Lessons Learnt from the Irrigation Perspective of the Sayama-ike Land Improvement District

- Irrigation Development in Zambia (I) -

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Abstract

This paper provides a case study of the Sayama-ike LID and looks at the functions, roles and operation and management aspects of the scheme. Highlights of valuable lessons of irrigation practices that could be transferred and adopted are presented to enhance development of irrigated agriculture in Zambia. The Sayama-ike LID demonstrates successful features of participatory irrigation management as a non-profit making and privatized irrigation organization. The LID has remained viable and sustainable under conditions characterized by urbanization, surplus crop production owing to high labor, land and water productivity, competition for water with other sectors, decline in command area, reduction in membership and increased number of part-time farmers. This study concludes with lessons that farmer-based irrigation organizations are vital for effective implementation of irrigation programs through participatory irrigation management. But while membership should consist of farmers who have to pay membership fees, the organization's viability and sustainability is enhanced through diversifying its activities to include both irrigation and non-irrigation activities. In doing so, an irrigation organization is able to expand its revenue base. Productivity of available labor, land and water resources is enhanced not just by provision of irrigation facilities, but also through consolidation of land that ensures organized farming, efficient field operations and drainage conditions.

Key Words: diversification of activities, irrigation organization, land consolidation, Sayama-ike land improvement district.

Introduction

The Sayama-ike Land Improvement District (LID) is a farmer's organization for irrigation established under the Land Improvement Law to enhance irrigated agricultural production as well as land and labor productivity. Following the promulgation of the Law after the Second World War, the LID has performed roles and functions in paddy irrigation related to construction and operation and maintenance (O/M) of irrigation facilities. In the recent past, the LID has widened its activities to encompass non-irrigation activities in an effort to improve the welfare of rural and urban communities and also in coping with the impact of urbanization and industrialization. Majority of members have also turned part-time farmers. Consequently, irrigated land of the LID has been decreasing as irrigation activities decrease particularly with respect to paddy fields.

The objective of this paper is to highlight irri-
igation features and attributes of the Sayama-ike LID that could be adopted as lessons in our efforts to improve performance of irrigation projects in Zambia. Majority of irrigation projects in the country are currently experiencing severe O/M problems that have been seriously undermining their performance and sustainability. However, the country is in dire need to develop a sustainable basis for irrigation as droughts become frequent and adversely affecting rainfed crop production. Also, the government does not have the capacity to finance or provide subsidies for construction of irrigation facilities and meeting costs for O/M activities etc. Against this background, practical transferable lessons must be adopted to build farmer's capacity through irrigation organizations. These lessons are drawn on the basis of practices, experiences and organizational activities and management of the Sayama-ike LID. Furthermore, the lessons are intended to help improve the scale and sustainability of paddy irrigation in the country’s largest fertile alluvial flood plain.

Today, the Sayama-ike LID is a dramatically transformed irrigation organization with modern office buildings and equipment, irrigation facilities and infrastructure. This is in sharp contrast, to the LID’s drastic reduction in membership and irrigation command area. As an autonomous irrigation organization that has stood the test of time, there are lessons to be learned by a developing country like Zambia in various aspects of irrigation.

Land Improvement Districts as Irrigation Organizations

As Japan was emerging from the ruins of the Second World War, comprehensive land legislations were enacted, replacing laws that had become out-dated with a view of increasing irrigated crop production and productivity of labor, water and land. The Government promulgated the Land Improvement Law and replaced the Arable Land Readjustment Law and the Irrigation Association Law. The Law broadly refers to programs for land development, land reclamation and natural disaster protection. It covers improvement activities related to upgrading of arable land infrastructure, including construction or modernization of irrigation and drainage facilities, dams and head-works to increase irrigated agricultural productivity in LIDs (Okomoto et al., 1985). The Law also refers to farmland consolidation activities and covers LIDs that operate as land consolidation projects. Land consolidation refers to a comprehensive approach for reorganization of farmland or agricultural fields through reshaping of land parcels into standard farmland blocks of 0.3 ha. The main objective of land consolidation was to enhance agricultural productivity through promotion of mechanized agriculture or use of advanced field machinery, effective control of drainage problems and provision of access roads and irrigation infrastructure.

