Irrigation Management Transfer in Nigeria: A Case of Financial Sustainability for Operation, Maintenance and Management

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ABSTRACT

IN THE PAST two decades (1970-90), Nigeria witnessed spectacular expansion of irrigated agriculture, with the Federal. Government of Nigeria and its institutions as the main actors. The situation has however been declining, gradually initially, but with gathering momentum in the last five years.

First, investments for new construction has steadily declined. Second, appropriation for operation, maintenance and management of existing completed systems became gradually insignificant, so that they could not even cover personnel cost. And most recently the Federal Government of Nigeria decided to partially commercialise the irrigation agencies by making them self financing of their operation, maintenance and management (OMM) expenditure. Meanwhile demands for increased aggregate food production and crop yield under irrigated agriculture grew.

The decreasing opportunities for new infrastructure coupled with increased demand for institutional progress led the Federal Government in collaboration with the International Irrigation Management Institute (IIMI) to experiment on and explore possible management partnership arrangements that would enhance the achievement of sustainable operation, maintenance and management of completed infrastructure and to improve and sustain higher productivity through institutional reforms.

In this paper are discussed experiences in Nigeria with Irrigation Management Transfer in the attempt to make irrigation agencies develop new competence and new alliance with farmers. Case studies shall be used to exemplify points and to serve as warning where necessary. Overall, irrigation management partnership (especially in the context of partial commercialisation policy) promises financial sustainability for operation and maintenance of the systems, thereby ensuring greater effectiveness, efficiency, productivity and at the same time guaranteeing survival of the irrigation agencies.

INTRODUCTION

The collapse of state control worldwide, created a new inevitability: state divestment and/or removal of subsidy on various products and services previously provided or operated and managed by state organs (Moore, 1992). The question facing many governments around the world today is no longer whether to transfer responsibility for management of public irrigation systems to beneficiaries or other non governmental organisations, but only how and when to do so. The transfer may be partial or complete and could be informed by factors other than the desire to achieve better performance per se. Irrigation management transfer (IMT) has also been described by such factors as turnover, transition, disengagement, takeover, participatory management, joint management privatisation and commercialisation depending on location and scope [(Vermillion, 1992).]

Irrigation Management in Nigeria is characterised by its phases. These phases were mainly dictated by the fortunes of the national economy. Irrigation development will be discussed in greater detail subsequently, but it suffices to state that until 1983, most public irrigation systems in Nigeria were entirely agency-managed and were very costly indeed.

The current national policy in Nigeria is to gradually turn over operation, maintenance and management (OMM) responsibilities at tertiary and even secondary levels to farmers on public large-scale modern irrigation schemes; and to handover fully the OMM responsibilities of smaller systems to beneficiaries. In addition, the agency is required to operate, maintain and manage the remainder of the irrigation system jointly with the farmers or non-governmental agencies in such a manner as to be self-financing from the revenues collected on irrigation water charges.

Preliminary results of what begun as a radical experiment under collaborative efforts with IIMI--to gradually transfer responsibility for OMM of completed irrigation system to farmers--has shown great potentials and promise. It is gradually attaining the status of an accepted practical process by which a hitherto costly agency-operated, -- -

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maintained and -managed irrigation system could be turned around through joint management with farmers; with visible, often dramatic gains for the agency, the government and the farmers who in addition take on an active role and responsibilities of OMM of at least the tertiary level. More importantly, IMT has become an educational process by which the farmers can grasp the fundamental practices and values of free enterprise while taking on increased responsibilities in controlling their means of livelihood and hence their own economic survival and wellbeing.

DEFINITION OF OBJECTIVES

Irrigation management transfer (IMT) is a multidisciplinary subject involving a complex interaction of technical, social, political and economic factors. It is not the intention nor is it practicable to present a field manual of IMT in Nigeria; rather the paper shall seek to establish the basis by which sustainability of OMM can be achieved through IMT. Sustainability here refers to the ability of the irrigation scheme to yield enough economic benefits such that farmers are willing to contribute resources to cover operation, maintenance and management costs for today's operator withoutcompromising the capacity of the system nor ability of future operators to operate, maintain and manage the project.

Achieving this objective will necessarily require the evolution of a certain organisational framework (as well as operational procedures) for the beneficiary. Evolution of a functional beneficiary organisation like the Water User Association (WUA) and the benefits to farmers and agency of joint management, (participatory management or IMT) shall be discussed. More specifically, the paper aims to:

i. provide the an understanding of the situation that led to the decision to pursue IMT in Nigeria;

ii. examine the limited experiences of IMT in Nigeria and of their contribution toward sustainable OMM of the irrigation systems; and

iii. offer suggestions on the best ways to attain sustainable development of irrigation systems through IMT.

