THE IMPACT OF IRRIGATION ON THE SOCIO-CULTURAL AND ECONOMIC LIVES OF A RURAL COMMUNITY. THE CASE OF YATTA FURROW IRRIGATION IN MACHAKOS DISTRICT, KENYA.

SARAH MUMBUA MUSILA

A THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE DEGREE OF MASTER OF ARTS IN ANTHROPOLOGY IN THE UNIVERSITY OF NAIROBI.

1993

DECLARATION

This thesis is my own original work and has not been presented for the award of a degree in any other university.

Sarah Mumbua Musila

This thesis has been submitted for examination with my knowledge as supervisor.

Dr. Joyce Olenja

Mr. Mumo Maundu

To my parents, Priscilla Mukulu and John Musila,
for making a lot of sacrifice so that
"the children can go to school";

and

my children, Emma Namenya and Rita Khalayi,
for giving me a reason to go on.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

ALDEV	The African Land Development Board.
ASAL(s)	Arid and Somi-Arid Land(s).
DC	District Commissioner.
DO	District Officer.
FAO	Food and Agriculture Organization.
GDP	Gross Domestic Product.
GNP	Gross National Product.
GOK	The Government of Kenya.
HCDA	The Horticultural Crop Development Authority.
IAS	Institute of African Studies.
IDB	Irrigation and Drainage Branch (of Ministry of Agriculture).
ILACO	International Land Development Consultants Limited (Arnhem, Netherlands).
ILO	International Labour Organization.
KANU	Kenya African National Union; the current ruling party in Kenya.
KANU-YW	KANU Youth Wingers; young (and, sometimes old) men who promote the interests of the party.
NIB	National Irrigation Board.
ODI	Overseas Development Institute (London).
SPSS	Statistical Package for Social Sciences.
TARDA	Tana and Athi Rivers Development Authority.
TRDA	Tana River Development Authority.
UON	University of Nairobi.

USAID	United States Agency for International Development.
WMS	Water Management Synthesis.

ACKNOWLEDGEMENTS

I am greatly indebted to DAAD (Deutscher Akademischer Austauschdienst - The German Education Exchange Service) for providing the funds that enabled me to do the coursework, research, and writing of thesis for the masters programme. Many thanks also go to Dr. Joyce Olenja and Mr. Mumo Maundu for their constructive criticism as supervisors.

I am indebted, too, to Drs. Anne and Patrick Fleuret for their assistance and kindness, expressed in various ways. Anne Fleuret's suggestions were helpful throughout all the stages of writing, and Patrick Fleuret carefully went through my draft and gave invaluable criticism. They welcomed me to their home and allowed me liberal use of their library and computer facilities.

A number of government ministries should be thanked for making their records available to me and generally co-operating with me. Worth of special mention are the Yatta Division Ministries of Agriculture, Water, and Health. The Horticultural Crop Development Authority, the Tana and Athi Rivers Development Authority offices and Irrigation and Drainage Branch (of MOA) in Nairobi were also of great assistance.

The respondents of Kithimani, Matuu, and Ndalani sub-locations, who sacrificed their time for me in spite of the heavy labour demands in the fields and domestic sector, need special thanks. It is difficult to conceptualise how this thesis would have materialised

without their co-operation. The co-operation of Mr. David Musau, the research assistant in the field, is also highly appreciated.

I owe many thanks, too, to "the father of the children" for his sacrifice in the domestic sector. Other individuals who made various contributions that made the writing of this thesis faster or less difficult are Drs. Kimani Gecau, Wembah-Rashid, Moses Kyule, W.K. Omoka, Simiyu Wandibba and W. Scheltema, Mrs. S. Weale, Mr. Paddy Mukono, Mr. Matere, Mr. David Beer and Mr. P. Wambua.

I am greatly indebted, as well, to my sisters, Clara Baing'aru and her family, and Yvonne Musuviwa for their tremendous support. Shelly and Justo D'Souza also provided a lot of encouragement.

Last, but not at all of least importance, I am thankful to Marianne Cooper (alias Ruth B.) and Donald Wandere (alias Franz B.) for their friendship, support and comradeship. The many discussions that we had, especially during coursework and proposal formulation, were not in vain. Ms. Cooper provided further support in technical aspects of computer use and various other ways that would be difficult to quantify. It is difficult to thank her enough.

It is impractical to mention all the people who made direct and indirect contributions that helped me in the writing of this thesis. I am, however, grateful to all of them; to all of you, *Asante*, *Asanteni sana*, and may destiny reward you in double measure.

ABSTRACT

Focus on irrigation studies in general and Kenya in particular has been mainly on the large-scale irrigation projects. This study makes a departure from this trend and examines the impact of a small-scale irrigation project on the lives of the local community.

Water is a major resource in irrigation. Its management presents a challenge to the people in Yatta as they have been living in areas in which no irrigation skills are required of them. The people blend both modern socio-cultural and indigenous institutions in the running of the irrigation system. Since the population is familiar with the mentioned institutions, it does not have to adjust to unfamiliar rules and regulations associated with new bureaucracies in large irrigation schemes. One of the recommendations of the study is that irrigation projects should as far as possible tap the local management systems as this not only avoids having to subject farmers to adjusting to stressful bureaucratic regulations but also enhances farmers' identification with the projects. It is cheaper in the long run in terms of overhead costs and is likely to lead to more sustainable development.

Labour in Yatta Furrow Irrigation is as crucial a resource as it is scarce. Irrigation has resulted in labour increase for both men and women. Gender roles in some cultivation tasks that were formerly performed mainly by women are re-defined to accommodate both sexes;

utilising every available labour source is seen as an adaptative technique. This notwithstanding, male labour is contributed more fully in cash cropping than in food cropping. Female labour contribution is recognised in both food and cash cropping. In absolute terms, however, cash cropping gets preferential labour input from both male and female members of the households.

One of the findings of the study is that though irrigation income does not determine the standards of living of the local population, it has a positive impact on them. The impact would be more pronounced if appropriate measures were taken to effect more realistic pricing policies of farmers' produce. Price fluctuation, the role of agents in the sale of crops and the cost of inputs are some of the factors that diminish farmers' returns.

CHAPTER ONE

INTRODUCTION

1.1 The Problem

In most irrigation schemes, farmers are given a blueprint development strategy that spells out their social and economic conduct. Therefore, studies that have been carried out in such schemes have concentrated on reviewing the success or failure of such schemes with reference to the pre-determined set of development variables. In Yatta irrigation scheme, there are no scheme-managed regulations regarding, for example, when and how much labour should be provided per household or restriction on the range of crops grown and their sale. It is important to establish how the farmers, most of whom are originally from a dry environment, cope with a new one where water is a main resource. How do they organise and manage their resources (particularly water and labour)? Do they appeal to their traditional institutions of social organization and relationships so as to shape their production or does the new environment foster the formation of new social relations? What crops do they decide to grow and why?

Many planners of development projects, irrigation schemes included, have made the assumption that if a project's benefits reach the heads of households they eventually go into improving the welfare of the family

at large. This study attempts to question this assumption.

A point of concern is the fact that irrigation schemes in Kenya have a poor success record. Indeed, with the exception of Mwea, which is self supporting, all the other national irrigation schemes survive on government subsidies (Makanda 1984:3; GOK 1984:183). The relative success of small-scale low cost schemes goes back to pre-colonial days but the development of the recent large-scale ones has over-shadowed these achievements causing them to be ignored (GOK 1989a:130,136; Kangangi 1982:iv,1; Carruthers 1973:41). It is pertinent to ask the question then, why do the small-scale irrigation schemes attain some success while the major ones have a discouraging record? Could it be because there is more room for individual enterprise regarding the choice of crops, labour input and general management of resources? Are the small-scale irrigation schemes then, more relevant to peoples' needs? These questions are of utmost importance considering the government's interest in improving the living standards of the rural areas. Besides, Kenya is mainly an agricultural country despite the fact that more than four-fifths of her total land surface lies in the Arid and Semi-Arid Lands (ASALs) zone (GOK 1989a). This area, nevertheless, carries more than 25% of the total human population and its livestock population is slightly more than half of that of the whole country (GOK 1989a). The ASALs are agriculturally marginal and largely

inappropriate for human settlement. Yatta irrigation canal is situated within this zone, and the Yatta experience sheds some light on how development might be fostered in such areas.

Despite the wish of the government to encourage equitable distribution of resources in the rural areas where the majority of the poor live, it was only in the late nineteen-seventies that attention was given to small-scale irrigation. Indeed in the 1970-74 Development Plan (GOK 1970), small-scale irrigation projects were disregarded and the justification for this move was that these were not large enough to justify the heavy overhead costs involved in organised irrigation. Yet the large-scale schemes in which the government has invested so much capital have proved expensive to maintain and are a serious drain on the economy. The government has been biased towards the large-scale irrigation projects, with the aim of realising high farm incomes and generating foreign exchange. While the importance of these ambitions is unquestionable, we should not forget that in some ASAL zones in Kenya, the needs are more basic: irrigation in such areas is not a supplementary but a necessary activity for subsistence (Dubel & Kwaasteniet 1983:25). The latest Development Plan does not completely ignore this fact:

> The new ASAL strategy will focus attention on self-sustaining innovation on production activities in the small-scale dry-land farming, irrigated and pastoral subsectors (GOK 1989a:134).

Increasing production in the marginal areas is important as migration from the high and medium potential areas to the less-populated arid and semi-arid lands (ASALs) has also been recorded (GOK 1989a:174-175). Besides, in the area of study, unemployment is high and increasing (NIB-ILACO 1974:11). It therefore becomes necessary to assess the economic potential of small-scale irrigation schemes in the improvement of rural life.

Though studies of the cost-benefit analysis of irrigated agriculture abound, studies of the impact of such projects on the social and cultural environment of the farmer are few and often short of facts (cf. Carruthers 1973:55; William 1979:2; Makanda 1984:44-45). The establishment of new villages in irrigation schemes brings into focus the human problems associated with bringing a community of persons of varying backgrounds, and often of limited means, into a different social organization. It is these social problems that have been inadequately focused on in irrigation studies. The study therefore presupposes that gross cash receipts that enhance the country's GNP are not a sufficient measure of a project's success. Benefits to farmers across the broad spectrum of their lives need assessment.

Available scanty literature suggests that marital unions have been destabilised by irrigation schemes (Rogers 1980:185-186; Hanger & Morris 1973:244). An attempt to assess the impact of the irrigation on the stability of the conjugal family has been made in this study.

The study questions the assumption that raising a project's output automatically increases the welfare of all concerned. The question of distribution of resources is very central to rural development which is the focus of many small-scale irrigation projects. Differential access to water, for example, has produced inequity in distribution of benefits in a number of small-scale irrigation projects (Dubel & Kwaasteniet 1983:69; Bromley 1982:59).

Uma Lele records a general male preferential labour input in cash crops (1975:26-27). Elsewhere, it has been suggested that only after attending to their subsistence gardens would women provide labour for cash cropping (Kangangi 1982:94; Rogers 1980:183). The study examines how labour patterns have been affected by irrigated agriculture in Yatta.

In sum, this study addresses the following main problems:

-resource management (specifically water and labour) in a small-scale non-organised irrigation scheme and its implication for the success of the irrigation.

-irrigated agricultural income generation and distribution within the household and from farmer to farmer and its implication for living standards and equity.

1.2 Justification

Most studies done on irrigation schemes have mainly appraised the schemes ability to produce more crops and therefore realise a high income. As mentioned in the Problem Statement, studies on the impact of irrigation on the socio-cultural environment of the farmers are inadequate (Carruthers 1973:55; William 1979:2; Makanda 1984:44-45). The need to have more development and ethnographic irrigation studies is felt especially in sub-Saharan Africa, particularly in East Africa (Fleuret 1985:103). This study attempts to address part of this need.

A study of the socio-cultural and economic aspects of irrigation gives a multi-dimensional approach towards the study of irrigation. This holistic approach is more realistic to planners as it takes into consideration the varied needs of farmers which are not simply economic. Farmers' satisfaction in the socio-cultural sphere has important implications for the attainment of a scheme's development goals. Knowledge of how a people are incorporated in the management and organization of resources in irrigation may shed light on some of the factors that have led to the failure of many irrigation schemes in Kenya. Studies of irrigation systems have not just been poorly focused on in terms of approach, the large-scale ones have been given more attention. Small-scale irrigation activities in Kenya need greater attention as they are low in cost and can be utilised in

a bid to improve lifestyle in the rural areas. This is especially important as the Kenyan population is increasing as a result of improved methods of morbidity and mortality control among other things. This leads to a pressure in the high and medium potential areas resulting in out-migration to the arid and semi-arid lands. An examination of small-scale schemes exposes less bureaucracy in exploiting resources. Employment opportunities are also enhanced and so are alleviation of poverty and promotion of the chances of food sufficiency in the nation as a whole.

Though my results suggest that the studies of a particular scheme throw light on issues that could apply to schemes in general, it cannot ignore other scholars' opinions that while we can talk of general trends, the impact of irrigation is largely project and time specific (Gutierrez 1967:H9; Bromley 1982:58; Chambers 1973:355-357). We cannot, for example, generalise wholesale for Kenyan irrigation for:

> Irrigation in Kenya is undertaken under diverse and complex situations of the environment and socio-economic conditions of the people (Makanda 1984:59).

This justifies studies of particular schemes.

Focusing mainly on the recipients of development projects as units of appraisal in general development projects and irrigation schemes in particular is considered a realistic approach . An understanding of the implications of irrigation decisions on farmers' socio-economic lives is envisaged with the hope of increasing planners' sensitivity to such issues, or else

rural projects intensify the gaps they are expected to bridge.

1.3 Objectives

Broadly, the study identifies:

1. water-use relationships with reference to socio-cultural institutions;
2. gender roles in irrigated agricultural production and irrigation system maintenance;
3. the projects' impact on development in general and rural development in particular.

Specifically, the study identifies:

1. the relationship between organization of water-use and management and socio-cultural organization;
2. the impact of irrigation on the gender division of labour in cultivation and furrow maintenance;
3. the irrigation's impact on the living standards of the population. This includes impact on:
   - income earning and distribution from farmer to farmer and within a farmer's family;
   - shelter quality;
   - purchase of household consumer durables;
   - livestock ownership and use;
   - employment;
   - choice of crops grown, food and diet, and frequency of ailments.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Review of Literature

Studies on the impact of irrigation on the lives of rural people indicate that irrigation has had both benefits and disadvantages (Vlachos 1972:16). Most studies confirm the hypothesis that irrigation increases crop production. There is not only greater intensity in cropping and yield per hectare but an increase in hectareage (Hurst 1985:17-19; Wanmali 1983:30-34,54).

Studying irrigation in South China, Vermeer (1977:175) found that irrigation gave an increase of yields of between fifty and a hundred per cent while Abbie (1982) found that in India:

> A gross cropped hectare of irrigated land produced in 1979/80 prices about Rs 2950 per year more than a hectare of rainfed land (Abbie et al. 1982:14).

Available literature explains that irrigation schemes may increase or decrease labour demands on households depending on the different schemes and the tasks to be performed. While traditional irrigation in China required great amounts of animal and human labour to empower machinery for water-lifting, more sophisticated irrigation with modern machinery reduced this requirement.

In Spain, Gutierrez (1976) reports, irrigation led to agrarian reform measures and intensified agrarian

training and market research studies. More labour for industry and public services was also needed and therefore employment was created. In Badajoz scheme (6800 hectares of irrigated land), it was estimated that one job was created for two hectares of productive land or for three hectares of less productive land.

In Turkey, Yegin et al. (1967) observed that irrigation led to reduced interest in adopting improved methods of farming: farmers were reluctant to intensify farming methods, especially if they had large hectareages and got enough income for their needs without innovating. This has the implication that irrigation would not necessarily produce a significant amount of increase in yield in such areas.

Wanmali (1983) found out that contrary to what is usually expected after irrigation has been adopted in an agricultural economy, irrigation in India resulted in diversification of cropping. The assumption is that farmers diversify to reduce risks but in Miryalguda and Vijayapuri, India, even though the element of risk was minimised, other crops - castor, groundnuts, sugarcane - were introduced in addition to paddy and jowar (Wanmali 1983:30-33).[1] There was, however a slight decline in percentage of land devoted to certain crops, but in absolute terms the land sown with them increased remarkably. Contrary to Yegin's findings in Turkey, the high yielding varieties were easily accepted and adopted

[1] In South Asia, however, Singh (1979) found that irrigation decreased diversification.

in Miryalguda, Taluka and Vijayapuri.

Singh (1979:93) notes that it is the small farmers who need credit more often but it is they who usually receive less of it, thereby becoming more constrained when it comes to increasing farm incomes. Mandal (1978) came up with similar findings in a study done in Myensingh in Bangladesh: small share croppers had to pay a quarter of their gross output as rental for hand pumps supplied by more prosperous farmers. This was in addition to paying a third of gross output as rent for land. The large farmers had also acquired the rights to ground water and sold it at nothing less than the maximum that small farmers could afford paying. The same was found true in Mexico (Bromley 1982:45) and Taiwan (Bromley 1982:57) and the Philippines (William 1979:20). Such differential access to resources has serious implications for the distribution of irrigation benefits to farmers. Hurst (1985:120) feels that surface irrigation can be managed more equitably than ground water irrigation. The case of irrigation among the Marakwet of Kenya, however, does not confirm this suggestion (Dubel & Kwaasteniet 1983).

In a study in Mexico, Bromley (1982) used the model of farmer interdependence to show that institutional uncertainty is a major impediment to creating irrigation systems which meet both efficiency and equity goals. In the study, farmers are seen as cautious optimisers who place safety ahead of profit maximisation (p.10). A downstream irrigator will only receive water at the

discretion of those upstream and some farmers cannot make managerial decisions because their supply is uncertain. Because of uncertainty, farmers are unwilling to adopt more productive practices even though farming is an adaptive behaviour that depends on previous experiments.

The Gezira scheme in the Sudan, Bromley (1982:47) notes, has weakened the extended family; as a result, labour has become the scarcest factor at critical stages of agricultural production.

In the Philippines, William (1979) studied two small-scale irrigation projects, Sibul and Talakscan, which were constructed in the same year. He demonstrated that land tenure and credit plus ability to get additional income greatly affected returns to individual farmers in both systems. In Talakscan, the small farmers could not freely participate in the land reform programme, for they depended on their landlords, who were opposed to the reform, for credit.[2] Thus, the richer farmers got richer while poor farmers got no significant benefits.

Rogers (1980) discusses marital instability caused by the insensitivity to women's and children's needs in the Upper Volta Valleys. The labour on cotton fields was too demanding for the women and no land was allocated for food crops. There were complaints from the women and some of them deserted their husbands (Rogers 1980:196).

---

[2] Under the agrarian reform programme in the Philippines, a small farmer could become owner of the land he cultivated by paying an annual amortization fee. The more prosperous landlords, however, were reluctant to adopt the programme as they wanted to maintain their grip on the small scale farmers (William 1979).

Women reacted in the same way in the Mwea irrigation scheme (Hanger and Moris 1973:244).[3] This is reminiscent of the ILO observation that women tend to lose more from agricultural schemes than do men (ILO 1981:13). It calls for a re-examination of the execution of the goals of development programmes in general and irrigation schemes in particular.

In another study, Rogers (1980) suggests that if all other variables are controlled for, women would benefit as much as, if not more than, men in irrigation projects. For example, in Chapula, Zambia, women successfully challenged the approach that registered only men as tenants, when it was actually they, the women, who provided the labour in a vegetable irrigation scheme. When they were registered in their own right, those registered for the first half of 1975 earned an average of K51.93 after deductions for inputs, while the men, who relied mainly on wives' *family labour*, earned K23.35. This suggests that women are capable of realising the benefits from irrigation schemes if they are given the opportunity. Women were also found to be more adaptable to new opportunities than men. In Malawi, the households headed by women were observed to have "greater economic incentives to innovate" than male-headed ones (Rogers 1980:189). Women are, however, constrained by unavailability of training, extension, credit, and other

[3] The significance of this constraint can be appreciated all the more when we consider that even though no land was allocated for food crops, women were expected to provide food subsistence for their families.

inputs. In general, Rogers (1980) feels that agricultural production in general and in irrigation projects in particular, increases at the expense of equity for women and their dependents; it also increases duality in the economy and within the family (1980:147). It would seem that irrigated agriculture does improve women's welfare in absolute terms, but in relation to men, inequality is exacerbated.

Vlachos (1972) used the systems model to establish the interdependent role of components of irrigation systems; the aim of such systems is to achieve certain goals. He saw an irrigation system as "a collection of people, devices, and procedures intended to perform certain functions" (p. 30). However, while farmers in an irrigation system can be viewed as an entity in the sense of wishing to increase their agricultural production in the scheme, they have different needs and the impact of a scheme can be experienced in a different way across the broad spectrum of farmers.

Vlachos further tells us that with the introduction of irrigation, existing organizations and institutional patterns become dysfunctional and have to adjust to the needs of the new situation. Individuals as well as groups have also to change; resistance to the changes may originate from those in established roles and positions of power, influence and authority (pp. 20-22).

Analysing the utilization of Kenya's irrigation potential, Makanda (1984) feels farmers can only benefit if their objectives are synchronized with the market and

natural conditions.

Makanda established that female farmers in Kibirigwi small-scale irrigation scheme generated less income from their agricultural enterprises than their male counterparts (p. 128). Yet Rogers (1980) showed that female farmers in Chapula, Zambia, on average earned twice the income that the male growers did (p. 187). This inconsistency might be explained by the fact that the women in Chapula had access to land in their own right, not as the wives of landowners as in Kibirigwi. Jones (1983) found that land tenure arrangements and remuneration terms affected productivity in Cameroon.

Makanda further found that education tended to reduce farmers' performance since with education they could get alternative employment (pp. 130-131). One would have expected education to improve performance as it should help understand the implications of innovation for cropping.

Crosson (1975) used an input-output model to show that irrigation can increase yield and employment opportunities. The shortcomings with this model are that the impact of irrigation projects on some socio-cultural factors cannot be measured by input-output analysis. Indeed, some of the factors involved do not lend themselves to quantification. The method is, however, useful in measuring the economic impact of a scheme.

Muga (1969) reports the social and economic problems experienced by tenants in the Ahero Scheme in the Kano Plains, Kisumu District. These problems include poor

house construction, ill health and an unhealthy environment (jiggers and mosquitoes abound, latrines flood during the rains, lack of diversification in cropping leads to a poor diet). The houses are also too few to accommodate all the members of the household. As the Luo traditional culture does not allow parents to share the same house with their grown-up children, many of the older children in the scheme go every evening to spend the night with their relatives outside the scheme (p. 12). This practice is inconvenient. Besides, although there is an increase in the per capita income of families on the scheme, the difference is not significant. In fact, most of the income has to go into buying foodstuffs as only rice, which does not even feature in the Luo staple diet, is grown in the scheme.

Literature concerning the organization and management of small-scale irrigation indicates the changing traits of irrigation associations. Among the Il Chamus of Kenya, Little (n.d.) notes the changing trends; the organization of irrigated agriculture gives the inverse of the indigenous social order. For example, the younger generation, instead of the elders, monopolizes positions of importance in the Lamelok and Longiron Kileloi Schemes. Little (n.d., p. 15), further notes that, due to the changing trends in labour organization (which is no longer provided on a reciprocal or co-operative basis), labour is a scarce factor and unless there is cash to hire labour, weeding and related tasks are done late and ineffectively, resulting in crop

failure.

Jones (1983) shows labour constraints are caused not simply by its scarcity: analysing the impact of an irrigated rice project on the labour of women, intrahousehold income distribution, and food provision in Cameroon, she concludes that women allocate their labour inefficiently due to intrahousehold conflict over income distribution. Using the bargaining model, she questions the neo-classical household model which assumes that:

> the household is a joint decision-making unit which allocates its resources and spends its income according to a mutually agreed upon and therefore identical set of priorities (Jones 1983:1).

In the bargaining model, the household members are seen as having both conflicting and complementary interests. The model is:

> based on the recognition that household members have different preferences and that due to their differential bargaining power, some members' preferences have greater weight than other members in determining the household patterns of resource allocation and income distribution (Jones 1983:5).

A monopoly of landholdings by wealthy men is noticed in the Ngambo area among the Il Chamus. Here, individuals make decisions independently of associations even though the main waterway is government-sponsored (Little, n.d.). Little, also, shows that success has been possible where irrigation has been co-ordinated with the economy. In some areas, the Il Chamus have failed in irrigation for, despite their earlier legacy of irrigation, they still largely perceive of themselves as pastoralists (n.d. p. 31).

Fleuret (1985) shows the efficiency of the Taita irrigation system, which exists without government support. Agnatic and affinal relationships are utilised to allocate land and water resources, and disputes are resolved by appealing to the same social relationships. Fleuret notes that in Taita, the importance of the organizational and managerial skills are more central to an irrigation scheme than the land and water; "the essence of irrigation is not land nor is it really water...it is resource management" (Fleuret 1985:42). In Taita, the management of social relations and that of natural resources are indistinguishable. This, however, "does not mean that kinship presents a convenient lexicon that people may use to talk about resources" (Fleuret 1985:41). Rather, it shows what Fleuret refers to as "the alignment of the moral order, the social order, and the natural order" (Fleuret 1985:41). Thus, Leach's (1980) findings in Pul Eliya are challenged. Leach submits that property relations are most important and therefore structure other relationships. He stresses rights in water rather than water organization and management:

> it is the emphasis on rights in water as opposed to rights in land which explains the many peculiarities of the traditional system (Leach 1980:116).

To check inequality in the distribution of resources, if a farmer owns a piece of land at the "lower field", he also owns land near the "upper field" and the selling is arranged in the same way:

> This fragmentation makes very good sense if it is remembered that what is being disposed of here is

> not really land at all, but rights to a proportion of the total water supply. The 'fragmentation' that results is not an economic vice but a moral virtue (Leach 1980:117).

The rights to resources are operated, though, in ambiguous kin relations. Kuper narrates the almost Malinowskian monistic view of man in Leach's account of irrigation in Pul Eliya:

> Kinship was an epiphenomenon of property relations, an elastic and fairly ambiguous idiom in which people talked about property relations. The 'kinship system' did not constrain behaviour; it was a mode of describing choices which were constrained rather by material factors (Kuper 1983:163).

In Pul Eliya, co-operation is very important in the utilisation of water; planting, for example, should start at the same time due to the interdependence of the farmers on account of the physical layout of the canal.

This study focuses on the labour patterns that have emerged in agriculture as a result of irrigation, and their implications for equity. Labour is an important input in irrigation. It has been suggested that many agricultural projects have increased the labour of women (see, for example, Rogers 1980:186, Henn 1984, Suda 1986). Other scholars have suggested that demand for agricultural labour has considerably increased in some irrigation projects, while in others it has decreased (ILO 1981:12, Vermeer 1977:190). Dubel and Kwaasteniet report that among the Pokot and Marakweta of Kenya, irrigation tasks are exclusively men's (1983:25, 29). Elsewhere, it has been reported that men have shown greater enthusiasm to participate in cash cropping tasks (Lele 1975:15, 26).

Discrepancies in the distribution of irrigation benefits are evident even at the household level, according to a number of studies. It has been assumed that the extra earnings received from the sale of produce in irrigation schemes go into improving the living standards of the household in general. In a number of irrigation projects, however, the head of the household (usually the male spouse) has been seen as the *chief tenant and principal labourer* while the other family members are workers who nonetheless get their dues (Rogers 1980:183, 186). The "trickle-down effect" from the heads of households has, however, not taken place in a number of cases. Yet, literature that confirms the contrary, that is, that an increase in tenants' incomes has actually led to better living standards for the members of the household, is also available (Kangangi 1982:111). My study does not question the credibility of these opposing findings, for it is not possible to generalise for all schemes. However, it considers the appropriation of irrigation benefits in the households as crucial, as this determines the standard of living of the majority of the people in a scheme. The general trend is that women and children tend to reap the least of the benefits from development projects in general and irrigation projects in particular (cf. ILO 1981:13, Hanger and Moris 1973:244, Rogers 1980:137).

2.2 Theoretical Framework

2.2.1 Cultural Ecology

To explain the cultural changes that have come as a result of Yatta irrigation, one needs to note the changes that have taken place in ecological and social terms. The new environment makes demands on the farmers to adapt to the new situation. Some of the changes that have taken place can be understood within the framework of cultural ecology. Expounding on the term "cultural ecology", Ellen (1982:281) submits that the "term is sometimes used more widely to refer to analyses of the relationship between culture, social organization and the environment" (e.g., in Harris 1978). Ellen, however, suggests it is best to limit the term to Steward. And Hatch writes:

> Cultural ecology is the study of the adjustment or relationship of culture to the natural environment (Hatch 1973:114).

The farmers in Yatta irrigation canal find themselves in a different type of environment with novel challenges and limited resources. To cope with their new environment, they re-define some of their cultural expectations. This is especially evident in the cropping patterns and utilisation of labour. One of the main and earliest proponents of a cultural ecological approach to understanding human behaviour submits that:

> Over the millennia, cultures in different environments have changed tremendously, and these changes are basically traceable to new adaptations required by changing technology and productive arrangements (Steward 1955:37).

and Hatch comments:

> Steward's version of culture may be characterised as practical rather than irrational, for in his view, human institutions are to be understood in terms of their adjustments to the exigencies of life (Hatch 1973:125);

and:

> Culture is not virtually autonomous from the hard realities of life but responds to them in an immediate way (Hatch 1973:1).

Steward's version of cultural ecology is given prominence in this study but it is supplemented with Leach's model of adaptation.

2.2.2 Leach's Model of Adaptation

Cultural ecologists often stress the interaction between the physical environment and culture (Kaplan & Manners 1972:79). In my study, it is necessary to also assess the social environment, and show how people adapt to changes in this sphere. It is, therefore, necessary to supplement cultural ecology with Leach's model of adaptation. Leach sees people as using or manipulating situations to cope with their socio-political and socio-economic demands. In his Pul Eliya irrigation thesis, he felt that kinship rules were bent or re-interpreted to permit the villagers to make the adaptive economic choices (Kuper 1983:162). In Yatta, there is marked individualism in labour utilisation. Since the people have been separated from their traditional clan relatives, it is not easy to establish pronounced ties in labour utilisation with neighbours who are similarly

constrained. Though the irrigators explain that they are too busy to have time for friends and relatives due to the labour-intensive cropping, it appears that the individualism they display is also an insurance against those who would want to reap where they have not planted. Further security amongst the irrigators is ensured by the spreading of risks: a number of them have two *shambas*, one in a dry-land farming zone and the other irrigated. There is also diversification in cropping even where only one holding is available. The dry-land farmers, on the other hand, have more active women cooperatives. They have more time to spare for their friends and they also recognise the need to secure social relations which would be useful to them incase of unforeseen calamities, for example, drought. A similar attitude of securing social relations in times of change was displayed by the Giriama emerging wealthy in a study done by Parkin (1972). Leach's Pul Eliya thesis is also pertinent here. Thus, cultural ecology and Leach's model of adaptation are useful in understanding the choices made in the utilisation of resources in Yatta (see the Literature Review for details on Leach).

2.2.3 The Multi-Dimensional Development Approach

Since the study deals with a number of different issues that are important in development, the multi-dimensional development approach is found useful in assessing the scheme's impact. The study comes at a time when a re-

interpretation of "development" has been called for (Todaro 1982: Rodney 1972; Foster-Carter 1985). Chambers (1978:393) also suggests that a holistic appraisal is necessary in irrigation projects.

Todaro (1982) sees the multi-dimensional facets of development as not simply growth and/or change but the alleviation of poverty by increasing the availability and widening the distribution of food, shelter and health. Besides, development should raise standards of living by providing more jobs, better education and higher incomes to enhance individual self-esteem. It should also minimise dependence and therefore increase individual choice (Todaro 1982:98). These facets of development have also been seen as pointers to rural development. Mbithi & Barnes (1975:97) see some of the major concerns of rural development programmes as: to ensure a subsistence food supply for all rural populations; raise incomes and distribute them equitably; and increase employment opportunities, health and family stability. They should also involve people in planning, implementing and evaluating their programmes. In addition, they ought to promote national integration through cross-ethnic rural interaction patterns and strengthen development administration machinery. Some of these are interests that are central to this study hence the focus on the impact of irrigation within a rural development framework.

2.3 Research Hypotheses

In the literature review, we have seen that large-scale irrigation schemes are generally administered bureaucratically. A "top down" approach is prevalent with the management making the major decisions on production, housing, labour utilisation and choice of cropping. Relative autonomy is, however, enjoyed by farmers in small irrigation schemes. They make decisions on the utilisation of their resources (water, land, capital and labour) and choose their own leadership. Since small-scale irrigation schemes are generally autonomous, it is likely that they do not use political leaders or government administrators to manage water-use. It is likely that the farmers in Yatta consider government and political institutions as well as indigenous institutions to be separate from irrigation and therefore irrelevant in irrigation management.

Further, the literature review has shown that irrigation has alleviated labour constraints in some areas but it has also increased labour demands in others. The former case mostly applies to irrigation projects that have led to greater technological efficiency. Since the technology utilised in cropping in Yatta is largely rudimentary, it is likely that irrigation has increased labour demands in the area. If this is the case, it is, again, likely that the farmers have re-interpreted their traditional labour utilisation patterns, that are largely based on gender, so as to cope with the increased labour

demand.

In addition to the above, it has been established that though irrigation generally increases income, irrigation benefits are not equitably received by all farmers. Further, irrigation returns are generally not well-spread in the families since the heads of households do not always make these (the returns) "flow down" to the rest of the members of their families. When this happens, it is mainly the women and children who suffer. This suggests that some households may have a low standard of living, even when they have a relatively high income, due to inequity in income spending among members of the households.

In view of the literature reviewed and theoretical framework examined, the following hypotheses were formed:

1. The organization (process) of water-use in irrigation is not related to the people's socio-cultural organization.
2. The division of labour by gender in agricultural production (cropping-activities) is not significant.
3. A farmer's agricultural (cropping) income does not determine the living standards of the members of the household.

2.4 Definitions

Irrigation:

A number of definitions have been given for irrigation. Vermeer (1977:183), for example, tells us that:

> According to the Chinese definition, irrigated land refers to the cultivated land that is provided with water through fixed and permanent irrigation facilities such as channels, reservoirs, ponds and dams, wells, water wheels and pumps. If, because of sufficient rainfall, no irrigation has been given on a certain area, although the facilities for it were there, it still is considered as irrigated area; the reverse is also true: if the facilities are there, but due to excessive drought no water can be supplied, it still remains irrigated area.