Hence, the Land Improvement Law paved way for redistribution of arable land, which was formally in the hands of landlords, in an effort to harmonize labor-force with land productivity and accelerate agricultural development to ensure food self-sufficiency. LIDs as irrigation organizations were then established throughout Japan and subsequently opening a new chapter for modern irrigation practices.

The organizational structure and capacity of LIDs vary with respect to area coverage or command area but has often been 1000 ha or more with an average membership of 1000 or more. Membership of LIDs basically consists of farmers from whom executive members and board of directors are elected during a general assembly meeting of farmers' representatives. Full-time staff such as managers, clerks, accountants and mechanics is employed for operation and maintenance and daily functions of LIDs.

The Sayama-ike LID

The Sayama-ike LID was founded on the basis of the Land Improvement Law as a non-profit irrigation organization. The LID is located in the southern part of Osaka as shown in Fig. 1. Ideally, the LID is an irrigation management and operational association, which is also a custodian of irrigation water and related infrastructure. Historically, farmers in Japan have played a central role in the construction and O/M of irrigation facilities including management and distribution of irrigation water at tertiary level. Cooperative work approach among generations
of farmers has created a vital traditional culture of mutual cooperation providing bedrock for LIDs and indeed for the Sayama-ike LID. The functions and activities of the Sayama-ike LID are varied and wide-ranging having broadened over time to encompass non-irrigation activities.

Initially, these activities were mainly two fold: (i) Promotion of irrigation projects and (ii) Operation and maintenance of irrigation facilities. As the country became urbanized, industrialized and self-sufficient, the Sayama-ike LID still had to continue performing its traditional functions while ensuring that it remained a viable and sustainable entity in a dynamic social-economic environment. From the view point of the Sayama-ike LID, this environment is characterized by a combination of factors amongst which are drastic decline in the command area and/or paddy fields, reduced membership and increased number of part-time farmers, urbanization, surplus crop production owing to high labor, land and water productivity, and also competition for water with other sectors such as industry.

It is most surprising that today, the Sayama-ike LID does not look like a farmer’s irrigation organization in an ordinary sense. It has modern buildings and equipped with modern office facilities and equipment, and bears all the hallmarks of a viable and sustainable independent entity. To understand how the LID has managed to fare so well against the background of the aforementioned conflicting changes, it is important to analytically look at the various activities of the LID related its core functions, O/M and the financing arrangements of its activities.

**Promotion of irrigation projects**

Promotion of irrigation projects is one of the core activities of the Sayama-ike LID. The projects are mainly small to medium scale irrigation projects that often include canals, turnouts, diversion weirs, reservoirs, intake structures, and dams and pump stations. Large scale projects requiring high level of technical expertise for planning, designing and construction are beyond the capacity of the LID and are undertaken by the central and/or local government engineers who also undertake the identification and needs assessment of irrigation facilities in the LID. However, promotion of irrigation projects in the district is the sole responsibility of the LID. This is done through community sensitization and awareness campaigns since beneficiaries later come to contribute towards cost for construction and O/M. Occasionally, the LID on behalf of the farmers can petition the local government through the Ministry of Agriculture Forestry and Fisheries (MAFF) for a particular project, but this is very much less common since planning falls under the authority of the local government itself.

In any case, a project may then be approved for promotion on the basis of the advice and recommendations of the official engineers. This kind of project promotion appears to provide for the necessary balancing and inclusion of views of stakeholders whose interests with regards to a project may conflict in the overall context of development. But from the LID’s standpoint, it means that an approved project is promoted based on adequately informed decisions and planning to ensure its viability and sustainability. For example, if an approval is made for a dam, it means the approval has passed all the necessary phases related to designs, financing.
aspects of construction and O/M including provisions in case of unforeseen problems during and after implementation. This is especially important when seen in the light of reduction of the command area and membership of the LID as well as increased number of part-time farmers.

