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ISSUES ON IRRIGATION FARMING
IN KENYA

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ISSUES ON IRRIGATED FARMING IN KENYA

1. INTRODUCTION

Kenya is short of good agricultural land. Based on rainfall patterns 9.3% of Kenya's land is classified as high potential (zone 2) and a further 9.3 per cent as medium potential (zone 3). Out of a total land area of 5.6 million hectares, however, only about 7 per cent can be described as good agricultural land in the sense of having adequate and reliable rainfall, good soils and not steeply sloping. Another 4 to 5% of the land is otherwise suitable for crops but is subject to periodic drought. About 3.3% of the land is currently forested, mostly in the high and medium potential zones. The productive activity on much of the remaining land is restricted to livestock grazing with varying degrees of intensity, tourism and wildlife preservation.

Table 1: Kenya: Land Potential and Use, Mid-1970s.

A. Land Potential				B. Land Use		
Zone +	Area (m. ha)	Share		Share	Area (m. ha.)	Description
I	Afro-alpine	0.1	0.1%	6.2%	3.5	Recorded Small Farms
				4.7%	2.7	Recorded Large Farms
II	High Potential	5.3	9.3%	1.8%	1.0	"Gap" Farms
III	Med. Potential	5.3	9.3%	3.3%	1.9	Forest Land
IV	Semi-Arid	5.3	9.3%	80.8%	46.0	Rangeland and Other Unsuited to Agr.
V	Arid	30.0	52.7%			
VI	Very Arid	11.2	19.7%	3.3%	1.9	Other Use
Total	56.9	100.0%		100.0%	56.9	Total

Source: Land Potential. Tidrick, Kenya: Issues in Agricultural Development, IERD, 1979 (mimeo). Land Use. Hazelwood, The Economy of Kenya, 1979.

The availability of high and medium potential land is present in Table 2 which is based on historic trends in population and internal migration patterns. In the three most densely populated provinces (Central, Western and Nyanza) high and medium potential land per capita

will fall by approximately one-half between 1969 and 1989 to approximately one-quarter hectare per capita. By the end of this decade, Kenya's less densely populated provinces (Eastern, Rift and Coast) will have little more such land per capita than Kenya's most populated areas had at the beginning of the 1970's i.e., just over half a hectare per person. On a national basis, availability of high and medium potential land will have fallen by more than half between 1969 and 1989 to approximately 0.4 hectares per person. (Henin, 1981).

Table 2: Kenya: Estimated Per Capita Availability of Arable Land By Province 1969, 1979, 1989.

Arable Land* ('000 ha.)	Population (000's)			Arable Land/Hectares Per Capita			
	1969	1979	1989)	1969	1979	1989	
Central	924	1,676	2,476	3,882	.55	.37	.24
Western	741	1,328	1,896	3,015	.56	.39	.25
Nyanza	1,252	2,122	2,863	4,335	.59	.44	.29
Eastern	2,692	1,907	2,756	4,261	1.41	.98	.63
Rift Valley	3,148	2,210	3,415	5,289	1.42	.92	.60
Coast	1,148	944	1,342	1,936	1.22	.86	.59
North Eastern	-	246	323	502	-	-	-
Nairobi	-	509	863	1,286	-	-	-
Kenya	9,905	10,942	15,942	24,506	.91	.62	.40

Source: Based on Henin, "The Characteristics and Development Implications of Fast Growing Population." in Killick, Papers on the Kenyan Economy, 1981.

Various sources have estimated that Kenya's crop land could be expanded by as much as 400,000 hectares (ha) through forest clearance, 500,000 ha. through irrigation and by one million ha. by valley bottom drainage (Ruthenberg, 1978, Tidrick, 1979, World Bank, 1984). Each of these methods have their own drawbacks including unresolved ecological issues.

This paper deals mainly with irrigation related issues. Irrigation could play an important role in increasing Kenya's agricultural production, and as a tool in the intensification of land use which will

be the key to Kenya's agricultural development. In addition, irrigation could play an important role in increasing the supply of arable agricultural land, and in absorbing some of the burgeoning population.

Yet irrigation development in Kenya is very limited. In 1980 for instance, it was estimated that about 3.5 million ha. were under arable or permanent crops (FAO, 1981). Of the total cropped area on a paltry 1.4% was under irrigation and/or drainage (Yeksoz, 1980).

The combined effect of the recent drought and Kenya's high population growth rate has rekindled interest in irrigation as a means of increasing the supply of agricultural land, achieving greater productivity per unit of land and stabilizing agricultural production in situations of adverse climatic conditions. This paper attempts to highlight some issues as related to irrigated agriculture in Kenya. The issues are posed as a basis for further discussion and are geared to the development of research priorities on irrigation policy in Kenya. The paper examines four major aspects of irrigation development to date: past experiences and current status, organization and institutional arrangements, manpower development, and research priorities.

2. IRRIGATION IN KENYA: PAST EXPERIENCE AND CURRENT STATUS

The evolution of irrigated farming in Kenya from the pre-colonial period to the present may be conveniently divided into five distinct historical phases: indigenous/traditional phase, slave labour plantations, colonial pre-war period, wartime developments, post-war colonial and post-independence developments. Accurate estimates of areas under irrigation cultivation during these historical phases (and even at present) differ widely since there is no generally accepted definition of "irrigation". In some cases only full water control system is included, while in others partial control is also included. Other categories include formal schemes with some kind of organised administration and field services while others included informal operations.

2.1 The Traditional Phase

Although there are very few historical accounts of traditional

irrigation in Kenya, the little evidence available suggests that local people in certain parts of the country have practiced irrigated farming as far back as 400 years ago. Notable among such groups are the Marakwet who developed an intricate system of irrigation furrows. These furrows are today concentrated in Tot Division of Elgeyo Marakwet District and number about 50, each having an average command area of 800 acres. While some of these furrows may have been expanded during the colonial period it is notable that the local Marakwet people had evolved an organizational mechanism for maintenance of the furrows and effectively controlled the distribution of water. This enabled the production of staple food crops in an area otherwise characterised by very low-rainfall.

The traditional irrigation system of the Marakwet has continued to operate even today (Ssenyonga, 1983). But the mechanism for its organizational efficiency appears to be rapidly collapsing as the traditional political structures disintegrate. Recently there have been some attempts to rehabilitate and modify the layout of the Marakwet furrows in order to make them more efficient. But one factor which will be crucial in their efficient operation is the ability of the local people to evolve a modern-type organization that will exercise disciplined use of water and maintenance of the furrows.

In the region south of Lake Baringo near Marigat the Il Chamus also developed an irrigation system based on water from the Perkerra River. This appears to have been abandoned by 1918 probably due to changes in environmental conditions. It would appear that some of the schemes were revived sometime during the colonial period without support from the government.

A somewhat crude system of irrigation was a form of moisture harvesting practiced by the Turkana along the lower banks of the Turkwell and Kerio Rivers. This system of receding flood cropping enabled the Turkana to produce sorghum and other staple grains. The system required very little organization and labour inputs. It may therefore not be considered irrigation in the strictest sense.