This definition lays a lot of emphasis on the availability of irrigation facilities irrespective of whether or not these facilities are being utilised. Many definitions agree with Kangangi's that irrigation is:

> the artificial application of water to soil to supplement water available from rainfall, the contribution of soil moisture and from underground for the purpose of crop growing (Kangangi 1982:18). (See also, Khatib 1969:D4; Vlachos 1972:18; Makanda 1984:10; Clark 1970:1).

This study defines irrigation as the artificial application of water to soil to assist the growth of crops.

Irrigation occurs under three main conditions: where there is an inadequate water supply, where there is an unreliable water supply, and where irrigation is used as a means of production and quality control. In places with inadequate water supply, water is derived partly from rivers and partly from underground sources while in the unreliable water supply cases the rainless months

with favourable temperatures are provided with the necessary moisture for plant growth. In the third condition, irrigation is used as a supplemental means of production and quality control to promote yields. This category of irrigation is practised in the eastern half of the United States of America, the former Soviet Union, Western Europe and parts of Sub-Saharan Africa (Vlachos 1972:18).

There are three irrigation types. The first is surface irrigation which is the application of water on the soil surface. Secondly, we have sub-surface irrigation whose water is distributed below ground surface at a depth varying from 30 centimetres to one metre - the layer of water percolates into the root zone through capillary action. Sub-surface irrigation includes water table control and sub-soil pipes. Finally, we have overhead irrigation which involves applying water on top of the crops. This includes the watering can, hosepipe and the sprinkler (Makanda 1984:10; Khatib 1969:B2).

Small-Scale Irrigation:

Fleuret (1985:104) discusses the ambiguity inherent in the term. What appears small in land area and capital investment to planners may be large-scale to the farmers involved. Moreover, bureaucratic organizations involved in implementing and making decisions on the types of technology to be used or level of investment may render

"large-scale" what apparently is small-scale.

Little (n.d., p. 35) feels small-scale and large-scale irrigation differ in their degrees of capitalisation, mechanisation, size, technical scale and relative importance of export crop production.

For the purposes of this thesis, small-scale irrigation is seen as low in technology and hectareage; it is gravity-fed and its farmers are largely autonomous in decision-making on crop production. Yatta irrigation is not indigenous but introduced; decisions on production and marketing of produce are largely the farmers', though. The Ministry of Agriculture and the Horticultural Development Authority offer advice especially on what crops to be grown depending on the market and how they should be grown but they do not interfere with the farmers' final decisions. The Ministry of Water Development controls water abstractions from the major furrow. The farmers themselves control abstractions from the secondary furrows.

Resources:

This refers to the variables that are important in irrigation, that is, land, water, capital, and labour. The resources (inputs) in general agricultural production (credit, extension, etc.) are also important in the analysis of factors affecting yield.

Organization (process) of water-use:

This refers to the machinery that runs water-use. Who occupies places of importance in water management and what are their duties and privileges? How is the water flow regulated and by whom and how are the furrows maintained? Who allocates access rights to the water and leadership roles and how are disputes solved?

Socio-cultural organization:

The term has been defined as:

> the process of harnessing human resources (e.g. coordinating human behaviour) to achieve specific goals. This is done through the establishment of interrelated roles (e.g. leadership) as well as the delineation of the appropriate spatial units both in a physical and social sense (Ssenyonga 1983:97; brackets in the original).

The study's definition of socio-cultural organization conforms to Redfield's definition of "social organization". He submits that:

> Social organization is the way that people put together elements of action so as to get done something they want done (Redfield 1960:58).

In the study, it refers to the relationships that are of importance in managing resources in the community. What are the positions of leadership and the duties that go with them? What channels are used in solving both irrigation and other social disputes? The study's interest is in exploring whether the principles governing socio-cultural leadership role allocation are the same or similar to those governing the organization of water-use and if not, are they necessarily in conflict?

Income:

This refers to monetary gains generated from agricultural production (cropping). Farmers are asked what their agricultural income is and how they spend it. The material inventory (Chapter 6) provides more information on how income is spent.

Household:

For purposes of this study, the household is a group of people that usually live and eat together. They assign labour for the fields and domestic tasks from a common pool. Thus, the household may be composed of the nuclear family or two or more such families and other members who may or may not be agnatic relatives or affines. The household is the unit of analysis in the study. It is the primary unit of both production and reproduction and also consumption. Netting et al. tell us:

> They [households] are a primary arena for the expression of age and sex roles, kinship, socialization and economic cooperation where the very stuff of culture is mediated and transformed into action (1984:xxii).

Jones (1983) sees the household as having both complementary and conflicting interests, a perspective adopted in my study.

Living Standards:

This refers to the quality of life. In the study, the parameters are food and diet, quality of shelter, household durables and livestock, frequency of ailments,

employment and income. Local preferences for shelter construction and consumer durables are captured in the assessment of living standards.

Adaptation:

Cohen (1974:3) tells us that:

> a population's adaptation is its relationship to its habitat...When we say a population is adapting, we mean that it is altering its relationship to its habitat to make that habitat a more fit place in which to live or to make itself more fit to live in that milieu.

A similar definition is given by Hardesty (1977:45):

> Adaptation is the process of creating beneficial relationships with the environment by means of behavioural, physiological and genetic/demographic changes.

A beneficial response is seen as one that contributes to solving a problem. Hardesty (1977: 22-23) sees two kinds of adaptation: external and internal:

> External adaptation is the process of making beneficial adjustments to the environment, while internal adaptation is the process of beneficial compensation for those adjustments within the organism (underlining in the original).

He, further, submits that in Anthropology, adaptation takes place in three kinds of cultural behaviour: technological, organizational, and ideological. In this study, "adaptation" refers to external adaptation. Though both the physical and social environment are important, emphasis is on the cultural, not physical environment. Adaptation in this study is, therefore, seen as the process of making behavioural changes to effect beneficial relationships with the environment.

Culture:

Culture is the sum total of the thoughts and actions of sections of the human community. It is shared, unique to groups and full of symbolism. It includes the tools and methods of harnessing energy and organization of social relations. Cohen (1974:1) sees culture as man's most important instrument of adaptation. He writes:

> A culture is made up of the energy systems, the objective and specific artifacts, the organization of social and political relations, the modes of thought, the ideologies, and the total range of customary behaviours that are transmitted from one generation to another by a social group and that enable it to maintain life in a particular habitat (Cohen 1974:1).

In this study, culture relating to cultivation and resource management (in particular water-use and labour utilisation) is given emphasis.

Environment:

Environment has been described by Tylor as, "The totality of the external conditions and influences that affect man" (Tylor 1988:187). This study sees environment as the external conditions that influence man's and woman's behaviour. Though the physical environment is an important external condition and certainly influences human behaviour, my study gives greater importance to the social environment. The interaction between the organization of social relations and the physical environment is not, however, overlooked.

CHAPTER THREE

THE STUDY AREA, POPULATION AND DATA COLLECTION

3.1 Background Information

3.1.1 Irrigation in General

The first known irrigation took place in Mesopotamia and other parts of the Old World: it was in the form of river flooding (Vlachos 1972). China has the largest irrigated area in the world followed by India, the United States of America, Pakistan and then the USSR (Hurst 1985:6-8).

The general objectives of irrigation schemes are: to provide employment opportunities to the unemployed and under-employed, to increase food production and therefore reduce and eventually overcome food deficits, increase foreign exchange earnings and savings, and raise levels of living and social welfare (Diebold 1969:A2-3; TRDA 1978:14). Often, particular schemes have contradictory objectives, for example, rural development versus foreign exchange earnings. The realization of irrigation objectives may depend on the size of the scheme and availability of resources, organization and management, and the relevance of the scheme to the needs of the projected beneficiaries. The impact of the schemes on the lives of the people can be felt differently across the different categories of farmers in a project, and also from scheme to scheme depending on the ecological and socio-economic context of the projected

beneficiaries.

3.1.2 The Kenyan Context

Irrigation existed in Kenya even before colonization. In "the Perkerra Irrigation Scheme", Chambers (1973:344), for example, reports that the Il Chamus practised irrigation on their millet and melons long before the floods of 1918 after which they changed their mode of production to pastoralism. Makanda (1984) reports that during the Second World War, more irrigation schemes were started in Nyeri and Embu districts to provide fresh fruits and vegetables to the British soldiers fighting in the war in Eastern Kenya. After the war, other schemes were started so as to occupy the Mau Mau detainees. Mwea, Perkerra and Yatta irrigation schemes were some of these (Makanda 1984:16, Chambers 1973:344, TRDA 1978:10).

In Kenya, the potential for large irrigation schemes (some of which has been developed) is in the Yala Swamp, Kano Plains, Taveta, Perkerra Settlement, and Upper and Lower Tana Basin. It is estimated to total between 200,000 and 600,000 hectares (Fleuret 1985; Makanda 1984; Kangangi 1982; Moris & Thom 1987). Irrigation potential on a small-scale basis has been recognized in virtually all the provinces. It accounts for 2400 hectares of irrigated land (Little n.d.:2). Some small-scale irrigation projects in Kenya are a part of government projects while others are privately owned and operated, mainly in Central Province (Makanda: 1984:17-18), and

others are wholly or originally indigenous. River valley irrigation practices are not fully assessed and recorded.

In addition to the general objectives of irrigation already mentioned, irrigation projects in Kenya are also attempts to distribute benefits in development in a more equitable manner and arrest environmental degradation (GOK 1989a:133). Consequently, irrigation schemes in some places in Kenya can be seen as integral parts of rural development. Rural development has been defined as:

> improving living standards of the mass of the low-income population residing in rural areas and making the process of their development self-sustaining (Lele 1975:20).

3.1.3 Yatta Irrigation Scheme

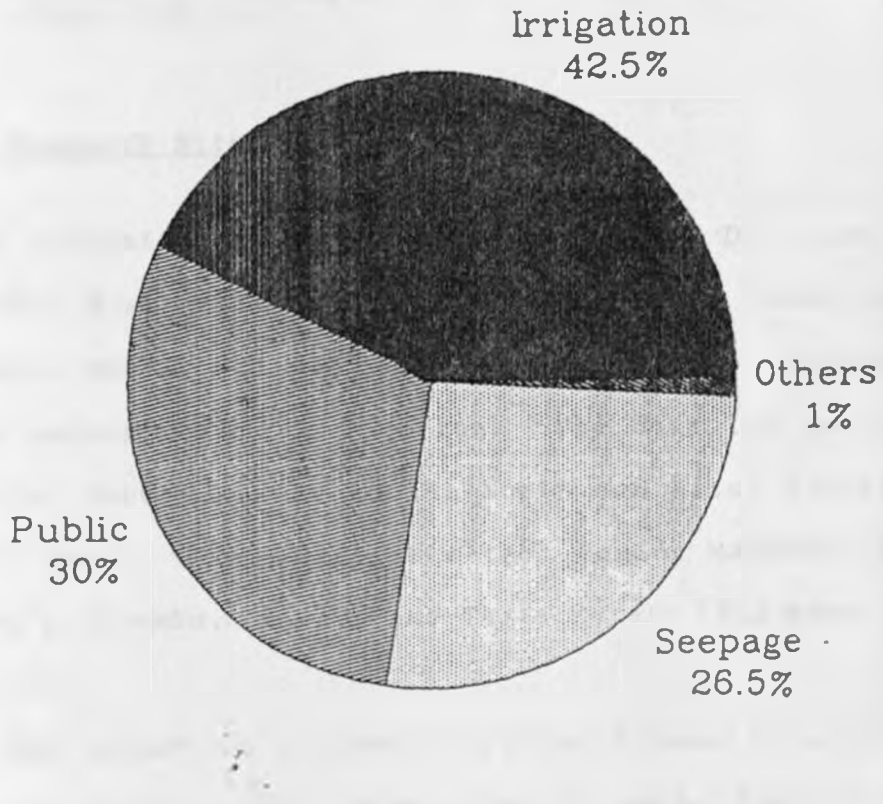
The idea of a canal from Thika River was mooted in 1936 but it was only during the height of the Mau Mau Emergency, in the early 1950s, that it was seriously considered. Its short term objective was to provide penal employment to Mau Mau detainees. The long term objective was to supply water to Yatta grazing lands and thus permit rotational grazing and irrigation development whose extent was not yet determined. The African Land Development Board (ALDEV) - with the stated aim of initiating development in the *Native Lands* - was thus instructed to start canal construction using Mau Mau detainee labour. Work was interrupted in 1958 when emergency regulations were eased and detainees were being repatriated to their areas of origin. Consequently,

hired labour and machinery were deployed for the construction of the last sections of the canal. It was inaugurated in 1959 still under ALDEV but Masaku County Council took it over soon afterwards. In 1975, the council experienced financial and technical problems preventing proper maintenance of the canal, and therefore the Water Apportionment Board transferred functions for the canal to the Ministry of Water Development. The latter became responsible for canal desilting, clearing of banks, regulation of intake as well as overall management of water abstractions. With a permitted normal flow abstraction of 1130 litres/sec., Yatta canal makes a substantial demand on the water resources of the Thika river (a tributary of the Tana).

Yatta irrigation scheme may be seen as semi-autonomous in the sense that some aspects of the scheme are organized by the government, for example water abstractions, but the farmers make their own decisions (sometimes with the assistance of the Ministry of Agriculture) on cropping, labour organization and the sale of produce. Horticultural crops, commonly referred to as "Indian vegetables", are grown mainly for export.[1] Food crops are also grown. The farmers have an average of 2.96 (5:12 for control) hectares of land. Due to labour and water constraints, the farmers only irrigate small plots on their land. (The various uses of the Yatta canal water are given in figure 3.1).

[1] Asian vegetables were introduced in Kenya by Indian railway workers during the construction of the East African Railway, but it was only in the 1970s that they were grown for export.

Figure 3.1: Uses of Yatta Furrow Water



Source: Divisional Water Office, Yatta Division

The "Asian vegetables" require much labour than the rest of the crops and are therefore planted on plots generally ranging between 0.1 and 0.05 of a hectare. In short, the Yatta Canal Irrigation Plan aimed at:

> increasing productivity of the land on either side of the canal by expanding and intensifying irrigated agriculture as well as animal husbandry; raising employment opportunities in the area through cultivation of labour-intensive irrigated crops; improving the standards of living of the area population through provision of piped water supply (TRDA 1978:14).

3.2 Research Site

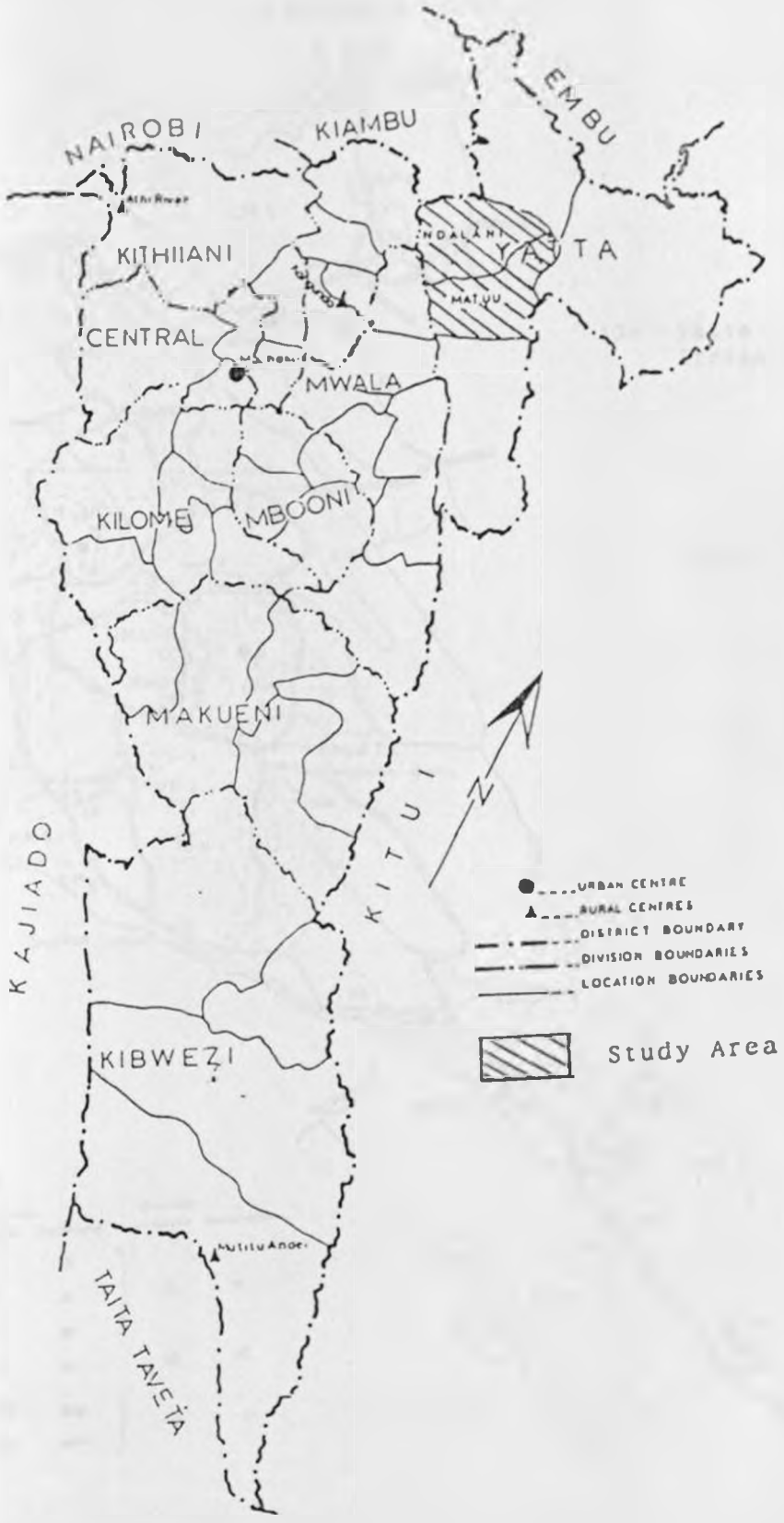
Yatta irrigation canal falls within Yatta Division of Machakos district. The division has four locations: Ndalani, Matuu, Katangi and Kinyaata. The irrigation falls mainly in Matuu location. The division borders parts of Embu district to the North and Kitui district to the East. Other districts that border Machakos are Murang'a, Kiambu, Kajiado and Taita Taveta (see Maps 3.1 and 3.2).

The scheme is a twenty by five kilometre stretch from the intake in the Thika river to Mwita Syano River which separates Kitui and Machakos districts. (Maps 3.3, 3.4 and 3.5 show, respectively, the location of the scheme canal in Machakos district, the location in relation to the immediate physical environment and the extent of the water supply of the scheme canal). The scheme has an elevation ranging from 1280 metres at the canal intake to 1234 metres at the end of the canal (TRDA 1978:3).

Map 3.1 Location of Machakos District in Kenya

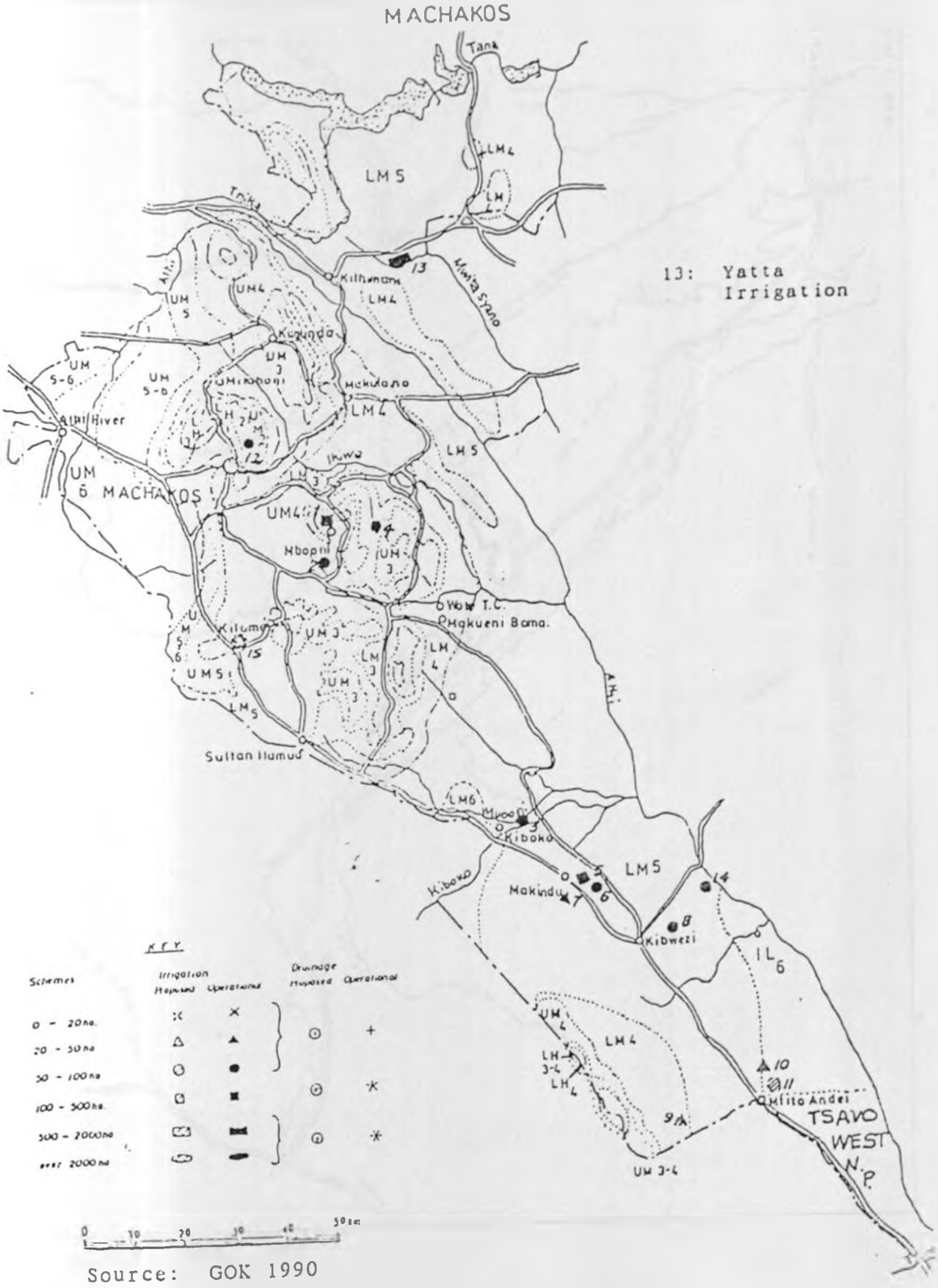
Source: GOK 1989b

Map 3.2 Machakos District Administrative Boundaries



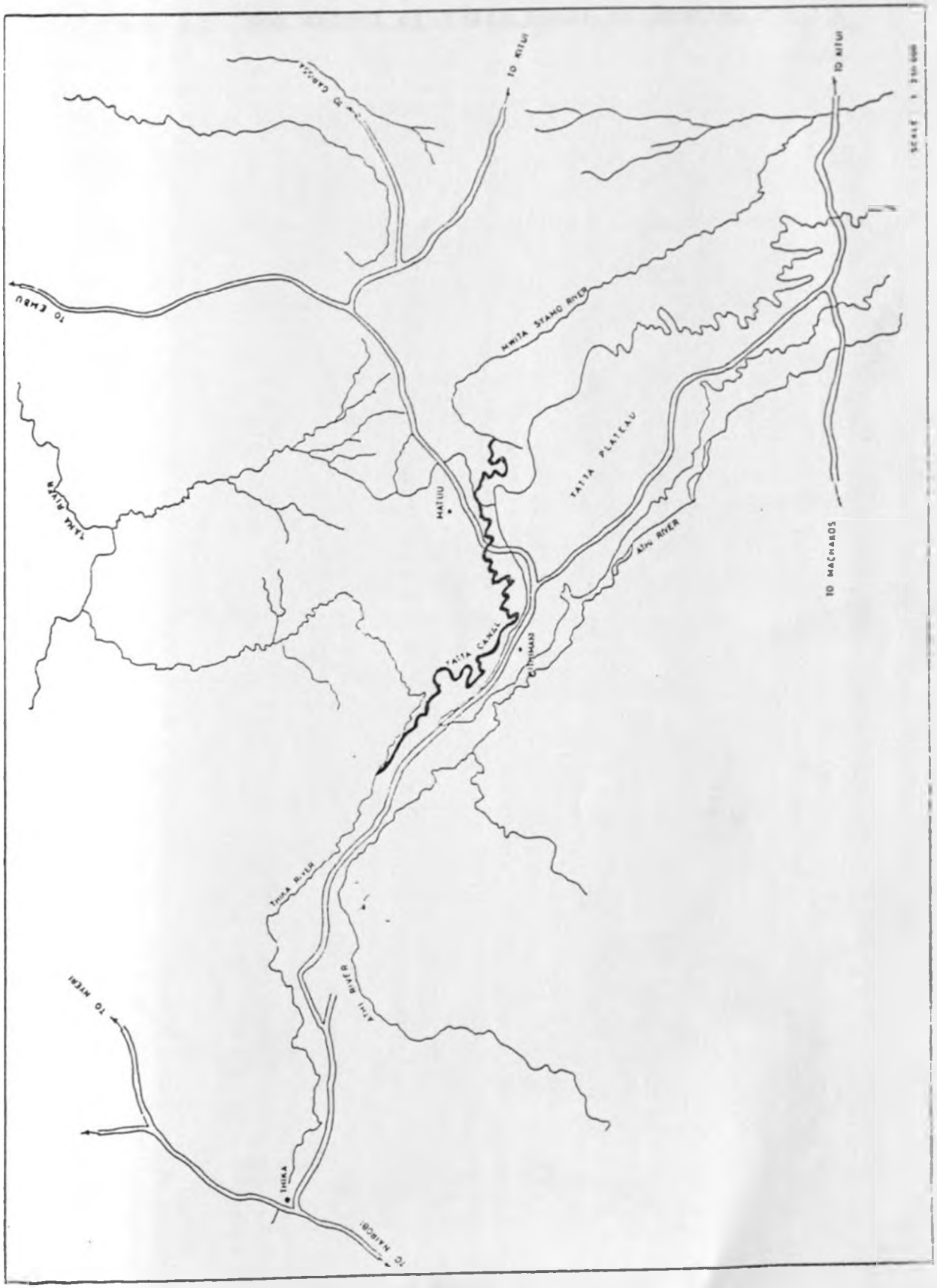
Source: GOK 1989b

Map 3.3 Location of Yatta Irrigation Canal "A"



Source: GOK 1990

Map 3.4 Locaiton of Yatta Irrigation Canal "B"



Source: TRDA 1978

N

Thika River

Athi River

GARISSA ROAD

YATTA CANAL

Kilimani

HD Office

Katulani River

GARISSA ROAD

Mathauta River

Kitangi Dam

Dam No. 15

Kithandu River

Kaututhuki River

Kiuwa River

Mathauta Dam

MATW

Mathauta River

YATTA CANAL

Kamituyo River

M20

M21

M22

M23

M24

M25

M26

M27

M28

M29

M30

M31

M32

M33

M34

M35

Spring

YATTA CANAL

LIMITS OF SUPPLY

M.5 ... M.37 : MILE MARK

Scale : 1:50,000

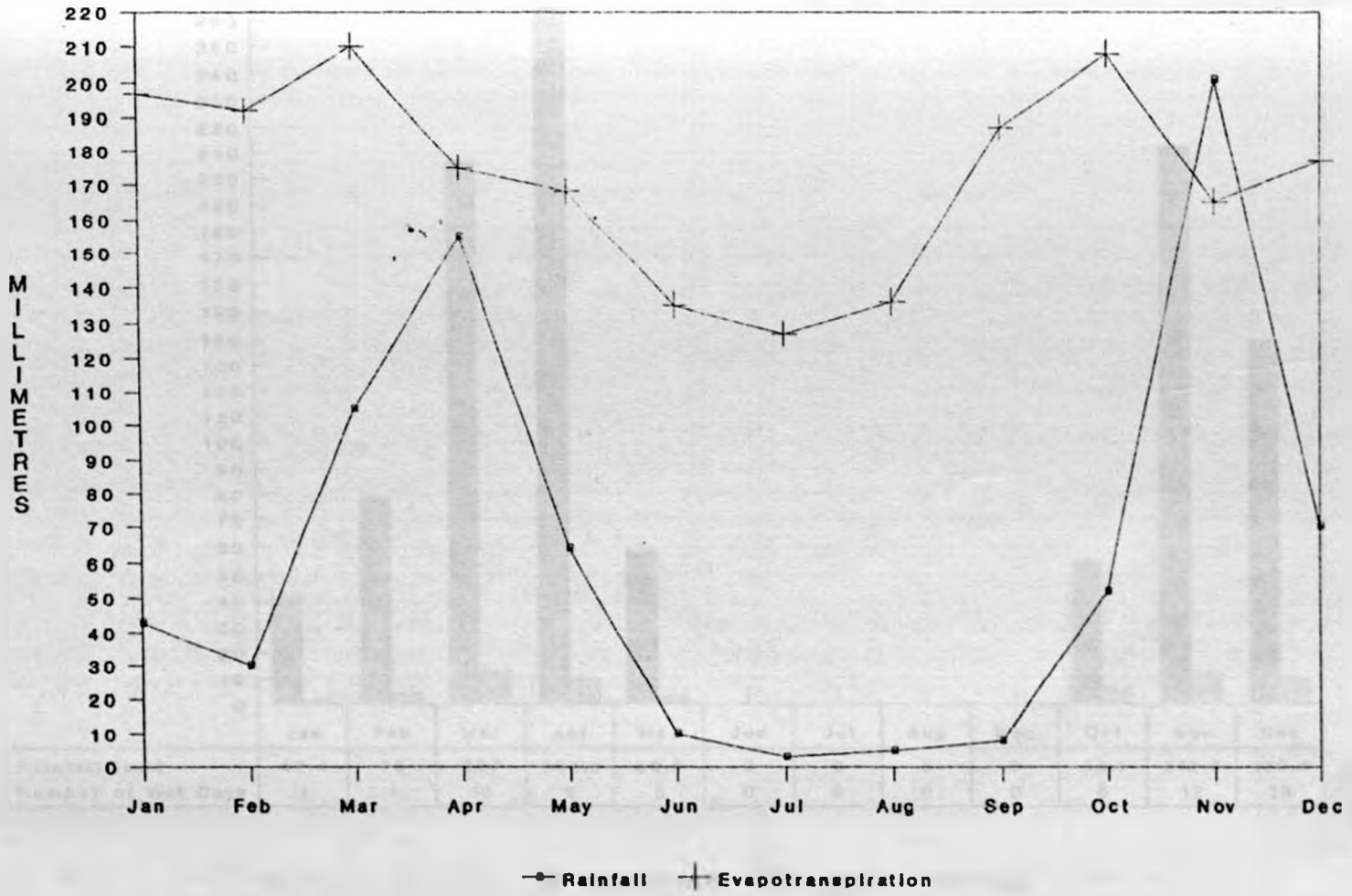
The area falls within the low potential agro-climatic zone (TRDA1978; GOK 1989b:5) with a bi-modal rain distribution with the long rains falling in March, April and May and short ones in October, November and December (graphs of rainfall distribution are given in figures 3.2 and 3.3).

The soils on both sides of the canal have been described as falling into three types: "moderately well-drained deep soils ranging from friable sandy clay loams to sandy clays" and "well-drained, deep friable red to dark reddish brown clays". Finally, there are the "deep poorly drained firm clays with a tendency to crack on drying" (TRDA 1978:3). The soil variation is pronounced within relatively short distances.

The population projection for Yatta division based on the 1979 census. was 209,736 for 1989 and 217,843 for 1990 with a density of 85 and 89 persons (respectively) per square kilometre (GOK 1989b:13).

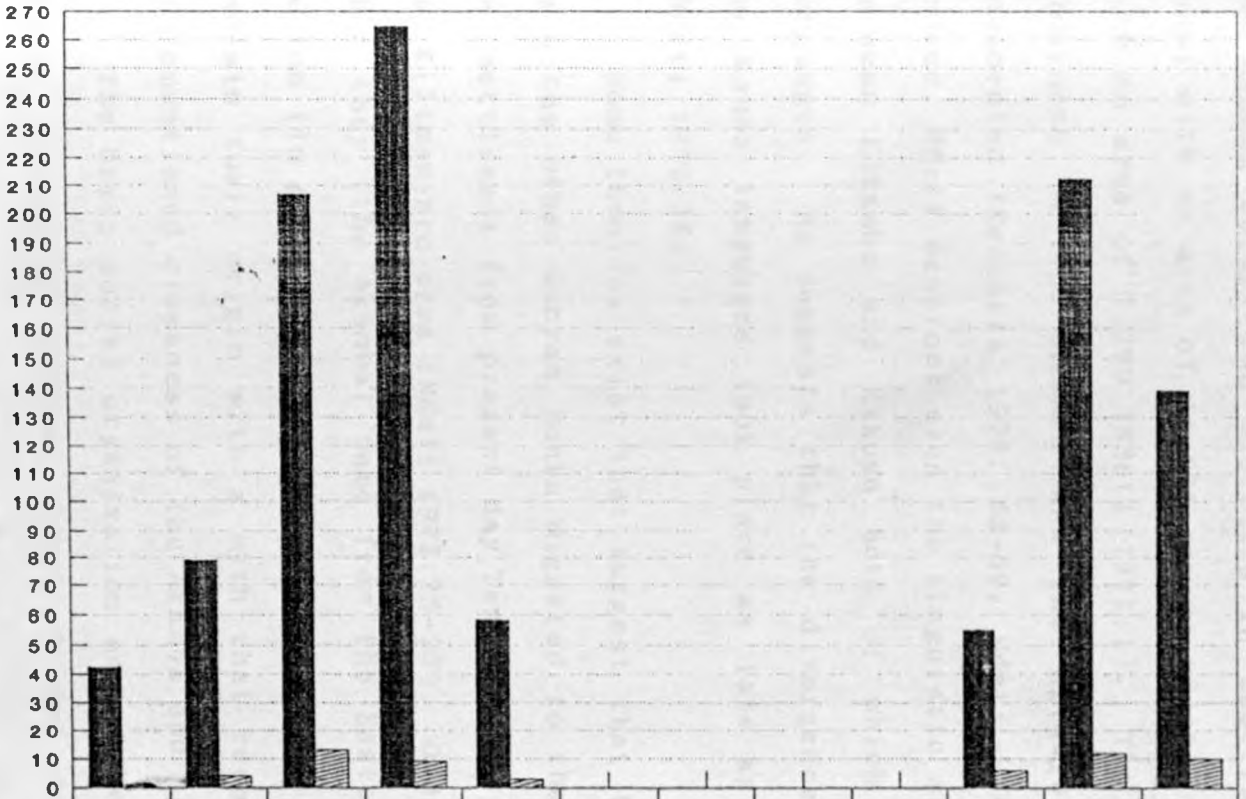
Prior to irrigated agriculture, maize and beans (forming the staple food in the area) and cow peas and pigeon peas were grown with low and uncertain yields. Presently, horticultural crops are also grown.