**Operation and maintenance**

A reservoir constructed as an element of an irrigation project is a multi-purpose reservoir operated and maintained directly by engineers and technicians specializing in hydroelectric power generation and flood control. In the recent past, the role of the Sayama-ike LID has greatly expanded to encompass non-irrigation activities aimed at improving the welfare of rural as well as urban communities. It means the range of beneficiaries of irrigation facilities have also expanded to include other sectors such as industry and local municipalities etc. While this is positive in the sense that it has reduced the burden for O/M on the Sayama-ike LID, it is the major identifiable factor in the changing status of the Sayama-ike LID from a traditional irrigation organization it used to be known.

Once the project is completed and commissioned, all administrative and management functions are transferred to the LID. Major facilities such as large capacity pumps, diversion dams, main and secondary canals above tertiary level are operated and maintained by the Sayama-ike LID itself while below tertiary level, O/M of irrigation canals and ditches including minor turnouts are responsibilities of organizations of the Mura i.e. rural farm communities. The Mura undertakes on-farm water management activities but also participates in the maintenance of village roads and the organization of local festivals in addition to cooperative O/M of on-farm irrigation facilities. It can therefore be said that O/M of irrigation facilities involves both direct and indirect beneficiaries from the public and private sectors within the Sayama-ike LID.

**Land consolidation exercise**

Land consolidation refers to a comprehensive approach for reorganization of farmland or agricultural fields, under the Land Improvement law of 1949, through reshaping of land parcels into standard farmland blocks of 0.3 ha. Under this program, it has been made possible to enhance agricultural productivity through increased efficiency in field operations of agricultural machinery as well as effective control of drainage problems and provision of access roads and irrigation infrastructure.

The land consolidation exercise brought about efficient machinery utilization and organized farming owing to improved farm drainage conditions leveled and regular shaped farmlands. But as a consequence, this also increased irrigation water requirements because of improved and independent drainage facilities for every plot. The land consolidation exercise is desirable but it is a costly undertaking that can only technically and successfully be conducted with a great deal of resources. This is because expensive heavy-duty machinery is used and also that precautionary measures are taken to ensure that the fertile top layer of the soil is by all means left on top afterwards.

Considering that much of the land in the Sayama-ike LID is consolidated, despite the mountainous topography, tremendous resources must have been spent. In this regards, the fundamental question is whether the benefits that have accrued from the exercise outweigh the cost incurred including any environmental adverse effects. From the LID’s point of view, certainly the benefits accrued in-terms of high labor, land, and water productivity, efficient field operations and improved surface drainage conditions are good grounds for justification. As urbanization and expansion of residential areas continue, it remains to be seen what will be left of the remaining paddy fields as well as the Sayama-ike LID itself.

**Membership of the Sayama-ike LID**

Membership of Sayama-ike LID consists of farmers from whom executive members and board of directors are elected at a general assembly meeting of farmers' representatives. The chairman of the Sayama-ike LID is often a prominent and respected influential person in society, in keeping with Japanese tradition. Other staff for O/M and daily functions of the LID includes managers, clerks, accountants and mechanics on full-time basis. Owning land is quite exceptional in Japan and so farmers as
landowners have a high status in society. So, as a farmer and landowner, the president of the Sayama-ike LID is an influential person in the farming community and society in general.

This arrangement helps us to understand why the offices and building of LID are so well equipped and furnished. It also sheds light on how the LID has managed to remain literally unaffected by such changes as the decline in command area and membership. It is observed that the society's hierarchical social strata dictate the leadership of the LID. But partly by tradition and design, the organizational structure of the LID itself is also hierarchical. Thus, the personal influence of the president and members of the LID is certainly not separable from that of the LID. This is where the Sayama-ike LID draws its strength and capacity to transform, adapt and remain viable in the face of so many changes.

**Financing of the Sayama-ike LID**

Financing of Sayama-ike LID basically consists of two components namely; (a) construction costs and (b) operation and maintenance costs.