CLIMATIC AND PHYSICAL CHARACTERISTICS

In accordance with the 1991 census, Nigeria has an estimated population of about 88.5 million people with a growth rate of about 1.7% per annum. It is located at the extreme inner corner of the Gulf of Guinea on the west coast of Africa, and occupies an area of 923,768 sq km. The country lies between latitudes 4° and 14° North of the equator and longitudes 3° and 15° East of Greenwich.

Although Nigeria lies wholly within the tropical zone, there are wide climatic and rainfall variations found in the country due to its location: south of the path of the westerly winds in the North and almost out of the true equatorial doldrums of the south of Nigeria; consequently, it is in the heart of the trade wind belt with generally "summer" rains and "winter" drought.

One of the highlights of the country's climatic characteristics is the wide variation in the features found within it. Rainfall average over 2,000 mm per annum in the South east, 1,000 mm in the centre and reducing to as low as 500 mm in the north. In the same areas the mean annual panevaporation varies from 2,450 mm, 2,620 mm, and 5,220 mm per annum, respectively. Similarly, the vegetation of thick mangroove forests and dense rain forests in the south give way to near-desert condition in the north-eastern corner of the country.

In addition, in the southern part of Nigeria the seasons are not sharply defined, with temperatures rarely exceeding 32°C (90°F), but humidity is generally very high (up to 90% in the morning) and nights are hot. On the other hand, in the central and northern parts of Nigeria - there are two distinct seasons: a wet season from April to October, with generally lower temperatures, and a dry season from November to March, with mid-day temperatures sometimes above 38°C (100°F) but with relatively cool nights. On the plateaus of Jos, Obudu and Mambilla, temperatures are more moderate.

Generally, the country is divided into eight agro-ecological zones for the purpose of irrigation practices based on rainfall and temperature which are the most significant parameters. Table I and Figure 1 give the agro-ecological zones of Nigeria with some of their climatic characteristics and state representation.

AGRICULTURE IN NIGERIA

Agriculture employs three quarters of the Nigerian working population. A recent survey (JICA, 1993) suggests that 39 percent of the land mass is potentially suitable for agriculture and out of these between 4.0 and 4.5 million hectare (approximately 4.5 to 5.0 per cent of the land) are judged suitable for irrigated agriculture but only 1.1 million

ha can be supported fully by the water available, the remaining 3.4 million ha being fadama.

Agricultural land holdings are generally small and scattered. The average number of farm plots per household ranges between 2 and 28 plots and between 0.5 and 5.0 hectares, increasing in size from the south northwards. Farming is generally rainfed and the subsistence variety is characterised by simple tools and shifting cultivation but an increasing number of farmers use animal traction for ploughing. Farms are usually split into village and fadama areas. The farmland owned by a household is considered to belong to many people--the living, the dead and countless numbers yet to be born (Iloeje, 1981).

The benefits of large-scale agriculture have been recognised, and the solution to the fragmented small farm plots has been the formation of cooperative societies. Large-scale agriculture, is however, primarily in the forms of plantation and irrigation projects owned by public authorities or private commercial interests.

Water is a limiting factor to agriculture in much of the country but most especially in the semiarid and dry sub-humid zones. The major crops grown in the country can be divided into two main groups: food crops - produced for consumption, and export products. Despite the importance of the export crops, the primary policy of agriculture is to make Nigeria self-sufficient in its food and fibre requirements.