FIGURE 3.2
MONTHLY RAINFALL & EVAPOTRANSPIRATION



Source: Ministry of Agriculture,
Nata Chitelur

FIGURE 3.3
MONTHLY RAINFALL: YEAR OF RESEARCH 1990



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	42.4	79	207	264.6	58.4	0	0	0	0	55.1	212.7	139.4
Number of Wet Days	1	4	13	9	3	0	0	0	0	6	12	10

Rainfall (mm) Number of Wet Days

Source: Divisional Agricultural Office,
Yuba Division

3.3 The Study Population: An Ethnography

3.3.1 The Akamba

The Akamba occupy two districts in Eastern Province: Kitui with an area of 11,696 square miles and Machakos with an area of 5,790 (Ndeti 1972:1). The historical closeness of the Akamba and the Agikuyu has been documented (Kenyatta 1978: 68-69, Ndeti 1972: 35-37). Indeed, Ndeti mentions even the linguistic similarities between Kikamba and Kikuyu both of which are Bantu languages. He suggests that the divergence of Gikuyu and Kamba languages took place as late as 1500 A.D. (Ndeti 1972:36).

Some theories exist that suggest that the Akamba, with the other Kenyan Bantu migrated to their present day settlement from present day Tanzania - specifically Mt. Kilimanjaro area (Ndeti 1972:25-27). Others suggest that they (the Akamba) came from the Eastern coastal region (in present day Giriama). The Akamba themselves explain their origin with a myth that recognizes the aforementioned closeness of the Akamba and Agikuyu.[2]

The basic social organization among the Akamba is Musyi, literally meaning "family" and "home" thus combining residence and affinal and consanguinal relations. The Kamba family, like the Gikuyu, can be monogamous or polygynous. In special cases, a "wife" may be acquired by another female without the expectation

---

[2] For more information on the Akamba myth of origin, see Bahemuka 1983 and Ndeti 1972.

that the couple concerned will engage in a physical relationship (Ndeti 1972:67-68, Musila 1987). The children of the *Iweto* (wife) have social, not biological paternity in the family. This marriage institution is also present among the Agikuyu (Tietmyor 1987) and other Kenyan ethnic groupings who may not necessarily be Bantu, for example the Kalenjin (Oboler 1985). The special marriage institution compensates for childlessness or lack of male heirs and might be compared to the Western practice of surrogate motherhood.

A family may consist of one or two or as many as four generation members (siblings, parents, grand parents, great grand parents) and collateral relatives who live in some kind of symbiosis. Besides the economic alliance, the family carries the other vital functions of human development, e.g., education and religion (Mbiti 1969).

Clans (*Mbai*) rank second to the family in social organization. *Mbai* is larger in size and more powerful and therefore responsible for major decision-making affecting the community. For example, if murder is committed or there is persistent feuding between two families, their clan or clans may assemble to deliberate and pass judgement. Serious disagreements and issues may be solved with the taking of the oath (*Kithitu, muma*).[3]

[3] For more information on oath-taking (*kithitu, muma*), see Ndeti (1972), Mbiti (1969).

There are more than 25 major clans (most of which are exogamous) among the Akamba. Each of them traces its name and descent from a known hero and usually identifies itself with a totem (Ndeti 1972, Lindblom 1920).

The Kamba elders who form the councils of leadership are chosen according to age and wisdom and good general behaviour within the community. Circumcision is necessary before making the transition from childhood to adulthood (traditionally, female circumcision was also necessary but this is not widely practised today due to Westernisation and Christian influence). After a male was circumcised, he ceased being a boy (*Kivisi - Kihii* in Kikuyu) and became a man capable of entering into marital unions.[4] The first stage of manhood is *Mwanake* (pl. *Anake*). *Nthele* is an advanced stage of *Mwanake* (in years). A *Nthele*, however, does not attend the dances attended by young men (*anake*). Both *Nthele* and *Mwanake* act as warriors in times of raids, etc. From *Nthele* stage, one becomes an elder, *Mutumia* (pl. *Atumia*). Eldership positions are given below in terms of seniority: *mutumia wa kisuka* (ordinary elder) - *mutumia wa nzama* (elder of the council) - *mutumia wa ithembo* (elder of the sacrificial ceremony).

Traditionally, the elders were very powerful politically and socially. They transmitted wisdom to the young and presided over disputes at the family and

[4] In contemporary Kamba and Gikuyu society, a person may not marry soon after circumcision since circumcision is performed much earlier than formerly, and initiates are virtually children.

clan levels. Though elders still wield some power, they have been marginalised considerably by modern centralized government institutions (chiefs, D.O.s. D.C.s).

Suggestions have been given that the Akamba, used to be a matrilineal community. Lindblom (1920:129), for example, sees the following as survivals of a matrilineal past:

- a mother's brother plays a vital role at celebrations in honour of the successful return of a young brave warrior;
- a man acquires the totemic taboo of the woman he marries. If he marries a Muusii (person from the Aasii clan), for example, he no longer eats liver. (The Aasii do not eat liver);
- if a man kills his child, he pays damages to the mother of the child;
- during division of blood-money[5], the victim's mother's brother is given one cow.

Though, as mentioned earlier, the Akamba lived amicably with the Agikuyu, both waged constant raids on the Maasai cattle and the Maasai did likewise on theirs (Ndeti 1972:99). The *Anake* and *Nthele* carry out the raids.

Ownership of property was entrusted to the adult male members of a clan and then the families. Collective ownership of property was especially evident in land and cattle ownership. Cattle and land could not be disposed

---

[5] Blood-money is the money paid to the relatives of a deceased person to compensate for his death. The persons paying blood money are known to have caused the death.

of without the consensus of the senior males in the large family. The concern of the Kamba about their livestock, fields, money, land and children, all of which are important for survival in their risk dominated environment, was mistaken by Edgerton (1971) to signify an obsession with property. He submits:

> Virtually every act during the course of a day was a calculated one, and that (sic) the heart of the calculation was the relevance of the act in terms of property (Edgerton 1971:98).

He also errs when he submits that all that is talked about in seriousness, gossip, jokes and laughter is property (Edgerton 1971:98).

3.3.2 The Agikuyu

The bulk of the Gikuyu population occupy the central parts of Kenya. Due mainly to land-pressure, however, many Agikuyu have migrated to different parts of the country. The Gikuyu population, that forms seventeen per cent of the male spouses interviewed for the treatment group and eight per cent for the control, is composed of farmers who were squatters on large-scale commercial farming areas before they were settled in the Yatta region.

The Agikuyu are, like the Akamba, agriculturists who cultivate the fields and practise stock-keeping. Traditionally, the land on which the Agikuyu and Akamba cultivated was owned by the clans and it was the relevant clan that distributed the land to the different families (whose children inherited the piece of land) who belonged

to the clan (Cavicchi 1977:202). Nevertheless, different categories of Gikuyu land ownership or use-rights have been recorded which suggest that, even before colonial land alienation, there was a landless class (called *Ahoi*) who had only use-rights to land (Kenyatta 1978:22,30).

The Gikuyu system of government was democratic (Kenyatta 1978:195). The elders who formed the councils of leadership were chosen according to age and wisdom and good general behaviour within the community for example leadership capability, bravery in wars, impartiality, self-sacrifice and discipline. No person would become an elder or a warrior before he was circumcised which was the first stage in adulthood. As soon as a boy was circumcised, he became a junior warrior. The next stages that he would look forward to passing through are (arranged according to seniority): council of senior warriors, council of junior elders, council of peace, and the religious or sacrificial council.[6] Ceremonies would be performed to herald the stages.

According to the myth of origin, the Agikuyu originated from Gikuyu (male) and Moombi (female).[7] Though the Agikuyu today are a male dominated society who are patrilineal, patrilocal and patriarchal, like the Akamba, suggestions are given in their legends that they were once matrilineal and female dominated.

---

[6] Though women also got circumcised and, by virtue of this ceremony, became adults capable of entering into marital unions, they joined neither the warrior classes nor eldership.

[7] For more information on the myth of origin, see Kenyatta (1978).

The daughters of Moombi continued to be the heads of their family groups and clans for many generations until women's supremacy was toppled by trickery. Legend has it that the women in their superior position in the community became domineering and ruthless fighters, practised polyandry, and, through sexual jealousy, men were put to death on account of adulterous behaviour or other minor offences. Besides, they (men) suffered humiliation and injustice. Consequently they plotted to revolt against the women's administration. Since the women were physically stronger and better fighters, the plot would be executed at a time when most of them, especially the leaders and their brave followers, would be pregnant. The men triumphed and turned the tables on the women: they abolished polyandry and established polygyny, changed the name *Mbari ya Moombi* (children of Moombi) to *Mbari ya Gikuyu* (children of Gikuyu) and established themselves as the heads of the families. They proposed to change the names of the nine clans but the women threatened to stop bearing any more children if that happened. As men were still quite afraid of the women, they conceded this. The clan names remain unchanged to this day and the nine names of the daughters of Moombi are the common women names among the Gikuyu women today. The Gikuyu male remains as the head of the family in all senses: he is the custodian of the family property and owner of the means of production and has to be treated with obedience and respect - no major

decisions can be made without his consultation.[8]

As mentioned earlier, the Agikuyu and Akamba cultivate the fields and keep stock (mainly cattle, sheep and goats). A man, his wife (or wives), children and sometimes other agnatic and/or affinal relations form an economic unit. A division of labour based on gender lines governs economic productivity (Kenyatta 1978: 53-55). In building, men cut timber and put up the framework, while the women cut and carry the grass, thatch houses and plaster them with clay or cow dung. The men build fences around homesteads, fields and cattle pens. Cattle are important as a display of wealth and also for their economic value (Kenyatta 1978:64-65). They provide milk, are given as bride-wealth and slaughtered during feasts. They also come in handy in times of famine.

Women in both Kamba and Gikuyu communities do the bulk of house chores. They prepare the food and cook it, fetch water and firewood, wash utensils and look after the young. In the fields, men clear the bush and break the virgin soil while women prepare the ground for planting. Both men and women plant; the men plant bananas, yams, sugar-cane and tobacco, while the women plant maize, beans and millet. Cutting drains or water furrows, pruning of banana plants, clearing paths and making bridges is a man's domain. Harvesting and weeding

[8] It is, however, noted that with western influence, urbanization and the concomitant shift from clan administration, and changing attitudes to women, Gikuyu men, like many others in the African community, are becoming less able to exercise a firm grip on all important family matters.

are chiefly tasks for women.

Men tend cattle, sheep and goats, slaughter the animals, skin them, distribute the meat and prepare the skins for sale. Dress-making, pottery and weaving of baskets is a woman's role. Wood-carving, bee-keeping, iron-smithing and hunting are tasks for men (today very little hunting and iron-smithing is done). Brewing beer and trading is done by both sexes. Women sell grain while men sell stock.

Communal labour was traditionally possible. Friends, relatives and neighbours could provide labour to a member for no pay or for a little pay in kind. Communal labour is no longer easily available as seen in Chapter 5. Boys and girls run errands and used to chase birds away from the fields when millet was still widely grown. Gender labour-division is not well-defined in children, but as they grow, they learn to do the tasks that are seen as appropriate for their sex.

3.4 Population and Sampling

The population for the study is 850 farmers that mainly use furrow irrigation. They occupy three sub-locations, namely, Matuu, Kithimani and Ndalani. The first two sub-locations fall in Matuu location while the third one is in Ndalani location. Both locations lie in Yatta division of Machakos District. The individual land holdings are of varying sizes with an average of 2.96 and 5.12 hectares per farmer for the treatment and

control groups, respectively.

As pointed out in chapter 4, settlement patterns were largely haphazard (except for the population settled by the government). Altogether, 156 farmers were interviewed, 50 of whom formed a control group. The distribution of the respondents is given in Tables 3.1 and 3.2.

Table 3.1: Distribution of Respondents per Location. N=106 (T), 50(C)

Location	Respondents		Percent	
	(T)	(C)	(T)	(C)
Matuu	76	30	71.7	60
Ndalani	30	20	28.3	40
Total	*106*	*50*	*100*	*100*

Key: T= Treatment sample, C= Control sample.

Table 3.2: Distribution of Respondents per Sub-location. N=106(T), 50(C)

Sub-location	Respondents		Percent	
	(T)	(C)	(T)	(C)
Matuu	47	08	44.3	16
Ndalani	30	20	28.3	40
Kithimani	29	22	27.4	44
Total	*106*	*50*	*100*	*100*

Using systematic random sampling method, I selected 106 farmers. Random sampling was preferred as it ensures that every sampling unit has an equal chance or probability of being selected for study as any other in the population (Chadwick et al. 1984:53; Bernard 1988:84). It gives results of findings that are representative of the studied populations and increases external validity in any study (Chadwick et al.1984:82). Systematic random sampling has not only the above

advantages: it is also easy to carry out especially in a situation where a sampling frame is obtainable. It was easy to get a sampling frame in Yatta. A list of the farmers who irrigate was obtained from the divisional Ministry of Water office and this facilitated the selection of the households. All the farmers who irrigate were allocated numbers. The least number of persons in an irrigation group was eight. To make sure that at least a member from each group was interviewed, it was necessary to interview every eighth household. A number (household) was randomly selected from the range of one and eight. Since the number picked was five, the next household selected was thirteen (five plus eight) and thereafter every eighth household was selected. A research assistant from the local area was engaged to help in the physical location of the households. Each water-group had, at least, a respondent interviewed.

Though initially I did not propose to use a control group, I later found it necessary to use one. A control group throws light on issues that are cloudy especially in labour allocation and food and diet. During fieldwork, it was observed that some farmers within the irrigated zone do not irrigate mainly because the force of gravity is not in their favour. Other holdings lie at the very tail end of the furrows. Some of the landholders have put in applications (in the Ministry of Water) for the use of water but the applications have not yet gone through as the Ministry has to give a limited abstraction for each furrow. A control group of

50 farmers was selected from the above two categories using a simple quota sampling method. Though this type of quota sampling is rare (Chadwick et al. 1984:67), it can be used reliably with small populations. Respondents from households that do not irrigate were interviewed. Attempts were made to include respondents from the three sub-locations. However, Matuu has a low representation (see Table 3.2) because the population in the sub-location that did not irrigate was also low. Though it is realised that controlling for irrigation impact is not particularly easy for such a group due to diffusion-related factors, it (the group) was selected as it has one great advantage, that is, it lies in a similar ecological zone as the treatment group. It is felt that the two groups are experiencing the other influences (that is, save irrigation) in a similar manner. In many African countries, Kenya not excluded, political leadership may account for differential experience in development; it is felt that the two groups are comparable as they experience the same political leadership. They receive similar extension services and general agricultural and social influence. The varying soils within short distances in the area have already been mentioned; selecting this group as a control ensures that soil variation is also controlled for.

The study group comprises 41.5% and 58.5% of male and female spouses respectively for the intervention sample and 34% and 66% for the control. The respondents' marital status is given in Table 3.3.

Table 3.3: Respondents' Marital Status.
N=106(T), 50(C)

Marital Status	Respondents (T)	Respondents (C)	Percent (T)	Percent (C)
Married	97	41	91.5	82
Divorced/Separated	1	3	0.9	6
Widowed	8	6	7.6	12
Total	*106*	*50*	*100.0*	*100*

The main ethnic groupings in the study area are the Kamba, followed by the Gikuyu. Tables 3.4 and 3.5 present the ethnic distribution of the male and female spouses in the households in the two samples. Factors affecting the patterns of settlement in the area are discussed at the end of chapter four.

Table 3.4: Male Spouses' Ethnic Groupings.
N=106(T), 50(C)

Ethnic Grouping	Male Spouses (T)	Male Spouses (C)	Percent (T)	Percent (C)
Akamba	85	44	80.2	88
Agikuyu	18	4	17	8
Aembu	2	1	1.9	2
Waswahili	1	0	0.9	0
Abaluyia	0	1	0	2
Total	*106*	*50*	*100*	*100*

Table 3.5: Female Spouses' Ethnic Groupings.
N=106(T), 50(C)

Ethnic Grouping	Female Spouses (T)	Female Spouses (C)	Percent (T)	Percent (C)
Akamba	84	46	79.2	92
Agikuyu	20	4	18.9	8
Aembu	2	0	1.9	0
Total	*106*	*50*	*100*	*100*

Other characteristics of the two samples are given in Table 3.6. The treatment sample has a higher mean household size than the control but it owns a lower mean

size of land. The range of hectareage in the two samples might be deceiving as it gives the impression that relatively large pieces of land are owned. However, only one household in the treatment sample (N= 106) has 20 hectares of land followed by one other household with 16.4: the rest have 10 and under, with 25 (23.6%) owning 0.8 of a hectare or less. Two hectares are owned by 36 (34%) of the households. The control sample has relatively larger holdings than the treatment. Only 16% of the households have less than two hectares compared to 40.6% in the treatment. Two hectares are owned by 44% of the households. The largest landholding is 15.6 hectares (which is also owned by one household - N=50) while the second biggest is 12 hectares (two households have this hectareage). The rest have 10 hectares and under.

Less land hectareage has been associated with intensive farming (see, for example, Netting 1986). The implication is that if people can produce enough food for their perceived needs (food consumption and/or sale), the desire to have large landholding would be lessened. In the same way, their labour utilization would be affected by their mode of production, with intensive farming mobilising less cooperative labour than family labour (see chapter five).

Table 3.6: Characteristics of the Samples

	Treatment	Control
Mean Household Size (Persons)	8.6	7.4
Household Range (Persons)	1-20	2-20
Mode (persons)	8	8
Percentage of Resident Male Spouses	77.4	54.0
Percentage of Resident Female Spouses	94.3	98.0
Percentage of Male Spouses Engaged in Farming Only	55.7	48.0
Percentage of Female Spouses Engaged in Farming Only	93.4	86.0
Number of Farms (First)	106.0	50.0
Number of Farms (Second)	41.0	9.0
Number of Irrigated Plots	109.0	0
Mean size of Land Owned (in hectares)	2.96	5.12
Range of Land Owned (in hectares)	0.4-2 0	0.8-15.6
Mode (in hectares)	2.0	2.0

Household size and range are analysed taking into consideration the definition of a household in this study that feels the household may be composed of more members than just agnates and affines. The household with only one person has a widowed man whose wife had an only daughter, who is now married. He is living with neither relatives nor hired labour (or friends); he hires daily agricultural labour. The households with two members (one for the treatment sample, and two for the control) have childless couples. Sixteen households (15.1%) in the treatment and ten (20%) in the control sample have eight persons. The highest number of members is twenty

for both samples but the next highest number is seventeen for the treatment and twelve for the control. The treatment group generally, has more household members than the control - 34.8% of the households have more than ten members compared to 10% in the control. Again, larger households may be more beneficial in labour mobilization: this does not, however, make households in the intervention sample self-sufficient in labour, as explained in chapter 5.

3.5 Methods of Data Collection and Analysis

3.5.1 Data Collection

Methods that could lend themselves to quantitative data analysis were utilized. Other methods employed could only lead to qualitative data analysis. The survey method was a major instrument of research. Both unstructured and structured questions were administered in questionnaire form focusing on the farmers (male and female) as resource persons. Kikamba was the language that was extensively used; Kiswahili was used where necessary. Though this method is time consuming and incurs travelling expenses, it has advantages in the sense that the interviewer can probe and rephrase questions where necessary. The questionnaire interviewing method also lends itself to easier quantitative analysis which may be more reliable. Besides, in interviewing, one gets more spontaneous answers. Bailey comments:

> Spontaneous answers may be more informative and less normative than answers about which the respondent has had time to think (Bailey 1978:182).

Non-verbal behaviour was monitored during the interviews. This was done in an attempt to establish the relative validity of data collected. The methods of simple observation and participant observation were also employed. It was possible, for example, to observe the labour utilized on the farms, the general living conditions of the farmers and differences that could relate to differential access to resources and benefits. Besides, simply sitting down with the congregation during *barazas* and hearing them air their grievances especially in relation to water-use and agriculture in general was highly informative. The disadvantage of observation is that a more or less etic approach is employed which is vulnerable to personal bias. Attempts to avoid the bias were made by complementing this method with other methods. Information obtained from observation leads to data that are often difficult to quantify but these have been interpreted bearing in mind that:

> Whilst gains of a productive health or social nature from water investments may be real and important, the translation of these gains into conventional economic units presents both conceptual and empirical problems (Carruthers 1973:26).

The lack of a reliable quantification machinery does not, nevertheless, underrate the importance of such data. Besides, the farmers themselves do not perceive their gains only in terms of numerical assessment.

Informal interviews and discussions were carried out with key informants as well as in focus groups of

farmers in their fields, market places and homes. These were free discussions in which informants expressed their opinions. They took place in the market places, homesteads, farms or wherever else the situations would allow. The advantage of this method is that it does not interrupt the informants' normal lives. It also yields information that is detailed, sometimes personal and not easy to generate from a questionnaire. The method was also useful in establishing rapport.

Sales agents (middlemen), agriculture and water officers were also interviewed. Library search was carried out and government sources of secondary data were utilized.

3.5.2 Data Analysis

Bernard (1988:319), defines data analysis as the search for patterns in data and explanations for the existence of such patterns. Data analysis procedures largely depend on methods of data collection. In my study, both qualitative and quantitative methods of data collection and analysis were utilized. The SPSS computer soft ware was used. Both Pearsons and Partial correlations were employed in data analysis and so were cross-tabulations, percentages and measures of central tendency.

3.6 Problems and Limitations Experienced in the Field

Travelling constraints were experienced during fieldwork. While it was easy to reach certain areas of the canal by

public transport, it was difficult to gain access to some respondents who were in the hinterland far from the road. Long distances had to be covered on foot. The rainy season and the mud accompanying it especially in the clayey areas did not make this task any easier. A lot of precious time was spent in reaching the areas.

Farmers in the irrigated fields had pretty little time to "waste" on researchers. The majority of crops planted are labour-intensive and low in technology. Besides, whatever was harvested had to be sold the very same day due to lack of a convenient storage system. Sometimes respondents became fidgety in the middle of the questionnaire. They had expected to spare about ten minutes or so in answering the questions and were getting concerned when they found it took longer. I solved this problem by informing them how long the questionnaire would take before hand and asking them whether they could spare that kind of time for me. Those who could not, gave appointments for a future date and generally honoured them.

Some respondents were uneasy about divulging information about their family members; questions related to income were especially poorly received. I had anticipated this, so in an attempt to guard against unreliable responses, I had to ask whether people were in regular employment or not and what the nature of the employment was. Even then one man simply told me I was enquiring too much about his family and refused to respond to the rest of the questionnaire while one woman

said she could not disclose family issues in the absence of her husband. No amount of persuasion could budge these two; eventually, I thought that even if they were to allow me to interview them, their responses would be unreliable anyway. Several other respondents expressed their fears that I could be working with the income tax department. My liaising with the local agricultural extension officers did offset some of the doubts.

Farmers were more interested in aid-related research. They wondered whether some loans or government aid programmes were imminent, and whether the research was associated with such programmes. They were disinterested in research for its own sake; they explained their apathy by saying some researchers had been there before me but they had not initiated any *maendeleo* (development) that could change the farmers' lives. This underscores the importance of applied research in the third world: the farmers are too busy worrying about their basic needs for survival to entertain research for its own sake.

I felt incompetent on a number of occasions when farmers asked me to advise them on particular problems related to crop production, especially pest control. I had to confess my ignorance. I forwarded the cases to the local agricultural extension officer who visited the particular homesteads and did the necessary. After some time, I got "a feel" of the general problems of the farmers and could answer some of the questions; I was also learning from the extension officers and farmers.

A number of farmers did not have records of their daily, weekly or monthly sales. A lot of questions had to be asked about the sales of each type of crop; at the end of the day, the final figure for income in the different households is largely an approximation.

On introducing the areas of interest in the research to the women respondents, I came across the typical conceptual problem of women farmers conceiving themselves and being conceived as secondary farmers. In the homesteads where the men were absent due to one reason or other, the women would wonder, *Nayu twiika ata na "aimi" maikw'o? Tuitonya usungia makulyo maku nesa.* ("Now what are we going to do and 'the farmers' are not around? We cannot answer your questions satisfactorily"). After assuring the women that the questions were not difficult and actually their opinions were also important in the research, they were cooperative.

CHAPTER FOUR

IRRIGATION SYSTEM MAINTENANCE AND WATER-USE

4.1 Organization of Water-Use

The Yatta furrow irrigation farmers are autonomous as far as water use is concerned. They, however, have to pay an annual water charge of Ksh.150 shillings[1] per farmer to the Ministry of Water. For the purposes of water management, the farmers organize themselves into groups. The groups' membership ranges between eight and fifty members depending on the capacity of the furrows to serve the farmers. Altogether there are 42 groups. The farmer groups are given names according to particular group wishes - some are named after one of their leaders (usually the chairman), after the places they are situated at, after some motto or after some animal (see appendix A, for some of the names of the groups). Most of the groups are named after the places they are situated in.

The structure of the irrigation system starts with the main intake at the Thika river and ends at Mwita Syano river. The flow of the water from Thika River to the field furrows (individual farmer holdings) may be represented by the following arrows:
Main intake ---> Main (primary) canal ---> Secondary canal ---> Tertiary canal ---> Field furrows.

[1] At the time research was done. U.S. $1.00 was equivalent to KShs. 23.00.

The farmers in collaboration with the local water officials decide the capacity of the furrows. Their decisions depend mainly on the physical layout of the canals and the amount of water available. The farmers liaise with the Ministry of Water and therefore the latter know which furrows can or cannot accommodate more farmers. They also know where a subsidiary furrow is technically feasible. If a new farmer needs water, he makes an application to the Ministry of Water as an individual. However, a group of farmers from one locality can request for water as a group, submitting each farmer's name. If the group is granted permission, each member pays the annual water charge fee and a furrow is created for them. The farmers themselves dig the tertiary furrow and the individual farmers build the field furrows (to the different farms). If an individual farmer is given use-rights of water, he is incorporated in the existing group that is nearest his or her farm.

The water officials cannot always allocate water to all farmers who request them to as water abstractions are limited especially during months of drought. During this period, there is less water, and also there is a need to let water flow to Mwita Syano river (which borders Machakos and Kitui districts) so that people from Kitui can get access to the water for domestic use. Besides, a lot of water is wasted through seepage, as the majority of the furrows are not cemented. Evaporation and transpiration also take their toll. The above description highlights the importance of both the

farmers' and government officials' decisions in water management.

The Ministry of Water officials are important in making decisions mainly at the upper end while farmers are important at the lower end (except for decisions to admit new members in a group or to create new groups in which cases both the officials and the farmers collaborate). The officials control water abstractions to the main canal and the secondary canals. Water groups regulate water from the secondary and tertiary canals while individual farmers manage water in the individual field furrows.

4.1.1 Leadership Qualities

The water-groups[2] select their own leaders. A very important qualification is residence in the area, if possible with farming as the sole source of income. Only when one possesses these qualifications, the farmers say, can one adequately identify with the farmers' constraints and give them the necessary attention. The other important qualification is that leaders have to be worthy of respect. A high percentage (83%) of the respondents give this as an important qualification (see Table 4.1). To the farmers "respect" denotes a host of qualifications: ability to settle disputes impartially, ability to be firm without being arrogant and ability to interact with the farmers across the spectrum of age and

---

[2] The terms water-group, water-organization and water-association are used interchangeably.

economic status. It also means being trustworthy and enlightened (without necessarily having gone through much formal education). The respondents who give "age" as a response say the leaders are older, mature people capable of making sound decisions. "Literacy" does not imply that if one has a higher level of education, one is more likely to be chosen; it means that the ability to read and write is important especially for the post of secretary. In the same way, being trustworthy is especially important for the treasurer since the group's funds have to be entrusted to him.

Table 4.1 Criteria for Selection of Water-Group Leaders

Criterion	Respondents (N=106)	Percent
Respect	88	83.0
Age	14	13.2
Literacy	9	8.5
Wealth	1	0.9
Total	*112**	*105.6**

** Respondents could give more than one response.*

A relative departure from some of the important traditional qualities of leadership among both the Akamba and the Agikuyu is seen (only 13.2% of the respondents see "age" as an important qualification). Under the traditional circumstances, old men and women were respected because the more the years they had, the more the wisdom they were expected to have. Advanced age meant that one had gone through the hierarchical stages from childhood to manhood and eldership (see chapter 3). The hierarchical stages were important in gaining skills

to manage the social and physical environment at the time. This environment was largely familiar to the people. The farmers now realise they meet different challenges (e.g., pricing of their produce in a market economy affected by outside forces that some of them do not fully comprehend and dealing with water and agricultural officers). They consequently realise that restricting leadership roles to the old would only work to their disadvantage as it is the relatively young who seem to comprehend the new challenges. But the old are still seen as capable of providing invaluable advice to the farmers especially in settling disputes. Thus, knowledge from men of all ages is tapped to manage the challenges faced by the farmers. This is an adaptative strategy in the Leachian sense. It can also be seen as a response to the exigencies of life in Steward's sense.

The positions in the water groups are for: chairperson, secretary, treasurer and their assistants, and committee members. The members of the committee range between two and four depending on the numerical strength of the particular group. The smaller groups also do not have assistants to the positions of chairperson, treasurer and secretary. In theory, the positions of leadership are open to both men and women, but in practice women are elected to the marginal positions (most of them are committee members). In principle, none of the women was elected to the position of chairperson or assistant but a few were assistant secretaries. Most of the women were also unwilling to

take up the higher positions, feeling that it was the men who were more capable of performing the senior roles (since "they are men" and also because they do not have domestic chores that make demands on their time). Though women are not fully integrated in irrigation leadership, they do not cite any constraints that they particularly face as a result of this marginalisation. Both men and women are involved in the election of leaders. In most groups, elections are carried out by a show of hands, in the absence of the proposed leaders.

Farmers insist that they do not choose their water-group leaders according to whether or not they have other leadership roles in the community. Yet, a closer examination reveals that farmers who are leaders in the community stand a better chance of being elected as leaders of the water groups. Out of the 16 formal political leaders in the different water groups, seven have been elected as water-group leaders. The seven consist of a councillor, and six KANU Youth Wingers. Besides, out of the 23 social leaders, 17 are elected leaders. These are village elders. In addition, eight out of the thirteen religious leaders (all are pastors of the christian ministry) are leaders of the water association groups. The people in places of employment locally (teachers, nurses, clerks, assistant chiefs, vegetable agents and so forth) generally have a high status both economically and socially. Out of the 68 that are members of water groups, 38 are elected leaders. Though the farmers insist that the leaders are not chosen

because of their other roles in the community, it cannot be coincidental that more than half of the leaders who enjoy other positions of importance in the community are chosen as leaders. Exceptions to this trend are the relatively successful local businessmen and the retired community members. The businessmen are considered too busy elsewhere to have time for irrigation while the retired do not have much commitment. It is likely that the businessmen get better returns from their businesses than they would get in irrigation and therefore pay little attention to farming and the retired are not very enthusiastic about farming procedures that they are probably unfamiliar with.

The types of authority in Yatta as seen in the description above can be summed up as political, social, economic, traditional and religious. Both modern and traditional authorities are considered. Youth wingers and a councillor fall in the political category while the economically better off people in the area are the teachers, some farmers, business men, clerks, an education officer, and other community members in regular employment. Traditional leadership is represented by the elders. Both modern and traditionally recognized positions of religious authority are taken into consideration (e.g., church ministers and traditional healers). All the different forms of authority cited enjoy a high social status. Indeed, the elders, religious leaders, KANU Youth Wingers and assistant chiefs are also employed in settling disputes that are

not related to irrigation.

The number of leaders is small as there can only be just a few leaders, for example, there are only three sub-locations in the sample and therefore three assistant chiefs, one of whom does not fall in the irrigation area. The two who fall in the irrigation zone are elected leaders (though both are only committee members). There is also some superficiality in the demarcation of the political, economic, social and administrative, traditional and religious roles; some do overlap (for example, the councillor in the area is a political leader who is also economically better off, and all types of authority in the area generally enjoy a high social status). This division, albeit artificial, is found necessary so that a focus on the different authorities that participate in the process of water use may be made.

The utilization of some of the roles of leadership in the community might be advantageous to the farmers and in their selection of the leaders, they do not lose sight of this fact. The assistant chief or councillor is, for example, in a better position to lobby for loans or donations (which most of the farmers say they need) for the farmers in general and his group in particular. The farmers also feel people in local employment are also generally more enlightened and are therefore more likely to come up with new suggestions that may be beneficial in leadership and also irrigated agriculture. On the other hand, if the religious leaders honour their christian teaching, they are not likely to misappropriate

other farmers' funds. The importance of the elders in settling disputes has already been mentioned.

4.1.2 Duties of Water-Leaders: Systems Maintenance and Equitable Water Distribution

The water-group leadership comprises the chairman, secretary, treasurer and committee members. The leaders liaise with the farmers very closely and meetings may be convened whenever it is necessary. Such necessity may arise if a dispute in water-use between two farmers has persisted or if there are pending communal duties to be performed. The leaders can convene a meeting if they think it is necessary or at the request of farmers. Otherwise most of the groups meet once a month or every two months. Dates of meetings are fixed during the monthly meetings. They are confirmed by the leaders at the chief's *barazas* (meetings) and funeral gatherings or any other meetings. Group leaders ensure that furrows are maintained, water charges are paid, equity in water distribution is attained and disputes are settled. Maintaining the system is a priority to the farmers as seen in Table 4.2.