Somewhat similar to the Turkana system but perhaps more labour intensive is the inundation irrigation along the banks of Lower Tana

among the Pokomo. Here flood-fed depressions and ox-bow lakes have been used to grow rice for many years. It is not clear, however, whether this form of irrigation predates Arab slavery when fairly large plantations were established along the East African coast. It is estimated today that this form of inundation irrigation along the Kenya coast continues to account more than 20 per cent of the total rice production in the country.

2.2 Slave-Labour Plantations

There is ample historical evidence indicating the establishment of large plantations along the coast by Arabs utilizing slave labour in the middle of 19th Century. Most of these plantations produced coconuts, cashewnuts, simsim, millet and other rainfall crops. In the river valleys around Kipini, Malindi, Shimoni and Vanga however, rice was produced under irrigation. One example of such irrigation schemes that has survived to date is the Vanga cluster. At one period this area was a major source of rice exports. But it is reported that "the cultivation of rice - the staple and export crop of the south coast and an important crop in river valleys did not survive the abolition of slavery, and the Coast took to importing rice....." (Cooper, 1981: 260). Following abolition some production of irrigated rice continued utilizing the labour of freed slaves and local Wadigo squatters. But the system appears to have progressively declined.

Today rice production in the Vanga areas relies on a system of tenant farming based on crude but fairly efficient water diversion from the Uмба River. Although the total irrigable area approximates 300 hectares, the area actually irrigated today is probably only one-fifth of this. The reduction in size may probably be explained by uncertainties concerning land tenure in the area coupled with socio-economic differentiation pertaining to land rights. While the descendants of the Arab slave masters, the Wavumba, own/hold proprietary rights over the land, they hardly farm, choosing instead to collect about one tenth of the produce from the Wadigo tenants. On the other hand, it is the farmers who must invest largely in form of labour, in the maintenance of the canals and the diversion structures.

2.3 Pre-war Colonial Period

Formal irrigation development in Kenya started during the construction of the Kenya-Uganda railway. Sometime between 1901 and 1905, some Indian coolies who had been working on the building of the railway were each allocated about 30 hectares in the Kibwezi-Makindu area. Although it is not clear how many farmers were involved, it is reported that that they utilized water from local springs and rivers to produce horticultural crops which they supplied to the railway construction crews. (Kimani, 1984: 260). It would appear that this effort became unprofitable once the construction of the railway was completed and most of the Indian labourers were repatriated or turned to retail business. Recently, some small scale irrigation activity has been re-established in this area by private entrepreneurs producing horticultural crops including chillies, french beans, and onions. They range from one to 50 ha. or more but neither the total area irrigated nor the volume of production is known.

2.4 War-time Irrigation Development.

The second colonial attempt to develop formal irrigation took place during the second World War. This was necessitated by the need to feed the British troops in East Africa and also to stem the general shortage of grains which resulted from war activities. Small scale schemes to produce horticultural crops were established at Karatina, Naivasha and Taveta.¹ But perhaps the most significant initiative of the period was the initiation of rice production along the shores of Lake Victoria on some of the land reclaimed by drainage and flood protection. One such effort at drainage was the so-called "Agembo" Canal along the Southern edge of Miruka Swamp which was some 45 kilometres long. This, and other colonial land development projects brought about 3,000 hectares of land under rice in the Kano and Nyakach area to make it an important area of rice production in the country during the 1940's.

It is not clear how irrigation of rice was organised and managed during this period in Nyanza, but it is very likely that considerable coercion must have been employed in the construction of the canal and other flood protection structures. Although a total of 8,000

hectares was estimated to be suitable for rice production the development of irrigation appears not to have been taken aggressively. Actual production was undertaken by individual peasants in small family plots with somewhat rudimentary irrigation structures, but yields of up to 5 tons per hectare were achieved. Some of the areas in which rice was produced under this programme include Awach Kano, Gem-Rae, K'Opudo, Kore I and II, Obange, and Wasare, all located in Kisumu District (Arao, 1984). It is significant to note that some of the activities of the irrigation and Drainage Branch of the Ministry of Agriculture is focussed on rehabilitation of some of these war-time rice schemes.

2.5 Post-War Colonial Period

By 1945 it was becoming clear that the only way to achieve long lasting results in agriculture within the native reserves was effective co-ordination of land and water conservation. The failure to do this earlier was partly due to lack of funds. Now that funds were available from the Colonial Development and Welfare Funds, and matched by funds from within Kenya it was possible to design long-term plans. This task was achieved largely by the African Land Development Organization (ALDEV) which was established in 1945. (See Sessional Paper No.8, of 1945). The main objective was to coordinate the activities of different departments responsible for land use in the native (African) reserves. (Blundell, 1962). ALDEV changed its title six times before it was disbanded in 1962. Although its original mandate was settlement in new areas this shifted over the years to land reclamation, conservation and intensive farming, including irrigation.

The need for irrigated farming had been felt since the 1930's and some areas with potential for irrigation had been identified and proposals made. For instance, the construction of the Yatta Canal was made in 1936 but was not accepted by the government because of high costs implied. Similarly an irrigation scheme at Ishiara was first mooted in 1929 with the object of breaking the recurrent famine cycle in Mbare, but it was not until 1950 that a small pilot scheme of 12 acres was started. A report made in 1936 for the restoration of the Il Chamus irrigation system along the Perkerra river was also shelved. It was not until the

late 1940s that funds were made available for pilot irrigation projects through ALDEV. The schemes which were started during this period are shown in Table 3.

Table 3. Pilot Irrigation Schemes: Area and Estimated Costs, 1961.

Area	Acreage	Cost up to 1961
Kiboko-Makindu	104	£ 1,025
Ishiara	100	£ 6,374
Mwea-Tabere	4959	£1,121,239
Perkerra	1000	£ 524,748
Makajini (Taita)	88	£ 4,554
Kimorigo-Kamleza	200	£ 8,581
Galole (Hola)	500	£ 342,930
Endo	200	£ 6,254

Source: Blundell, 1962, African Land Development in Kenya, 1946-62 Nairobi, English Press Ltd.

It should be noted, however, that these figures are only indicative of the funds actually spent by ALDEV in developing the irrigation infrastructures and establishing pilot schemes up to 1954. For in that year a major decision was taken by the colonial administration to put the large number of Mau Mau detainees to useful employment on the development of the large irrigation schemes, namely Perkerra, Hola and Mwea-Tabere; the last being the largest.