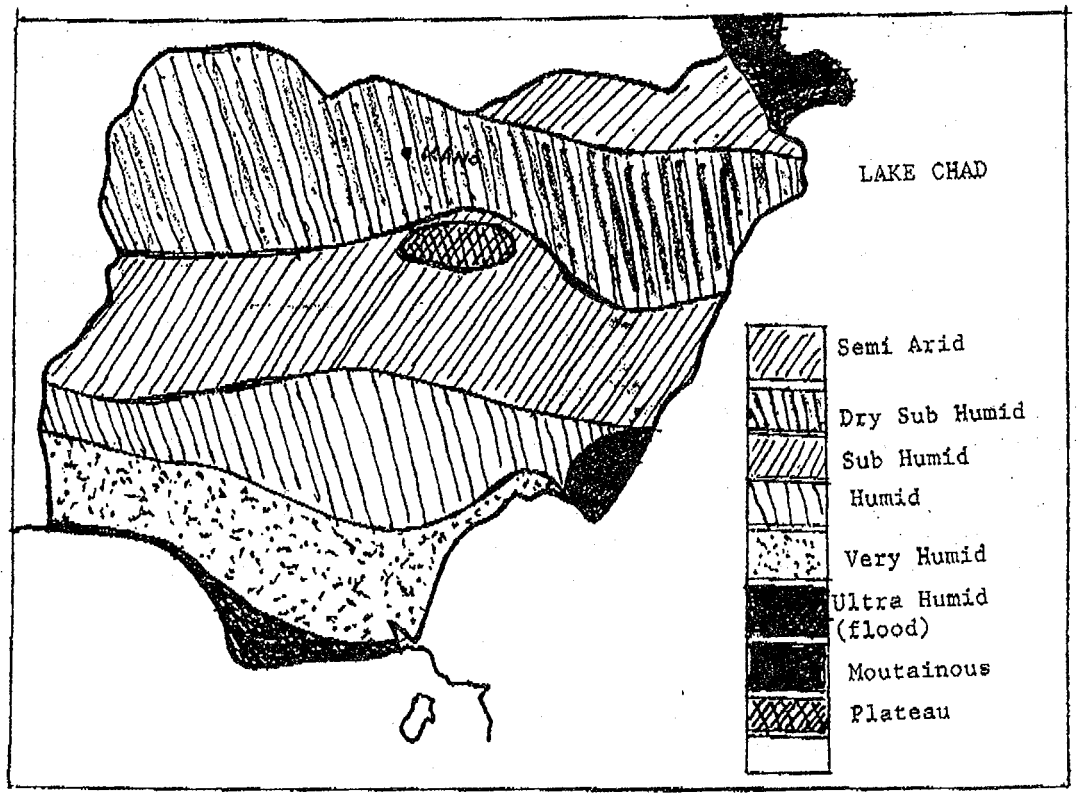
The most important food crops by value are rice, yams, soyabeans, guinea corn (sorghum), millet, corn, cocoyams, beans (cowpeas). Many fruits and vegetables are also grown. Palm oil, groundnut and sesame seed oil are staple foods. On the other hand, the principal export crops are rubber, cocoa, cotton, palm oil and kernels. The physical output of agricultural exports in terms of aggregate index (base 1960) fell from 105.6 in 1970 to 63.8 in 1975. This sharp drop was attributed mainly to the five-year drought, but the situation has been aggravated in recent years by rural migration to the cities. Between 1966/67 and 1991/92 agriculture's share of GDP fell from 59.7% to 35% as a result of reduced agricultural output and the greatly increased output of the petroleum sector.

Table 1. Agro-ecological zones of Nigeria with some climatic characteristics.

ZONE DESCRIPTION	OF LAND	ANNUAL RAINFALL(MM)	MAN MONTHLY TEMPERATURE (C)		
			MAX	NORMAL	MIN
Semi Arid	4	400- 600	40	33-32	13
Dry Sub Humid	27	600-1000	39	31-21	12
Su Humid	26	1000-1300	37	30-23	14
Humid	21	1100-1400	37	30-26	18
Very Humid	14	1120-2000	37	28-24	21
Ultra Humid (flood)	2	2000+	33	28-25	23
Moutainous	4	1400-2000	32	29-14	5
Plateau	2	1400-1500	36	24-20	14

Source: Modified from FAO (1991).

Figure 1. Agro-ecological zones of Nigeria.



IRRIGATION AND WATER RESOURCES DEVELOPMENT

A broad review of water resources development in Nigeria reveals that between 1962 and 1968, FAO and U.S. Bureau of Reclamation were requested to study and suggest in broad perspectives ways of developing agriculture in Nigeria. In recognition of water as a limiting factor to agriculture, both studies recommended a more active government involvement in planned water resources development and in particular the promotion of irrigation (and Martins and Nwa 1982). Until then irrigation practice was rudimentary - using residual flood waters and moisture in the low lands called fadama (flash flood plains), and supplemented with shadufs (a traditional device that lifts water onto the land). The main crop produced using these traditional methods of irrigation was mainly vegetables. Early water resources development for agricultural purposes was in the hands of the private sector for the production of sugarcane with only a minor role by states in the northern region of Nigeria.

As a result of the FAO and the U.S. Bureau of Reclamation studies in the early 1970s, three pilot public irrigation schemes were developed, all in the sub arid and dry sub humid agro-ecological zones, namely: Bakolori Scheme, the Kano River Irrigation Scheme and the Chad Basin Scheme. The success of these pilot schemes coupled with the five-year drought (1970-1975) led to the establishment of 11 River Basin Development Authorities (RBDAs).