Table 4.2 Functions of the Water Organization

Function	Respondents (N=106)	Percent
Furrow maintenance	77	72.6
Ensuring the payment of water bills	65	61.3
Ensuring equitable water distribution	22	20.8
Uncooperative farmers	7	6.6
Providing communal labour to individual farmers	1	0.9
Total	*172**	*162.2**

** Respondents could give more than one response.*

Maintaining furrows entails, desilting, collecting stones and sand, building (cementing furrows and constructing bridges wherever they are required), repairing the damaged areas, digging new diversions where this is necessary and cutting grass on the furrow banks. Furrows are maintained communally except in the small stretch that leads to an individual farmer's field. In the latter area, the farmer is responsible for maintenance. Some of the maintenance tasks have to be done regularly while others are done only occasionally. For example, collecting stones and sand and cementing are only done occasionally as it is not often that farmers can afford buying cement to cement parts of their furrows (only the parts that seem to erode fast are cemented). Desilting is done once a month on average. It is necessary, however, to mobilize a lot of labour at the end of every rainy season; then, desilting, cutting grass on the furrow banks and repairing the damaged areas is mandatory.

Furrows are maintained by the farmers that own them (that is, by the water-group that uses them). Communal labour is deployed from the households that form a water-group. After a decision has been reached on when to repair furrows, for example, every household irrespective of their land-holding size sends a member to represent them for the day. The leaders and farmers have to be vigilant about this.

Water bills are paid by groups. Each group collects from its members the yearly subscription fee of KSh. 150 and then forwards it to the local water office. The money cannot be accepted unless it is the full amount for the group. Most of the groups pay for the farmers who have not been able to raise the money in time, from the group treasury, and then the onus is upon them to ensure that they recover their money. If a farmer is unable to raise the money due to circumstances beyond his/her control, he/she can be given as much as a year's grace within which to pay the money. After the year is over, he/she is not allowed to irrigate. This does not happen often. I only came across two farmers who had been thrown out of their groups. One of them had been bereaved. Her husband had died the previous year and she had spent the little money they had on the funeral expenses and therefore could not afford the yearly fee. According to her, her plight was worsened by the fact that all the other members of her group belonged to a different ethnic grouping from hers and therefore exercised very little tolerance with her. The second

farmer had been thrown out on the basis of indiscipline. Persistent water disputes with her neighbour had culminated into physical confrontation. The group met and decided she was in the wrong. This misbehaviour cost her expulsion from the water group and a goat to pacify the elders.

Expulsion from a water-group, which is synonymous to withdrawing a farmer's right to water, is only a last resort. Temporary withdrawal of water supply is, however, a popular mode of punishment and can be done in the event of failure of a household to provide communal labour for furrow maintenance, unnecessary delay in payment of water bills or poaching one's neighbour's water. Cash fines are also administered (Table 4.3). The cash goes into buying cement for repairing furrows, bridges and paying the yearly contribution for those members who have not been able to pay theirs on time. Cash fines range from KSh.20 to 200 depending on the offence and the group. Before punishment is administered, farmers said, verbal warnings are given. Often, the need for serious practical sanctions for non-compliance does not arise.

Table 4.3 Punishments Administered to Unco-operative Farmers

Punishment	Respondents (N=106)	Percent
Cash fines	55	51.9
Temporary withdrawal of water supply	46	43.4
Verbal warnings	32	30.2
Paying for cement	4	3.8
Providing extra labour for furrows	4	3.8
Total	*141**	*133.1**

** Respondents could give more than one response.*

For the irrigation system to work, every farmer must cooperate; individuality is limited by the very physical dependence on one another. Irrigation schedules are arranged and farmers are required to stick to their schedule and close the diversions leading to their farms as soon as their time is over to allow the farmers downslope to get water. It is a serious offence to block another farmer's access to water. But the necessity to give punishment arises only occasionally. Disputes are very rare and this may be confirmed by the almost insignificant number of farmers who feel "disciplining uncooperative farmers" is one of the duties of the leaders of the water-groups (see Table 4.2). Leaders preside over deliberations but decisions (including those concerning punishment) are made by the water-organitztion as a whole. Thus, the leaders are in some sense, a sort of a trustee that executes the wishes of the group as a whole. This collective approach in governing the use of irrigation water is reflected in the groups' collective

thought and expression. For example, in trying to explain the circumstances leading to the expulsion of the two members I have cited from their groups, farmers (even those without leadership roles) would say "we saw it fit to expel her from the group", not "the leaders saw it fit to expel her from the group".

The farmers' identification with the irrigation system came out very clearly in both formal and informal interviews. This is a significant point as it may give us one explanation for the relative success in the management of small-scale irrigation schemes. The farmers are able to identify with the scheme whose destiny lies mainly in their hands: they have worked hard and continue to do so to sustain it. They feel it is theirs, and they have a commitment to sustain it for their own good. They re-examine their decisions and regulations from time to time and decide what changes are necessary. Making changes is made easier by the fact that the bureaucracy in running the scheme is not as overwhelming as it is in the bigger irrigation schemes. The gap between the leaders and the ordinary members with reference to organization of water-use is minimal. Besides, both know they share the ownership of water and they stand to lose significantly should the system fail.

The number of hours a farmer can irrigate each day, and the frequency of irrigation per week, depends not on landholding size but on the number of members in the group. This results in irrigation periods ranging from once a week to free access whenever a farmer wishes to

irrigate (Table 4.4). Farmers generally feel a twice-a-week supply of water is adequate. This feeling is, however, contradicted by the fact that though only 24.5% get water once a week, 50.9% of the respondents say that their water supply is inadequate for irrigation purposes. They feel there is too little water for too many farmers. Those farmers who wish to irrigate during the night can do so (there are no night irrigation schedules).

The farmers who have two *shambas*[3] do not affect the concept of equity in water distribution very much as the majority of them have one dry-land *shamba* and one irrigated *shamba* (refer to Table 3.6). However, three farmers irrigate two separate *shambas* each, with the implication that they receive greater amounts of water relative to the other farmers. Each of them belongs to two water groups as their plots are in separate locations. They, therefore, pay the yearly contributions twice and provide labour for irrigation maintenance in their two groups.

Table 4.4 Frequency of Irrigation

Frequency	Respondents (N=106)	Percent
Twice a week	50	47.2
Once a week	26	24.5
Whenever I wish	13	12.3
Thrice a week	12	11.3
Four times a week	5	4.7
Total	*106*	*100.0*

[3] The terms *shamba*, field and farm are used interchangeably.

The farmers consider equity in water distribution to mean that every farmer gets the same amount of water irrespective of landholding size. A more appropriate measure of equity might be the distribution of water according to hectareage so that every hectare gets water (with the ironically negative implication for equity that households with larger farms would get more water for their fields). An alternative water distribution method might also be based on household size so that larger households in terms of number of members (and therefore income requirement and mouths to feed) could get a larger portion of water than the households with fewer members. However, the farmers allege that if individual household differences were to be considered, more disputes would arise from water distribution. They suspect that if water distribution was based on land hectareage, some farmers would inflate their land size so as to be allocated more water. They, further, know that some households have large farms but they do not need a lot of water as they cannot irrigate the whole of their fields due to labour constraints. Similarly, households with more members do not necessarily have larger fields to cultivate. In short, the farmers rightly feel that if personal differences were to be considered, many variables would need consideration; it would be difficult to decide which farmer needs more water without causing serious misunderstanding. After all, they argue, they all pay a standardised yearly contribution. Farmers, therefore prefer making their own special arrangements

to cater for individual water needs as discussed in the next sub-topic.

4.1.3 Special Inter-Farmer Arrangements in Utilizing Water as a Scarce Resource

Farmers can make inter-personal arrangements without interrupting other farmers' water supply, that is, a farmer who has just planted can request a neighbour who is mainly harvesting to "loan" him a few hours of water-supply. The loaning is of two types. In the first case, the farmers can make arrangements so that one gets some of the other's water for a week or two after which period the second farmer would have his or her turn for the same period. If he so wishes he can be paid at a later unspecified date when he, too, would need more water. The second type is not a case of obligatory repayment. A farmer can ask his neighbour to allow him to use his water for a specified number of hours or a whole "shift". He would not be expected to pay back the hours. However, should the neighbour be in a similar problem in future, courtesy would require the farmer to do him a good turn. This flexibility in water-use works out well for the farmers. It can be seen as a strategy to manage water as a scarce resource.

Flexibility in water-use is made possible by the manner in which the farmers utilize their plots.[4] A farmer plans his work in the fields in such a way that

[4] The cash vegetables, which are given priority in irrigation, are not inter-cropped. Different plots ranging between 0.05 and 0.1 of a hectare each (within the main farm) are planted with different crops depending on a farmer's wishes. One part of the farm is preserved for food crops which are generally inter-cropped.

different plots are planted at different times. Consequently, the peak irrigation needs are moderated (as crops need relatively more water soon after planting and weeding but little to none, during harvesting). If a farmer is harvesting in most of his plots he can afford sacrificing a few hours or a full shift to his needy neighbour. Thus, individual farmers space their planting cycle so as to reduce peak water needs. They also coordinate with neighbouring farmers in times of peak water needs so as to manage water scarcity. The strategy also alleviates the ever-present labour constraint. The constraint is particularly felt during the harvesting of horticultural crops as the crops have to be sold by two O'clock, the same day.[5] Horticultural crops cannot keep till the following day due to lack of storage facilities. Thus, the strategy solves environmental management constraints in both physical and social terms.

Another inter-personal arrangement that is made by farmers is that relatives from dry land areas can be given usufructuary rights of parts of holdings that lie in irrigation zones, at least for a time. Irrigated land can also be sold to relatives (both affinal and agnatic) at a slightly cheaper price than it would be sold to outsiders. Relatives from dry-land zones also come in search of maize and beans (or peas) in periods of shortage. That way, they are partially compensated for

---

[5] During harvesting, cartons are collected by farmers from the vegetable agents as early as six o'clock. It is necessary to collect them early especially when harvests are abundant because buying is done on a first come, first served basis; farmers who come later do not get any cartons. Getting cartons is synonymous to getting a buyer for one's harvest for the day: it is these cartons that are filled and taken to the collection centres by two o'clock for collection.

lack of access to irrigation water. They, in turn, occasionally provide labour.

The maintenance of the irrigation system in Yatta furrow and the communal responsibilities associated with maintenance activities have been examined. Though the organization of water-use is not based strictly on traditional organization structures (closely knit family ties and clan systems), elders who feature strongly in traditional leadership have a considerable influence. The elders do not necessarily come from the same clan. This is a feature (sharing clanship) that is often impractical in a situation where settlement has not been effected considering whole families but where only segments of families have migrated on their own or have been allocated land by the government. In the area of study, a water-group may not only have members from different clans, but also from different ethnic groupings, depending on local settlement patterns, which were largely dictated by the farmers' provenance of initial shamba (see Tables 4.5 and 4.6).

Table 4.5 Provenance of Initial *Shamba*

Provenance	Respondents (N=106)	Percent
Given by government	34	32.0
Claimed it	27	25.4
Inherited from father	22	21.0
Bought	15	14.1
Inherited from mother	3	2.8
Inherited from husband	2	1.9
Hired	2	1.9
Given by grandmother	1	0.9
Total	*106*	*100.0*

Table 4.6 Provenance of Second *Shamba*

Provenance	Responses (N=106)	Percent
No second shamba	65	61.3
Claimed it	18	17.0
Bought	11	10.4
Inherited from father	6	5.7
Hired	5	4.7
Given use rights by a relative	1	0.9
Total	*106*	*100.0*

Most of the sample acquired their land in the area in the last 40 years, with 40.6% settling between 1950 and 1960 and another 40.6% between 1970 and 1989. Most of the Gikuyu population settled there between 1970 and 1973 during the widespread government programmes aimed at resettling the landless in Kenya. The people who were given land by the government were settled in generally the same area. Most of the Agikuyu had been squatters on commercial farms, after they were alienated from their land during colonialism. However, some of them later sold their land and moved to other areas of settlement. Land was sold to both the Akamba and the Agikuyu thus disrupting the earlier settlement that was effected more or less according to ethnic groupings.

The population that "claimed" their land simply occupied previously unoccupied land that they thought lay in relatively reasonable areas, for example, near the seasonal rivers. Most of the land that was "inherited" had initially been "claimed". The farmers who "claimed" land came mainly from other areas of Machakos that were already experiencing land pressure (for example, Kangundo

and Mwala). Though affines and/or agnates could sometimes migrate together, it was more common for family segments to migrate alone leaving relatives in their places of origin.

Three categories of water-groups emerge from the settlement patterns. The first one is what could be termed as a same-family water-group. It is composed of a male head of a family, his wife/ wives, his sons and the sons' wives. There are only two such groups in Yatta irrigation. The first one is in a polygynous household while the second one is in a monogamous one. The second category can be referred to as a same-ethnic-grouping water-group. As the term suggests, members in this category belong to one ethnic grouping. They may or may not belong to the same family or clan. The final category is the different-ethnic-grouping water-group and is composed of members belonging to two or more ethnic groupings. Some of the members of the group may belong to the same family but, on the other hand, there could be a member who does not share ethnic grouping with anybody in the group.

Due to the several family combinations that generally form water groups, elders have been chosen from across the ethnic groupings. Traditionally important traits like age are no longer necessarily limiting factors in the selection of leaders. Proximity in physical terms dictates who becomes a member of which group and therefore who has a chance of getting a leadership role in the group first and foremost. Of

course affines and/or agnates living in the same neighbourhood are likely to find themselves in the same group but their ties may not have as much consequence in the running and utilization of water in Yatta as such ties do, for example, in Fleuret's Taita community (1985) or Ssenyonga's Marakwet (1983).

In this chapter, we have seen that assistant chiefs, elders, KANU youth wingers and even a councillor are utilized in water-management and so are religious leaders. Thus, we see a blending of both traditional and modern socio-political and cultural institutions in the organization of water-use. The institutions are used in solving disputes in water organization and also other social problems that may not be related to water-use, suggesting that relatively similar principles are used in both water-use and social organization. Both social organization and the organization of water-use are related and do not conflict. Therefore, the study has rejected the hypothesis that "The organization (process) of water-use in irrigation is not related to the people's socio-cultural organization". This was hypothesized in the light of the understanding that small-scale irrigation schemes generally enjoy a high degree of autonomy relative to large-scale ones in terms of leadership. It was anticipated that the population in Yatta would consider irrigation to be distinct from their socio-political life therefore rendering elders, political and government administrative leadership irrelevant in the process of water-use. It was also felt

that indigenous leadership would be marginalised in an area with haphazard settlement patterns. The research established, however, that adaptation was made even in leadership requirements so as to deal with the new situation; elders are selected not only from different clans but also from different ethnic groupings.

CHAPTER FIVE

DIVISION OF LABOUR IN CULTIVATION AND FURROW MAINTENANCE

5.1 Introduction

Sharp gender divisions in agricultural labour utilisation for both the traditional Agikuyu and the Akamba have been discussed in Chapter Three. In the present chapter, the division of labour in contemporary Yatta communities, is examined for the different tasks that are performed in crop production and irrigation. Due to the great diversification in both food and cash cropping (see Appendix B for a list of cash and food crops grown), it was not practical to examine individual cropping patterns. A dichotomy for the crop categories, however, emerges and is discussed on the basis of food-and cash-cropping.

All households from the treatment sample (N=106) grow both food and cash crops (two households had, however, not grown any cash crops in the previous month because they did not have reliable labour) while only seven from the control group (N=50) do. The rest grow food crops only. Irrigation helps the farmers to diversify their cropping and the diversification is evident in both food and cash crop categories. Cash crops are defined rather loosely in this study since crops planted as cash crops by one farmer are planted as

food crops by another. For this study, they (cash crops) are those crops that are planted with the aim of generating income from their sale. Most of these are vegetables that are largely termed "Indian vegetables" as they are largely unpalatable to the local community and are bought by mainly Asian businessmen (based in Nairobi) through local agents. They are then exported to parts of Asia and Europe (Germany, Denmark, France, Holland, Belgium and Britain). The farmers who plant "food crops" with the express aim of not just getting enough for home consumption but producing a relatively large surplus for sale are seen as growing them as both food and cash crops. In the same vein, those farmers who only sell their produce not because they have a surplus but because they need to buy other food stuff with the income (e.g., selling maize so as to buy beans) are seen as simply growing food crops. The rationale for this is that the cash received after sale is re-invested in food. Indeed, the farmers in this category do not perceive themselves as cash-croppers.

5.2 Marginalising Gender Labour Division: An Adaptive Strategy

The cash crops grown in the study area are highly labour-intensive. Most of the households cannot meet their labour demands satisfactorily without hired labour. Hired labour is plentiful during months of drought as workers come from the dry adjoining areas (including parts of Kitui district that border the study area) to

the irrigation zone. During the rainy season, though, the farmers are busy planting and weeding their own fields. Monthly hired labour rates range between Sh. 200 and 700 while daily rates are between Sh. 10 and 80, with means of Sh. 317.2 and 31.5 respectively. The farmers feel that labour payments reduce their profits, especially because other inputs (mainly fertilizers and pesticides which are mandatory in cash cropping) force them to dip deeper into their pockets. Daily labour terms are more popular than monthly ones among both the farmers and the labourers. The farmer says casual labour is more efficient albeit more expensive; the worker says it is more lucrative. Labour peak demands are experienced during planting, weeding and harvesting. The farmers make arrangements so that when they are harvesting some crops, they can also be planting others or weeding so that they can have mature crops available for sale throughout the year. Other reasons for this planting arrangement have been discussed in chapter four. Farmers, however, avoid having crops flowering in the period between late June and early August as they say the cold spell during this period is detrimental to nearly all the crops they grow for sale.

Although hired labour is mainly done by males, an examination of the gender labour division in the households does not show a sharp division in planting, weeding and harvesting (Table 5.1). Preference for male labourers may be explained by the fact that many farmers feel male workers are more able to withstand the harsh

working conditions (long hours often without lunch). But women work the same amount of hours as their male counterparts in their own household farms, not to mention that, after they leave the fields in the evenings (or break for lunch, if they are lucky), they have to prepare meals for their families. I suggest that a reason for this preference is also that though it is considered fine for the women to contribute labour for their household farms, it is considered unbecoming to sell the labour to another household. Doing so would greatly hurt the spouse's male ego as he would be seen as abandoning the family and letting it be so desperate that the wife is forced to sell her labour to raise money for food while it is he who is expected to provide for the family. In addition to the above, it is impossible for women, who often have other children and husbands at home to look after, to work far away from their homesteads as they have to commute. Only two households employ women on a permanent basis to work on the farms compared to 26 households employing men. The women workers in the two households are commuters. They are remunerated with both grain and cash while all the male workers exchange their labour exclusively for cash. This propagates the traditional perception of women as providers of food for the family while men are expected to provide for the other needs (e.g., shelter and clothing). In contemporary society, meeting "the other needs" increasingly requires cash income.

Table 5.1 Division of Labour in Cash Cropping: Treatment Sample (N=106)

Task		AF	FC	both AF & FC	AM	MC	Both AM & MC	HL	CL
Breaking Land (R)	Hhs.	35	0	0	53	0	1	60	0
	%	33	-	-	50	-	0.9	56.6	-
Breaking Land (O)	Hhs.	3	17	2	0	18	3	14	0
	%	2.8	16	1.9	-	17	2.8	13.2	-
Planting (R)	Hhs.	73	0	0	69	0	1	38	0
	%	68.9	-	-	65.1	-	0.9	35.8	-
Planting (O)	Hhs.	4	47	6	0	52	3	30	0
	%	3.8	44.3	5.7	-	49	2.8	28.3	-
Manuring (R)	Hhs.	68	1	0	68	1	1	34	0
	%	64.2	0.9	-	64.2	0.9	0.9	32.1	-
Manuring (O)	Hhs.	7	40	5	1	44	3	25	0
	%	6.6	37.7	4.7	0.9	41.5	2.8	23.6	-
Weeding (R)	Hhs.	72	0	0	70	0	0	39	0
	%	69.7	-	-	66	-	-	36.8	-
Weeding (O)	Hhs.	6	47	7	2	53	3	27	1
	%	5.7	44.3	6.6	1.9	50	2.8	25.5	0.9
Spraying (R)	Hhs.	28	0	0	68	1	0	28	0
	%	26.4	-	-	64.2	0.9	-	26.4	-
Spraying (O)	Hhs.	4	7	3	6	11	2	12	0
	%	3.8	6.6	2.8	5.7	10.4	1.9	11.3	-
Harvest (R)	Hhs.	68	0	0	69	0	0	40	0
	%	64.2	-	-	65.1	-	-	37.7	-
Harvest (O)	Hhs.	9	43	6	5	49	3	24	1
	%	8.5	40.6	5.7	4.7	46.2	2.8	22.6	0.9
Sale (R)	Hhs.	53	0	0	63	0	0	8	0
	%	50	-	-	59.4	-	-	7.5	-
Sale (O)	Hhs.	4	9	1	4	8	1	6	0
	%	3.8	8.5	0.9	3.8	7.5	0.9	5.7	-

Key: AF = adult female. FC = female child: AM = adult male: MC = male child: HL = hired labour: CL = co-operative labour: Hhs.= number of households: R = regularly: O = occasionally.

Planting, manuring, weeding and harvesting (in cash-crops) are tasks that are performed by both men and women in the households on a regular basis (see Table 5.1). As pointed out in Chapter 3, weeding and harvesting were particularly female tasks in traditional Gikuyu and Kamba society. How then can we explain the situation in the irrigation scheme that clearly shows provision of labour on a regular basis reflects a negligible labour division

in the tasks, a trend that is confirmed by a randomised time allocation survey (see Table 5.14). This is contrary to observations that point to males as increasingly becoming part-time or absentee farmers due to migration (see, for example, Spring 1988:22; Henn 1984; Suda 1986). One way of explaining this is first and foremost the fact that male labour is available since male migration to urban centres or other areas for employment is largely absent; 82 (77.4%) of the respondents live in the same compound with their spouses on their farms. Secondly, a general trend has been observed that males have shown a greater interest in cash cropping than food cropping (e.g., Lele 1975:26,15). I suggest that marginalising gender labour division is also a strategy to utilise the scarce resources available, in this particular instance, the labour resource. This is in keeping with the cultural ecology theory. Both Steward and Leach submit that, faced with new challenges, people would re-interpret their norms to cope with the new exigencies. Steward, a proponent of the theory notes how cultures in different environments have been known to adapt (1955:37). In Leach's Pul Eliya thesis, kinship rules were reinterpreted to permit the villagers to make the necessary adaptive economic choices. Though Leach has sometimes been accused of seeing people as a monistic batch deliberately looking for ways of benefitting themselves (e.g., Kuper 1983:162), the farmers in Yatta irrigation seem to be simply making logical, rational choices out of the limited options available to them.

An examination of the households in the compounds confirms the fact that farmers do not have a large labour pool to choose from. Unlike in the clan lands where compounds may have a number of households in the homestead belonging to affinal and or agnatic relations whom a farmer can count on during times of peak labour demands, 69 (65%) of the respondents live in single household compounds. Besides, children can only provide labour occasionally as they go to school and others are too young to work. Acute labour constraints are experienced since, other than the immediate household labour, only wage labour is available (and even this is sometimes scarce). Cooperative labour is virtually non-existent.[1] It is difficult to understand the absence of cooperative labour when there are aspects of cooperation

---

[1] Though women belong to informal cooperatives (*kikundi*, pl. *ikundi*), these are not concerned about easing labour demands for members; they are concerned about contributing funds for unforeseen emergencies. One of the women respondents, for example, had her house burnt down. The other women came to her rescue by bringing her grass for thatching a new hut, and helping with the actual thatching. There are also associations for easing funeral expenses. Each household contributes a certain amount of money per month. If a member of the group is bereaved, part of the money from the treasury is used for funeral expenses. These associations (for funerals) are open to both men and women.

Women in dry land areas have more time to spare for visiting. They, for example, meet in any of their friends' homes on a given day "to take tea" and give some monetary contributions in an endeavour aimed at helping one save a relatively substantial amount of money to buy some item for oneself such as furniture. The idea is that an individual's money comes in such small sums that one ends up spending it on small miscellaneous items, but if she is given a lump sum in the contributions, she can buy "something that she can see".

An interesting feature of the women groups is a contribution made towards visits to one's natal parents. This is called *Muthoko* and is a relatively big occasion (especially in the irrigation zone), sometimes involving hiring of vehicles to transport the group and buying items like sugar, bananas and other edibles. The group is rewarded with a feast by their hosts. Traditionally, it was the husbands with their parents who would *thoka*. *Ku-thoka* is to visit one's parents-in-law (parents of the wife) with gifts as tokens of appreciation for "giving out" their daughter. Traditionally, such gifts could be taken as part of bride-wealth but the occasions were not always formal. An examination of what uses respondents make of their stock shows most of them use them for milk, sale, ploughing and sometimes meat, but very rarely as bride-wealth. Though there is a shift from payment in stock to cash, some in-laws today pay very little and others circumvent paying altogether. Apparently, women use *Muthoko* reciprocity to compensate their natal parents for the slowly dying practice of bride-wealth.

Women's groups are based on church membership and neighbourliness. One woman can therefore belong to two groups; one of her church denomination members and the other of her neighbours.

in the social sphere. One reason could be the heterogeneity of the farmers in terms of clan groupings, although heterogeneity does not stop them from evolving other ties in a bid to adapt to the new situation, as they have done in water utilisation. It has, also, been suggested in cultural ecology that the mode of production influences social organization. Netting (1986:76), for example, tells us that if cultivation is limited in scale but painstaking and careful, a nuclear family is likely to provide all the labour. Studying the Kofyar of Northern Nigeria, he notes the change from reliance on nuclear family labour as intensive homestead agriculture changes to shifting cultivation. More labour is obtained by marrying more wives, extending households by retaining married sons, hiring labour and organising voluntary work parties with beer-drinking (Netting 1986:77). He also notes that a village on the Fijian island of Moala showed a predominance of extended families as several widely separated food sources had to be exploited (Netting 1986:76). It is possible that the intensity of irrigated farming in Yatta is one of the causes of lack of cooperative labour.

With such limited labour resources available, it is practical for farmers to adjust their labour management techniques to suit their requirements. To the farmers in Yatta, this has necessitated a re-examination of the division of labour by gender in agricultural production.

How do we, however, explain the fact that some of the tasks in cultivation are still predominantly male

tasks (breaking land, spraying pesticides and, to a slightly lesser extent, crop-selling - see Table 5.1)? Breaking land in food cropping is also largely a man's task (Table 5.2). How do we also explain the importance of female labour in food-cropping relative to the male, which is also apparent in the control group (Tables 5.2 & 5.3)? An explanation for the gender discrepancy in labour allocation in breaking land may partly lie in the fact that the technology that is mainly used is still culturally preserved for men (see Tables 5.5 & 5.8). The technology employed in the other cultivation tasks is still relatively rudimentary (see Tables 5.6 & 5.7). It is culturally acceptable for both men and women to use the hoe but the ox-plough is mainly preserved for men. Though the ox-plough is used extensively in planting food crops (Table 5.9), we see that women labour contribution in this task is quite high in both the treatment and control groups. This is because, while generally men do the actual plough management in planting, the women are responsible for putting seeds in the trenches already made by the plough. In breaking land, only plough management is necessary and therefore the insignificance of women participation in this task.

Table 5.2 Division of Labour in Food Cropping: Treatment Sample (N=106)

Task		AF	FC	Both AF & FC	AM	MC	Both AM & MC	HL	CL
Breaking Land (R)	Hhs.	37	0	0	52	0	0	66	0
	%	34.9	-	-	49.1	-	-	62.3	-
Breaking Land (O)	Hhs.	2	19	1	1	20	2	10	0
	%	1.9	17.9	0.9	0.9	18.9	1.9	9.4	-
Planting (R)	Hhs.	84	0	0	63	0	0	48	0
	%	79.2	-	-	59.4	-	-	45.3	-
Planting (O)	Hhs.	3	52	5	3	54	2	20	0
	%	2.8	49.1	4.7	2.8	50.9	1.9	18.9	-
Manuring (R)	Hhs.	50	0	0	36	0	0	26	0
	%	47.2	-	-	34	-	-	24.5	-
Manuring (O)	Hhs.	2	30	5	3	32	1	14	1
	%	1.9	28.3	4.7	2.8	30.2	0.9	13.2	0.9
Weeding (R)	Hhs.	84	0	0	64	1	0	40	0
	%	79.2	-	-	60.4	0.9	-	37.7	-
Weeding (O)	Hhs.	4	57	5	6	60	1	23	0
	%	3.8	53.8	4.7	5.7	56.6	0.9	21.7	-
Spraying (R)	Hhs.	15	2	0	19	2	0	8	0
	%	14.2	1.9	-	17.9	1.9	-	7.5	-
Spraying (O)	Hhs.	1	4	1	2	4	0	2	0
	%	0.9	3.8	0.9	1.9	3.8	-	1.9	-
Harvest (R)	Hhs.	83	1	0	65	0	0	38	0
	%	78.3	0.9	-	61.3	-	-	35.8	-
Harvest (O)	Hhs.	2	54	6	6	56	1	17	0
	%	1.9	50.9	5.7	5.7	52.8	0.9	16	-
Sale (R)	Hhs.	76	0	1	23	0	0	5	0
	%	71.7	-	0.9	21.7	-	-	4.7	-
Sale (O)	Hhs.	8	5	0	2	5	0	3	0
	%	7.5	4.7	-	1.9	4.7	-	2.8	-

Key: AF = adult female: FC = female child: AM = adult male: MC = male child: HL = hired labour: CL = co-operative labour: Hhs.= number of households: R = regularly: O = occasionally.

Table 5.3 Division of Labour in Food Cropping: Control Sample (N=50)

Task		AF	FC	Both AF & FC	AM	MC	Both AM & MC	HL	CL
Breaking Land (R)	Hhs.	23	0	0	16	1	1	11	0
	%	46	-	-	32	2	2	22	-
Breaking Land (O)	Hhs.	2	3	0	3	4	0	8	0
	%	4	6	-	6	8	-	16	-
Planting (R)	Hhs.	39	0	0	29	1	1	22	0
	%	78	-	-	58	2	2	44	-
Planting (O)	Hhs.	1	6	0	2	7	0	9	0
	%	2	12	-	4	14	-	18	-
Manuring (R)	Hhs.	33	0	0	24	0	1	7	0
	%	66	-	-	48	-	2	14	-
Manuring (O)	Hhs.	3	9	0	2	10	1	9	0
	%	6	18	-	4	20	2	18	-
Weeding (R)	Hhs.	40	0	0	32	1	1	10	0
	%	80	-	-	64	2	2	20	-
Weeding (O)	Hhs.	4	13	0	2	16	1	16	0
	%	8	26	-	4	32	2	32	-
Spraying (R)	Hhs.	2	0	0	3	0	0	1	0
	%	4	-	-	6	-	-	2	-
Spraying (O)	Hhs.	0	0	0	0	0	0	3	0
	%	-	-	-	-	-	-	6	-
Harvest (R)	Hhs.	43	0	0	33	0	1	9	0
	%	86	-	-	66	-	2	18	-
Harvest (O)	Hhs.	3	13	0	1	16	1	10	0
	%	6	26	-	2	32	2	20	-
Sale (R)	Hhs.	27	0	0	14	0	0	3	0
	%	54	-	-	28	-	-	6	-
Sale (O)	Hhs.	3	1	0	0	2	0	5	0
	%	6	2	-	-	4	-	10	-

Key: AF = adult female; FC = female child; AM = adult male; MC = male child; HL = hired labour; CL = co-operative labour; Hhs.= number of households; R = regularly; O = occasionally.

Table 5.4 Division of Labour in Cash Cropping: Control Sample (N=7)*

Task	AF	FC	Both AF & FC	AM	MC	Both AM & MC	HL	CL
Breaking Hhs.	6	0	0	5	0	0	0	0
Land (R) Valid%	85.7	-	-	71.4	-	-	-	-
Breaking Hhs.	0	0	0	0	0	0	2	0
Land (O) Valid%	-	-	-	-	-	-	28.6	-
Planting Hhs.	7	0	0	5	0	0	0	0
(R) Valid %	100	-	-	71.4	-	-	-	-
Planting Hhs.	0	1	0	0	1	0	2	0
(O) Valid%	-	14.3	-	-	14.3	-	28.6	-
Manuring Hhs.	7	0	0	5	0	0	0	0
(R) Valid %	100	-	-	71.4	-	-	-	-
Manuring Hhs.	0	1	0	0	1	0	2	0
(O) Valid %	-	14.3	-	-	14.3	-	28.6	-
Weeding Hhs.	7	0	0	5	0	0	0	0
(R) Valid %	100	-	-	71.4	-	-	-	-
Weeding Hhs.	0	1	0	0	1	0	2	0
(O) Valid %	-	14.3	-	-	14.3	-	28.6	-
Spraying Hhs.	3	0	0	4	0	0	1	0
(R) Valid %	42.9	-	-	57.1	-	-	14.3	-
Spraying Hhs.	0	1	0	0	1	0	0	0
(O) Valid %	-	14.3	-	-	14.3	-	-	-
Harvest Hhs.	7	0	0	5	0	0	0	0
(R) Valid %	100	-	-	71.4	-	-	-	-
Harvest Hhs.	0	1	0	0	1	0	0	0
(O) Valid %	-	14.3	-	-	14.3	-	-	-
Sale Hhs.	7	0	0	5	0	0	0	0
(R) Valid %	100	-	-	71.4	-	-	-	-
Sale Hhs.	0	1	0	1	0	0	1	0
(O) Valid %	-	14.3	-	14.3	-	-	14.3	-

Key: AF = adult female; FC = female child; AM = adult male; MC = male child; HL = hired labour; CL = co-operative labour; Hhs. = number of households; R = regularly; O = occasionally.