In some cases, irrigation projects which were started under aegis of ALDEV utilizing Mau Mau detainees' labour flourished in their early years but virtually collapsed after the closure of the detention camps and the repatriation of the detainees from 1956 onwards. This was the case for the Ishiara Irrigation Scheme. By 1960 only 18 of the original Mberere farmers were still on the Ishiara scheme, and the following year the main furrow was choked with weeds and it was being proposed that the Scheme be abandoned. A comment by a colonial official at the time aptly sums up the Ishiara experience: "It is unhappily a standing example of the change inherent in giving people something for nothing" (ALDEV, 1962: 108). But perhaps this official's frustration is also indicative of the

failure of ALDEV and the government of the time to appreciate the unique social and managerial considerations that should be incorporated in the design of any irrigation project. Although the larger irrigation projects started under ALDEV were taken over by new institutions set up by the independent Kenya government, some of the social and managerial problems inherent in irrigated farming have continued to bedevil the new bodies.

As a fair comment on ALDEV's efforts to promote irrigated farming in arid areas it is important to note the provision of £3,000 for the repair of the Embobut Farrow and another £2,000 for replacement of sections of the aqueduct to ensure reliable supply of water in Marakwet traditional schemes. It is significant that the Marakwet irrigation system are still functional today, suggesting perhaps that a preferable approach to irrigation is to build on and to augment the existing local technology than to introduce completely new and alien technologies.

2.6 Post-Independence Development

Irrigation development in Kenya since Independence (1963) may conveniently be considered under five main headings: public large scale schemes, government-promoted smallholder schemes, NGO - assisted small scale projects, large-scale commercial farms and traditional systems. A residual category which we shall not discuss here include very small projects relying on bucket irrigation. The estimated acreage under irrigation is shown in Table 4.

Table 4: Irrigated Area by Type of Scheme and Crops, 1986

Type of Irrigation	Principal Crops	Area (HA.)
Large Commercial	Coffee, pineapple and miscellaneous	23,400
National Irrigation Board	Rice, cotton and horticulture	8,950
Bura	Cotton, maize	2,500
Modern Small-holder (IDB or NGO Promoted)	Rice, maize and horticulture	2,500
Regional Authorities & other Public Agencies	Maize, rice and horticulture	1,200
Modern Small-holder (Private)	Horticulture	500
Traditional Smallholder	Maize, sorghum, millet legumes	800
Total		39,850

2.6.1 Public Large-Scale Projects

As we have already pointed out these projects owe their origin to the ALDEV period although they have subsequently been very significantly expanded. These projects are mainly designed to provide settlement opportunities for the landless. The tenant farmers are allocated 1.2 - 1.6 ha. and are required to provide labour to grow crops in accordance with instructions of the board. But unlike settlement schemes on rainfed land tenants on public irrigated schemes do not have security of tenure. They operate instead on the basis of an annual temporary occupation licence that could be revoked should a tenant fail to comply with the stringent management rules obtaining on the scheme.

The National Irrigation Board (NIB), established by an Act of Parliament in 1966 (Chapter 347 Laws of Kenya) is responsible for the planning, implementation, water management, mechanised cultivation, procurement of inputs and marketing in all the public irrigation schemes of which there are now six: Mwea, Hola, Perkerra, Ahero, West Kano and Bunyala. Currently these schemes cover the areas and produce the crops indicated in Table 5.

Table 5: National Irrigation Schemes by Area and Major Crops, 1985

Scheme	Area	Crops
Mwea	6299	Rice
Ahero	840	"
Bunyala	212	"
West Kano	295	"
Hola	870	Cotton
Bura-West ¹	2500	"
Perkerra	200	Chillies

¹ Bura is currently under the Ministry of Agriculture as a special project.

Owing particularly to the very high cost of developing this type of irrigation, especially following the sad case of Bura West, there appears to be increasing reluctance to invest in large scale public

irrigation. In addition, the status of tenants with respect to insecurity of tenure and rather large water charges have caused much general disillusionment that the future of this model for the future development of irrigation in Kenya appears very weak.

2.6.2 Public Small-Scale Projects

These comprise small scale irrigation systems built since the late 1967 either entirely by the Government or in collaboration with church based aid/donor agencies. Such schemes are mainly located in the arid and semi-arid areas of northern Kenya and were designed to provide an alternative sources of livelihood to the nomadic pastoralists in those areas following severe droughts and political insecurity in which livestock losses were nearly total. The first of these projects were assisted by the FAO/UNDP funds. Examples of such projects include Katilu, Merti and Galfasa.

Due to the very small acreages allotted to each family on these schemes it is doubtful whether they are likely to promote sedentarization of the nomadic pastoralists. At best they have only been able to offer an opportunity for some families to diversify their source of livelihood.

Recently the government has adopted a positive stance towards small scale irrigation based on low investment in irrigation infrastructures and management by the farmers themselves. It is envisaged that water from a common source would be shared by 100 to 300 farmers without altering the land tenure system or farm boundaries. (Kimani, 1984) Unfortunately there appears little coherence within the government agency responsible for small scale irrigation: the Irrigation and Drainage Branch. Different terms by donors with their own technical experts appear to be more crucial in determining the organizational arrangements within the particular schemes.

2.6.3 NGO-Sponsored Small Schemes

This is really a variant of the previous category in that their sponsoring agencies expect that eventually they would be taken over by the farmers themselves with technical assistance from the government.

The organizations involved include National Christian Council of Kenya, the Catholic Secretariat, the Dutch Reformed Church, the Kenya Freedom from Hunger Council among others. Some of these agencies have in the past relied on the technical expertise of volunteers some of whose professional competence may be questionable. It is important therefore that they should be encouraged to utilise the professional services of the IDB in designing and planning the layout of irrigation schemes. But this in turn would require that the IDB should have a rational plan for the recruitment, deployment and utilization of the personnel it has. An additional requirement is that greater attention should be given to the organization and training of farmers to enable them to evolve effective water management systems. In this respect the experience and apparent success in Hewani village irrigation project should be replicated in other schemes whether sponsored by NGOs or directly by the government. (Migot-Adholla, et. al 1983). In the long run the same approach should be considered for the NIB schemes.

2.6.4 Large Scale Commercial Systems

Large-scale commercial irrigation accounts for more than 50 percent of all irrigated land in the country. It comprises largely supplementary sprinkler irrigation of high value crops like coffee and pineapples. It is estimated that about 21,432 ha. of coffee are under irrigation (Whittaker, 1984) while about 2,000 ha. of pineapple are grown under irrigation. In the mid-1960's coffee research had demonstrated that coffee irrigation was profitable and hence coffee estates have developed irrigation activities based on sprinkler systems.

In other areas with dependable water supplies, irrigation is used to produce high value horticultural crops, like cut flowers, asparagus, french beans and courgettes for export. These activities are currently concentrated around Lake Naivasha although there are scattered operations in other places. Given the efficiency of operation of private large-scale schemes in contrast to public schemes, it would appear that this presents a promising area of activity which public and private financial institutions should assist.

3. FINANCING IRRIGATION PROJECTS

In accordance with the evolution of irrigated farming in Kenya, the mode of financing irrigation may be traced through a number of overlapping phases. The oldest and most persistent method of irrigation development remains voluntary communal labour. This is the method used to develop and maintain most of the traditional irrigation systems discussed earlier. But given the lack of historical accounts on the actual labour employed to develop such traditional irrigation systems it is not possible to make cost estimates of this mode of development and to compare it with other alternatives.

