most fertile
28. Which land do you think receives the best supply of water
29. Which land would you prefer to work on
30. Are you involved in other economic activities, if yes, what
31. How important is the land farming as a source of income

D. Water Rights/Management

32. What water rights do you have now
33. Are the rules governing water rights written down
34. Who decides on who should get water, and when
35. Are there any disputes about this
36. Has water rights/management of the spate changed in your time
37. What do you know of water rights/management in your fathers time
38. Do you believe the water distribution system is fair, if no
39. How would you propose water was distributed

E. Farming Practices

40. Do you own animals, if yes
41. Do you use the animals to cultivate the land
42. If no, how do you alleviate the problem
43. How much time do you spend on the different agricultural activities
44. What are the main constraints to crop production
45. What responsibility do you have for repairing main agim
46. Are you involved in main agim reconstruction or is that someone else's responsibility
47. How were you involved in main agim reconstruction in the past
48. What are the agim built of
49. Are different agim used in different locations
50. How frequently are agim washed away
51. How do you expect to repair agim in future
52. Do you feel you should contribute to repair of bunds in future, if no
53. Why not
54. Do you migrate to the highlands during the spate season, if yes
55. Would you still migrate to the highlands if water resources improved
56. Would you still migrate to the highlands if more crops could be grown
57. Have you received any agricultural training through the Ministry, if no
58. Can you spare the time / are you willing to undergo any training
F. Gender Issues

59. Do the women participate in agricultural activity
60. In what aspects of agricultural activity do women participate
61. Are there many women heads of household
62. How do female heads of household make a living
63. Are female heads of household entitled to the same land tenure as men
64. Are there any female representatives as Ternafii Tashkil

G. Financial/Credit Information

65. How much do you earn from agricultural/non agricultural activity
66. Do you need credit for your spate irrigation operation, if yes
67. What is the form of your credit
68. What is the source of your credit
69. For what purpose do you use the credit
70. In what form do you repay the credit
71. Do you receive any services for free that you used to pay for
72. If yes what type of service
73. Who supplies the service

H. Farmer Organisation

74. Is there/has there been a farmer organisation in the past
75. Is there/has there been an Agricultural/Irrigation committee
76. If yes, what has their function been
77. Do you think the Tashkil/Ternafi represent you well at present
78. What have the Ternafi Tashkil told you about the development project
79. It is proposed to create a new farmer organisation, that is not responsible to the Kebabi, how do you feel about this
80. What level of responsibility do you think the new farmer organisation should accept for the new irrigation system
81. Do you think the Ternafi Tashkil should be paid for the work they do on your behalf

I. Development project

82. Has anyone spoken to you about the development of the irrigation system, if yes
83. Who has spoken to you
84. Have you discussed the irrigation development amongst yourselves

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Appendix 3.1

85. Have you discussed the irrigation development with any of the officials involved in the development?

86. Have you had any feedback from the officials involved?

87. What support do you believe the Ministry of Agriculture should provide in the future for spate irrigation?

88. Why do you believe you should be provided with support?

89. How would you be prepared to contribute to the cost of operating and maintaining the new irrigation structure in the future.
Appendix 6.1: Regional administration's version of the current farmer organisation (partially or entirely due to the dynamic nature of the system)