* *Only seven households in the control group grow cash crops.*

Table 5.5 Implements used in Breaking Land in Cash Cropping N=106 (T), 7 (C)

Implement	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Tractor only	17	0	16.0	0	18.3	0
Ox-Plough Only	47	1	44.3	14.3	50.5	14.3
Hoe and Panga	13	0	12.3	0	14.0	0
Tractor and Plough	10	0	9.4	0	10.7	0
Hoe and Plough	6	2	5.7	28.6	6.5	28.6
Hoe Only	0	4	0	57.1	0	57.1
Missing	13	0	12.3	0		
Total	*106*	*7*	*100*	*100*	*100*	*100*

Key: T = treatment sample, C = control sample

Table 5.6 Implements used in Planting Cash Crops N=106 (T), 7 (C)

Implement	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Plough Only	7	1	6.6	14.3	7.7	14.3
Hoe Only	70	4	66.0	57.1	76.9	57.1
Tractor and Plough	2	0	1.9	0	2.2	0
Hoe and Plough	12	2	11.3	28.6	13.2	28.6
Missing	15	0	14.2	0		
Total	*106*	*7*	*100*	*100*	*100*	*100*

Key: T = treatment sample, C = control sample

Table 5.7 Implements Used in Weeding Cash Crops N=106 (T), 7 (C)

Implements	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Plough Only	2	0	1.9	0	2.7	0
Hoe Only	62	4	58.5	14.3	83.8	14.3
Hoe and Plough	10	2	9.4	28.6	13.5	28.6
Hoe and Tractor	0	1	0	57.1	0	57.1
Missing	32	0	30.2	0		
Total	*106*	*7*	*100*	*100*	*100*	*100*

Key: T = treatment sample, C = control sample

Table 5.8 Implements Used in Breaking Land in Food Cropping N=106 (T), 50 (C)

Implement	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Tractor Only	14	0	13.2	0	17.1	0
Hoe Only	0	1	0	2	0	4.8
Plough Only	57	16	53.8	32.0	69.5	76.2
Hoe and Panga	3	0	2.8	0	3.7	0
Tractor and Plough	7	3	6.6	6.0	8.5	14.2
Hoe and Plough	1	1	0.9	2	1.2	4.8
Not Applicable*	0	16	0	32.0		
Missing	24	13	22.7	26		
Total	*106*	*50*	*100*	*100*	*100*	*100*

** Do not break land before planting*

Key: T = treatment sample, C = control sample

Table 5.9 Implements Used in Planting Food Crops N=106 (T), 50 (C)

Implement	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Tractor	1	0	0.9	0	1.2	0
Plough	55	27	51.9	54.0	63.9	54.0
Hoe	9	2	8.5	4.0	10.5	4.0
Tractor and Plough	3	3	2.8	6.0	3.5	6.0
Hoe and Plough	18	18	17.0	36.0	20.9	36.0
Missing	20	0	18.9	0		
Total	*106*	*50*	*100*	*100*	*100*	*100*

Key: T = treatment sample, C = control sample

Table 5.10. Implements Used in Weeding Food Crops N=106 (T), 50 (C)

Implement	Households		Percent		Valid %	Valid %
	T	C	T	C	T	C
Plough Only	5	2	4.7	4.0	6.8	4.0
Hoe Only	31	23	29.2	46.0	41.9	46.0
Hoe and Plough	38	25	35.9	50.0	51.3	50.0
Missing	32	0	30.2	0		
Total	*106*	*50*	*100*	*100*	*100*	*100*

Key: T = treatment sample, C = control sample

Spraying cash crops (and some of the food crops) is done by handling a container with liquid pesticides that are known by the farmers to be toxic. The toxic levels are not exactly known but most of the farmers express their concern about the toxicity. Apparently, the women are more anxious of the chemicals' effect and concede that they are more adversely affected by them, hence their more pronounced lack of enthusiasm to use them. The men simply explain that pesticides are not a woman's affair as they are too strong for them and so they can only spray the crops if their male spouses are absent or sick. The farmers measure the effect of the chemicals on a person by the degree of drowsiness experienced by a person after spraying. To neutralize the effect, farmers take milk before and after spraying their crops. They also bathe after spraying to wash off the chemicals that may have strayed onto their bodies.

Though the technology employed in breaking land and the toxicity of pesticides explains in part the discrepancy in female/male labour contribution in the two tasks (land-breaking and spraying pesticides), one other explanation is the fact that these tasks do not put as much pressure on the farmers' time as do the others (e.g, planting, weeding and harvesting). A farmer can cover a relatively larger area in breaking land and spraying crops within a shorter time than he can while planting, weeding or harvesting. Besides, while all crops have to be planted and of course weeded and harvested, farmers

do not spray all their crops (partly due to the fact that they cannot afford the pesticides) and breaking land (land-preparation) is not always done before planting. If the labour pressure for breaking land and spraying crops were as great as it is in the other tasks, I suggest that gender labour division would be marginalised even in these two tasks. It is likely that even the social norms governing use of plough technology would be re-interpreted or bent to accommodate the scarce male and female labour resources.

5.3 Decision-Making in Cultivation and Furrow Maintenance

Typically, the respondents in both the treatment and control samples say the spouses make decisions on labour arrangements (when and who to perform certain tasks) together, but if spouses have differing preferences, it is the man's opinions that hold sway. This applies to both cash and food cropping. Many respondents (89, 84.0%) concede that they have crop preferences in relation to labour input. 35 of whom are male and 54 female. About two thirds (22) of the men prefer cash crops, a third (10) food and three have preferences for crops in both food and cash cropping categories.[2] On the other hand, about a third (17) of the women prefer cash crops, two thirds (33) food crops and four fall in both categories. More females than males (twenty versus six,

[2] The actual crops preferred were first recorded and later, categories (cash, food or both) were created.

respectively) say they prefer putting labour into food cropping because the household requires food crops. However, most of the respondents prefer the crops they do because they bring an income (see Table 5.11). Asked whether there are other household members with crop preference, 77 (72.6%) respondents answered in the affirmative and, again, the reasons for preference were first, better and more reliable income (59 respondents) and then their importance as food crops (22 respondents). The control group gave similar responses, the only differences being that "generating income" is a secondary response (10 respondents) to "food provision" and "they are women crops" is given a higher response (nine respondents) suggesting that crop division is more pronounced in the control group (reasons why this division is less important in the treatment sample have already been given in this chapter).

Table 5.11. Reasons for Preferential Labour Input. (N= 89)ß

Reason	Households	Percent
Yield better income	51	57.3
Household requires food crops	26	29.2
Demand a lot of labour	18	20.2
Do not demand much labour	8	8.9
Have short maturing period	6	6.7
*Total **	*109*	*122.3*

** A respondent could give one or more responses.*

ß Only 89 respondents prefer putting labour into particular crops.

Most of the respondents in the treatment group prefer the crops they do because they bring an income. About

71% (25 out of 35) of the males with crop preferences give this as their (or one of their) reasons while 48% (26 out of 54) of the females do. For many women, this response does not necessarily signify preference for cash crops as defined in the beginning of this chapter.[3] This preference for income generating crops is further confirmed by the responses to the question "Would you, in your opinion, say that members of the household prefer putting labour mainly into the crops from whose income they benefit?" Only 38.5% (41 respondents) answered in the negative. Out of the 65 who answered in the affirmative, 41 are female. 35.8% of respondents feel that differential labour input affects food crop yield while 0.9% feel it affects cash crops and the rest feel none of the crops is affected. These figures suggest that more household members either prefer providing labour into cash cropping or they are coerced (explicitly or implicitly) into providing this labour. Elsewhere in this chapter, it is pointed out that, although women contribute labour for food-cropping more frequently than men, in absolute terms, food cropping is given only secondary attention. Though both male and female spouses give the impression that they make production decisions together, further interviews indicate that in the

[3] Women can sell *food crops* in small quantities without requiring permission to do so from their husbands. They can also spend the income accrued from such sales with greater autonomy than the income they get from "cash crops". This may also explain why we have 26 out of 54 females expressing their preference for some crops because *they yield better income* while the responses to indicate cash crop preference show a total of only 21 (seventeen for food and four for both food and cash) females that state preference for cash crops. This renders the emic definition of *cash crops* ambiguous: some female farmers who do not state their preference for cash crops prefer crops from which they get an income but still perceive these as *food crops*.

households where men are present, they hold overall control of labour. The implication of this is that they (men) generally direct labour to the plots and crops they prefer. Since women, on the other hand, give the impression that they, too, benefit from cash cropping (see chapter 6), they do not need to be coerced into providing their labour. Possibly, negotiation prevails in the labour arrangement with, still, male spouses having the upper hand. Table 5.12 illustrates this point. Though the number reluctant to work is small, it cannot be purely coincidental that all of them are male. Certainly, males can more easily mobilise household labour, and withdraw their own labour from the household pool without consultation with their spouses, with similar ease.

Table 5.12 Reasons for Occasional Labour Input N=103(T), 49(C)ß

Reason	Households		Percent	
	T	C	T	C
School Attendance	85	33	80.2	66
Other Employment	27	9	25.5	18
Reluctance to Work	5	1	4.7	2
Illness	73	41	68.9	82
*Total**	*190*	*84*	*179.3*	*168*

Key:

T= treatment group, C= control group

** A respondent could give more than one response.*

ß One respondent in the control sample and three in the treatment, reported no differential labour contribution in their households.

What the above description is highlighting is the fact that though members of the households point out that they

all generally contribute and benefit from household crop production, they do not always have an identical set of priorities. The production decisions and activities of the different members of the household are not always in consonance as they (the members) have both complementary and conflicting interests. The diversity of interests in households has been identified by other scholars (Jones 1983; Laslett 1984; Spring 1990). Netting et al. (1984:xxii) throw some light on the understanding of household decision-making when they point out that "Decisions emerge from households through negotiation, disagreement, conflict and bargaining". Though there seems to be a lot of "negotiation" in Yatta households, there are also ripples of discontent. Decision-making in income spending, a topic which is discussed in chapter 6, also points to this discontent.

5.4 Male Preference for Cash Crops

In Yatta irrigation, adult male members of the household participate extensively in the sale of cash crops (Table 5.1). While there is not a remarkable difference in their participation and that of their female counterparts in the labour tasks in cash cropping, the difference is overwhelming when we consider the sale of food crops in both the treatment and control samples (Tables 5.2 & 5.3). Unfortunately, we cannot make meaningful comparisons with cash cropping in the control group as only seven of the fifty farmers in the control sample

grow cash crops (see Table 5.4). They mainly use simple technology (Tables 5.5 & 5.7), and their division of labour by gender is not very pronounced (Table 5.4). We have already mentioned that male preference for cash crops has been observed in other studies. Apparently, the interest in the sale of crops is aimed at receiving the income and thereafter controlling its use. The greater the income, the more crucial is the interest in controlling the resource. Respondents, both male and female, often said that if they got a large surplus of food crops, the male spouses would sell it, otherwise the women would. In the same vein, the female spouses can use their own discretion in spending agricultural income if this income is little, but this "privilege" is denied them if the income is substantial.

A changing trend is also observed in the so-called "female crops". Traditionally, female crops were those of which women were in charge. Women provided labour for these crops: their cultivation needed careful hands and *pangas* were used instead of the hoe lest the tubers of such crops be interfered with. They also could sell them, although most of them brought negligible income. For the study groups, these were mainly sweet potatoes, arrowroots(taro), pumpkins and cassava. They were not supposed to form part of a main meal and could be eaten only as snacks or breakfast, or provided as food for the children (especially sweet potatoes and arrowroots). They came in handy, however, for children as well as adults, in times of food shortage. It is these female

crops, notably the sweet potato, that are now changing their "female crops" status as they are becoming marketable in large quantities. While 66% of respondents say that sweet potatoes are mainly a women's crop, the respondents who plant them as a cash crop do not view them as a female prerogative. Both men and women contribute labour for these, including selling the produce. Indeed, the farmers have even changed from the traditional technology of using the panga to plant and weed them; they now use the more efficient plough. The suggestion made here is that if typically female crops are found to be lucrative, they slowly cease being female crops and men become equally (if not more) interested not only in investing their labour in them but controlling the income accrued from their sale. The crops would also lose their rather inferior status among cultigens and if they became very important economically, it is likely that they would gradually come to be perceived as male crops (in the study area, 17% of the study sample state that cash vegetables are mainly male crops while only one respondent says they are female crops. The remainder state that the crops are for both men and women).

The male spouses let their wives sell the food crops because the income received from their sale is relatively little. It is also more seasonal (most of the households depend mainly on rainfall for their food production, while cash cropping receives the bulk of the irrigation water). Since the women continue to play an important cultural role in nurturing their families, they consider

their role in food cropping important. They express their feeling that although their husbands do give them some support in terms of cash flow (from cash cropping), they cannot take chances and therefore have to grow some food crops. They further state that it is they and the children who suffer the most whenever there is a food shortage, and make such comments as: "the children cry and ask their mothers for food, not their fathers". They also reckon that in times of food shortage, husbands come home late, after the children have cried and slept. Some farmers explain how some households have experimented with planting cash crops only, since they are more lucrative, hoping to use part of the income later to buy food for their families. The women have learned the hard way, as they put it, that "When the money gets into men's pockets, it is not at all easy to retrieve"; hence the need to plant and provide labour for both food and cash crops.

Labour in furrow maintenance is clearly a man's domain. Even though about 86% of the respondents say that both sexes maintain the furrows, a survey of who provides labour in the individual sample households reflects a marked male labour contribution on a regular basis in most of the households (see Table 5.13), and in all of the tasks. This discrepancy in what people say they do and what they actually do can be explained in cultural terms. It is possible that with the introduction of irrigation, the people felt that both sexes should participate in labour contribution so as to

manage scarce labour efficiently. Since the communal furrows are not within the homestead, however, it is probable that they are also associated with "outdoor" tasks that are traditionally performed by men. Thus, while conceptually division of labour in furrow maintenance does not exist, it is prevalent in practice. This may also explain why this division is less pronounced in the maintenance of the diversions in the individual household plots. As mentioned in chapter 4, the households (men, women and children) maintain the diversions to their individual holdings, but the rest of the furrows are communally maintained (and actually communally owned) with each household sending a representative whenever maintenance tasks are due. It is these representatives who are theoretically both men and women, but in practice predominantly men. Only households which do not have male members to represent them send women to do so. However, while in Marakwet and Pokot, the gender role divisions are governed by rigid social expectations and taboos (Dubel & Kwaasteniet 1983) and therefore present a great constraint in households without males, in Yatta, women can easily participate in furrow maintenance tasks when necessary. This flexibility allows the farmers to manage the environment with scarce labour resources.

Table 5.13. Division of Labour in Furrow Maintenance N= 106

Task		AF	FC	Both (AF & FC)	AM	MC	Both (AM & MC)	HL	CL
Digging (R)	Hhs.	35	0	0	60	0	0	20	0
	%	33	-	-	56.6	-	-	18.9	-
Digging (O)	Hhs.	33	4	1	10	8	1	11	0
	%	31.1	3.8	0.9	9.4	7.5	0.9	10.4	-
Collecting Stones (R)	Hhs.	34	0	0	61	0	0	20	0
	%	32.1	-	-	57.5	-	-	18.9	-
Collecting Stones (O)	Hhs.	34	4	1	10	8	1	11	0
	%	32.1	3.8	0.9	9.4	7.5	0.9	10.4	-
Cementing (R)	Hhs.	35	0	0	61	0	0	20	0
	%	33	-	-	57.5	-	-	18.9	-
Cementing (O)	Hhs.	33	4	1	10	8	1	11	0
	%	31.1	3.8	0.9	9.4	7.5	0.9	10.4	-
Desilting (R)	Hhs.	35	0	0	60	0	0	20	0
	%	33	-	-	56.6	-	-	18.9	-
Desilting (O)	Hhs.	32	4	1	11	8	1	11	0
	%	30.2	3.8	0.9	10.4	7.5	0.9	10.4	-
Repairing (R)	Hhs.	34	0	0	61	0	0	20	0
	%	32.1	-	-	57.5	-	-	18.9	-
Repairing (O)	Hhs.	33	4	1	11	8	1	11	0
	%	31.1	3.8	0.9	10.4	7.5	0.9	10.4	-
Cutting(R) Grass	Hhs.	35	0	0	61	0	0	20	0
	%	33	-	-	57.5	-	-	18.9	-
Cutting(O) Grass	Hhs.	33	4	1	10	8	1	11	0
	%	31.1	3.8	0.9	9.4	7.5	0.9	10.4	-

Key: AF = adult female; FC = female child; AM = adult male; MC = male child; HL = hired labour; CL = cooperative labour; Hhs.= households; R = regularly; O = occasionally.

Furrow maintenance tasks are not done frequently as they are not always necessary. This partially explains why gender division of labour in maintenance has not been considerably minimised as has happened with the demanding tasks in cultivation. Besides, furrows are dug using hoes and forks, desilting is done using hoes and shovels, stones and sand are transported to the sites where they are needed using wheelbarrows and wheel carts, grass is cut using pangas and slashers, while repairing furrows entails mainly rebuilding damaged furrows using mud and

stones and tree-branches, and only occasionally cement. Most of the jobs in maintaining the furrows are reminiscent of the building tasks that are performed by men. This may partly explain the marked male labour contributions in this area.

Contrary to Kangangi's study in Kibirigwi, which points out that women contribute labour to cash-cropping only after they have finished weeding in their food *shambas* (1982:94), both men and women in Yatta invest more time in cash-cropping. Even though in the study, women contribute labour into food-cropping more regularly than men, in absolute terms, food-cropping is given only secondary attention. Despite the fact that much of the period during which the research was done was planting and weeding time for food crops, randomised time allocation checks established that only a few households had adults planting and weeding in their food-crop *shambas* (see Table 5.14), compared to those doing the same tasks in cash cropping.

Table 5.14 Random Time Allocation, Specified Tasks (N=106 for food, and 104 for cash crops)ß

Task	Adult Female		Adult Male		Hired Labour	
	Hhs.	%	Hhs.	%	Hhs.	%
Planting (Food)	1	0.9	2	1.8	1	0.9
Planting (Cash)	36	34.6	37	35.5	27	25.9
Weeding (Food)	10	9.4	8	7.5	7	6.6
Weeding (Cash)	70	67.3	66	63.4	47	45.1

Key: Hhs.= households.

ß Two households were not growing cash crops at the time.

A number of the farmers are aware of this

differential labour input. When asked which crops (if any) they thought were affected by differential labour input, 36% of the respondents said that food crops were, while only one informant said cash; the rest said none of the crops was affected. Both the farmers engaged in dry land farming and those with irrigated holdings are aware that the farmers in the irrigated zone have a lot more pressure of work. My observations confirmed this, especially in Kithimani and Matuu sub-locations. This is quite a constraint, especially for women, as they have to perform their domestic tasks in addition to cultivating the fields. A great number of this category of farmers, both men and women, complain that they hardly have time to relax or visit their friends and relatives.

We have noted that while the gender division of labour is marginalised in planting, manuring, weeding and harvesting in cash-cropping, it is still pronounced in breaking land, spraying pesticides, and the sale of crops, tasks which are mainly a male domain. In food cropping, male predominance in labour contribution is apparent in breaking land. In the rest of the tasks, a marked female contribution is observed relative to men's.

Division of labour, as has been seen, depends on what crops are grown, the tasks performed, and technology used to perform them, the amount of labour needed to perform the tasks, and its availability. The hypothesis that "the division of labour by gender in agricultural production (cropping activities) is not significant" has been demonstrated in planting, weeding, manuring and

harvesting cash crops, but not substantiated in breaking land, spraying crops, and, to a lesser extent, selling crops. It has also been disproved in all furrow maintenance tasks. In food-cropping, nearly all the tasks are performed on a more regular basis by women, but male contribution, though relatively low, is not really insignificant except in the sale of crops.

It has also been pointed out that men are keen on controlling agricultural income, especially if the income is substantial. This is not surprising considering that in the traditionally male-dominated society of the Akamba and the Agikuyu, the important resources in the economy (e.g., land, cattle, money) are controlled (or supposed to be controlled) by the men. I have also demonstrated that managing a scarce resource (that is, labour) in irrigation has undoubtedly affected the gender division of labour in the household and may in part be seen as responsible for reducing the division of labour in some cropping tasks. It has as well been pointed out that other factors (e.g., general male preference in cash cropping) also come into play. The shape that the adaptive changes take is controlled by the amount of work pressure the farmers face in different tasks and the technology used, among other things.

CHAPTER 6

THE IMPACT OF IRRIGATION ON LIVING STANDARDS

Raising the living standards of rural populations is an important objective of rural development programmes. In fact, it was one of the stated objectives at the outset of the irrigation project in Yatta. It is not possible to measure adequately all the facets of development or living standards, as they are numerous, and even if we had the time, some of them cannot be measurable in quantifiable terms. In this chapter, the parameters of living standards that are examined are income, shelter quality, material and animal (livestock) wealth, food and diet and employment. One of the more obvious but nevertheless crucial ways in which water availability has changed rural life in Yatta is that it has alleviated the drudgery (especially for women) inherent in a rural setting with domestic water constraints. Before irrigation was introduced in the region, Thika and Athi Rivers were the only sources of water available throughout the year. Making one trip to fetch water in the rivers was a whole day's endeavour for most of the farmers. Since most of the households planned only a daily trip, water had to be used as sparingly as possible with possible serious implications on domestic hygiene.

6.1 Income

As mentioned in chapter 4, all but two farmers (N=106)

grew both food and cash crops in the period when research was conducted. Though the two usually grow cash crops in addition to food crops, they grew only food crops at the time, and cited labour problems as their main constraint. All the respondents appreciate the fact that they can get better yields from their farms not only in cash-cropping but also in food-cropping. Though some of them state that they do not really get any significant income after deducting the income spent on inputs, they nevertheless admit they are still better off economically than they were before they started irrigating. Table 6.1 shows the income distribution for the month before the questionnaire was administered together with the previous season (for the crops grown seasonally). Most of the farmers (67.9%) had experienced a bad season (and harvest) as there had been too much rain.

Table 6.1. Income from Crop Sales N=106(T), 50(C)

Amount	Households		Percent	
	T	C	T	C
< KSh.300	12	3	11.3	6
300-500	14	5	13.2	10
501-1000	24	9	22.7	18
1001-2000	26	7	24.5	14
2001-3000	10	1	9.4	2
3001-4000	3	2	2.8	4
4001-5000	3	0	2.8	0
5001-6000	0	0	0	0
6001-7000	0	0	0	0
7001-8000	4	1	3.8	2
8001-9000	0	0	0	0
9001-10000	0	0	0	0
10001-15000	0	0	0	0
15001-20000	4	0	3.8	0
> 20000	2	0	1.9	0
No sales	4	22	3.8	44
Total	*106*	*50*	*100*	*100*

Key: T= treatment sample, C= control

At the time of research US $ 1 = Ksh. 23

The income shown in the distribution is the net income (after the expenses for the inputs have been deducted). The mean income is Ksh. 2,496.2 (Ksh. 750 for control sample) with the lowest income reported being less than Ksh. 300. The mean is misleading as 71.7% of the farmers got Ksh. 2000 per month or less. The relatively high mean is due to the wide dispersion of income with a few farmers getting quite a high income while the majority did not. The trend is also reflected in the farmers' responses to the question about their average income in a bad harvest. Most of the farmers (76.6%) get less than Ksh. 1000 in a bad harvest. However, in a good harvest 50% of the farmers get more than Ksh. 3000.

Though the income figures may appear small in other people's terms, to the farmers themselves they are not; they feel the income has improved their lifestyle a great deal as it has minimised constraints related to paying school fees, buying clothes, and foodstuffs that are not readily available in the home environment. Table 6.2 shows that most households spend their income on paying school fees, buying clothes, paying for farm expenses and buying food. It seems ironic that farmers in an irrigated zone would buy food but if this (expense) is observed against the background of a semi-market food economy, it will be easier to understand. The farmers buy foodstuffs to supplement the diet they get from food grown in their *shambas*. What most households purchase are additives and vegetables especially cabbage, and tomatoes which generally do not do well in the area.

Meat, wheat flour, bread and buns are also bought but only occasionally; they are seen as optional and are bought only when there is a special occasion, such as guests or some celebration. Cereals (specifically maize) and legumes (beans, pigeon peas and cow peas) form the staple food of the study population and are planted by all the farmers (at least maize and one legume crop). Generally most cash crops are irrigated while only a few food crops are. Each farmer chooses individually what food crops to irrigate but in principle beans, cabbage and *sukuma wiki* (kale) are irrigated while maize, pigeon peas and cow peas are not. The rationale used is that while the latter can withstand harsh conditions, the former cannot.

Table 6.2. Uses of Agricultural Income (N= 106)

Use	Households	Percent
Buy clothes	65	61.3
Pay school bills	61	57.5
Buy food	52	49.1
Pay *shamba* bills	45	42.5
Purchase household items	36	34
Build residential houses	17	16
Buy livestock	15	14.2
Save	13	12.3
Buy land	5	4.7
Construct business premises	5	4.7
Buy drugs	3	2.8
Pay bridewealth	2	1.9
*Total**	*319*	*301*

** A respondent could give one or more responses.*

The farmers argue that the fruit and vegetable agents affect their full realisation of benefits from agri-cultural sale. They feel the agents do not experience the inherent risks involved in the actual

management of farms yet they are the ones who get the lion's share from the sales. The arrows illustrate how the horticultural produce finally reaches the consumers: Farmers (on the farm) ---> Local agents ---> Agents from Nairobi---> Buyers (mainly Asian) in Nairobi (Exporters) ---> Buyers in Europe and Asia (importers) ---> Consumers.

The farmer on the farm does the bulk of work on the farm and takes his produce to the collection centres, the local agents buy (nearly always in cash terms) the produce from the farmers and wait for the "agents from Nairobi" to come and load their lorries with ready and well packed produce. Actually, "the agents from Nairobi" come to distribute cartons as early as five or six o'clock in the morning and after distributing them, they go to places of their choice to relax, and come back at about two o'clock to collect their produce. They take it to the exporters in Nairobi who arrange for airfreight to the importers.

It is the local agents and the agents from Nairobi whom the farmers look at with the greatest suspicion. The local agents have the disadvantage of being known to the farmers as they are resident in the area. The farmers believe that the local agents, in collaboration with their counterparts from Nairobi, deliberately lower the price of the farmers' produce so as to maximize their profits. It is no wonder that the farmers have coined a name for agents: *Mbiviti* - literally, an animal that sucks another dry of blood.

The agents, on the other hand, say they are paid only Ksh. 2 (by the employers) for each carton they get from the farmers. The farmers allege that since the agents can get more than Ksh. 200 in a day (a truckful), this is not any meagre remuneration by rural standards considering they are not responsible for vehicle maintenance, fuel expenses or any other overhead costs of the trade. It is, further, widely believed that the agents do not give the farmers the prices quoted for them by their employers in Nairobi; they lower the prices for the farmers and then "pocket" the difference. Some of the agents interviewed admitted that some of their colleagues are truly unscrupulous but they were quick to add that many others are not.

The farmers' predicament is bad enough given the low prices of their produce; it is exacerbated by price fluctuation. The prices fluctuate on a weekly and sometimes daily basis. They range between Ksh. 10 and Ksh. 80 per carton of three kilos for french beans and five to seven kilos for the other vegetables (refer to appendix B for a list of the other vegetables). The cartons are 288 mm by 203 mm by 108 mm for french beans and 381 mm by 285 mm by 162 mm for the other vegetables. The fluctuation is so bad that sometimes farmers decide to feed their produce to livestock (as they are offered such low prices). The pricing system affects the equitable distribution of income with the farmers who do the toiling gaining the least and the agents benefitting more. The agents explain that prices fall due to

circumstances beyond their control, viz bumper harvests in the area, lack of cargo space for export, bumper harvests in the other countries that rival them in the export of the crops particularly Zambia, Zimbabwe, and Cyprus, and weak demand for the produce due to self-sufficiency of the consumers when their own harvests are good. Vegetables are exported mainly to parts of Asia and Europe (France, Denmark, Germany, Holland, Belgium and Britain).

The impression that respondents persistently give is that paying school bills, buying food, clothes and consumer durables, providing shelter and even buying stock go into improving the living standards of the household members in general. Some of the variables mentioned such as food, clothes, and shelter liberate people from sheer basic needs. Education should improve a people's lifestyle not only in a material but also spiritual sense, thus enabling them to be in better control of their destiny. Such advantages of education should flow down to the other family members in terms of enlightenment, inspiration and, if possible, material comfort, so as to improve the general lifestyle of the family. An examination of the decision-making structure in the household may throw light on the agricultural remuneration of the different household members and is important in assessing equity in the distribution of agricultural income.

6.1.1. Decision-Making on Income Distribution in the Household

Though respondents give the impression that income is spent to the benefit of the whole household, in other responses it is clear that there is occasional misuse of income. For example, when asked whether one person should be in charge of household income or two (or more) people, 88 (83%) and 24 (48%) of the respondents in the treatment and control samples, respectively, prefer two or more people. The most frequent reason given for this preference is "so that diverse interests of the members of the household can be accommodated" (50 (47.2%) in treatment and 20 (40%) in the control) while the second most frequent response is "to check misuse of income", and the third is, "so that whoever puts in labour can benefit". The control sample gives only these three reasons while the treatment group gives a fourth one: "so that if one member is absent, the others can authorise spending". It is clear that the more the income, the greater the need to have more than one person in charge: 88 (83%) respondents in the treatment sample see this need while only 24 (48%) respondents in the control do. This could mean either that when the income is little, other members of the household may not mind too much if it is misappropriated or the chances of misappropriating increase as the income increases or both.

Those who advocate one person being in charge of income give the following reasons (in order of

frequency): "to avoid misunderstandings and quarrels about spending", "to conform to nature as nature requires that man leads (these said male heads of households should be in charge)". Each of the following responses was given by one respondent: " one person (the man) should, because women are easily tempted to buy things" and "one person (the woman) because she knows the needs of the household better". Most of the respondents who prefer one person feel that it is more convenient for one person (usually the man) to make decisions on expenditure and inform the rest of the family members about his decisions; two people are likely to differ on expenditure priorities and this brings friction in a home. Those who say two or more, on the other hand, feel that the very potential for different expenditure priorities in a family calls for more or less democratically chosen ways of income spending to accommodate those very varying interests. Again, the two opinions conform to the definition of a household as having both complementary and conflicting interests as already pointed out in chapter 5. However, this study notes that though some households in Yatta do not distribute their income to the satisfaction of all their members' interests, the general consensus is that most of them do.

It is mainly the male spouses who receive cash incomes accrued from agricultural sale (in 62 of the households - N=106), and decisions on spending are made mainly by the male heads of households, as Table 6.3

shows.

Table 6.3. Decision-making on Cash Expenditures (N=106)

Decision-maker	Responses	Percent
Male household head	50	47.2
Wife/female household head	27	25.5
Joint (husband and wife)	29	27.3
Total	*106*	*100*

We have already pointed out (in chapter 5) that most of the households prefer certain crops first and foremost because they are a source of income. Most of the respondents (65, 61.5%) also point out that members of their households prefer putting labour into the crops from whose income they benefit. The implications of this preference are important for the success of the irrigation: household members who do not benefit from their labour contributions are likely to withdraw it or contribute it inefficiently to bargain for better remuneration. Since labour contributions are given by both male and female members, it is likely that agricultural income benefits nearly all the members of the household. However, the desire to take precautions (for example, have two or more persons controlling the income) that is expressed by most of the households, points to the awareness that household interests are not completely in consonance. This, again, highlights the view that the household is a unit that, nevertheless, has members who have both conflicting and conforming interests.

6.1.2 Factors Affecting Farmers' Realisation of Benefits

Respondents are aware of the constraints that affect their realisation of better incomes. Price fluctuation and the role of agents have already been mentioned as constraints. Another variable which is high on the agenda is the price of inputs, specifically pesticides, fertilizers and labour. The labour problem has been exacerbated by schooling as the bigger children who could contribute to ease labour demands are in school. The extended family system that provided a large labour pool cannot be turned to, as relatives of most of the respondents live far away from the irrigation zone in their clan land. Cash crops are labour intensive and very little mechanization is used. Though some of the farmers have managed to import young relatives who are school leavers or drop outs in search of employment, from their original home places, many others cannot. Hired labour is mandatory in growing cash crops even for the farmers who have access to labour from relatives.

Pests are a menace to the farmers. The price of inputs is a great constraint (see Table 6.4), and some of the farmers find that after they make the deductions of capital invested in inputs, profits are marginal. Besides, some pests have become resistant to the pesticides already in use but farmers dare not stop using them for they do not have any better options and they know that not using any pesticides at all is synonymous

with having no harvest. Thus, they are suffering a double loss.

Table 6.4. Factors Affecting Farmers' Realisation of Benefits (N=106) ä

Factor	Households	Percent
Shortage of fertilizer/pesticides	78	73.6
Shortage of labour	46	43.4
Sales agents (middlemen)	45	42.5
* Too much rain	23	21.7
Seepage	19	17.9
Poor soils	18	17.0
* Water shortage	18	17.0
ß Wild animals	8	7.5
Price fluctuations	7	6.6
Weather conditions	5	4.7
Shortage of farm implements	4	3.8
Land shortage	2	1.9
Lack of extension advice	2	1.9

** When research was done there had been too much rain but there usually is not enough water for all the farmers' needs.*

ß This problem is only experienced by farmers from Ndalani sub-location. The animals come from a nearby government stretch of land that is unutilised except at the farthest end from the farmers, where the National Youth Service have a camp and farm.

ä Respondents could give more than one response.

Respondents complain about seepage. Though research was done during the rainy season, which aggravated the problem, the farmers who are downslope experience this problem even during the dry spells. Seepage levels are pretty high as a result of using earthen canals and poor methods of managing water. Poor water management methods also lead to water-logging in some areas while in others farmers receive too little water. Farmers of a group have access to water for similar durations irrespective of the sizes of their landholding. Even though some

farmers feel that those with larger fields should have access to water for longer periods, they also admit that the farmers' general feeling that this allowance would be open to abuse and could eventually create disputes and ill-feeling is well-founded.

Land shortage is a stated constraint by a number of farmers. While some farmers feel that their small land size has affected their production negatively, correlations show low association between land size and income realised controlling for the other variables (partial correlation =0.2615). The concept of land size is also varied among farmers; while some of them complain about land shortage, others feel that having such "big pieces" of land has made their lives much better. These are mainly the farmers who were formerly squatters on commercial farms in different parts of the country but feel that the land given by the government to them (two hectares) has improved their lifestyle in a lot of ways and raised their self-esteem.