It must be underlined though, that considerable organization and discipline is necessary to develop and maintain any irrigation system regardless of the particular social and political arrangements. Thus, reliance on voluntary labour contributions presupposes a well organized structure of governance with negative sanctions against those who fail to contribute their share of labour or otherwise flout the regulations for water management, which are the basic prerequisite for irrigated farming. It is not surprising, therefore, that traditional irrigation works especially those utilising furrows, developed in fairly harsh environments where rainfed farming offered little option, for instance, among the Marakwet of Kerio Valley. Otherwise, it would appear that irrigation developed under very rigidly hierarchical social systems in which it was possible to commandeer the labour of the underprivileged classes without pay. Indeed, this appears to have characterised formal irrigation development in Kenya from about the middle of the 19th Century until the end of the colonial era.

3.1 Slave Labour

The "financing" of irrigation in kind by utilizing slave labour was widely used by Arab landowners along the Coast from Witu to Vanga. Slave labour was employed in the construction of diversion weirs, excavation of supply canals and in binding the rice fields. The cost of slave labour was low and equal to the cost of maintenance of the slaves.

Although it is not clear when or how rice production was introduced in Kenya, there is some evidence that rice was an important

export of the coast from about 1860's when agriculture, based on slave labour was the mainstay of the coastal economy. The Arab and Swahili landowners between Witu and Vanga are reported to have owned as many as 500 slaves each and the value of a shamba or plantation was estimated by the number of slaves working on it (Salim, 1973: 100). It is conceivable that some of these plantations, particularly in river valleys and flood basins were producing rice under some irrigation system. One clear example of an irrigation system based on slave labour was above Vanga port by the Uмба River. Here, it is estimated that nearly 500 hectares of rice were irrigated before slavery was abolished around the turn of this century.

The abolition of slavery and consequent labour shortages must obviously have affected the levels of production since irrigated rice cultivation requires not only considerable labour but also organization and security of rights over land-use in well irrigated valleys. But while shortage of labour may have led to the clogging of watercourses in some of the plantation, retention of rights over land by the Arabs and Swahili and the choice by some of the former slaves to remain with their masters as serfs, implied that rice production would continue, albeit at a much reduced level. In reality the new relations between those who worked the land and the landowner had not changed significantly. Historians have observed that the coastal Arabs and Swahili showed little interest in protecting their interest even before slavery was abolished. "Rarely did he visit his shamba to claim his exact share. This negligence of, or unconcern for, his material interest sprang from any of several reasons: good nature, coastal indolence or realization that too firm a control over slaves would only drive them away." (Salim 1973: 101). Those slaves who elected to remain as indeed the present day tenants on the irrigated rice schemes in Vanga, are bound to the Vumba landowners by more subtle bonds than physical ones sentimental attachments to the 'masters' farm, social and above all religious bonds.

As the colonial government sought to increase rice production to meet the general world shortage of grains during the 1940's it would appear that the system of share cropping (or metayage) which still obtains to day in Vanga was encouraged. But with improvements in world rice supplies during the 1950's little interest was shown in promoting

irrigated rice cultivation in former slave plantations. During the entire tenure of the African Land Development Board (ALDEV) not more than £1,111 was spent in the attempt to rehabilitate the Vanga Irrigation Scheme.

3.2 Colonial Government Grants and Prison Labour

By far the most significant initiative in financing irrigated farming in Kenya were grants for the rehabilitation and resettlement of African lands made by the Labour Government in its Ten Year Plan for starting in Kenya. Although settlement in irrigation schemes played an insignificant role in the overall plan, it is important to note that nearly all the investigations, soil surveys or designs for pilot projects on nearly all the existing public schemes were undertaken during this period. Initially it was expected to rely on machinery and paid labour but this was changed during the 1950s as the need arose to find "useful" employment for Mau Mau detainees.² Thus, the availability of large numbers of "free" labourers was utilised to achieve a faster rate of irrigation development than had been envisaged previously.

While it is not possible to make an accurate estimate of the financial and human costs involved in the development of these pilot schemes, perhaps a rough indication may be obtained from Table 6. which indicate the situation at the end of the 1961 financial year.

Table 6: Estimated Scheme Costs, 1961.

Scheme	Area (ha.)	Grant/Loan	Cost per Ha. .
Mwea-Tebere	2024	1,121,239	554
Perkerra	174	524,748	3016
Ishiara	28	6,374	228
Galole	274	353,691	1291
Kyai (Kibwezi)	40	1,025	26
Makajini (Taita)	36	4,554	126
Yatta Furrow	59 km	324,982	558 km
Total			

2. At the peak of building of Mwea-Tebere in 1956, a total of 3,426 Mau Mau detainees were utilized.

3.3 Donor Agency Grants for NGOs

In the years immediately following Independence a number of Non-Governmental Organizations (NGOs), notably the National Christian Council of Kenya, the Catholic Secretariat, the Salvation Army, Kenya Freedom from Hunger Council etc. have been promoting small scale irrigation schemes mainly in Turkana, Pokot, Mandera, Isiolo, Tana River districts. Generally, it would appear that these organizations have merely acted as conduits giving legitimacy to foreign church based NGOs who have sought to promote irrigation among dispossessed nomadic pastoralists as part of a relief and rehabilitation programme. But depending on the dramatic effect of the suffering of the target population, which in turn determines the ease with which funds may be raised, some of the projects have subsequently collapsed. Some of them have had to be taken over by the government and to be rehabilitated. The Village Irrigation Projects in the Tana Delta are a case in point, having initially been sponsored by the National Christian Council of Kenya.

Because of their nature of operations, where often funds may be channelled through a foreign volunteer/expert attached to the project, (to be disbursed at his discretion), it is not possible to give reliable estimates of the cost of development of such NGOs sponsored small scale irrigation schemes. It would also appear that some of the NGOs have operated with little regard or consultation with the relevant Government agencies.

Given the very specific character of the constituencies upon which charitable NGOs rely for raising funds, it may not be very easy to control their activities and ensuring accountability. At the moment it is not possible to give an estimate of the total area of irrigated land developed by the NGOs, its cost per unit of land, its productivity or the number of farmers.

3.4 Foreign Aid and Kenya Government Grants

The financing of irrigation development through foreign aid is a predominantly post independence phenomenon. The initial funds were for the expansion of Mwea irrigation scheme, and in 1968, consisted of

a grant from the International Freedom from Hunger Council and a loan from the KFW of the Federal Republic of Germany. Since then there have been several grants and loans which have amounted to an estimated Kshs 3.5 billion for public sector irrigation development including consulting services (Kenya, 1968). Further funding is being sought for Tana Delta irrigation development and for an expansion of Mwea.