Initially (1976-1986), the RBDAs were charged with the responsibility of holistic land and water resources development in their basin. In 1986, their functions were curtailed to only water resources and rural development, with no direct involvement in supply of agricultural inputs to farmers, marketing, agricultural extension services or direct agricultural production. Subsequently, there have been several adjustments and review of water resources development policies culminating in the Water Resources Decree No.101 - 1993 which is based on the appropriation doctrine and vested the rights and control of water with the state. Generally, the decree recognises and upholds the principle of private rights to take and use land and water, but makes it subject to their complying with certain procedures, processes and principle, the limits of the rights being determined by the extent of beneficial use.

The water resources potential of the country is estimated to be 250 billion cubic meters (m^3) comprising 190 billions

m^3 of surface water with the balance in the form of groundwater. Currently there are 161 units of completed dams/headwork with a combined storage of about 30,000 million m^3. Out of these, 76 units with aggregate storage capacity of 11 billion m^3 are for irrigation with total planned area of 525,000 ha but of which only 69,000 ha are actually irrigated - corresponding to an achievement ratio of about 13% (JICA, 1993).

Records [(FMWR, 1992)] reveal that between 1976-1990 about two billion dollars (US$2,000,000,000) of public funds were invested in the development of large to medium public irrigation projects. Consequently, irrigated agriculture witnessed spectacular growth, rising from slightly more than 25,000 ha of irrigated farmland in 1975 to the current 204,896 ha [(Adeniji, 1992)]. Surface irrigation in its various forms (basins, borders and furrows) are used predominantly for water applications in both public and private irrigation schemes.

In 1986, due to a combination of various political and economic situations, the Federal Government of Nigeria introduced the structural adjustment programme (SAP) - a macro-economic reform package that included devaluation of the national currency, commercialisation and privatisation of public enterprises; gradual removal of subsidy and reduction in annual recurrent appropriation not just for irrigation but right across the board, etc. These policy measures were all aimed at promoting economic efficiency and higher productivity.

The impact of these economic reforms on irrigation development was very significant. Most of the ongoing irrigation development projects were scaled down, some to construction of headworks only, while others were suspended at various stages of implementation. The subsidy on OMM was gradually withdrawn leading to significant reduction in appropriation for recurrent expenditure - of the irrigation agencies-the RBDAs. The commercialisation and privatisation policy placed the RBDAs among the public enterprises to be partially commercialised. This was interpreted to mean that the government was to continue to provide funds for investment in the development of new irrigation infrastructure, but that all completed projects were to be managed by the RBDAs without any recurrent subvention from the government after a transition period of between 3 and 5 years.

Most of the formal large-scale public irrigation projects in Nigeria were developed, operated, maintained and managed by the Federal Government through its agency, the RBDA whereas small and medium scale public irrigation schemes have been developed by State Governments. Most recently the Federal and selected State Governments through a World Bank supported programme have been involved in the promotion of private irrigation systems under the "National Fadama Development Programme". The programme seeks to replace the use of shaduf by way of providing credit to farmers to acquire petrol engine driven centrifugal pumps to lift water from shallow wells to expand their holdings.

TRENDS IN IRRIGATION MANAGEMENT

Usually the state and their organs own the physical elements of the public irrigation systems (dams, canals, channels. etc.,) and in some cases even the farm land. At the feasibility and construction stages, farmers are often ignored. On completion of development of the infrastructure, the cost of OMM was until recently also borne fully by the agency and, by, extension, the government. In those cases, where the agencies compulsorily acquired the land, farmers were allocated land either on a seasonal or annual basis, while in other situations the land were even directly cultivated by the agencies. In fact until 1986, following changes in the mandates of the RBDA (restricting their activities to water resources management), they not only owned, operated, maintained and managed most of the public irrigation schemes, but even provided the farm machinery for land preparation, supplied inputs like seed, fertilizer and herbicides; prescribed crop to be grown, harvested, guaranteed the price and even marketed the produce (Andrae and Beckman, 1985).

Consequently, until recently there was hardly any role for the farmers other than to divert water from the tertiary canals or field channels into their farm plots and tend the crops, and only as from 1983, did they even have to pay token irrigation water charges. Therefore, the government played a dominant role in the OMM and even in agricultural production on the irrigation schemes; while farmers became highly dependent. Agency staff took decisions and performed the OMM functions in complete disregard to or without consultation with the farmers. Consequently, non compliance by farmers led to occasional conflicts and even in some cases skirmishes between farmers and agency staff. This unfortunate situation led to serious wastages and the unproductive use of resources: water, soil and not the least of which were funds (Kolawole, 1990).

While this pattern of benevolent patron/client relationship persisted, the funds for OMM came from the treasury. Even the token irrigation water charges were never collected in most cases and where they were collected they were insignificant. Neither the agency officials nor the farmer showed any enthusiasm in the OMM (Maurya, 1993).