Some households feel more involvement by extension officers would improve their production. Most of the respondents (and the population they represent) are well-reached by extension services except for some areas in Ndalani sub-location which certainly need better service.

Variables like education of the spouses, access to extra income (and therefore capital), whether or not spouses live together, do not affect the realisation of income. The assumption often made is that education would help a farmer get information and adopt it

efficiently in farming and therefore improve his performance. But education, on the other hand, can be a causative factor in reduced farmer's performance as it could induce him to spend time on other types of employment. In fact, the latter was found to be the case in Kibirigwi irrigation (Makanda 1984). In Yatta, the relationship between income and the education level of the male spouse is non-existent. It is given by Pearson's r = - 0.0639. Access to extra income may have similar effects as education on the farmers. While the income may be invested in farming and therefore result in more profits, it can also be a disincentive to the farmers as they can get alternative sources of earning a living. In this study, it does not seem to have any effect - the partial correlation of income earned from agriculture and the existence of other channels of bringing income into the family controlling for the other variables is 0.0628. The correlations suggest that the amount of income received by farmers depends a lot more on individual entrepreneurial skills and probably labour availability rather than other socio-economic variables.

One factor that has been found to affect the performance of women is tenure arrangements that favour male ownership of land (see, e.g., Makanda 1984; Brain 1976; Rogers 1980; Hanger and Moris 1973). The women (and the men) in this study do not see this as an issue. In fact, when asked to mention their constraints in production or even general constraints in the irrigation scheme, only two (1.9%) respondents mentioned this as a

constraint - not even in informal interviews was male land tenure an issue. Even in dealing with prescriptions for the constraints experienced, only two (1.9%) respondents (and both were male) felt access to loans using title deeds as security, would help them. In the same vein, correlations show no link between land tenure and agricultural productivity. This is surprising considering the findings from other scholars; it raises a serious methodological issue: are scholars studying and reporting their own priorities or they are reporting the constraints of the rural population as experienced by the population itself, in an emic sense? It cannot, however, be denied that agricultural innovations are carried out in diverse situations and some constraints could be largely project-specific. It, further, suggests that before women can have interest in land ownership in their own right, they need to know how or whether they stand to benefit by doing so (land ownership for women may, however, increase performance in female headed households).

It is also felt that women may not necessarily gain more from land ownership, unless they are bona fide heads of households, if other familial obligations relegate them to a secondary position as male dominance can control their production even in such circumstances. For example, women who have accumulated small income and eventually bought stock (goats or cattle) in the area cannot sell them without permission from their husbands but the husbands can sell the same. Of similar

significance is the fact that the two married women in the sample who own land in their own right are not completely free to utilise the land as they wish - they have to liaise with their husbands who are migrant workers, one in Nairobi and the other in Western Kenya. One of them cannot grow cash crops even though she would like to as her husband has refused to endorse her viewpoint. Thus, female land (and general property) ownership *per se* may not signify improved decision-making, performance or equity in gender relations. What, therefore, is needed is, probably, a complete understanding and re-examination of the gender equilibrium in all spheres, hopefully leading to an overhaul of the whole engine of gender relations.

6.2 Wealth Inventory

Different parameters have been used by different scholars as measures of standards of living and wealth (Long 1968, Awiti 1973, Fleuret 1980). In assessing wealth and living standards in this study, some of the local definitions have been captured such as preferences for certain shelter types and household consumer goods. Some of the young people in the study area do not see livestock as a form of wealth but the older generation do. All, however, do feel that livestock come in handy in times of constraints. They are an investment to alleviate shortage of funds for paying school fees, especially at the beginning of the year when fees are

high, and they are also a form of insurance in case of sickness.

6.2.1 Shelter

Shelter is an important pointer to wealth and living standards in Yatta. Both the young and older people feel that if a person is wealthy, he would live in a house that has tiles or corrugated iron for roofing. It would have walls of brick or blocks and the floor would be cemented. The house would also be big (with more rooms and good ventilation). Such a house would be more costly to construct than the house constructed with materials that are easily available locally (with thatch roofing, mud walls and floors made of earth). A person with a big house is also considered to have a high standard of living.

The advantage of shelter as an indicator of wealth is that it is visible to the interviewer and therefore more reliable as it can be visibly ascertained. According to the survey, many of the respondents are doing fine as 70.8% of them have iron roofed houses while the rest have grass-thatched ones. Brick-walled houses are owned by 62.3% of the respondents while 19.8% have houses made of blocks and 17.9% have houses of mud. Only 37.7%, however, have cemented floors. Cementing is not exactly a priority for many households. All houses belonging to the household are rated but the data presented (Tables 6.5 and 6.6) are those of the principal

dwellings only (sleeping quarters of the respondent and spouse).

Clearly, income from irrigated agriculture does not make much impact on the type of housing the respondents live in, that is, relative to the control group. Not much difference is observed in the roofing, wall and floor types. And, although at first glance there is an apparent difference in the house size and ventilation, this difference is not particularly significant; the houses in the treatment group that are significantly bigger than those in the control are only three (2.7%). Both samples have the highest percentage of respondents living in two-roomed houses and the differences between the two percentages is not pronounced (36.8% and 40% for the intervention[1] and control samples respectively). The second highest percentage, again for the two samples, lives in three - roomed houses (with 22% from the control and 18.9% from the intervention group). No major difference is observed in the rest of the room categories.

[1] The terms *treatment sample/group*, *intervention sample/group*, and *stimulus sample/group* are used interchangeably.

Table 6.5. House Construction in Treatment and Control Groups N=106(T), 50(C)

Type of Materials	Households		Percent	
	T	C	T	C
Corrugated Iron Roof	75	35	70.8	70
Thatched Roof	31	15	29.2	30
Block Walls	21	6	19.8	12
Brick Walls	66	39	62.3	78
Mud Walls	19	5	17.9	10
Cement Floor	40	16	37.7	32
Earth Floor	66	34	62.3	68

Key: T = treatment, C = control

Table 6.6. Size and Ventilation of Principal Dwelling N=106(T), 50(C)

Number of Rooms	Households		Percent	
	T	C	T	C
1	15	7	14.2	14
2	39	20	36.8	40
3	20	11	18.9	22
4	20	8	18.9	16
5	4	2	3.8	4
6	5	1	4.7	2
8	1	0	0.9	0
11	1	0	0.9	0
21	1	0	0.9	0
Missing	*0*	*1*	*0*	*2*
Total	*106*	*50*	*100*	*100*
Number of Windows				
None	10	6	9.4	12
1	13	8	12.3	16
2	31	18	29.3	36
3	22	6	20.8	12
4	14	9	13.2	18
5	6	3	5.7	6
6	5	0	4.7	0
7	2	0	1.9	0
9	1	0	0.9	0
11	1	0	0.9	0
21	1	0	0.9	0
Total	*106*	*50*	*100*	*100*

Mean N Rooms (T) = 3.05
(C) = 2.61

Mean N Windows (T) = 2.9
(C) = 2.26

Mode N Rooms (T) = 2
(C) = 2

Mode N Windows (T) = 2
(C) = 2

Median N Rooms (T) = 2
(C) = 2

Median N Windows (T) = 2
(C) = 2

Houses of two to three rooms are inadequate for the study group's needs. Focused interviews and general information from respondents indicated that most of them need at least a four roomed house: one room would be a bedroom for the couple, one for the female children, one for the male[2] children and the other would be "a relaxing place" especially when they have visitors. Many families are comfortable entertaining their visitors outside the houses or in the kitchens but they feel inconvenienced when it is cold or raining and they get visitors whose kin relationships with them are too formal to allow interaction in the kitchen. Only 30.1% and 24% of the households in the treatment and control groups, respectively, have four or more rooms which is the minimum house size requirement as we have mentioned. Irrigation has therefore improved the quality of shelter only a little bit (that is, again, relative to the control group). This is puzzling considering that at the beginning of this chapter we have already established that respondents from the irrigated zone get more income and both samples from irrigated and non-irrigated areas have indicated similar preferences for housing given the resources. Correlation statistics portray negligible association between income and housing. For example, when income is correlated with the size of houses (number of rooms) controlling for the other variables, the correlation obtained is 0.0935 for the treatment group

[2] Although male children eventually move to their own houses, they are not required to do so until they are 12-14 years.

and 0.1171 for the control sample. Even when additional income of the households is not controlled for, the correlation is still low. For example, the partial correlation coefficient of income with house size controlling, not for availability of extra income, but marital status is 0.0582 for the intervention sample and 0.1207 for the control. Further correlations and cross-tabulations of income by floor types and roofing materials follow the same trend. The relationship between income and the variables mentioned is not linear. The pertinent question is: why are people who have a high agricultural income not living in relatively much better houses and how do poor farmers construct relatively good houses? The latter question may be explained by availability of extra income but when this variable (extra-income availability) is correlated with housing, no major relationship is portrayed. One of the following factors or a combination of the factors may offer an explanation to the questions:

-- some of the respondents do not give the true account of their agricultural income.
-- some of the income (or a great part of it) got from agriculture is not put into housing.
-- some of those who have little or no agricultural income have supplementary or other income which they invest in house construction with the effect that their houses sometimes surpass those of the respondents with better agricultural income, in quality.

The first possibility can arise with respondents who do not keep records of their expenditure on inputs in which case they would give a figure that is closer to their gross income than the net. This is not a far-fetched possibility considering the fact that most of the farmers do not record their daily expenditure and income. Studies done elsewhere (e.g., Fleuret & Fleuret 1982:22) have also shown that many respondents are uncomfortable when it comes to discussing matters to do with their income. Some of them inflate the figures while others downplay them depending on their interests and fears.

The third possibility is quite plausible. The second possibility is more difficult to understand, in light of the amount of income earned by the treatment group. If good housing is a priority to the population but only a small percentage of the sample seem to put their income into it, there is a big possibility that they do not have a surplus to spend on housing after they have paid for their more pressing needs which, again, suggests that the amount of income quoted is inflated. The possibility that income is misappropriated, though not impossible, is not the general trend as already discussed. Most respondents, both male and female, contend that agricultural income is spent more or less to the benefit of the household. Field observation has shown that this is the prevailing case although some of the male respondents confess that they have to have an evening of real beer-drinking once in a week or so to

relax after a week's hard work (beer-drinking is traditionally prohibited for women). Some women also confess that some of the men spend the money irresponsibly though they are quick to point out that their own husbands do not fall into this category of delinquents.

The possibility that some households have weak rights to land and therefore they do not want to invest in housing was considered but none of the households fall in this category. And only three households invest in residential housing elsewhere. There is also the possibility that although bigger houses are considered ideal, house size is still relative; this would have the implication that even the poorer households in the area have what they believe to be adequate housing so they spend money on other things. It would seem, then, that house construction is not such a priority after all, or income figures quoted by the respondents are unreliable or income is spent on other items, which brings us to the next sub-section.

6.2.2 Household Consumer Durables

Household consumer durables are another index of measuring living standards and wealth in my study. Usually the households with more of the consumer durables have a greater purchasing power than their counterparts. An assumption is made that these durables lessen drudgery, thus enhancing the farmers' living standards.

The peoples' preference in consumer durables was explored before inventory was started. A record of the consumer durables survey is given in Table 6.7.

Table 6.7. Ownership of Consumer Durables N=106(T),50(C)

Item	Households		Percent	
	T	C	T	C
Torch	103	46	97.2	92
Charcoal stove	90	37	84.9	74
Hurricane lamp	87	36	82.1	72
Radio	87	39	82.1	78
Bicycle	57	15	53.8	30
Wheelbarrow	57	9	53.8	18
Iron bed	54	22	50.9	44
Pressure stove	41	17	38.7	34
Ox-plough	40	16	37.7	32
Ox-cart	37	9	34.9	18
Cassette player	24	16	22.6	32
Sofa set	23	10	21.7	20
Wardrobe	19	4	17.9	8
Posho mill	14	1	13.2	2
Water tank	11	8	10.4	16
Record player	9	3	8.5	6
Pressure lamp	6	1	5.7	2
Sewing machine	5	1	4.7	2
Gas cooker	3	0	2.8	0
Tractor	3	0	2.8	0
Car or lorry	3	1	2.8	2
Motorbike	2	1	1.9	2
Television	2	0	1.9	0

T = treatment group, C = control

The consumer durables inventory reflects a generally not too low standard of living by rural standards, according to the population's assessment. Appropriate technology is employed by many households in cooking as evidenced by the number of households that have pressure stoves (41, 38.7%) and charcoal stoves (90, 84.9%). Most of the households have hurricane lamps (87, 82.1%) as opposed to the tin lamps that are common in the rural areas. The durables mentioned are found even in most of

the houses of farmers who do not have other sources of income. However, all the households that own gas cookers, tractors and motor vehicles have household members remitting income from either salaried jobs or businesses and one of the two respondents owning televisions has extra income (that is, other than agriculture).

After realising that the ox-plough is used a lot in cultivation, one would have expected to find out that most households own an ox-plough. In the discussion about the division of labour and technology employed in farming (in chapter 5), it was confirmed that the tractor is used by only a few households and even these use it only occasionally. Only after we have understood the loaning system in plough use can the mystery of the few ploughs be solved. Plough loaning takes several shapes in the area. In the first one, a person with a plough but no oxen can borrow oxen from a neighbour who has oxen but no plough. They, then, take turns to utilise the resources. The second type of arrangement can be made between a person with a plough and oxen but no labour and one who has none of these but plenty of labour. The latter can exchange his labour for use-rights of the plough. Finally, a farmer can be loaned the plough for a fee or free of charge for a day or two or a couple of days. The households that loan each other these items are linked together by different loyalties. Sometimes these are blood or marriage relationships; sometimes the farmers are members of the same women group, church

group, funeral group, ethnic grouping or just good neighbours. As in water management, new relationships are formed to utilize the available resources.

A comparison of the treatment and control samples shows that the differentiation in household durables ownership in the two groups is not particularly remarkable but it is evident. Differentiation is evident mainly in lighting, cooking and transport technology. The items that show a difference of about six percent or more in ownership (percentage of households that own them in both samples) are hurricane lamps, beds, charcoal stoves, wardrobes, grinding (*posho*) mills, wheelbarrows, bicycles and ox-carts. In all the named items, the treatment group shows a higher percentage of ownership. It may be argued that the stimulus sample possesses more bicycles, wheelbarrows and ox-carts because they need them more than the control group (for daily transportation of their produce). The control group needs transportation for the sale of their produce only occasionally - usually at the end of the harvesting season. Their crops can be harvested, processed and stored to be sold conveniently in bulk (the crops are mainly cereals and legumes). Transport can therefore be arranged once every season. The farmers in the control group who do not wish to sell their produce all at once can sell small proportions at a time depending on their needs. This is what most of them do as they are mainly subsistence farmers who generally sell their produce only to buy other items necessary for their subsistence. Such

proportions are easy to carry with *syondo* (sing. *kyondo*) - traditional baskets carried by women on the back (subsistence produce is mainly sold by women as was explained in the last chapter). The treatment sample also has a small percentage of respondents that own some items that none of the control sample has, namely, gas cookers, tractors and televisions. Wardrobes are seen as items of luxury that only those who have much income to spare can buy. The items with negligible differential ownership in the two groups are vehicles, ox-ploughs, motorbikes and sofa sets. There are only two items of the consumer durables that are possessed by a higher percentage of the control group than the treatment group, viz, watertanks and cassette players. In short, although the differentiation is not particularly pronounced, household durables show a higher socio-economic differentiation than shelter suggesting that agricultural income is probably spent more on household durables than shelter. The distinction is not, however, commensurate with the income differentiation in the two samples.

6.2.3 Livestock

Though the younger generation in the population does not generally think livestock is necessarily a measure of a person's wealth, the older generation are unequivocal about its validity. Since the age distribution is wide, it was found necessary to include livestock to cater for individual preferences in wealth acquisition. Moreover,

small stock in the area contribute to the food and diet of young children as recorded later in the chapter. In this way, they have a positive impact on the nutrition of the people. Also, while cows are important mainly for procreation (increasing in numbers and therefore giving a higher chance of greater income after sales) and milk, oxen are important for ploughing. Besides, most of the respondents express the opinion that livestock come in handy in times of shortage of money, for example, for school fees.

Table 6.8 gives a record of livestock ownership in the two samples. Again, little difference is exhibited by the two samples except where improved cattle are concerned. Irrigation makes it more convenient to grow animal feed. It also makes it possible for six out of the nine respondents who own mixed-breed cattle to accumulate enough income to buy them (see Table 6.9). Since none of the households in the control sample has improved livestock, it is clear that those households that irrigate have a higher chance of owning mixed-breed cattle.

Table 6.8. Livestock Ownership N=106(T),50(C)

Type of Livestock	Households		Percent	
	T	C	T	C
Poultry	100	46	94.3	92
Goats	81	40	76.4	80
Indigenous Cattle	78	37	73.6	74
Sheep	34	19	32.1	38
Improved Cattle	9	0	8.5	0
Donkeys	1	0	0.9	0

T= Treatment group. C= control group

Table 6.9. Sources of Income for Buying Livestock Treatment Group (N=106)

Income Source	IM/Cattle	I/Cattle	Goat	Sheep	Poultry
Agriculture (Hhs.)	6.0	36.0	51.0	24.0	82.0
(Valid %)	66.7	46.2	62.9	70.6	82.0
Inherited (Hhs.)	1.0	15.0	5.0	3.0	0
(Valid %)	11.1	19.2	6.2	8.8	0
Agriculture (Hhs.)	0	2.0	2.0	0	0
& Inherited(Valid %)	0	2.6	2.5	0	0
Agriculture (Hhs.)	1.0	5.0	5.0	0	0
& Other (Valid %)	11.1	6.4	6.2	0	0
Other (Hhs.)	1.0	20.0	18.0	7.0	18.0
(Valid %)	11.1	25.6	22.2	20.6	18.0
Total Owners (Hhs.)	*9*	*78*	*81*	*34*	*100*
Total %	*100*	*100*	*100*	*100*	*100*
Control Group (N=50)					
Agriculture (Hhs.)	0	11.0	12.0	6.0	24.0
(Valid %)	0	29.7	30.0	31.6	52.2
Inherited (Hhs.)	0	1.0	2.0	1.0	0
(Valid %)	0	2.7	5.0	5.3	0
Agriculture (Hhs.)	0	1.0	1.0	1.0	0
& Inherited(Valid %)	0	2.7	2.5	5.3	0
Agriculture (Hhs.)	0	0	1.0	0	0
& Other (Valid %)	0	0	2.5	0	0
Other (Hhs.)	0	24.0	24.0	11.0	22.0
(Valid %)	0	64.9	60.0	57.8	47.8
Total Owners(Hhs.)	*0*	*37*	*40*	*19*	*46*
Total %	*0*	*100*	*100*	*100*	*100*

Key: Hhs = households

Indigenous livestock keeping may be viewed as a way of burdening the farmer rather than enhancing his standards of living. Often, livestock make a lot of demands on the time of the farmer with seemingly very little economic value. The traditional mode of rearing livestock requires the farmer to take them to the grazing

fields and look after them the whole day without counting the opportunity cost. In harsh conditions, calving is less frequent and therefore not only reproduction but also milk constraints are experienced. Besides, livestock in some communities in Africa have been kept for sentimental reasons or as status enhancing symbols rather than to promote better nutrition or economic standing (see, for example, Harden 1990:137) . Though this study does not underestimate the role of perceived status in enhancing self esteem, it feels an examination of the use of livestock to the farmer in Yatta is justifiable in a bid to establish whether livestock boost the living standards of the people in any way.

The uses of livestock are given in Tables 6.10 a-c. The tables show a multiplicity of livestock uses. For a number of farmers, livestock are some form of security that is turned to when hardship knocks on the door: they are sold to offset heavy school deficits and emergencies like sickness or food shortage. Small stock (especially chicken) are eaten especially when farmers have visitors and this occasionally supplements the diet and insures against further expenses, e.g., buying meat from the shops. The farmers' diet is further supplemented by rabbits and domestic doves that are kept by many households. Rabbits and doves are exchanged for chickens in friendly gestures.

Though the figures give the impression that the farmers slaughter and sell their stock often, this is not at all the case. Further informal interviews established

that sheep, goats and cattle are hardly ever slaughtered; only when there is a big occasion such as a son's wedding or large group of visitors can this be done. Not being able to always pay for tractor services, the farmers rely a lot on their oxen for breaking land, planting and occasionally weeding. Also, an examination of the use to which livestock is put exposes a changing trend in favour of paying goats as bridewealth rather than cattle that were the main animals of transaction in the traditional society. Cash is also increasingly becoming a more convenient item of transaction than animals.

Table 6.10a. Livestock use N=106(T), 50(C)

Use	Indigenous Cattle Hhs.		Valid %		Improved Cattle Hhs.		Valid %	
	T	C	T	C	T	C	T	C
Milk	1	0	1.3	0	4	0	44.5	0
Sale	6	0	7.7	0	1	0	11.1	0
Ploughing	12	3	15.4	8.1	0	0	0	0
Milk & sale	0	0	0	0	2	0	22.2	0
Milk & manure	2	0	2.6	0	2	0	22.2	0
Milk & meat	0	2	0	5.4	0	0	0	0
Milk, sale & ploughing	19	9	24.3	24.3	0	0	0	0
Milk & ploughing	5	0	6.4	0	0	0	0	0
Milk, sale, bride wealth & Ploughing	2	0	2.6	0	0	0	0	0
Milk, sale, bride wealth, ploughing & prestige	1	0	1.3	0	0	0	0	0
*Other combination	30	23	38.4	62.2	0	0	0	0
Total	*78*	*37*	*100*	*100*	*9*	*0*	*100*	*0*

**Usually milk, sale, ploughing, meat & manure.*
Hhs.= Households

Table 6.10b. Livestock use N=106(T), 50(C)

Use	Sheep				Goats			
	Households		Valid %		Households		Valid %	
	T	C	T	C	T	C	T	C
Meat	0	0	0	0	2	0	2.5	0
Sale	6	0	17.6	0	9	0	11.1	0
Meat & sale	18	10	53	52.6	30	6	37.0	15
Milk & sale	0	0	0	0	4	2	4.9	5
Milk & manure	0	0	0	0	0	2	0	5
*Other combination	10	9	29.4	47.4	36	30	44.5	75
Total	*34*	*19*	*100*	*100*	*81*	*40*	*100*	*100*

**For goat, usually, meat, sale, milk and occasionally bridewealth; for sheep meat, sale and manure.*

Table 6.10c. Livestock Use N=106(T), 50(C)
Poultry

Use	Households		Valid Percent	
	T	C	T	C
Meat	4	0	4	0
Eggs	16	5	16	10.9
Meat & sale	18	0	18	0
Meat, eggs & sale	62	41	62	89.1
Total	*100*	*46*	*100*	*100*

6.2.4 Differentiation in Living Standards

Like livestock, certain items in the material inventory may appeal more to certain categories of households or members of households depending on their functional, aesthetic and status values. The aesthetic and status values may depend on variables such as age and sex. Some items of material culture may also have gender-specific functions and therefore preference. To control for difference in interests in the households, it is necessary to examine the totality of all the variables

taken into consideration: housing, animal wealth and consumer durables. Assessment of all wealth indices across the households in the study gives us a picture of the general living standards of the sample households as opposed to the specific distribution of particular items of wealth. Both approaches to the examination of wealth in the samples are important: while the latter informs us what kind of wealth we are talking about and its distribution in the cross-section of households, the former gives us some sort of summary of all the wealth for the different households.

To get a summary of the wealth distribution, scores are awarded to each of the items possessed and the total score is taken into consideration with the total scores of the other households. Though items of better value are generally given higher scores, there is some amount of arbitrariness in the awarding of the scores as the scores given are not exactly the equivalent value in a market situation relative to the market value of the other items. This is an error that is difficult to avoid; even the market value of many items is largely arbitrary.

Since the assessment already done in the chapter does not give us the quantity distribution, that is, how many items of each item are possessed by each household, the score awarding approach fills this gap. The scores are awarded as shown in Table 6.11.

Table 6.11 Scores of Standard-of-living Indices.

Index	Scores
Shelter	
Roofing Materials:	
Tiles	2
Corrugated Iron	1
Thatch	0
Walls:	
Blocks	2
Bricks	1
Mud	0
Floor:	
Cement	1
Earth	0
size:	
For Each Room	1
For Each Window	1
Household Durables	
Torch	1
Tractor	3
Car or Lorry	3
Television	3
All Other Items	2
Livestock	
Improved Cattle	4
Indigenous Cattle	3
Goats	2
Sheep	2
Donkey	2
Poultry	1

Figures 6.1 and 6.2 give a visual impression of the distribution of household scores in the two samples. Scores are grouped together (every 10) to facilitate the impression.

FIGURE 6.1 HOUSEHOLD SCORES
Treatment Sample

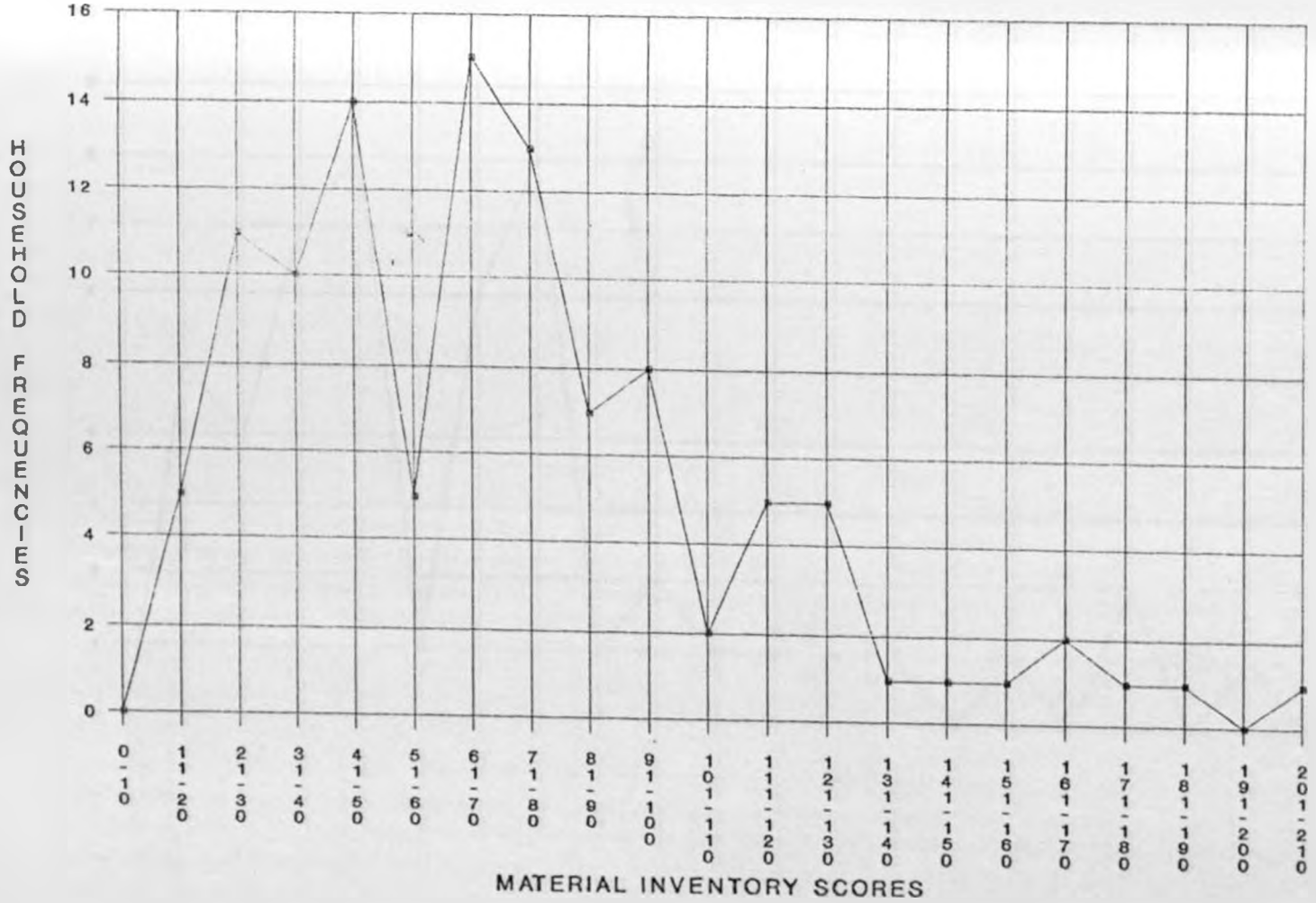
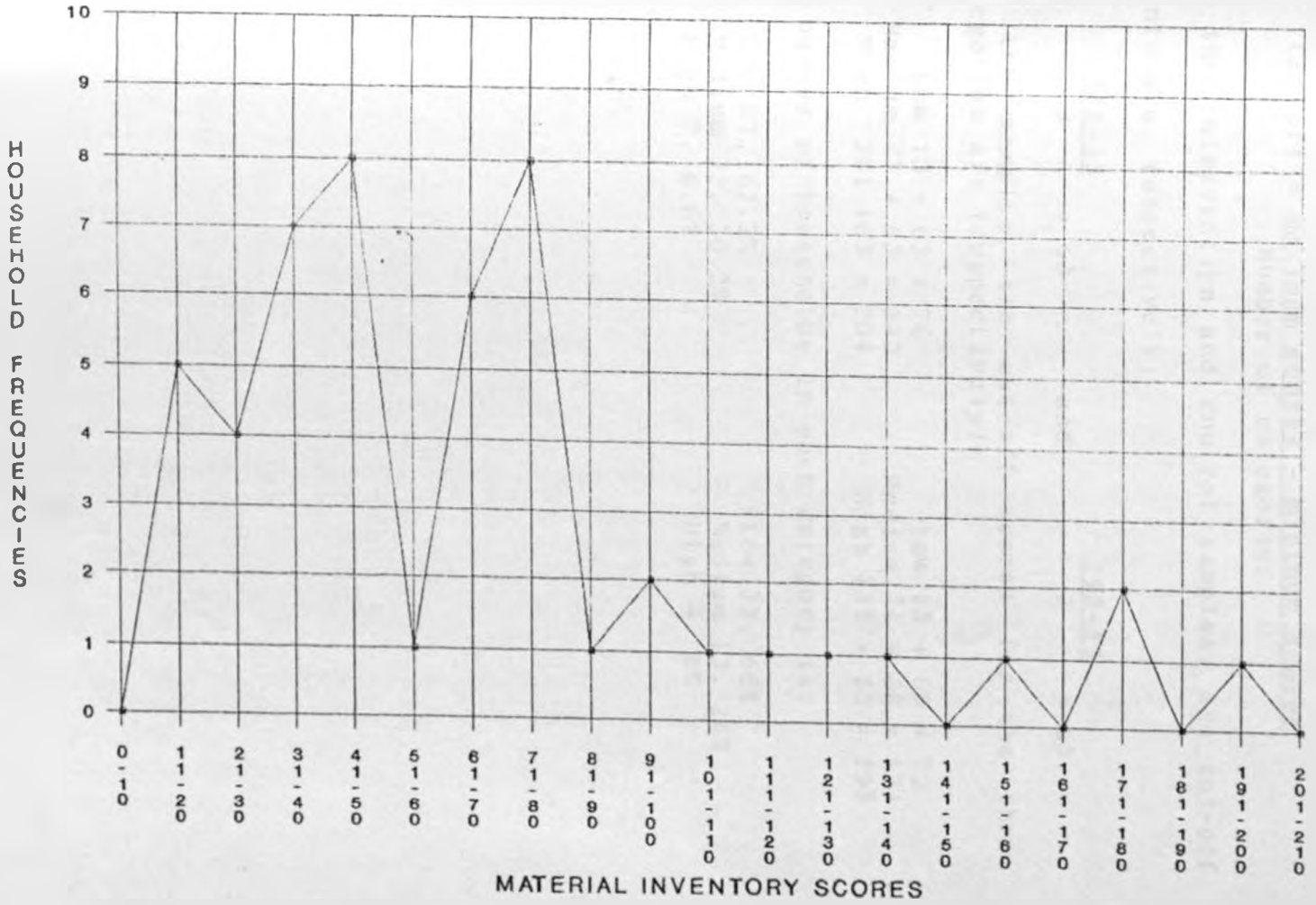


FIGURE 6.2 HOUSEHOLD SCORES
Control Sample



Tables 6.12 and 6.13 give the total scores for each sample household. To get differentiation into three categories of standards of living (high, medium and low), the following formula has been used:

$$\text{Cut-off} = \frac{\text{maximum scores - minimum scores}}{\text{Number of categories}}$$

For the intervention and control samples, the cut-off points are, respectively:

$$\frac{203-13}{3} = 63 \quad \text{and} \quad \frac{195-13}{3} = 60.$$

For the samples, the cut-off scores for the three categories are (respectively):

Low 13 + 63 = 76	Low 13 + 60 = 73
Medium 77 + 63 = 140	Medium 74 + 60 = 134
High 141 +63 = 204	High 135 + 60 = 195

The number of households in each category is:

Low 67, 63.2%	Low 33, 66%
Medium 32, 30.2%	Medium 13, 26%
High 7, 6.6%	High 4, 8%

Table 6.12 Distribution of the Standard-of-Living Scores: Treatment Sample (N=106)

Scores	No.Hhs.	Percentage	Scores	No.Hhs.	Percentage
13	1	0.9	69	3	2.8
16	1	0.9	72	1	0.9
18	1	0.9	73	1	0.9
19	2	1.9	74	2	1.9
21	1	0.9	75	4	3.8
23	1	0.9	77	2	1.9
24	3	2.8	79	1	0.9
25	2	1.9	80	2	1.9
27	1	0.9	81	1	0.9
28	2	1.9	82	1	0.9
29	1	0.9	86	1	0.9
32	2	1.9	87	3	2.8
33	1	0.9	89	1	0.9
34	1	0.9	94	4	3.8
36	1	0.9	95	1	0.9
37	3	2.8	97	1	0.9
39	2	1.9	99	2	1.9
42	1	0.9	101	1	0.9
43	2	1.9	102	1	0.9
45	2	1.9	111	1	0.9
46	2	1.9	113	1	0.9
47	2	1.9	116	1	0.9
48	2	1.9	117	1	0.9
49	2	1.9	119	1	0.9
50	1	0.9	121	1	0.9
51	1	0.9	122	1	0.9
52	1	0.9	123	1	0.9
55	1	0.9	125	1	0.9
57	1	0.9	130	1	0.9
61	1	0.9	142	1	0.9
63	3	2.8	151	1	0.9
64	2	1.9	167	1	0.9
65	2	1.9	168	1	0.9
66	1	0.9	173	1	0.9
67	1	0.9	187	1	0.9
68	2	1.9	203	1	0.9

Key: No. Hhs.= Number of Households.