The large-scale irrigation schemes which were developed using Mau Mau labour were managed by the Department of Agriculture until 1966, when the National Irrigation Board (NIB) was established through an Act of Parliament. The NIB is a statutory board/parastatal and is the specialized irrigation development which is charged with planning, design and implementation of irrigation projects. According to the Act the functions of NIB are:

- a) To conduct research and investigations into the establishment of irrigation schemes,
- b) To raise funds for the development of schemes,
- c) To co-ordinate and plan settlement, and to determine the number of settlers to be accommodated in schemes,
- d) To design, construct, supervise and administer schemes, and to make regulations for the day-to-day management and administration of the schemes,
- e) To promote the processing and marketing of crops grown on the schemes, and
- f) To support the study of irrigation by awarding bursaries or scholarships.

After its establishment the NIB took over the running of Mwea, Perkerra and Hola. Since then it has expanded Mwea-Tebere to its present 6,299 hectares, built Ahero Pilot Scheme (840 hectares), Bunyala Scheme (212 ha.), West Kano (925 ha.) and Bura West (3,900 ha.). In addition to the NIB other irrigation agencies have come up in recent years as discussed below.

The NIB activities are largely confined to operation and management of existing schemes. Feasibility studies, design and initial implementation are invariably undertaken on its behalf by foreign consultants and contractors. This has been particularly the case with its latest project, Bura West.

This influences the scheme costs. All the NIB schemes, and especially Bura tend to have a large component of infrastructure and settlement cost. In addition the organization itself was over-bureaucratised at the head office, an arrangement which does not make for efficient operations on the ground.³ In addition, the NIB accounting system tends to obscure details of the performance of individual schemes. Further more it would appear that service charges to farmers for (water and cultivation) are exceedingly high. Yet although it is likely that individual schemes, and especially Mwea and Bunyala could make a substantial profits, any such gains are needed to subsidise the poorer schemes and to maintain the head office staff. Overall, therefore, the NIB has made operation losses as audited figures available for some five years would indicate (see Table 7, Consolidated Income/Expenditure Account 1977-82).

Table 7: Income & Expenditure of NIB Operational Schemes (excluding Bura, 1977, 1982)

Particulars	1977/78	1978/79	1979/80	1980/81	1981/82
Income	1,279,855	1,698,021	1,858,574	1,799,280	2,813,229
Expenditure	1,552,603	1,756,404	2,084,386	2,619,474	3,154,345
Excess of Expenditure over income	272,748	58,383	225,812	820,194	341,116

These figures exclude accounts in respect of Bura which currently, is perhaps the most expensive scheme being developed (anywhere in the world?). These estimates are US \$25,400 per hectare for irrigation works alone and about US \$33,000 per family settled. The case of Bura perhaps epitomises the pitfalls of the NIB style of operation which relies so heavily to foreign consultants, expert advisors, and contractors. Table 8 gives a breakdown of costs for the Bura Scheme. But it is conceivable that even these costs would be much higher, especially those relating to farmers, some of whom have abandoned their plots and returned to a state of landlessness in their former areas of origin.

3. The takeover of Bura management by the Ministry of Agriculture included a promise that Bura Irrigation Settlement Project would be managed at site.

Table 8: Breakdown of Costs for Bura West Irrigation Scheme.

	Estimated Cost (Million US \$)	Percent
Irrigation Works	42.5	25.0
Roads/Airfields Infrastructure	7.4	4.3
	59.7	35.1
Public Health	1.4	0.8
Afforestation	1.7	1.0
Vehicle/Equipment	6.9	4.1
Cotton Ginnery	10.0	5.9
Consultants	14.2	8.3
Agricultural Management	4.0	2.4
NIB Operation	12.9	7.6
Farm Inputs	8.4	4.9
Training	1.1	0.6

Total Investment per Hectare US \$25,400

Total Investment per Settler Family " \$33,000

Source: Toksoz (1981) p. 15.

Due to its escalating costs and failure to show good results on the ground, the ambitious plans for the expansion of Bura have been drastically scaled down and the project removed from NIB.

But apart from the costs involved and management inefficiencies within the NIB operated schemes, it would also appear that there are no longer vast land frontiers with potential for irrigation where large scale schemes could be developed. The options for the future thus clearly point to small scale projects with a built-in plan for phased farmer management. In any case it is increasingly becoming politically difficult to justify treating those settled on irrigation schemes as virtual "serfs" in contrast to those settled in areas of rainfed agriculture. Clearly the NIB will have to be drastically transformed so that the farmers on the schemes can realize some amount of autonomy and derive maximum economic benefits for their labour.

3.5 Irrigation and Drainage Branch (MALD)

Following the plethora of agencies involved in small scale irrigation during the 1960s and 1970s, the Irrigation and Drainage Branch (IDB) was created in 1978/79 with responsibility for co-ordinating the development of all small scale irrigation projects in the country. It was formed through the merger of the small scale Irrigation Development Project and the Arid Regions Irrigation Development Programme within the Land Development Division of the Ministry of Agriculture. Table 9 shows the estimated area under various PIUs. An attempt was made to decentralise operational activities in the field by setting up Provincial Irrigation Units in all provinces. Unfortunately, this has led to the sponsorship of various PIU's by different donor countries so that, for instance, the Netherlands are identified as the financiers of small scale irrigation projects in the Rift Valley while the Italians are establishing themselves in the Western Province.

Table 9: Area of Small-scale Irrigation by PIU, 1984.

PIU	Schemes in Operation or under Rehabilitation	Schemes under Construction and Planning
Coast Province	750	-
Rift Valley Province	900	1,250
Nyanza Province	765	100
Central Province	175	100
Eastern Province	550	100
North Eastern Province	100	100
Western Province	-	-
Total	3,240	2,300

Source: Gitonga, S.M. (1985) Policy options and Implications for Irrigation Development in Kenya. Paper prepared for the FAO Informal Meeting, Rome, 24-25 June 1985 (mimeo).

A disturbing feature of this development is that the team leaders or co-ordinators of these donor programmes have a virtual free-hand over project selection and disbursement of funds. Because of the high cost of personal emoluments, the tendency to rely on expensive technology and equipment and the clear reluctance of so-called foreign experts

to give their local counterparts the opportunity to learn by doing, most of the IDB operations have become just as expensive as those under the NIB, although there are some few notable exceptions (Table 10).

In order to improve the performance of small-scale schemes and particularly to lower the costs the IDB overall strategy has adopted the following objectives:

- a) To keep the cost of irrigation development to an absolute minimum by employing low-cost technology as much as possible and by inducing farmers to contribute toward this development by providing at least one or two days of free labour;
- b) To involve the farmers in the planning and construction of "their" system in order to educate them on the function of the various structures in order to enable them to operate and maintain the system on their own afterwards, and to impart some sense of ownership and control;
- c) To emphasize the organization of farmers into water users' associations able to carry out routine operation and maintenance activities. (Hence a policy to assist the schemes where the farmers are already collectively irrigated); and
- d) To limit the agency's role to technical design and construction, enabling it to move elsewhere after construction. (Arao, 1986).