The commercialisation and privatisation policy that partially commercialised RBDA services changed all these, as existing irrigation systems are required to be self supporting in financing the OMM in such a manner that their productive and satisfactory performance is not impaired. Regretably the rather sudden and sharp reduction in appropriation for recurrent expenditure to RBDA led to several shortcomings in the system's OMM which resulted

in premature deterioration of the infrastructure and low level productivity of the assets. Consequently, farmers became unwilling to pay the irrigation water charges and to accept responsibility for OMM at tertiary level at the onset, insisting that the system be rehabilitated.

The RBDAs were at a cross road - with little or no financial support from the treasury for OMM and, in some cases, burdened with rapidly deteriorated irrigation systems - their survival was at stake. The issue was therefore how to transmute physical and technical elements of the irrigation systems, along with the formal and informal organisations and social structures towards a common goal and common results - namely: higher productivity for the farmers, and greater contribution to the economy and the society.

For the RBDAs, it became obvious that a survival strategy was required and urgently too. Such a strategy it was suggested would have to be based on an organisation designed for joint performance of the agency and the farmers, and capable of perpetuating itself. The irrigation systems have to be made productive and capable of providing for costs, without which they would destroy the capital and wealth expended in their creation and in the long run their capacity to be productive shall be impaired.

THE REQUIREMENTS FOR FINANCIAL SUSTAINABILITY FOR OMM

Three factors - the subordination of commercial to political interest, the fact that agency survival was not dependent on success, and failure to harness the power of self interest - were the root causes of poor performance of our irrigation agencies and deminishing productivity of irrigation systems. Yet, continued productivity of irrigated agriculture remains the most crucial function of irrigation management. It is natural therefore, that diminishing productivity/performance from some existing irrigation systems coupled with environmental concerns including land degradation should focus attention on the need to develop irrigation systems management which are geared to ensuring economic and environmental sustainability in the longer term.

In assessing "financial sustainability" for OMM of an irrigation system there are four basic elements that need to be considered:

a. the resource limitations;

b. the specific costs associated with operation, maintenance and management activities;

c. the farming systems (and farmers) using the irrigation systems; and

d. the infrastructure forming the irrigation systems and the agency responsible for its management.

The need to move towards sustainable system in the light of limitation in land and water resources and of needed finances for new improved irrigation systems requires that existing facilities be operated, maintained and managed adequately. This has placed considerable additional demands on the institutional managers to increase productivity per unit of land or unit of water, sometimes both, and in improving levels of service at minimum achievable cost.

Previously, the cost of OMM of public irrigation projects was funded directly from the treasury; consequently the relationship between the cost of the service and the capacity or willingness by the farmers to pay that cost was obscured. Partial commercialisation, however requires that these costs be wholly or partly met by water users/farmers directly by way of irrigation water charges or fees; obviously therefore, there is a growing need for the relationship to be more sharply focused.

In determining the scope of IMT to be pursued, specific costs associated with individual irrigation management activities have to be identified. Such identification of costs is a pre-requisite at least for realistic budget preparation, articulation of effective measures to improve performance and/or cost reduction, and is also imperative as a starting point in the development of long-term strategies for cost recovery from users and beneficiaries, an issue which is crucial to successful IMT.

If IMT is to lead to sustainable OMM of the system, then farmers need to be organised and to be more "business like" in an increasingly competitive market and with added responsibility. On the other hand, partial commercialisation policy now requires managers of irrigation agencies to be more "commercially" oriented in the management of the irrigation and drainage systems.

Unfortunately, we have seen that because irrigation system managers ignored OMM this resulted in premature deterioration of the facilities and hence the need for costly rehabilitation. The common [sing-song] has been to attribute the dismal situation to inadequate finance. No doubt adequate finance is an essential prerequisite for good OMM, yet deficiencies in institutional, technical and organisational aspects of our irrigation management are equally

important factors that have hindered continued productivity of our irrigation system.

More specifically, the key element of sustainable system operation, maintenance and management is the direct involvement of the water users, which was not institutionalised. Involvement of farmers and water users would enable transfer or turning over part of the functions of irrigation system OMM to them. To effect this however, [farmer and water user capacity] has to be strengthened and the irrigation agency has to take the lead in encouraging WUA to evolve.