Mean = 70.830

Median = 66.500

Mode = 75 & 94

Table 6.13 Distribution of the Standard-of-Living Scores: Control Sample (N=50)

Scores	No.Hhs.	Percentage	Scores	No.Hhs.	Percentage
13	2	4.0	67	2	4.0
17	2	4.0	69	1	2.0
19	1	2.0	71	1	2.0
24	1	2.0	72	1	2.0
25	1	2.0	75	1	2.0
26	1	2.0	76	1	2.0
30	1	2.0	79	3	6.0
32	1	2.0	80	1	2.0
33	1	2.0	89	1	2.0
35	2	4.0	92	1	2.0
36	1	2.0	94	1	2.0
37	2	4.0	109	1	2.0
43	2	4.0	111	1	2.0
44	3	6.0	122	1	2.0
45	1	2.0	134	1	2.0
49	1	2.0	152	1	2.0
50	1	2.0	176	1	2.0
54	1	2.0	180	1	2.0
61	1	2.0	195	1	2.0
66	2	4.0			

Key: No. Hhs.= Number of Households

Mean = 66.120

Median = 57.500

Mode = 44 & 79

An examination of the measures of central tendency given for the two samples (see Tables 6.12 and 6.13) reflects little difference in the living standards of the two groups. Nevertheless the treatment sample has a generally higher standard of living compared to the control sample. For both samples, there is a high percentage of households in the "low standard of living" group. Both samples have their lowest score as 13. This is quite a low score considering that what this means in more practical terms is that the household could have a two roomed house, thatched, and with a floor made of

earth, one window, a torch, a hurricane lamp, an iron bed, a wheelbarrow and three chickens.

Cross-tabulations indicate that the scores, like the sizes of houses and their materials of construction, do not have a strong association with the income earned from agriculture. In fact, the correlation coefficient (Pearson's r) for income and scores obtained is 0.1143. This further reinforces the suggestion that income is not a good index of measuring living standards or socio-economic standing as it is difficult to elicit reliable responses where it (income) is concerned.

To ascertain how much irrigated agricultural income has been spent on improving the living standards of the farmers, an assessment of the sources of income for purchasing the different household durables and livestock has been done. This complements the respondents' responses about their general spending patterns that have been recorded in Table 6.2. Since it is more specific, it gives a better approximation of spending patterns in the samples. The details of the findings are given in Tables 6.9 and 6.14. The tables throw some light on the puzzle of irrigated agricultural spending. Clearly, the treatment sample gets the bulk of its income for purchasing household durables and stock from agricultural income. The only exceptions are pressure lamps, iron beds, water tanks, wardrobes, gas cookers, sofa sets and motorbikes which are purchased mainly with "other income". "Other income" mostly refers to income accrued from some business, salaried or wage labour. With

reference to stock. we may add other possibilities namely bridewealth or gifts even though these are rare except for poultry or goats, with the latter given as gifts or token to only special friends especially if they have done one a great favour (such as getting employment for one's son or daughter). On the other hand, the control sample gets the bulk of its income for buying household durables and stock from "other income". The only exception is poultry: 52% of the households get the income for purchasing poultry from agriculture.

Table 6.14 Sources of Income for Buying Household Durables N=106(T), 50(C)

	Agricultural Income				Other Income				Agriculture & Other				Total Hhs Owning	
	Households		Valid%		Households		Valid%		Households		Valid%			
Item	T	C	T	C	T	C	T	C	T	C	T	C	T	C
Torch	70	14	68	30.4	28	31	27.2	67.4	5	1	4.8	2.2	103	46
Charcoal stove	67	13	74	35.1	23	24	26	64.9	0	0	0	0	90	37
Hurricane lamp	58	16	66.7	44.4	25	19	28.7	52.8	4	1	4.6	2.8	87	36
Radio	47	13	54	33.3	36	26	41.4	66.7	4	0	4.6	0	87	39
Wheel-barrow	39	1	68.4	11	18	7	31.6	78	0	1	0	11	57	9
Bicycle	34	5	60	33.3	23	10	40	66.7	0	0	0	0	57	15
Ox-cart	26	3	70.3	33.3	11	6	29.7	66.7	0	0	0	0	37	9
Iron bed	23	3	42.6	13.6	31	19	57.4	86.4	0	0	0	0	54	22
Ox-plough	22	2	55	12.5	18	14	45	87.5	0	0	0	0	40	16
Pressure stove	21	2	51.2	11.8	18	15	44	88.2	2	0	4.8	0	41	17
Cassette player	16	2	66.7	12.5	7	14	29.2	87.5	7	0	4.1	0	24	16
Sofa set	9	3	39.1	30	14	7	60.9	70	0	0	0	0	23	10
Wardrobe	8	2	42.1	50	11	2	57.9	50	0	0	0	0	19	4
Grinding mill	8	0	57.1	0	6	1	42.9	100	0	0	0	0	14	1
Record player	7	0	77.8	0	2	2	22.2	66.7	0	1	0	33.3	9	3
Water tank	3	3	27.3	37.5	5	5	45.5	62.5	3	0	27.2	0	11	8
Sewing machine	3	0	60	0	2	1	40	100	0	0	0	0	5	1
Tractor	3	0	100	0	0	0	0	0	0	0	0	0	3	0
Motor-vehicle	2	0	66.7	0	1	0	33.3	0	0	1	0	100	3	1
Gas cooker	1	0	33.3	0	2	0	66.7	0	0	0	0	0	3	0
Pressure lamp	1	0	16.7	0	5	1	83.3	100	0	0	0	0	6	1
Television	1	0	50	0	1	0	50	0	0	0	0	0	2	0
Motorbike	0	0	0	0	2	1	100	100	0	0	0	0	2	1

A further observation is that the households in both samples do not generally use a combination of agricultural income and "other income" for the purchase of their items: often it is either agricultural income or "other income" and the treatment sample uses mainly the former while the control uses the latter. Thus, though the samples do not have exactly pronounced differences in their living standards according to the parameters I have already examined, they actually have different sources of the income used to purchase these items. This observation further suggests that one sample must be engaged more in agriculture or finds agriculture more lucrative than other employment while the other is more engaged in "other income" sources or finds "other income" sources more lucrative. This makes sense considering that one group has a water resource for agricultural production while the other does not.

Out of the intervention sample, only 22.6% of the households have members of the households in casual employment (wage labour) compared to 40% in the control group and only 46.2% of the households have household members in more permanent employment (salaried employment) compared to 58% in the control group. 55.7% of the male spouses in the treatment group are in farming only compared to 48% in the control; the female spouses are 93.4% for the treatment sample compared to 86% for control. The figures suggest that since farmers in the irrigated zone can be fruitfully engaged in agricultural production on their own farms, they have less desire to

look for alternative employment than those in dry-land farming. For the latter, agricultural production has more risks and therefore alternative employment is sought to offset the impact of the risks. Predictably, there is less out-migration to urban centres in the treatment sample: 82 (77.4%) of the spouses in the treatment sample live in the same compound, on their household farms, compared to 27 (54%) in the control group. The majority of them are employed on their farms only. One of the aims of rural projects is to make life in the rural areas more meaningful to the rural population in a bid to minimise rural-to-urban migration. Irrigation in Yatta is achieving this objective.

The number of spouses living together in the treatment sample is a pointer to relatively stable families as opposed to other accounts of irrigation projects that have disrupted family unions and occasionally led to desertion of husbands by their wives (Rogers 1980; Hanger and Morris 1973). Yatta irrigation is possibly different in this respect because family concerns seem to be better catered for in farmer-organised irrigation units like Yatta (and Marakwet, Ssenyonga 1983; Northern Kenya, Little n.d; and Taita, Fleuret 1985) as opposed to government-organised ones. Gender-specific interests, for example, in growing particular types of crops can be more easily taken care of at family levels. Matters of conflict arising from housing different age-sects or contact-prohibited relationship members in the same house have been noted

in some irrigation schemes (see Muga 1969; Hanger and Morris 1973). These do not arise in Yatta in particular and are not likely to arise in farmer-organised schemes in general as building arrangements are executed by each farmer according to his needs. Such socio-cultural aspects are not at all to be overlooked as they could mean the difference between success and failure in a scheme.

6.3 Food and Diet

The overall food intake in the area is derived from the combinations eaten as "morning food" (breakfast), "middle-of-the-day food" (lunch) and "evening meal" (supper). Records of whatever foods were found being eaten, if any, were made so as to counter-check the authenticity of the interview responses. The actual foods (such as maize and beans) were recorded, but later these were grouped into categories: proteins, carbohydrates and vitamin groupings. Table 6.15 presents the results of the responses given. Though most foods contain some amounts of proteins, carbohydrates and vitamins, food categories were made taking into consideration their major nutritive values with the aim of focusing on overall adequacy in energy and protein. Mostly, the foods eaten for lunch and supper are maize and beans, plus (occasionally) any of the vegetables grown for home consumption which include cowpea leaves, pumpkin leaves and less frequently *sukuma wiki* (kale).

The population is also making attempts to adopt the new vegetables mentioned in Chapter 5. The most successful ones in terms of ease of adoption are french beans and eggplant. Many households also occasionally eat fruits during lunch break, especially the men and children while waiting for the women to finish cooking. This may suggest a biased fruit intake based on gender lines, but most likely this is compensated for as fruits are picked and eaten as snacks by all sexes at any time of the day depending on one's wishes. The most popular fruits are pawpaws which are plentiful. Guavas are also plentiful, but they are not popular as they are reputed to cause stomach upsets. Oranges and bananas are also popular but they are not plentiful (the list of all fruits eaten is given along with the other crops in appendix B).

Table 6.15 Food Intake in the Samples N=106(T), 50(C)

	Morning meal (Breakfast)				Middle-of-day meal (Lunch)				Evening meal (Supper)			
	Hhs.		Percent		Hhs.		Percent		Hhs.		Percent	
	T	C	T	C	T	C	T	C	T	C	T	C
Carbohydrates	1	1	0.9	2	0	0	0	0	1	0	0.9	0
Proteins	0	0	0	0	0	0	0	0	0	0	0	0
Vitamins	0	0	0	0	0	0	0	0	0	0	0	0
Carbohydrates & Proteins	87	41	82.1	82	0	1	0	2	1	1	0.9	2
Carbohydrates & Vitamins	1	1	0.9	2	0	0	0	0	3	1	2.9	2
Proteins & Vitamins	0	0	0	0	0	0	0	0	0	0	0	0
Carbohydrates, Proteins & Vitamins	12	6	11.4	12	103	48	97.2	96	96	47	90.6	94
None	5	1	4.7	2	3	1	2.8	2	5	1	4.7	2
Total	*106*	*50*	*100*	*100*	*106*	*50*	*100*	*100*	*106*	*50*	*100*	*100*

Key: T= Treatment. C= Control. Hhs.= Households.

The quality of breakfast is not poor but it is less nourishing than the middle-of-the-day and evening meals. Though 82.1% of the households have carbohydrates and proteins, the protein intake appears inadequate especially for adults. The main source of protein is milk in tea for adults and porridge (with milk) for children. Sweet potatoes and arrow roots are eaten with fresh or fermented milk but more often with tea. Since there is not enough milk to go round, children are given priority in milk intake and the tea either gets very little milk or is simply *chai rangi* (black tea). Adults also take porridge, but while children have more milk added to their porridge, adults have very little or none at all. A study done in the neighbouring Kitui district has shown a similar trend: children are given priority in food consumption in times of food shortage (Akong'a 1988:111). Though porridge made from finger millet flour is preferred for children, many households have to content with maize, as millet is grown by only a few farmers and is therefore expensive. Farmers say it requires too much labour.

The records reflect negligible difference in food intake in households in dry land and irrigated zone. An explanation for this could be the fact that the main foods eaten are the traditional foods for both the Akamba and Agikuyu. They are grown by both the intervention and control samples. Indeed, 99% of the intervention sample households and 98% of the control say they eat mainly foods grown in their *shamba*. (Additives are purchased

by all the households when they can afford them). The only difference is that seasonality affects the availability of vegetables in the control sample. This does not, however, hit the control population hard as they have learnt to live in a sort of symbiotic relationship with their irrigating neighbours in as far as food consumption is concerned.[3] They can pick (with permission) cow pea and pumpkin leaves from their neighbours' plots without a fee. The two types of vegetables are still grown mainly for consumption and to sell them especially to neighbours is actually considered as either being too desperate or stretching the limits of greed too far. The farmers, anyway, prefer selling the more lucrative vegetables mentioned in the last chapter.

Frequency of food intake in the sample does not illustrate such an impressive record. Two thirds (2/3) of the treatment group concede they sometimes miss a meal, usually lunch, due to overwork especially during harvesting. By the time they are through with the daily routine it is already 3 or 4 o'clock so they either will have lunch then or decide to wait a little while for the evening meal. Frequently, they content themselves with a snack (a fruit, a sweet potato, a piece of arrow root or a bun and cup of tea) and wait for the evening meal. Contrary to this, about 2/3 of the respondents in the control group say they do not miss any meals. In this

[3] In this respect, the control group is not ideal but the advantages of having such a control group outweigh the disadvantages, as pointed out in "methodology".

respect their food intake is generally more regular and their meal times are better planned. In focused interviews, it was established that the control group can spare more time for their mid-day-break meal preparation than the stimulus sample. Indeed, while one of the objectives of the implementation of the irrigation was introducing labour-intensive cropping to raise employment opportunities for the local people (TRDA 1978:14), it is ironic that many respondents complain that very little time can be spared for lunch preparation or leisure or visiting relatives who live outside the irrigation zone. In this respect, the intervention sample is more likely to suffer from undernourishment than the control.

To get a clearer grasp of the types of food eaten by the sample households, if any members of the households were found eating, the type of food eaten was recorded. Only a few households were found eating (33,31.1%). In 20 households, young females (under 14 years) were found eating; in 10 households adult females were; in 13, males under 14 years and in 13 others adult males were (all from 33 households). Food seems to reach every age and sex fairly equally except that in most of the households (in 20 households) female children were found eating while only in 13 households were the male ones eating. All the 33 households had both male and female children. This suggests a bias in food intake in favour of female children.

Though the respondents found eating were only a small fraction of the samples, the record of what they

were found eating seems to suggest that the combination of carbohydrates plus proteins are the foods that are eaten most frequently, not proteins plus carbohydrates plus vitamins as pointed out by the respondents (cf. Table 6.15 with 6.16, lunch and supper). This may indeed be so, but the evidence of vitamins (only) and vitamins plus carbohydrates intake (Table 6.16) suggests that vitamins are occasionally available in the diet of some households.

Table 6.16 Random Checks of Food Intake N=106(T), 50(C)

	Households		Percent		Valid%	
	T	C	T	C	T	C
Carbohydrates	8	2	7.6	4	24.2	16.7
Proteins	0	1	0	2	0	8.3
Vitamins	5	1	4.7	2	15.2	8.3
Carbohydrates & Proteins	12	5	11.3	10	36.3	41.7
Carbohydrates & Vitamins	5	2	4.7	4	15.2	16.7
Proteins & Vitamins	0	0	0	0	0	0
Carbohydrates, Proteins & Vitamins	3	1	2.8	2	9.1	8.3
None	73	38	68.9	76	68.9	76
Total	*106*	*50*	*100*	*100*		

Key: T= Treatment, C= Control

In addition to the above regular foods, people occasionally eat other foods that are not necessarily more nutritious, such as *chapati*, rice, meat. They are

available mainly on purchase arrangements and cannot therefore be eaten regularly by the majority of the households. Chickens are periodically slaughtered and their eggs are generally given to young children, thus augmenting their protein intake. Domestic rabbits and doves are occasionally eaten by some households as stated in the beginning of the chapter.

The ailments that are reported as frequent by the respondents in their households are coughs and colds (flu), headache and malaria.[4] About 2/3 of the households that reported frequency of ailments, said ailments were more frequent in children (under 14 year-olds) while 1/3 said it was mainly the adult members who were afflicted. Two respondents said that they had cases of child malnutrition (kwashiorkor) in their households. Though the aim was to get a general idea of the extent of malnutrition, it is likely that there were more cases, as respondents were not always able to diagnose and children were generally unavailable for observation since they were in school. Records made available by health officials in Matuu health centre and Ndalani dispensary in the study area showed the cases of child malnutrition shown in Table 6.17 during the indicated months in 1990.

[4] Malaria is, most likely, less frequent than perceived since in the local area (and generally), malaria and more general "fevers" cannot be easily distinguished.

Table 6.17: Child Malnutrition in Matuu and Ndalani

1990	Matuu Health Centre	Ndalani Dispensary
Jan	12	7
Feb	11	12
Mar	4	8
Apr	3	9

The cases cited were mainly of kwashiorkor, marasmic and under-weight children. This may not reflect the actual cases of undernourished children in the study area as these were only cases that were brought forward for treatment but health officials felt that malnutrition was not an outstanding problem; it was present but not rampant.

6.4 The Multi-dimensional Development Approach in the Assessment of Living Standards

The chapter has looked at the impact of irrigation on income, housing, household durables, livestock ownership, food intake and diet, frequency of illness and employment. It was established that the effect of seasonality on food availability has been controlled for by irrigation and therefore most farmers are assured of getting enough harvest at least for their home consumption. Indeed, they have added more vegetables and fruits in their diet which was difficult to achieve during dryland farming. This is no mean achievement considering the past threat of hunger not only in the area but in most of the district (Kliest 1985).

Irrigation, employment (even on own farms) and the concomitant incomes have put to an end dependence on famine relief handouts, thus enhancing the self-esteem and enthusiasm of farmers. In a study done in Kitui District that borders the study area, drought and famine were found to cause apathy (Akong'a 1988).

The local farmers have been involved a great deal in the implementation of the irrigation. Indeed, they deal with their own day-to-day problems related to water-management using similar institutions to those used to solve other disputes. They have therefore managed to identify well with the project. All these are facets of assessment of living standards that are important in the multi-dimensional development sense. Todaro (1982), for example, sees improving living standards of a people as not simply providing change but alleviating poverty by increasing the availability and widening the distribution of food, shelter and health, providing more jobs, better education and higher incomes to enhance individual self-esteem and minimising dependence and therefore increasing individual choice (Todaro 1982:98). Similar variables are seen as important by Mbithi and Barnes (1975:97). The approach is in favour of a holistic method of measuring living standards which has also been recommended by scholars of rural development (e.g., Chambers 1978:393) in the assessment of irrigation projects. Though various variables have been considered, not all water benefits have been quantitatively examined, as Carruther's opinion (1973:26) that translating water

investments into economic units presents conceptual and empirical problems is quite legitimate.

In view of what the chapter examined, it is not possible to conclude that a farmer's agricultural income determines the standards of living of the members of the household. The respondents with a higher income (within the group) do not necessarily live in better houses than those with less, neither do they necessarily have more valuable household durables or better food intake. However, all respondents with improved cattle have higher incomes than most of the other farmers. Income does not correlate highly with the scores for the farmers' possessions (Pearson's r = 0.1143), nor does it correlate highly with food taken for supper or breakfast (Pearson's r = 0.0452 and -0.0470, respectively).

Income is spent in many ways that benefit all the members of the household contrary to what the study had envisaged before research: that women and children would be disadvantaged. Standards of living in the area are determined by various variables some of which are income earned from wage or salaried employment, consumption patterns and possibly education. Agricultural income has a positive impact on the standards of living but it does not determine them. Thus, the hypothesis that "Agricultural income does not determine the living standards of the members of the household" has been validated by this study. Though during hypothesising, it was felt that women and children are not likely to reap from agriculture as much as the male members of the

households, as studies done elsewhere have pointed out (see, e.g., Rogers 1980: ILO 1981 and Hanger and Morris 1973 in Literature Review), there is no suggestion that women and children have any special constraints as a result of irrigation. Agricultural labour, for example, is a great constraint but to both men and women. Evidence is available that not all members of the households have similar spending priorities but most of the households assert they are comfortable with the spending patterns in their households. If there are members who sometimes go on spending sprees, respondents explain, these are just a few irresponsible exceptions. Thus, the hypothesis was validated, not on the basis of differential access to agricultural benefits, but because some farmers with a low agricultural income live better than others with much more. Thus, though irrigation income has a positive impact on living standards, its association with the standards is not a linear one; it does not always determine whether a farmer will have low or high living standards.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

One of the objectives of the study was to examine the relationship between the management of water-use and socio-cultural institutions. Modern socio-cultural systems as well as indigenous institutions were examined. One of the findings of this study is that both of these institutions have been blended in the running of Yatta irrigation. The importance of tapping local management systems is that the people do not have to adjust to unfamiliar rules and regulations. The implication of this is that the organization of water-use does not present the stress that is associated with adjusting to fit into new bureaucracies.

Clans in the irrigation zone cannot be functional in the same way as they were prior to the settlement because, as pointed out earlier, only segments of families have migrated on their own. The population, thus, selects elders, not according to clan groupings but according to physical habitat in relation to water furrows and then age, wisdom and good general behaviour in the community. This is an adaptation to the new environment in which social organization based on clan principles would be impractical.

The relative autonomy of the farmers in making the decisions concerning water-use and choice of cropping reinforces the farmers' sense of ownership of the

irrigation project and also leaves room for individual family choice and priorities. This partly explains the relative success of the small-scale irrigation projects compared to the bigger and usually immensely bureaucratic ones. In this respect, the study's findings are similar to Fleuret's (1985) and Ssenyonga's (1983). Aspects of concern in large scale schemes have been documented by Chambers (1973), Muga (1969), Brain (1976) and Bromley (1982), among other scholars. Large scale irrigation administration could learn a lot from small-scale irrigation administration and organization like that found in Yatta.

Gender roles in Yatta irrigation have been modified in certain tasks to adjust to the scarce labour resources. Tasks that have been formerly mainly for women (harvesting and weeding) are performed by both men and women. This is contrary to the findings of studies done elsewhere that submit that, if the division of labour in agriculture is modified, it is the women who acquire tasks that are men's (Spring 1988; Henn 1984). However, while men participate more fully in cash cropping, women are engaged in both cash cropping and food cropping. Consequently, women perform a lot of work as they have also to perform their domestic chores. This concurs with other studies that have found that women's labour has been particularly increased by agricultural development projects (Rogers 1980; Spring 1988, 1990; Henn op.cit.) The findings of this study differ with Kangangi's(1982) which point out that women in Kibirigwi irrigation only

participate in cash cropping after they have attended to their food crops.

Increase in women's labour in Yatta does not, however, suggest that the men are idle. Indeed, the study found that irrigation has generated increased labour demands on both men and women. It further found out that the tasks where traditional labour division has been modified are the ones with the heaviest work demand. This is an example of adaptation of culture to the exigencies of life situations. The modification, though evident in food-cropping, is more pronounced in cash cropping. Innovation in technology is also more likely to take place in cash cropping (sweet potatoes for sale are planted and weeded using the plough, while the hoe and particularly the *panga* is used in potato gardens cultivated for home consumption). Though sweet potatoes were traditionally a women's crop, they are no longer perceived as such. We can conclude that men are likely to show enthusiasm for any crop, provided its status is or changes to be "cash crop". Technological innovation in food cropping is an area that requires deliberate attention lest advancement in food cropping lags behind. Low food crop yields would deplete benefits from cash cropping as income from cash crops would be spent on purchasing food items to supplement food supply. Since women participate more than men in food cropping, lack of technological advancement in this area would also mean a lot more labour for women and therefore differential gender benefits. This information could be useful to

development agencies and government institutions wishing to target particular gender groups as participants in and beneficiaries of agricultural projects.

While gender labour division has been marginalised in some tasks in Yatta, it is quite in force in others (see chapter 5). It has been pointed out that division of labour patterns seem to depend on the crops grown, the tasks performed and technology used to perform them, the amount of labour needed to perform them and its availability. Introducing agricultural projects that are low in technology is, again, likely to increase the labour of women (especially if the crops are food crops).

Irrigation has improved the standards of living of many farmers. At the domestic level, women have been spared the drudgery of covering long distances in search of water for household chores. Other irrigation benefits are relatively evenly distributed at the household level, but the gaps are wider in the distribution from farmer to farmer. Only 6.6% of the farmers are in the high standard of living group while 63.2% are in the low-standard and 30.2% are in medium. Success in irrigation farming in Yatta depends on individual enterprise and availability of resources, particularly labour, fertilizer, pesticides and water. Logically, this should imply that the households with other sources of income (that is, other than agriculture) should receive better agricultural income (since they have capital to buy the inputs) and should also rank highly in the standard of living scores. Studies done in various places (see

Fleuret 1990:273 for a complete reference) have found out that households that have other sources of income are generally wealthier and healthier. Since this is not generally the case in Yatta, it seems that members of the household do not necessarily invest their off-farm income in purchasing the items that are used as indices of wealth or enhancing agricultural production. This is not a far-fetched suggestion considering that Makanda (1984) found out that the households with off-farm income were less interested in agricultural production as they had alternative sources of income. It is also likely that (as pointed out in chapter 6) the income figures given by the respondents are unreliable. Other variables do not affect yield (and income) significantly. Correlations of agricultural income with land size, land tenure (based on gender), age, ethnic grouping, education, marital status and non-farm income availability (and therefore greater ability to purchase inputs) are quite low.

Though irrigation has improved the standards of living of the people, agricultural income does not determine the standards. The farmers in the irrigation zone have a higher income generally than the farmers in the control group. Nevertheless some farmers in and outside the irrigation zone have low agricultural income but relatively higher standards of living (than their counterparts with higher agricultural income) when the other indices (and eventually cumulative scores) are considered. This highlights the heterogeneity of the

farmers in terms of access to farming resources, sources of income and entrepreneurial skills. Farmers in Ndalani sub-location are more disadvantaged in terms of water availability and extension services input. A conscious attempt to distribute the services more equitably should therefore be made.

It has been pointed that 77.4% of spouses in the treatment group reside together on their farm compared to 54% in the control group. Many of the spouses in urban centres find it difficult to sustain their families in towns. This necessitates a "split" in the family. The spouse living in the rural area (who nearly always is the woman) has to supplement her partner's income by being involved in rural production - specifically agriculture. This "split" in the family can be seen as a potential threat to the stability of the family. Indeed, only one respondent expressed her desire to stay away from her spouse; all the others expressed their preference to be together but cited mainly economic reasons for their separate residences. The low out-migration figures for the treatment group suggest that if the living standards in the rural areas were improved, many rural populations would prefer living in the rural areas instead of the towns. Thus, pronounced rural-to-urban migration is necessitated not just by the attractive factors in the seemingly glossy town life but also by the repelling factors in the harsh rural conditions. It is, consequently, futile to make policies focusing on theoretical suggestions aimed at encouraging rural

populations to stay in the rural areas without simultaneously making deliberate attempts to improve rural lifestyle.

Though the impression that households are harmonious is given, responses to some of the questions analysed in chapters 5 and 6 suggest that members of the household are not fully in consonance. A high percentage (83%) feels that, not one, but two or more persons in the household should be in charge of agricultural income so that all household members' interests are served. Moreover, only 27.3% of the households involve both spouses in decision-making on cash spending (see chapter 6). The fact that the more income there is, the greater the male spouses' control of income-spending is, points to the potential lack of transparency in income spending. Skewed use of irrigation benefits may minimise the interest of the disadvantaged household groups in participating in crop production. It may also widen the gaps in irrigation benefit distribution that many projects are set on minimizing. Though the study does not feel that misuse of household income is prevalent in Yatta, the potential danger cannot be overlooked; household members do have both complementary and conflicting interests.

Diversification in food cropping has added variety to the food and diet of the local people. The more obvious areas affected positively are the fields of fruits and vegetables most of which could not be grown prior to the introduction of irrigation. Since the crops

grown prior to the introduction of irrigation were mainly maize, beans, pigeon peas, cow peas and pumpkins, vegetables were eaten seasonally. Fruits were also limited. With crop diversification, positive impact on the nutrition of populations has been noted by other scholars. For example, in her Mexican study, Dewey (1978) found that crop diversification had a positive impact on the nutritional status of children. In contrast, irrigation projects that practise mono-cropping have had a negative effect on the nutritional status of the farmers [see Chambers (1973) about Mwea, and Muga (1969) about Ahero]. Diversification in irrigation cropping in Kenya has been achieved more by small-scale irrigation projects. In this respect, non-planned small-scale irrigation projects have done better in Kenya than the large scale planned ones. This study recommends them as they are also less demanding in management costs and can be easily sustained by rural populations. They would go a long way in improving rural economies.

More food diversification would be achieved if farmers adopted most of the "foreign" crops in their diet. Presently, it is mainly the fruits that have been adopted with ease. French beans and eggplant have also been well adopted. Nutritionists situated at the divisional office in Kithimani have been training the farmers on cooking methods for the new vegetables in a bid to facilitate their adoption in the local diet. With more such efforts, it is likely that the farmers will grow the crops both for sale and for food consumption.

Such efforts could guard against the cases of malnutrition that have been ironically found in some irrigation projects.

Farmers' income would be enhanced if better pricing policies were made. Extreme price fluctuation might be minimised by the formation of a strong cooperative. The cooperative office bearers should be committed and reliable in their dealings with the farmers. The present cooperatives are virtually dead and therefore of little use to the farmers. A strong cooperative would also rescue the farmers from the shylocks who form the bulk of the middlemen (agents). If the cooperative exported the produce directly, greater profits would be realized. A strong cooperative would also be better placed to lobby for more markets and cargo space for the farmers' produce; the government should be supportive of such cooperatives. Attempts, for example, should be made by the relevant government bodies to secure markets for farmers and make available appropriate cold storage facilities so that delays in marketing do not affect farmers drastically. Presently, if the produce is not collected on the day of harvest, it perishes and then farmers incur losses.

To offset the drawback experienced by farmers due to the cost of inputs, namely, fertilizer and pesticides, loans with minimal interest could be provided for the farmers. With a well managed cooperative, this could be organized with relative ease. The loan could be in the form of the inputs instead of cash.

The disadvantages of cooperatives, according to the farmers, are that they have a tendency to embezzle farmers' funds and introduce bureaucratic arrangements that work to the disadvantage of the farmers. In the absence of reliable cooperatives, marketing groups of a hand-full of farmers, can be formed in conjunction with the Ministries of Agriculture and Cooperatives. Such groups could enter in marketing agreements with various bias. Zoning in crop production, may also be introduced, so as to guard against flooding the market for various crops. With strong and reliable marketing groups, farmers could lobby for loans from the buyers of their produce.

Research by agronomists should be carried out to look into the possibility of planting crops that need less fertilizer and pesticides. Since these inputs, coupled with labour demands, form the heaviest burden on the farmers, crops that need less of them would alleviate the burden. Related to this and of equal importance are studies related to the new found pests' resistance to the pesticides in current use in the area. Research would hopefully establish what changes in pest control should be made. Further research aimed at establishing the toxic levels of the pesticides in use and whether or not these are safe for use is necessary. Farmers express concern over the drowsiness experienced after spraying pesticides (see chapter 5). Long term effects of continued use of such pesticides by mothers may be detrimental, especially to foetal development and nursing

babies.

The effect of irrigation on food and diet has been discussed in the study. Further study focusing specifically on the nutritional standards of the people in the irrigation zone (especially children) using a more technical methodology (e.g. anthropometry) would complement the results arrived at in this study; it would give a more quantifiable nutritional standards assessment.

Irrigation has increased employment opportunities in the area. Though this was one of the goals of the project, farmers feel labour scarcity is detrimental to their social life as they hardly can spare time for leisure. They can visit friends and relatives only during emergencies. Labour demands could be lessened by greater utilization of appropriate technology. Orientation of women to technological innovations would also minimise labour demands for them (in the study area only a few women operate the plough and the three tractors in the study sample are all operated by men).

Due to seepage, some houses and latrines have fallen down, and some fields have been water-logged, creating not only an inconvenience for the farmers but also a potential health hazard. Though they do not remember the exact date, farmers are aware that once, there was an outbreak of cholera in the area. Mobilizing farmers (financially and labour-wise) to cement at least the secondary canals and the main diversions from the canal would minimise seepage. It would also check the

environmental degradation accompanying irrigation. A more efficient use of water is also called for: this applies to both the farmers and Ministry of Water officials. Though part of the research was done during a wet period when irrigation was virtually unnecessary, many furrows were still open. Apparently farmers are concerned about their supply of water during the dry spells; many of them are not bothered when water is abundant even though they are supposed to close the furrows. In the same way, the water officials say they close the secondary canals (since they control the abstractions from the main furrow, anyway) during months of rain but this is (was) not always done. Methods of harvesting water in the wet months to save it for use in the drier ones should be devised.

A 1988 research effort aimed at establishing the spread of bilharzia (schistosomiasis) in the area of research reported 231 cases (figures made available to me by Matuu health centre). In 1989, 43 cases of bilharzia were diagnosed at Matuu health centre. The great difference in the figures might be explained by the fact that the 1988 research was community based and household-focused while the 1989 cases went to the centre to seek medical attention. Medical personnel explained that the research was not necessarily limited to the canal area - it extended to the neighbouring Masinga Dam area. They also explained that most of the bilharzia-causing snails were found in fresh water streams and thought the furrow was more likely to harbour amoebae.

Since other studies related to irrigation in Kenya have indicated a rise in cases of schistosomiasis with the introduction of irrigation (Odingo 1977; Muga 1969), it would be important to explore the extent of not only amoebic but bilharzia-related ailments.

APPENDIX A

Names of some Water Groups in Yatta Irrigation.

1. Simba (Lion) Group.
2. Canal Group.
3. Gachuma (one of the Leaders).
4. Muia Mulwa (Leader) Group.
5. Kauthuluini "A" (Named after a Place).
6. Kauthuluini "B" (Place).
7. Agricultural Scheme "A" (Place).
8. Agricultural Scheme "B" (Place).
9. Kithendu "A" & "B" (Place).
10. Wendano (Friendship) Group.
11. Kumina Kimena (Combating Hatred).
12. Kakumini "A" & "B" (Place).
13. Kaluluini "A" & "B" (Place).
14. Konani (Corner) Group.
15. Evergreen Group.