Since it appears that the future direction in development of irrigation is likely to be biased towards small scale operations — this also appears to be the donor's preference — it is imperative that the IDB should have — the competence to facilitate effective co-ordination of the development of small scale irrigation activities. This not only calls for the appointment of a professionally and administratively competent persons to head the IDB, but it would also suggest elevation of the Branch to a Division to give it more clout. For at the moment it now appears that the donor Team Leaders/Co-ordinators have taken over all the financial decision making roles!

3.6 Government Loans (AFC)

So far there appears to have been little irrigation involvement by the specialized public agricultural credit organisations such as the Agricultural Finance Corporation. This may partly be explained

Table 10: Units Costs of Selected Irrigation Projects

Project Name & Location	Type & Acreage	Cost/ha. Shs	Method of Implementation
El Ndume Irrigation Project Baringo district	Small Scale Furrow System (100 ha)	Kshs 25,000 (US \$ 1,560)	Farmers provide some of labour requirements Government provides technical help and finance. Foreign personnel limited to 1 expatriate. Dutch and Kenya Govt. funds.
Lower Tana Village Irrigation Project, Tana River district	Small scale basin system (64 ha.)	Kshs 350,000 (US \$8,750)	Farmers participation minimal. Heavy use of expatriate and Kenyan technical personnel. World Bank and Dutch and Kenya Government funds.
Mitunguu Irrigation Scheme, Meru district	Small scale gravity sprinkler system (400 ha.)	Kshs 140,000 (US \$500)	Farmers contribution minimal and limited to provision of land. German and Kenya Government funds. Technical assistance German. Irrigation system by Nairobi-based Contractor.
Extension of Mwea Irrigation Scheme, Kirinyaga	Large scale basin system	Kshs 80,000 (US \$500)	No farmer participation. Land development machinery provided by Ministry of Agriculture. Kenya Govt. funds. No expatriate personnel.
Kibwezi Pilot Irrigation Scheme, Machakos district	Pumped sprinkler system (55 ha.)	Kshs 50,000 (US \$3,125)	No farmer participation. Design and supervision Kenya. Kenya Government funds.
Bura Irrigation Project, Tana River district	2500 ha.	Kshs 480,000 (US \$30,000)	No farmer participation. Heavy external consultant and contractor involvement; Kenya, Dutch, EEC and World Bank funds.

Source: MOA, Kenya, Irrigation Development in Kenya, A Report of Inter-ministerial task force, 1986.

by the limited scope for irrigated farming in the country and particularly among the small-scale farmers. It is conceivable that credit agencies like the AFC may in future take a more active role in financing small scale irrigation development, especially among individual farmers. Complications may arise, however, in funding larger projects where land is pooled together by a number of farmers (due to land tenure problems) and the need to use title deeds as collaterals for loans. Probably the approach used in advancing loans to group ranches may be employed in a modified form. Alternately, farmers may be required to lease their land to a corporate entity of which they remain members. The new entity would then act as a legal person and enter into contractual agreement with the financing agencies. But for such an arrangement to work effectively it is vital that the farmers as a group, should be given the necessary extension education and supported by the relevant government agency (the PIU technical team) in order to evolve an economically efficient organization.

It is probably in the area of irrigation extension and water users education that the Government is weakest. A fact which calls for a review of the training of irrigation engineers and technical officers to sensitize them to the social and organizational problems relating to irrigated farming. So far, emphasis appears to have concentrated too much on purely technical engineering and agronomic training.

3.7 Commercial Loans

Although figures are not readily available it is evident that some of the large scale commercial irrigation farms producing high value horticultural crops and/or coffee and pineapples have been able to raise commercial loans from local banks to finance their operations. It is foreseeable that as irrigated farming becomes more significant in Kenyan agriculture this source of finance could play a more important role. The challenge, however, is to expand the scope of activity so that commercial loans play a more prominent role than at present in promoting public irrigation projects. It would appear that foreign bilateral or multilateral loans are not particularly cost-effective in developing irrigation — or other enterprise, for that matter. Some estimates indicate that despite their large magnitudes

only a very small fraction of foreign loans ever go into the projects they are intended for. In this sense, it has then been argued that nearly 75 per cent of all development that has taken place in Third World countries since the 1960s, has been financed from local resources. There is no reason, then, why irrigation should be an exception. But this will require deliberate policy decisions and the requisite training and a system of incentives, including the rational deployment of personnel. For only then will private financial institutions feel adequately confident to invest in irrigated farming.

4. LAND USE

4.1 Land Use

While the Government of Kenya has given priority to food production in the National Food Policy paper (Sessional Paper No 4 of 1981), irrigation and drainage are also identified as one of the means providing potential increases in food production. But today there is little unused agricultural land in the high potential regions, and the settlement and land use patterns are such that it is already very difficult to design the lay-out of irrigation schemes in some irrigable areas with high population densities.

It is perhaps necessary that before the situation gets completely out of hand a national land use policy should be evolved. Such a policy would give indications as to the type of farming and cropping patterns suitable for particular land areas. In addition, a modest land-tax predicated upon the estimated production of the recommended land use might be imposed to provide the necessary disincentive to discourage the present tendency where some people hold land for its asset value or for speculative purposes without any immediate plans to farm. A major pre-requisite for this, of course, is a detailed cadastral survey, going beyond the mere establishment of existing use rights as at present, but also assessing the potential value on the basis of recommended optimal utilization patterns.

This issue has been broached and discussed often reluctantly, and only tangentially at that, by politicians and policy makers since the early 1970's. Unfortunately, given the necessity for proper design

and layout of irrigated farming, it is a question that cannot be postponed by further, unless irrigation activity has to concentrate, as it has in the past, in areas of sparse human population and on land which is either owned by the Government directly (State Land) or held in trust for the local population by County Councils (Trust Land).

But even on freehold land, given the very extensive parcelization that is already taking place as a result of population pressure, it may be necessary to impose a moratorium, reorganise settlement pattern and re-consolidate once again in order to facilitate rational land use and efficient farm lay-out. In the case of irrigated farming, this cannot be over-emphasised.

4.2 Human Settlement and Land Tenure

Related to the issue of land use, discussed under 4.1, is the question relating to the use of large scale irrigation projects to settle the landless. Although this was the original mandate of the NIB, experience has shown that such settlements operate more efficiently when tenants are recruited from the immediately surrounding region. This has partly to do with the precarious state of household incomes in many of the NIB schemes, so that tenants can rely on the support of the extended family some of whom may be making substantial gains from rainfed farming, livestock production or other economic activities. But it has also to do with adaptability in the somewhat remote and difficult environments in which some of the large scale schemes are located, e.g. Perkerra, Hola, Bura. It is not surprising therefore that the rate of "defection" for the Bura scheme, especially by tenants from the Central Highlands has been so high — 55 percent of all defectors constituting more than 20 percent of tenants by March 1983 (Migot-Adholla, 1983, Ruigu et al., 1984).