HJRBDA - IIMI COLLABORATIVE ACTION RESEARCH ON IMT

All of the foregoing scenario simply goes to illustrate a fairly obvious truth: the need to turnover - at least partially - the irrigation management to non-governmental entities even if indirectly. However, for such turnover to be successful it, in part, requires the creation of institutions and organisational structures which promote true partnership among concerned parties. The crux of which involves the formation or preferably the evolution of water users' associations (WUAs). The logic is obvious; irrigation agencies are organisations with definite structures and a set of objectives, targets and authority backed by law to operate towards their set goals. Farmers must also be organised into an organisation with its structure, objectives and sufficient authority to relate with the agency as equal partners.

In realisation of the foregoing, the Federal Government of Nigeria, invited the International Irrigation Management Institute (IIMI) to a collaborative action research programme using the Kano River Irrigation Project (KRIP) as a test case for IMT. KRIP is under the management of Hadejia-Jama'are River Basin Development Authority (HJRBDA) and is one of the largest operating irrigation schemes in Nigeria with 15,000 ha of command area. This research, it was hoped, would serve as a test case so that lessons learnt on IMT experiment, here will be utilised for other systems in Nigeria.

The focus of the collaborative research on irrigation management transfer is fourfold - namely:

a. Institutional strengthening and support involving making legal provision for sharing of responsibilities between the farmers, farmer organisation and the agency (HJRBDA);

b. introduction of necessary changes in mode of management to facilitate the transition from agency management to joint management;

c. analysis of the operation and maintenance procedures and the corresponding cost and responsibility sharing necessary to ensure efficient and effective performance of the system;

d. resource mobilisation including review of existing and articulation of alternative resources and of procedure for mobilizing them.

Three pilot sites were selected on KRIP for the collaborative action research on IMT. The general characteristics of the three pilot sites are as per Table 2 and represent about 4% of the command area and involve about 4.5% of the total farm families.

Table 2. Major characteristic of the 3 pilot locations.

Name of pilot site	Number of farmers	Area (ha)	Average Land holdings (ha)	Location the KRIP
Bangaza	145	271	1.86	Head
Agolas	325	139	0.42	Middle
Karfi	423	126	0.29	Tail

Source. IIMI Field Survey, (1992).

To enable farmers take responsibilities and participate in the system management, they were organised in 1990/91 into groups of Water User Associations (WUAs) for each hydrologic boundary, with the objective of sharing system operation and maintenance responsibility and a common binding force of utilisation of water in a particular water course. This contrasted with the previous method of organising farmers based on the Cooperative Credit and Marketing societies (CCM) organised at village level to take over responsibilities for provision of services rendered by the Authority in areas of tractor hire services, input supply, marketing of farm produce and arranging credit facilities. However they were not successful in taking part of the responsibility of the irrigation system management.

The use of village as a basis for formation of a water user associations was found to be infeasible. For instance, at Karfi site, the farmers came from six different villages. Even if they are to corne from one village and to belong to the project, yet such a group of farmers would be unwieldy and too large to be managed effectively. Hence, it was reasoned that the boundary within distributary channel level should be used as the basis for the formation of a Water User Association on KRIP. Luckily, most farmers own their farm land, thus ownership of the land was made a prerequisite for membership of WUA. Again, it was reasoned that village affinity should be deemphasized; otherwise the tendency to lure away WUA from its water management concerns to pursuing community development programme under strong village influence could be high indeed.

The formation of WUAs was not based on any blue print, rather the HJRBDA and IIMI staff remained as the facilitators and WUA was allowed to grow out of farmer interactions. However, regular contact was facilitated both by the HJRBDA and IIMI staff to monitor and facilitate their activities. A group of farmers took the leadership initiative after several discussions and encouragement by HJRBDA/IIMI staff, and a called meeting of their colleagues in the distributary channel to form their WUA. The role of the facilitators was that of providing information to the farmers and giving suggestion for improvement of the WUA. Regular weekly meetings under a tree in the middle of the farm were well attended and records of such meetings were kept. Even those WUA that started poorly picked up following arrangement for farmer to farmer visits, largely because the peer group pressure challenged the ego of the farmers and helped accelerate their training.

BENEFITS OF IRRIGATION MANAGEMENT TRANSFER

The benefits of the collective efforts of the farmers through the WUA was immediate and significant. Specifically in the dry season of 1991/92 WUA for Agolas was able to clean the 2.3 km length of distributary canal leading to a 12% increase in the flow of water in the middle and tail section of the canal (Kazaure, 1993). The improvement in hydraulic performance occasioned by the improved farmer organisation resulted in time-saving for the irrigators who were more prepared to abide with what they considered to be their own irrigation schedule as opposed to the previous agency-imposed" schedule. The tail end farmers no longer had to come at night to irrigate their field.

Table 3. Distributary canal cleaning by WUA.