APPENDIX B

Crops Grown in Yatta Irrigation Scheme

Food Crops

	Kamba/Swahili Name	Botanical Name
Carrots	Kalati/Karoti	Daudus carota
Cassava	Manga/Muhogo	Manihot esculenta
Cow Peas	Nthooko/kunde	Vigna unguiculata
Finger Millet	Wimbi/Wimbi	Eleusine coracana
Pigeon Peas	Nzuu/Mbaazi	Cajanus cajan
Pumpkin	Malenge/Tango	Cucurbita maschata Cucurbita maxima
Sorghum	Muvya/Mtama	Sorghum bicolor
Spinach Beets	Sivinakyi/Spinachi	Amarunthus
---	Ndae/	Ximenia
---	Ndania/dania	Cociondrum satirum

Cash Crops Grown

	Kamba/Asian or Swahili Name	Botanical Name
	Kalela/ Karella	Momordica charantia
	Waluli/ Valour	Hibiscus Sp.
	Mbinda/ Okra	Hibiscus sculentus L.
	Tindola/ Tindori	Citrullus lanatus Var Fistulosus
Bix	Langi/Rangi	Bixa orellana
Cashewnuts	Koloso/Korosho	Anacardium accidentale
Chillies:	Ndulu/Pilipili:	
Freson		Capsicum frutescens
Long red Cayena		Capsicum annuum
Long Sweet Pepper		Capsicum annuum
Coffee	Kaawa/Kahawa	Coffea robusta/Coffea arabica
Onions:	Itunguu/Vitunguu:	
Red Creole		Alluim cepa Var
Bombay Red		Alluim cepa Var
Tropican High Breed		Alluim cepa Var
Spung		Alluim fistulosum L
Tobacco	Kumbatu/Tumbako	Nicotiana tubacum

Crops Grown for Both Food and Cash

	Kamba/Swahili Name	Botanical Name
Arrow Roots	Nduma/Nduma	Xanthosoma or Colocasia
Avocado	Mavokoto/Avokado	Persea amercana
Bananas	Maiu/Ndizi	Musa Spp
Beans	Mboso/Maharagwe	Phaseolus Spp
Broadbean	Mbumbu,Nzavi	Dolickoo lablab
Cabbage	Makovisi/Kabeji	Brassica oleracea Var Capitata
Coconuts	Nathi/Nazi	Cocos nucifera
Eggplant	Makondu/Mbilingani	Solanum melongena
French beans	Misanzi/	Phaseolus nilgaris
Green Grams	Ndengu,Voyo/Pojo	Vigna radiata
Irish Potatoes	Maluu/Viazi	Solanum tuberosum
Kale	Sukuma/Sukuma Wiki	Brassica oleracea Var Aceptata
Lemons	Ndimu/Limau	Citrus limon
Maize	Mbemba/Mahindi	Zea mays
Mangoes	Maembe/Maembe	Mangifera indica L.
Onions	Itunguu/Vitunguu	Allium cepa Var Cepa
Oranges	Masungwa/Machungwa	Psiduim guajava L.
Passion Fruits	Makundi/	Passiflora edulis
Pawpaws	Mavavai/Papai	Carica papaya
Sugarcane	Iwa/Miwa	Saccharum officinarum
Sweet Potato	Makwasi/Viazi Tamu	Ipomoea batatas
Tomatoes	Nyanya/Nyanya	Hycopersicum esculentum
Yellow Grams	Ndengu,Voyo./Dengu	Vigna radiata

Where English names are unavailable, only local names are given.

Coconuts, cashewnuts, tobacco, and bix were grown by only one respondent, in his second shamba, which is in Coast Province

BIBLIOGRAPHY

Abbie, L., J.Q. Harrison and J.W. Wall.
1982 "Economic Returns to Investment in Irrigation." World Bank Staff Working Paper No. 536. Washington DC: World Bank.

Akong'a, J.
1988 Drought and Famine Management in Kitui District, Kenya. In D. Brokensha and P. Little (Eds.). Anthropology of Development and Change in East Africa, pp. 99-120. Boulder, Colorado: Westview Press.

Awiti, A.
1973 Economic Differentiation in Ismani, Iringa Region: A Critical Assessments of Peasant Response to the Ujamaa Vijijini Programme. African Studies Review. 3:209-239.

Bailey, K.D.
1978 Methods of Social Science Research. New York: The Free Press.

Bahemuka, J.M.
1983 Our Religious Heritage. Nairobi: Thomas Nelson and Sons.

Bernard, H.R.
1988 Research Methods in Cultural Anthropology. Newbury Park: Sage Publications.

Brain, J.L.
1976 Less than Second Class. In N.J. Hafkin, and E.J. Bay, (Eds.). Women in Africa: Studies in Social and Economic Change. Stanford, CA: Stanford University Press.

Bromley, D.W.
1982 "Improving Irrigated Agricultural Institutional Reform and the Small Farmer." World Bank Staff Working Paper 531. Washington DC: World Bank.

Carruthers, I.D.
1973 Impact and Economics of Community Water Supply: A Study of Rural Water Investment in Kenya. London: Wye College, University of London.

Cavicchi, E.
1977 Problems of Change in Kikuyu Tribal Society. Bologna: Emi.

Chambers, R.
1973 The Perkerra Irrigation Scheme: A Contrasting Case. In R. Chambers and J. Moris (Eds.). Mwea: An Irrigated Rice Settlement in Kenya, pp.344- 364. Munchen: Weltforum Verlag.

Chambers, R.
1978 Identifying Research Priorities in Water Development. Water Supply and Management. 2: 389-398.

Chadwick, B.A., H.M. Bahr and S.L. Albrecht.
1984 Social Science Research Methods. Englewood Cliffs, New Jersey: Prentice Hall.

Clark, C.
1970 The Economics of Irrigation. Oxford: Pegamon Press.

Cohen, Y.A.
1974 Man in Adaptation: The Cultural Present. Chicago: Aldine Publishing Company.

Crosson, P.R.
1975 The Impact of Irrigation Investment on Regional and Urban Development. In R. Cummings (Ed.). Inter-Basin Transfer of Water: American Case Study. Iowa State University Press.

Dewey, K.G.
1978 "The Impact of Agricultural Change on Diet and Nutrition in Tabasco, Mexico." Paper Presented at the Symposium on Mexican Food Systems in Historical Perspective, for the Annual Meeting of the American Anthropological Association, Nov. 14-18. Los Angeles, California.

Diebold, P.B.
1969 "Assessment of Irrigated Projects in the Light of Integrated Agricultural Planning." Working Paper A, 5.5.69. In Report on the Symposium on Agricultural Development and Planning in Irrigated Areas, May, 5-23. Berlin-Tegel: Reiherwerher.

Dubel, I. and M. Kwaasteniet.
1983 Irrigated Agriculture as a Base of Subsistence: The Cases of the Pokot and the Marakwet: with Reference to the Labour of Women. Amsterdam: University of Amsterdam.

Dundas, C.
1915 The Organization and Laws of Some Bantu Tribes in East Africa. Journal of the Royal Anthropological Insitutie. (RAI), XLV

Edgerton, R.B
1971 The Individual in Cultural Adaptation: A Study of Four East African Peoples. Berkeley: University of California Press.

Ellen, R.
1982 Environment, Subsistence and System: The Ecology of Small-scale Social Formations. London: Cambridge University Press.

Fleuret, P.
1980 Sources of Material Inequality in Lushoto District, Tanzania. African Studies Review. 23(3).

_____
1985 The Social Organization of Water Control in the Taita Hills, Kenya. American Ethnologist, 12: 103-118.

_____
1990 Food Farmers and Organizations in Africa: Anthropological Perspectives, with Implications for Development Assistance. In R. Huss-Ashmore and S.H. Katz (Eds.). African Food Systems in Crisis, Part 2: Contending with Change. New York: Gordon and Breach.

Fleuret, P. and A. Fleuret.
1982 "Socio-Economic Determinants of Nutrition in Taita, Kenya." Paper Presented at the Annual Meeting of American Anthropological Association, Dec. 1982, Washington D.C.

Foster-Carter, A.
1985 The Sociology of Development. Lancashire: Causeway Press.

Government of Kenya
1970 National Development Plan 1970-74. Nairobi: Government Printer.

_____ _____
1977 National Development Plan 1977-83. Nairobi: Government Printer.

_____
1984 National Development Plan 1984-88. Nairobi: Government Printer.

_____
1989a National Development Plan 1989-93. Nairobi: Government Printer.

_____
1989b District Development Plan (Machakos), 1989-93. Nairobi: Government Printer.

Gutierrez, F.B.
1967 Social Problems in Connection with the Settlement and Agricultural Development of Irrigated Projects. Working Paper no.H, 22.8.67. In Report on the Seminar on Economic and Social Aspects of Agricultural Development of Irrigated Areas, August 2-29. Berlin-Tegel: Reiherwerher.

Hanger, J. and J. Moris.
1973 Women and the Household Economy. In R. Chambers and J. Moris (Eds.). Mwea: An Irrigated Rice Settlement in Kenya, pp.209-244. Munchen: Weltforum verlag.

Harden, B.
1990 Africa: Dispatches From a Fragile Continent. New York: W.W. Norton & Company.

Hardesty, D.L.
1977 Ecological Anthropology. New York: John Wiley and Sons.

Harris, M.
1978 Group Territories or Territorial groups? Comments on an Inter-Disciplinary Problem in Cultural Ecology. In D. Green, C. Haselgrove and M. Spriggs (Eds.). Social Organization and Settlement. Oxford: British Archaeological Reports International Series (Supplementary) 47 (i).

Hatch, E.
1973 Theories of Man and Culture. New York: Columbia University Press.

Henn, J.K.
1984 Women in the Rural Economy: Past, Present and Future. In M.J. Hay and S. Stichter, (Eds.). African Women South of the Sahara, pp. 1-18. London: Longman.

Hurst, C.
1985 "Energy and Irrigation in India." ILO Working Paper, Sept. Geneva: ILO.

International Labour Organization.
1981 Rural Development and Women in Asia. Proceedings and Conclusions of the ILO Tripartite Asian Regional Seminar, April 6-11. Mahabaleshwar Maharashtra, India. Geneva: ILO.

Jones, C.W.
1983 "The Impact of the Semry Irrigated Rice Production Project on the Organization of Production and Consumption at the Intra-household Level." Nutrition and Development Project Paper No. 83-1. USAID.

Kangangi, G. M.
1982 "The Role of Small Scale Irrigation Schemes in Rural Development: A case of Kibirigwi Irrigation Scheme." M.A. Thesis. Department of Urban and Regional Planning, University of Nairobi.

Kaplan, D. and R.A. Manners.
1972 Culture Theory. London: Prentice Hall.

Kenyatta, J.
1978 Facing Mount Kenya. Nairobi: Heinemann.

Khatib, A.B.
1969 "Requirements for Development in Irrigation Planning." Working Paper number D, May 1969. Cairo: FAO.

Kliest, T.
1985 "Regional and Seasonal Food Problems in Kenya." Food and Nutrition Studies Programme, Report No. 10/1985. Ministry of Finance and Planning, Nairobi, Kenya and African Studies Centre, Laiden, Netherlands.

Kuper, A.
1983 Anthropology and Anthropologists. London: Routledge and Kegan Paul.

Laslett, P.
1984 The Family as a Knot of Individual Interests. In R.M. Netting, R.R. Wilk and E.J. Arnould (Eds.). Households: Comparative and Historical Studies of the Domestic Group. Berkely, CA: University of California Press.

Leach, E.R.
1980 Village Irrigation in the Dry Zone of Sri Lanka. In E.W. Coward (Jr.) (Ed.). Irrigation and Agricultural Development in Asia. Perspectives from the Social Sciences, pp.91-126. London: Cornell University Press.

Lele, U.
1975 The design of Rural Development: Lessons from Africa. Baltimore: The Johns Hopkins Univ. Press (for World Bank).

Lindblom, G.
1920 The Akamba in British East Africa. Uppsala: Archives D'Etudes Orientales.

Little, P.D.
n.d. Irrigation Associations Among Pastoralists: Some Organizational and Theoretical Considerations from Northern Kenya. In D. Attwood and S. Barishar (Eds.). Cooperatives and Rural Development. (Oxford: Oxford University Press, forthcoming).

Long, N.
1968 Social Change and the Individual. Manchester: Manchester University Press.

Makanda, D. W.
1984 "The Utilization of Kenya's Irrigation Potential: A Case Study of Kibirigwi Irrigation Scheme." M.A. Thesis. Department of Economics, University of Nairobi.

Mandal, M.A.S.
1978 Handpump Irrigation in Bangladesh: A Comment. Bangladesh Development Studies, 1, Writer 1978.

Mbithi, P. and C. Barnes.
1975 Spontaneous Settlement Problems in Kenya. Nairobi: East African Literature Bureau.

Mbiti, J.
1969 African Religions and Philosophy. Nairobi: Heinemann.

Moris, J.R. and D.J. Thom
1987 African Irrigation Overview: Main Report no. 37. (WMS). Africa USAID.

Muga, E.
1969 "The Socio-Economic Problems of the Ahero Pilot Resettlement Scheme Area in Kano Plains in Western Kenya." Department of Sociology, University of Nairobi.

Musila, S.M.
1987 "The Socio-Economic Status of Women Married to Others: A Case Study of Iveti Location in Machakos District." A Post-Graduate Diploma Dissertation, Institute of African Studies, University of Nairobi.

Ndeti, K.
1972 Elements of Akamba Life. Nairobi: East African Publishing House.

Netting, R.M.
1986 Cultural Ecology. Prospect Heights, Illinois: Waveland Press.

Netting, R.M., R.R. Wilk and E.J. Arnould (Eds.).
1984 Households: Comparative and Historical Studies of the Domestic Group (Introduction). Berkely, CA: University of California Press.

NIB-ILACO.
1974 Tana River Feasibility Studies: The Masinga Area. Vol.1: Main Report. Arnhem (Netherlands): ILACO.

Obolor, R.S.
1985 Women, Power and Economic Change. The Nandi of Kenya. Stanford, CA: Stanford University Press.

Odingo, R.S. (Ed.).
1977 "Final Report on a Trans-disciplinary Ecological Study of the Kamburu/Gtaru Hydro-Electric Dam Area on the Tana River Basin in Eastern Kenya." Department of Geography, University of Nairobi.

Parkin, D.
1972 Palms, Wines and Witnesses: Public Spirit and Private Gain in an African Farming Community. San Francisco, CA: Chandler.

Redfield, R.
1960 The Little Community, Peasant Society and Culture. Chicago: The University of Chicago Press.

Rodney, W.
1972 How Europe Underdeveloped Africa. Dar-es-Salaam: Tanzania Publishing House.

Rogers, B.
1980 The Domestication of Women: Discrimination in Developing Societies. London: Tavistock Publications.

Singh, I.
1979 "Small Farmers and the Landless in South Asia." World Bank Staff Working Paper No. 320. Washington DC: World Bank.

Spring, A.
1988 Putting Women in the Development Agenda: Agricultural Development in Malawi. In P. Little and D. Brokensha (Eds.). Anthropology of Development and Change in East Africa, pp.13-42. Boulder, Colorado: Westview Press.

1990 Profiles of Men and Women Smallholder Farmers in Malawi. In R. Huss-Ashmore and S.H. Katz (Eds.). African Food Systems in Crisis Part 2: Contending with Change. New York: Gordon and Breach Science Publishers.

Ssenyonga, J.W.
1983 The Marakwet Irrigation System as a Model of a Systems-Approach to Water Management. In B.E. Kipkorir, R.C. Soper, and J.W. Ssenyonga (Eds.). Kerio Valley: Past, Present and Future, pp. 96-111. Proceedings of a Seminar held at The Institute of African Studies, University of Nairobi, May 21-22, 1981.

Steward, J.
1955 Theory of Culture Change: The Methodology of Multilinear Evolution. Urbana: University of Illinois Press.

Suda, C.A.
1986 "Labour Utilization and Utility Patterns on Small Farming in Western Kenya: Implications for Agricultural Production." Ph.D. Dissertation, Department of Sociology, University of Missouri, Columbia.

Tana River Development Authority (TRDA).
1978 "Upper Tana Catchment: Development Potential of the Yatta Canal - a Preliminary Study." Nairobi: TRDA.

Tietmyor, E.
1987 "Woman to Woman Marriage Among the Agikuyu." A Seminar Paper Presented at the Institute of African Studies, University of Nairobi.

Todaro, M.P.
1982 Economics for a Developing World. London: Longman.

Tylor, E.B.
1988 Dictionary of Anthropology. Delhi: GOYLSaaB.

Vermeer, E.B.
1977 Water Conservancy and Irrigation in China, Social, Economic and Agro-technical Aspects. Leiden University Press.

Vlachos, E.
1972 "Socio-Economic Aspects of Irrigated Agriculture." Paper Presented at the Seminar on Prospects for Irrigation in West Africa. October 23-27, 1972; Ibadan, Nigeria.

Wanmali, S.
1983 "Service Provision and Rural Development in India: A Study of Miryalguda Taluka." Research Report no.37, Feb. 1983. International Food Policy Research Institute.

William, S.
1979 "The Impact of two Communal Projects in the Philippines." Institute of Economic Development and Research, School of Economics, University of the Philippines.

Yegin, H., N. Ulgen and O. Agaoglu.
1967 Report on Turkey. In Report on the Seminar on Economic and Social Aspects of Agricultural Development of Irrigated Areas, August 2-29. Berlin-Tegel: Reiherwerher.

Questionnaire

1. Name of Respondent.....

2. Location.....

3. Sub-Location.....

4. Male/Female.....

5. Marital Status.....

6. How many wives do you/does your husband have?.....

7. If more than one, what is your position? (for women respondents).
   (a) First wife
   (b) Second wife
   (c) Third wife
   (d) Other (specify)

Information about members of the household:

8. (a) Name of wife.....
   (b) Name of husband.....

9. Information about husband and wife/wives:

	Husband	1st Wife	2nd wife
(a) Age	.....	.....	.....
(b) Residential Place	.....	.....	.....
(c) Level of Education	.....	.....	.....
(d) Occupation	.....	.....	.....
(e) Where born	.....	.....	.....
(f) Ethnic grouping	.....	.....	.....
(g) Place of residence before joining the scheme	.....	.....	.....
(h) When did you come to the irrigation scheme?	.....	.....	.....

10. How many people live here altogether?.....

11. Number of households in the homestead.....

12 A). Information about first wife's children:

Name	Sex	Age	Education	Marital Status	Place of Residence	Occupation	Birth-date
1...	...	...	.....	.....	.....	.....	.....
2...	...	...	.....	.....	.....	.....	.....
3...	...	...	.....	.....	.....	.....	.....
4...	...	...	.....	.....	.....	.....	.....
5...	...	...	.....	.....	.....	.....	.....
6...	...	...	.....	.....	.....	.....	.....
7...	...	...	.....	.....	.....	.....	.....
8...	...	...	.....	.....	.....	.....	.....
9...	...	...	.....	.....	.....	.....	.....
10..	...	...	.....	.....	.....	.....	.....

B) Information about second wife's children:

Name	Sex	Age	Education	Marital Status	Place of Residence	Occupation	Birth-date
1...	...	...	.....	.....	.....	.....	.....
2...	...	...	.....	.....	.....	.....	.....
3...	...	...	.....	.....	.....	.....	.....
4...	...	...	.....	.....	.....	.....	.....
5...	...	...	.....	.....	.....	.....	.....
6...	...	...	.....	.....	.....	.....	.....
7...	...	...	.....	.....	.....	.....	.....
8...	...	...	.....	.....	.....	.....	.....

C) Information about other members of the household

Sex	Age	Education	Marital Status	Place of Residence	Occupation	Birth-date	Relation with respondent
1..	...	.....	.....	.....	.....	.....	.....
2..	...	.....	.....	.....	.....	.....	.....
3..	...	.....	.....	.....	.....	.....	.....
4..	...	.....	.....	.....	.....	.....	.....
5..	...	.....	.....	.....	.....	.....	.....
6..	...	.....	.....	.....	.....	.....	.....

13. Agricultural Information:

(a) Size of land in acres.....
(b) Gender and designation (in the household) of land owner.....
(c) Any title deed?.....
(d) How big is your *shamba*?

14. Do you have another piece of land?.....

15. If yes, where? Near (can commute), far?

Size of second *shamba* in acres.....

16. Which piece of land do you irrigate?
    a) First b) Second c) Both d) None

17. How did the owner acquire the pieces of land/*shamba*?

	First piece	Second piece
(a) Inherited from father	.....	.....
(b) Inherited from mother	.....	.....
(c) Inherited from husband	.....	.....
(d) Allocated to me by husband	.....	.....
(e) Allocated to me by wife	.....	.....
(f) Was given by government	.....	.....
(g) Allocated by members of male spouse's lineage	.....	.....
(h) Allocated by members of female spouse's lineage	.....	.....
(i) Land was bought	.....	.....
(j) Other (specify)	.....	.....

18. Crops grown.

(a) Cash crops.

Cash crops		Area covered	
First plot	Second plot	First plot	Second plot
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

(b) Food crops

Food crops		Area covered	
First plot	Second plot	First plot	Second plot
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

19. Who performs the following tasks in crop production? How often? What implements do they use?

(a) Cash crops:

Tasks Performed	Regularly		Occasionally		Implements Used	
	First Plot	Second Plot	First Plot	Second Plot	First Plot	Second Plot
Clearing land	.....	.....	.....	.....	.....	.....
Breaking land	.....	.....	.....	.....	.....	.....
Planting	.....	.....	.....	.....	.....	.....
Manuring	.....	.....	.....	.....	.....	.....
Weeding	.....	.....	.....	.....	.....	.....
Spraying	.....	.....	.....	.....	.....	.....
Harvesting	.....	.....	.....	.....	.....	.....
Packing	.....	.....	.....	.....	.....	.....
Marketing	.....	.....	.....	.....	.....	.....

(b) Food crops

Tasks Performed	Regularly		Occasionally		Implements Used	
	First Plot	Second Plot	First Plot	Second Plot	First Plot	Second Plot
Clearing land	.....	.....	.....	.....	.....	.....
Breaking land	.....	.....	.....	.....	.....	.....
Planting	.....	.....	.....	.....	.....	.....
Manuring	.....	.....	.....	.....	.....	.....
Weeding	.....	.....	.....	.....	.....	.....
Spraying	.....	.....	.....	.....	.....	.....
Harvesting	.....	.....	.....	.....	.....	.....
Packing	.....	.....	.....	.....	.....	.....
Sale (if done)	.....	.....	.....	.....	.....	.....

Under "regularly" and "occasionally", put the appropriate letter.
a = females under fourteen years.
b = females over fourteen years.
c = males under fourteen years.
d = males over fourteen years.
e = male hired labour.
f = female hired labour.
g = cooperative/communal labour.
h = other (specify).

20. Do you use artificial fertilizer for:
a) cash crops?.....
b) food crops?.....

21. What are the rates for hired labour?
    Daily Ksh.....
    Monthly Ksh.....

22. Who decides
(a) when the different tasks have to be performed?
(b) which members of the household have to perform them?

Tasks	Cash crops		Food crops	
	a	b	a	b
Clearing land	.....	.....	.....	.....
Breaking land	.....	.....	.....	.....
Planting	.....	.....	.....	.....
Manuring	.....	.....	.....	.....
Weeding	.....	.....	.....	.....
Spraying	.....	.....	.....	.....
Harvesting	.....	.....	.....	.....
Packing	.....	.....	.....	.....
sale	.....	.....	.....	.....

Insert the appropriate letter in the spaces provided.

i) Male head of household
ii) His wife
iii) Both i) & ii)
iv) Female head of household
v) Other (specify)

23. What factors make some of the members of the household (if any) want to contribute labour only occasionally?
  a) some go to school.
  b) some don't want to contribute fully (specify).
  c) some are engaged in other activities (explain).
  d) other (specify).

24. Is there any distinction in responsibility over the crops, based along gender lines?.....

25. If so, which are the crops
    a) for women?.....
    b) for men?.....

26. Who is responsible for the sale of crops sold in the household?

Name of crop	Person marketing
.....	.....
.....	.....
.....	.....

27. Which of the crop/s mentioned in 26. fetch/es more income?
.....
.....

28. How much did you fetch for the crop/s in the last harvest/month?
.....bags
.....Ksh.

29. Would you say that was a good harvest?.....

30. How much do you usually fetch for:
a) a good harvest/month?
.....bags
.....Ksh.
b) a bad harvest/month?
.....bags
.....Ksh.

31. Who receives the cash income?
a) male head of household
b) his wife
c) both a) & b)
d) female head of household
e) other (specify)

32. How is the cash spent?

.....
.....

33. How, actually, was the cash for the last harvest/month spent?
.....
.....

34. Who decides how the cash should be spent?
a) male head of the household
b) his wife
c) both a) & b)
d) female head of the househead
e) other (specify)

35.a) Is/Are there any crop/s that you are more inclined to put labour into?.....
b) If yes, i) which ones and ii) why?
....
....

36.a) Is there any crop/s that other members of the household are more willing to provide labour for?.....
b) If yes, i) which ones ii) and why?
....
....

37. Would you, in your opinion, say that members of the household prefer putting labour into the crops from whose income they benefit?
Explain.....
.....

38. If yes for question 37.a) do you think this affects the yield for certain crops? .....
b) Which ones?.....

39. What other factors (if any) do you think affect crop yield?

40. Do you think two or more members of the household should be in charge of income got from (irrigated) agriculture or you feel only one person should?
.....
Give reasons.....
.....

WATER-USE INFORMATION

41. Do you have an association for controlling water-use?.....

42. If so, (a) what is its name?
.....
(b) what is its membership (number)?
.....
(c) how many leaders does it have, and what is their designation?
.....

43. What are its duties?
.....
.....

44. How are its leaders selected?
According to:
(a) age.....
(b) wealth.....
(c) education.....
(d) other (specify).....

45. A) i) Are there any members in your association who hold political offices (Councillors, Member of Parliament, KANU Youth Wingers)?.....
ii) If so, how many?.....
iii) If some of them are elected leaders of the water organization, what positions do they hold?
- Chairperson - Treasurer
- Secretary - Committee member

	Number	Positions held
B) Government administrative positions (chief, assistant chief)?	.....	.....
C) Clan/Village elders?	.....	.....
D) Religious leaders?		
Indigenous (Healers, Seers).....		.....
Modern (Islamic/Christian)		.....

E) People in regular employment locally (teachers, nurses, business pers.,clerks) ....

46. Who is responsible for solving water disputes?
.....

47. What sort of fines are administered to the uncooperative people?
.....
.....

48. What are the duties involved in maintaining the canals and who are the members of the household who perform them?

Tasks performed	Members performing them		
	Regularly	occasionally	Implements used
1.....	.....	.....	.....
2.....	.....	.....	.....
3.....	.....	.....	.....
4.....	.....	.....	.....
5.....	.....	.....	.....
6.....	.....	.....	.....

Put the appropriate letter:
a) females under 14 years. b) females over 14 years.
c) males under 14 years. d) males over 14 years.
e) male hired labour. f) female hired labour.
g) cooperative/communal labour.
h) other (specify).

49. a) Are there any precautions taken so that every farmer can have equal access to water?.....

b) If yes, specify:
.....
.....
.....

c) Do you, yourself, always get water when you need it?.....

d) Explain.....
.....

50. a) How many times in a week do you irrigate?
.....

b) Is this frequent enough for your needs?
.....

c) If no in b), what reasons force you to get inadequate water?
.....
.....

51. How else do you utilize the water from the canal (other than irrigating)?
.....
.....

GENERAL INFORMATION

52. Do you have members of the extended family living outside the irrigation scheme?.....

53. If yes for 51, what exactly is your relationship with them?

a) brothers
b) sisters
c) parents
d) Uncles or aunts
e) In-laws
f) other (specify)

54. How often do you visit them?

a) once every two weeks
b) once a month
c) once every six months
d) once a year
e) Other(specify)

55. How often do they visit you?

a) once every two weeks
b) once a month
c) once every six months
d) once a year
e) other (specify)

56. a) Would you have liked to visit them more often?.....

b) If yes, what prevents you from visiting them more often?.....
.....

57. a) If the spouse resides in another place, would the two have liked to be together?.....

b) If yes, what reasons force you to stay together?
.....
.....

c) How often do you visit each other?.....

d) What hardships do you encounter that you think would not be applicable if you stayed together?

.....
.....

e) In particular, is there any area in irrigated agriculture where you think you would perform better if you were together?

.....
.....

58. How do you decide what crops to grow and when?

a) advised by extension workers
b) advised during chief's *barazas*
c) follow neighbours' advice
d) decide myself
e) other (specify)

59. How do you get information on marketing avenues?

a) advised by extension workers
b) advised during chief's *barazas*
c) follow neighbours' advice
d) decide myself
e) other (specify)

60 a) Are you a member of any cooperative?.....
b) If not, why are you not a member?
.....
.....
.....
c) If yes, what are its advantages to you?
.....
.....
.....

61. What are the advantages of being in this irrigation scheme?
.....
.....

62. What are the disadvantages?
.....
.....

63. What problems do you face that you think could be solved?
.....
.....

64. What suggestions do you offer for solving these problems?
.....
.....

65. Is there anything else you would like to say about the scheme?

.....
.....

RANDOM TIME ALLOCATION

Location..... Sub-Location .....
Household Number..... Day.....Time.....

Agricultural Activities

Tasks	Cash Crops	Food Crops
Clearing Land	.....	.....
Breaking Land	.....	.....
Planting	.....	.....
Weeding	.....	.....
Manuring	.....	.....
Spraying	.....	.....
Harvesting	.....	.....
Packing for sale	.....	.....
Marketing	.....	.....

Stock Keeping

Tending cattle	.....
Milking	.....
Taking to the dip	.....
Other	.....

Irrigation tasks

Digging furrows	.....
Cementing furrows	.....
Stone-collecting	.....
Desilting	.....
Repairing furrows	.....
Cutting grass	.....

Domestic tasks

Sweeping	.....
Cleaning utensils	.....
Fetching water	.....
Fetching firewood	.....
Washing clothes	.....
Cooking	.....
Eating	.....
Caring for children	.....
Sick	.....
Visiting	.....
Relaxing	.....
Other tasks	.....

Insert in the appropriate spaces
a) Females under 14 b) Females over 14
c) Males under 14 d) Males over 14
e) Male hired labour f) Female hired labour
g) Cooperative labour

More Information on the Socio-Economic Survey.

1. Shelter.

A). House characteristics:

	Main House	Kitchen	Other
i) Type of roof (grass. iron, tiles)	.....	.....	.....
ii) Type of wall (mud. brick, block)	.....	.....	.....
iii) Type of floor (earth, mud, cement)	.....	.....	.....
iv) Number of rooms	.....	.....	.....
v) Number of windows	.....	.....	.....

B) Source of income for building house:

	Main	Kitchen	Other
agriculture	.....	.....	.....
other	.....	.....	.....

2. Household items.

	Quantity	Source of income that bought item	
		Agriculture	other
a) Pressure Lamp	.....	.....	.....
b) Hurricane	.....	.....	.....
c) Torch	.....	.....	.....
d) Iron bed	.....	.....	.....
e) Radio	.....	.....	.....
f) Record player	.....	.....	.....
g) Cassette player	.....	.....	.....
h) Charcoal stove	.....	.....	.....
i) Pressure/wick stove	.....	.....	.....
j) Bicycle	.....	.....	.....
k) Water tank	.....	.....	.....
l) Sewing machine	.....	.....	.....
m) Wardrobe	.....	.....	.....
n) Gas cooker	.....	.....	.....
o) Grinding mill	.....	.....	.....
p) Sofa set	.....	.....	.....
q) Wheelbarrow	.....	.....	.....
r) Ox-cart	.....	.....	.....
s) Ox-plough	.....	.....	.....
t) Motorbike	.....	.....	.....
u) Motor-vehicle	.....	.....	.....
v) Tractor	.....	.....	.....
w) Television	.....	.....	.....

3. Livestock

Type	Number	Owner	Source of income that bought (if bought)		Reasons for keeping stock
			Agriculture	Other	
Improved cattle	.....	.....	.....	.....	.....
Indigenous cattle	.....	.....	.....	.....	.....
Goats	.....	.....	.....	.....	.....
Sheep	.....	.....	.....	.....	.....
Poultry	.....	.....	.....	.....	.....
Donkeys	.....	.....	.....	.....	.....

4. Household members performing casual jobs.

	Sex	Relationship with household head	Occupation	Place of work	Residence	Income earned monthly/ weekly
a)..		.....	.....	.....	.....	.....
b)..		.....	.....	.....	.....	.....
c)..		.....	.....	.....	.....	.....
d)..		.....	.....	.....	.....	.....
e)..		.....	.....	.....	.....	.....
f)..		.....	.....	.....	.....	.....
g)..		.....	.....	.....	.....	.....
h)..		.....	.....	.....	.....	.....
i)..		.....	.....	.....	.....	.....
j)..		.....	.....	.....	.....	.....

5. Household members performing salaried jobs

	Sex	Relationship with household head	Occupation	Place of work	Residence	Income earned monthly
a)..		.....	.....	.....	.....	.....
b)..		.....	.....	.....	.....	.....
c)..		.....	.....	.....	.....	.....
d)..		.....	.....	.....	.....	.....
e)..		.....	.....	.....	.....	.....
f)..		.....	.....	.....	.....	.....
g)..		.....	.....	.....	.....	.....
h)..		.....	.....	.....	.....	.....
i)..		.....	.....	.....	.....	.....
j)..		.....	.....	.....	.....	.....

6. Food Intake

a) What foods does this household have for

Morning meal?	Middle-of-the-day meal?	Evening meal?
.....	.....	.....
.....	.....	.....
.....	.....	.....

b) Do you make the foods mainly from crops you grow in your shamba?.....

c) What foods do you buy, if any?
.....
.....

d) Does the household sometimes miss one or more of the meals mentioned above? .....
If yes, which?:
Morning meal.....
Middle-of-the-day meal.....
Evening meal.....

e) If "yes" for (d), what reasons force you to miss meals?.....
.....

f) Record food eaten at the moment (if any).
.....

7. Who are the members of the household who often get sick, if any?.....

What ailments do they suffer from?
.....