But 'defection' from Bura has perhaps also been aggravated by false expectations of more secure tenurial rights, and inadequate health and education facilities. Historically, recruitment of tenants for Bura began at a time following the settlement the landless on previous farms in the former White Highlands (Million Acre Schemes), or on areas previously reserved for forests or wildlife conservation,

and lately on former sisal estates purchased by the government. Even though settlers in areas like Yatta, Ngwata, Kikumbulyu, Shimba Hills and Lake Kenyatta, might not have land titles, they operate on a relatively more secure usufructory rights than those operating on irrigation schemes. Thus on the basis of social justice and equity it is no longer possible to justify the prohibitive conditions under which one group of Kenyans are virtually reduced, to serfdom under the Irrigation Areas Rules (CAP 288 Laws of Kenya) administered by the NIB. Further, it may also be argued, especially in case of the older schemes developed by virtually "free" Mau Mau detainees labour, that the tenants have already amortised — through the very high service charges — whatever the cost of such schemes was. It is therefore time that the tenancy rules was modified to give the farmers a greater stake in the land they have been working on, in some cases, for nearly 30 years! But this of course, is not to suggest that all the rules necessary for the efficient running of irrigated farming be abolished. Evidence from elsewhere however, indicates that the standardised tenancies may not be essential, and indeed often limit initiative and hamper the best use of a farmer's resources. This kind of tenancy is also uncommon in Asia (Tiffen, 1986) where irrigation is more developed. It is conceivable that like the Kenya Tea Development Authority, the NIB could retain a technical and advisory role while entering a partnership with farmers in which the farmers own their land in a proprietary sense.

4.3 Water Rights

Kenya has limited water resources and water is perhaps one of the major constraints facing irrigation development in the country.⁵ Water is the major determinant of the country's irrigation potential of 540,000 ha. (see Appendix I). Other factors are soils, and topography. Kenya's population is increasing very rapidly and this is creating an increasing demand for water. As the demand for water increases, competition for access to it by the various groups in society will intensify. Therefore, the optimization of water use and the rational allocation among conflicting demands for domestic, industrial,

5. Capital (and particularly foreign exchange) is the main constraint - the scope for irrigation developed based on availability of land and water resources is hardly exploited.

irrigation, hydropower, rural/urban, public and private etc. will gain special importance as the population continues to increase.

The apportionment of water among various users is the responsibility of the Ministry of Water through the Water Apportionment Board. There are various Catchment Boards to cover the main catchments. The allocation of water for irrigation and other uses is thus the responsibility of MoW.

It is necessary to review the existing system of water rights (traditional, legal) which determine access to water, and the implication for such rights for irrigation development. The rights should be structured in such a manner as to ensure efficient utilization, conservation and protection from pollution. A National Water Master Plan for Kenya which provides detailed information on the availability and reliability of the country's irrigation and hydropower potential was completed during the 4th Plan Period (1979-83) while River Basin Studies are being executed.

The regional development authorities which were set up to stimulate and accelerate development in their respective basins: a) Tana and Athi Rivers (TARDA). b) Lake Victoria Basin (LBDA) and c) Kerio Valley (KVDA) have some responsibility for water related development including irrigation and drainage and could be of assistance in planning water and land use.

5. AGRICULTURAL MARKETING AND PRICING

The legal basis for the management of large-scale (NIB) irrigation schemes in Kenya is provided by the Trust Land (Irrigation Areas) Rules (CAP 288, Laws of Kenya). The rules are very comprehensive and clearly stipulate the rights and obligations of both management and the tenants. The system of rules are said to have been adopted to give the management better control of cropping and to ensure some degree of control and discipline. Among other things the rules provide for the disposal of the crop which is grown, for instance, rice in Mwea, cotton in Bura and Hola, chillies and onions in Perkerra. Whatever the crop, it has to be sold through a single channel i.e. to the board

(National Cereals and Produce Board (NCPB) and Cotton Lint & Seed Marketing Board (CLSMB) and paid through the NIB in order to enable the NIB to re-coup the costs for land preparation, water and other inputs, which it provides. Since the crops which can be grown are predetermined by the Board it is crucial that farmers be provided with the necessary incentives for their production.

The appropriateness of the marketing system level of prices which the tenants receive need to be reviewed. For instance, the controlled price of a 12 two kg bale of rice which sells at slight above Kshs 200 at National Cereals and Produce Board sells for up to Kshs 400 in the black market and it is always impossible to get in shops. This high price is due to excess demand. Neither the producer nor the consumer benefits (the middleman makes a killing). Is it not possible to increase the price to the farmer since a consumer subsidy is out of fashion? Similarly, the price of irrigated cotton was reported to be about 20% less than the market price (Midterm evaluation, 1984) and does not allow the farmers to obtain a premium for the superior quality of irrigation cotton. (Ruigu *et al.*, 1984). The pricing system does not take into account the possibility of higher ginning out-turn for some cotton varieties. This is likely to be a constraint for the adoption of other cotton varieties.

The issue of marketing and pricing of various commodities which are produced under irrigation deserves further scrutiny. It is not only important to consider the incentives aspect but also the income implications, and the timeliness and considerable delays experienced before the farmers are finally paid. Needless to say that the farmer is not paid any interest on his money during this period (but interest on loans continue to accumulate). Malnutrition and poverty are rampant in our irrigation schemes and could be reduced by a more efficient payment system for the produce. There are also issues as to whether there are more lucrative crops which could be substituted for some of the current ones. For instance, in the Perkerra scheme chillies continue to be grown despite recurring marketing problems. The production of groundnuts in Bura could be expanded and so on. Profitability of the enterprise should be used to determine the crops which are grown. The issue of high value crops in irrigation schemes is always stressed. But do the crops which are grown have a value which is high enough?

6. TRAINING AND RESEARCH

6.1 Training

Our investigations suggest that the country has not developed an adequate manpower to cope with irrigation development problems. In the implementation of the Bura Scheme it was argued that there were few senior and experienced engineers. It has also been argued that the NIB has not developed the institutional capability in engineering, agronomy, or accountancy skills to be able to adequately provide these services to the irrigation schemes.

The lack of qualified manpower is an important constraint to improved performance of irrigated agriculture in Kenya. Table 11 shows the number of Kenyan personnel in the public sector. The information presented concerns engineering and irrigation management cadres. The numbers are inadequate to cope with the existing schemes leave alone an expanded irrigation programme. This explains partly the observed tendency to rely on consultants and expatriates, and the lack of effective control of consultants. In Bura for instance, consultants designed the project and also acted as Engineer-in-charge of implementation to the detriment of the project.