Site	Period	Length (m)	Cost (N)	
			1	2
Agolas	Feb. 1992	1930	3165.20	8492.00
Agolas	July 1992	150	246.00	660.00
Bangaza	Nov. 1992	185	6068.00	16280.00
Azore	Dec. 1992	1046	1719.09	4602.00
Agolas	Dec. 1992	750	1230.00	3300.00
Bangaza	Jan. 1993	1400	2296.00	6160.00
Bangaza	Mar. 1993	1300	2132.00	5720.00

Source: IIMI Field Notes).

Notes 1. Based on N1.64/m as actually computed for work done at Agolas on 1st, 2nd and 8th February, 1992.

2. Based on N4.40/m as of May 1991 contract rate for D.C. cleaning.

3. Exchange rate: 1 US$ = 1.0, 2.50, 7.50, 8.50, 13.30, 17.50, 21.996. Naira () in 1983, 1986, 1989, 1990, 1991, 1992 and 1993, respectively.

The participatory approach also led to significant improvement in maintenance of the infrastructure. For instance, the WUA's of Bangaza were able to clean 70% of the distributary canal and 60% of their field channel while those at Agolas and Karfi contributed to cleaning 80% and 100%, respectively, of both their distributary canal and field channels in the 1992/93 cropping season.

The Government average expenditure on OMM of irrigation systems in 1983 for instance was in the neighborhood of US$750/hectare (ha)/year while the irrigation water fees were approximately US$95/ha/year. In contrast, the current average cost of OMM contributed by the government has dwindled to about US$10/ha/year while irrigation water fees are US$25/ha/year, the entire reduction in irrigation water fees being attributable to national currency depreciation arising from economic reforms (Maurya, 1993).

Collection of higher percentage of water charges from WUA areas was also achieved. Both the farmers of WUA areas and HJRBDA staffers are agreed that WUA has helped mobilise farmers to pay their collected water charges even before water was released to them for the dry season cropping. Prior to the formation of WUA collection of water charges was below 50%. Recent innovation following the introduction of an incentive clause on resource mobilisation saw a sharp increase in total irrigation water charges collected by the WUA. Specifically the clause in the agreement signed between HJRBDA and the WUA provides, inter-alia, that the USER in conjunction with the AUTHORITY (HJRBDA) shall conduct a comprehensive crop, coverage survey of the distributory canal in each cropping season (wet and dry) at appropriate times; authorise the WUA to collect seasonal irrigation water charges from its members on behalf of HJRBDA with a provision that a rebate of 10- 15% of the total water charges shall be granted to the WUA in the event that 80-100% of the charges are collected and paid to HJRBDA. (Kura, 1993).

The crop survey of Karfi shows that there was also 80% increase in crop coverage in the dry season following the formation of WUA. Evidence also abound as per table 4 to suggest that the economic returns to the farmers following introduction of the participatory joint management and formation of WUA witnessed a significant increase.

And more significantly the evolution or formation of WUAs and the subsequent turnover of irrigation management to them, is in another context a strategic intervention that has a substantial multiplier effect on the rural economy, because it strengthens the autonomous operational (organisational) capacity of rural communities while mobilizing human resources. Again, evolution of WUAs is not only of strategic importance with regard to successful implementation of joint management of the irrigation facilities but also in its role of ensuring the consolidation, continuity, and sustainability of the momentum, processes and gains of the whole national rural development efforts.

Table 4. Changes in profitability of irrigated agriculture.

Year	Production Cost N/ha (a)	Total Proceed from farm produce N/ha (b)	Returns to Famer N/ha b-a =c
88/89	44,442.50	9,500.00	5,057.50
89/90	4,907.65	11,295.00	6,388.00
90/91	7,000.42	16,980.00	9,979.58
91/92	7,845.11	18,719.95	10,874.84
92/93	7,895.13	19,989.00	12,093.87

TOWARDS SUSTAINABLE IRRIGATION DEVELOPMENT

The state has demonstrated its rejection of the concept of permanent subsidy through the policy of privatisation and commercialisation and more significantly by way of support of collaborative action research on IMT, and obviously, the issue of sustainability of the projects is therefore crucial. How then, can this brief overview of issues and efforts made so far assist in identifying a sustainable development path for irrigation in Nigeria?

The general consensus is that IMT requires changes in the power structure, in the sharing of responsibilities and in the role of farmer and irrigation agency. It requires joint management based on partnership. Consequently, in order to bring about the desired transition from agency management to joint management the following have to take place:

i. change in the relationship between the farmer and agency personnel and in the perception and understanding of the needs of both parties;

ii. frequent consultation based on discussion and interaction with farmers group; and

iii. the farmers group should not only be assigned duties and responsibilities but should also be granted rights as well.