Manpower planning and training for all professionals required in irrigation agriculture needs more emphasis. It should start with the evaluation of the scope and the need for irrigation in Kenya followed by an analysis of jobs or skills which have to be performed. It has to be recognized that irrigation is a highly multi-disciplinary activity with a major emphasis on agricultural production and marketing. Irrigation is however very dependent on disciplines outside agriculture and particularly engineering (Carter et. al., 1983). It will be necessary to restrict the review on the most crucial disciplines such as civil engineers, irrigation engineers, irrigation management and soil and water engineers. It may be also important to focus on other disciplines or skills which may be severely limiting, for instance, agronomists with some knowledge of soil and water relationships. Since our concern is with irrigation development we need to focus on the entire process from planning to construction to post construction or operational stage. A more complete discussion of this subject is provided by Lenselink and

Table 11: Specialized Irrigation Personnel in Public Agencies

Staff	Discipline	National Irrigation Board	Irrigation & Drainage Min. of Agr.	Tana & Athi Rivers Dev. Authority	Kerio Valley Development Authority	Lake Basin Development Authority	Ministry of Water	Total
A	Civil Engineering	2	-	1	1	1	-	5
	Agricultural Engineering	1	1	1	1	1	-	5
	Irrigation Management	10	1	3	1	1	-	16
	Total	13	2	5	3	3	-	26
B	Civil Engineering	7	-	3	1	1	1	13
	Agricultural Engineering	-	4	-	1	1	-	6
	Irrigation Management	-	10	-	1	-	-	11
	TOTAL	7	14	3	3	2	1	30
	GRAND TOTAL	20	16	8	6	5	-	56

Source: To recapitulate these include:

- 1) the National Irrigation Board
- 2) the Irrigation and Drainage Branch of the Land Development Division of the Ministry of Agriculture.
- 3) the regional development authorities:-
 - a) Tana and Athi Rivers Development Authority (TARDA)
 - b) The Lake Basin Development Authority (LBDA)
 - c) The Kerio Valley Development Authority
- 4) the Ministry of Water Irrigation Section
- 5) the Ministry of Planning and National Development, Rural Development Section
- 6) various County Councils, through the District Development Committee.

Scheltema (1987). It would be useful in this study to show the norms for staffing of the institutions dealing with irrigation and the present practises concerning manpower planning and training. The existing training programmes for irrigation specialization from technician level to university should be reviewed. This should include some assessment of irrigation development in the future manpower demand. In the Kenyan context the situation is complicated by a lack of coherent irrigation policy.

6.2 Irrigation Research

Research related to irrigation is mainly carried by the National Irrigation Board. It carries research on varieties of various crops grown under irrigation. A more detailed discussion of the NIB Irrigation Activities are presented by Ogombe and Roelogsen, 1987. The National Agricultural Research Laboratories (NAL) of the Scientific Research Division of the Ministry of Agriculture and Livestock Development also has an irrigation and drainage section. This section is geared to tackling water management problems of both rain fed and irrigated agriculture. Some of the studies already undertaken include water management and use on red soils of Upper Tana, Salinity Development in Lower Tana, and drainage problems and reclamation problems at Yala Swamp. Research on soils, irrigation and socio-economics is envisaged.

The need for irrigation management research cannot be over-emphasized and should constitute an important aspect of monitoring and evaluation.

7. NEED FOR THE AN INSTITUTIONAL FRAMEWORK FOR CO-ORDINATING IRRIGATION MATTERS

7.1 The Need for Co-ordination

As already mentioned there are about eight governmental organisations involved in irrigation. Clearly, there is a need for co-ordination to avoid the present duplication of efforts, wastage of resources and misallocation of personnel (as has occurred in the case of Yala Swamp). It would appear that given the expected diminished role of the NIB, increased involvement of regional authorities in planning, decentralised

implementation which is implied by the District Focus strategy of development and the possibly greater involvement of NGOs and other donors in small scale schemes, such co-ordination would best be performed by a new or reorganised and much strengthened irrigation organization such as an irrigation and drainage division within the Ministry of Agriculture or parastatal.

Overall, the case for a single authority to co-ordinate all irrigation activities in the country should be examined. It should include the evaluation of a unified agency for co-ordinating the functions of various departments, regional authorities, NGOs and private agencies or individuals in the area of irrigation, without necessarily being an implementing agency. Such a body should maintain a pool of expertise in all matters pertaining to irrigation development and management, and should be able to avail the same, to all irrigation schemes if called upon to do so.

7.2 National Irrigation Policy

Kenya does not have an explicit National Irrigation Policy. A clearly formulated irrigation policy would be crucial in determining the effectiveness of the co-ordinating body. It would stipulate the goals which should be met, establish the priorities and a framework for implementation. In addition, it should permit consistent action by the various agencies and help avoid duplication and/or competition. Effective co-ordination, however, cannot occur in a policy vacuum.

The Ministry of Agriculture and Livestock Development has already taken initiative towards the formulation of Irrigation Policy. These deliberations could help in generating some of the necessary information to assist those charged with the task.

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Appendix 1: Irrigable Areas of Kenya

Drainage Basin	Location of Irrigation	Cropping Pattern	Irrigation Potential	Current Population Status
1. LAKE VICTORIA BASIN AND ASSOCIATED AREA				
1.1 Nzoia river	Middle/lower	Rice/Sugar Cane	65,000	Medium
1.2 Yala/Nzoia rivers	Yala Swamp	- do -	15,000	low
1.3 Sondu/Nyando rivers	Kano plain	- do -	60,000	high
1.4 Kuja/Migori rivers	Lower	- do -	25,000	high
1.5 Mara river	Upper	- do -	20,000	high
1.6 Lake water	Shore area	- do -	15,000	medium
	Total		200,000	
2. TANA AND ATHI RIVERS BASIN AND ASSOCIATED AREA				
2.1 Tana river	Upper	Coffee/hort/maize/legumes	100,000	high
	Middle/lower	Cotton/maize/legumes	40,000	low
2.2 Athi river	Delta	Rice/Sugar Cane	60,000	low
	Upper	Coffee/hort/maize/legumes	10,000	high
	Middle	Coffee/hort/maize/legumes	25,000	medium
2.3 Lumi river	Lower	Cotton/maize/legumes/bananas	5,000	low
	Upper	Cotton/bananas/hort/maize	1,000	low
2.4 Engare Uaso	Njoro springs	- do -	4,000	medium
	Lower	Cotton/hort/maize/legumes	10,000	low
	Total		255,000	

Appendix 1: cont'd

3. KERIO VALLEY BASIN & ASSOCIATED AREAS				
3.1 Turkwel river	Middle/lower	Cotton/maize/ legumes	25,000	low
3.2 Kerio river	Upper/middle	- do -	20,000	high
3.3 Lake Baringo	Lake shore & related areas	- do -	15,000	low
	Total		60,000	
4. OTHER DRAINAGE BASINS				
4.1 Lake Naivasha	Shore area	Hort/pasture/ legumes	10,000	high
4.2 Engare Uaso North	Upper	- do -	10,000	low
	Lower	Maize/legumes	10,000	low
4.3 Small scattered Drainage Basins		Maize/Sorghums/ legumes	5,000	low
	Total		25,000	
All Basins	Total		540,000	