The experience on KRIP reveals that disproportionate training and reorientation effort was devoted to farmers compared to scheme officials (Omotowoju, 1993). This may have been the result of the erronous view that it is the farmer that always has to be reformed. Certainly, experience has shown that scheme officials are the more difficult party to adjust, there is therefore the need to give equal or more attention to the training of scheme officials and facilitators.

Similarly, the recorded positive response of the farmers to what they believe to be their own irrigation schedule, points to the need for assistance to be given to communities early in the conception of the project, to enable them evolve associations during the planning phase, such as to cultivate the desired sense of responsibility and ownership of the scheme - which may be missing when WUAs are organised at the post-Implementation stage.

One peculiar problem of the developing nations is that the beneficiary expects too much from public agencies and their officials. There is therefore the need for the facilitator in his intermediary role to build up the capacity of the farmers group to appreciate the constraints of the agency and agency officials, thereby discouraging unrealistic expectations and hence collapse of the system through discouragement of one party to the partnership.

Again we have learnt from experience that the agency is at an advantage by virtue of having objectives, a definite structure and authority, and backed by law to operate towards its objectives; on the other hand, WUAs lack similar legal recognition. Efforts would therefore be made to get legal provision regarding WUAs. Luckily the support and influence of donor agencies are complementary and hence favour the move to get the necessary legal provision for WUAs.

The collaborative research experiment with IMT on KRIP and Hadejia Valley Projects have justified our beliefs with better performance in productivity, resource mobilisation, agency-farmer relations, and higher level of service (Pradhan et al, 1993).

There are emerging pressures on the state to privatise elements of the distribution components of irrigation systems. In theory even this may be possible in future. But it is advisable not to give away the component free because as Thomas Pains points out "What we obtain too cheap we esteem too lightly." In order for the far ranging benefits to accrue to farmers from IMT, farmers and farmer groups must make their own decisions to accept the responsibility transferred to them - and they must be freely committed to it as they must commit some of their resources to the choice. It is better therefore for WUAs to evolve rather than to be formed.

CONCLUSION

When the public irrigation systems are agency managed, an owner's concern dominates the thinking; and management activities tend to be focused on such things as investment needs, obtaining more subvention from the treasury etc., so that little time is spent on the systems' more diffused obligation: to operate, maintain and manage the systems for sustainable performance and to protect the interests of the beneficiaries of the system. All of this simply shows that agency managed systems involving private farmers hardly pay attention to farmer's problems as officials are too busy with their own problems.

Adequate finances constitute an essential prerequisite for good OMM of irrigation systems, but cost recovery from users and farmers for the costs of OMM of irrigation and drainage facilities have been torturous and full of pit falls. Obviously financial management of irrigation systems would be of compelling concern, otherwise the system performance and sustainability would be in jeopardy. More research would however be needed not only to make IMT an effective means of cost recovery from users but as a means to achieving sustainability and equity of resources utilisation and development for food and fibre production to meet basic food needs into the future, as well as increasing productivity of the farmers.

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Appendix a

Analysis of cost OF OMM against revenue collected and government grants for Kano River Irrigation Project.

Year	Total Expenditure on OMM (N/annum)	Total Realisable Water Charges (N/annum)	Government Subvention and Grants (N)	Total Revenue Actually collected (N)	Total Water Charges collected (N)	Supplus/(Deficit) on Cost of OMM (N)	Percentage of Water charges collected (%)	Remarks
(a)	(b)	(c)	(d)	(e)	(f)	g =(e +d-b)	h = f/cx100	
1983	3,220,242		10,396,203	308,403	108,142	7,484,364		
1984	2,365,812		9,975,000	741,083	237,573	8,359,271		
1985	2,816,829		7,665,489	334,043	128,951	5,182,703		
1986	2,620,477		2,852,783	534,493	131,734	766,799		Introduction of Sap
1987	2,861,087	4,885,166	1,043,859	689,533	129,411	(1,136,695)	2.65	
1988	886,144	5,952,700	1,090,872	804,290	429,701	1,009,018	7.22	
1989	2,012,974	6,000,000	2,960,324	1,393,597	891,896	2,340,947	14.86	
1990	3,823,735	6,280,675	1,790,296	4,052,203	3,462,610	2,018,764	55.13	First year of formation of WUA at three experimental sites.
1991	5,251,484	5,860,000	2,637,713	3,530,572	3,019,281	916,801	51.52	
1992	9,262,139	4,979,000 Note: Based on the hectarage actually cultivated multiplied by N500/ha. Except 1987/88 when it was N494/ha.	6,572,540	4,776,482	2,086,883	62.29		