**Construction costs**

Construction costs of major and minor irrigation facilities, including reservoirs of the LID is subsidized by the central and local governments by as much as 70 – 80 %. The remaining unsubsidized portion of the total construction cost is covered by the LID through a loan obtained at low interest rates and payable in annual installments by beneficiary member farmers. A grace period of about 5 years is often provided and the loan is redeemable in 20 years or more with annual interest rates as low as 5 %. Agricultural cooperative banks provide farmers with loans, credit and mutual insurance services to cover their share of the cost for construction and operation and maintenance. This form of financing the construction of irrigation projects provides for an indefinite period of public ownership of infrastructure and associated facilities through LIDs. But more importantly, it helps to create strong sense of ownership and responsibility among beneficiaries. While construction subsidies may appear excessive, this can be viewed in perspective in-terms of the wide range of beneficiaries of the facilities from both the private and public sectors. For example, a reservoir constructed as an element of an irrigation project is a multi-purpose reservoir intended ideally to cater even for hydroelectric power generation and flood control. Canals and drainage facilities within the LID equally provide service to rural and urban communities including industry.

In this regards, it follows that the cost of construction must indeed be shared among all the stakeholders and beneficiaries and as such the huge subsidies can be justified on these grounds. But partly because the LID covers the unsubsidized portion and also that the project is located within its district, it retains custody of the facilities. Thus, the multi-purpose and/or multi-functional role of both major and minor facilities on one hand and the wide range of beneficiaries in both public and private sectors on the other, provide conditions that allow the LID to meet construction costs.

**Operation and Maintenance costs**

Funds necessary for day-to-day O/M of major facilities and for the management of the central LID office are collected from member farmers. All the cost for O/M are regarded as the responsibility of farmers since there are no provisions for subsidies from central and local governments. Ideally, the money for O/M is collected from the member farmers whose contribution towards O/M costs is calculated based on the paddy field acreage owned by individual farmers rather than on the basis of accumulated volume of irrigation water delivered. This is regarded as membership fee or dues or water charge. However, farmers are also allowed to pay by labor such as removing of sediments and trash from canals and mowing of grass on dam embankments.

O/M costs of the LID are further minimized through engaging farmers to operate pumps and turnouts and to tend ditches without pay instead of using full-time salary employees or central office personnel. Sometimes farmers voluntarily carry out cooperative maintenance work without pay such as removing canal sediments and mowing grass on embankments. But
because municipalities have delegated some of their responsibilities onto the LID which then undertake to provide such public services as recreation parks, sewage disposal and rainfall drainage, environmental protection works etc., they contribute as much as 50 to 70% as a cost-share towards the total LID’s O/M costs. In addition, the non-agricultural sectors also contribute in the order of 20% towards meeting the LID’s operating costs by providing skilled manpower and other relevant services free of charge. Again, it can clearly be seen that the LID’s dependence on farmers to meet O/M costs is actually very minimal. Its capacity to meet costs for O/M much depends on non-agricultural activities by offering a wide-range of water utility based services to both the public and private sectors.

Irrigation Performance of the Sayama-ike LID

Pond-fed irrigation system

The Sayama-ike LID comprises 1 dam referred to as the Sayama-ike mother pond and more than 80 smaller dams referred to as daughter ponds including 5 weirs, 2 main canals and several sub-main (laterals) canals with a total length of 18 km. The scheme is made up of 33 local irrigation associations. The Sayama-ike mother pond is an off-stream dam with a total storage capacity of 2.5 million cubic meters and capable of releasing about 3 million cubic meters in an irrigation season (Ogino et al., 1984). As an off-stream dam, it relies on water collected from precipitation and melting winter snow. Downstream of the mother pond is a series of daughter ponds located inside each irrigation block that are fed by the mother-pond within the command area.

Irrigation performance of the Sayama-ike LID is looked at from a perspective of the effectiveness of irrigation water delivery and distribution based on its unique Pond-fed irrigation system. The system is considered particularly popular for effectively distributing and meeting anticipated irrigation water demands during dry spells. The way it operates is based on the principle that the reservoir capacity is a measurable effective water source independent of river flow with only precipitation changing stochastically. It follows that by using probability analysis of records of precipitation based on collected data for effective storage capacity of the reservoir and the corresponding irrigated acreage, it is possible to evaluate the systems ability to effectively meet anticipated irrigation water demand in each year. During an abnormally dry season, the mode of water distribution is occasionally interchanged between simultaneous and rotational systems in-order to equitably and effectively distribute irrigation water to all plots of paddy fields in the LID’s command area.

It is clear that the extent of effectiveness and the functioning ability of the pond-fed irrigation system heavily depend on precipitation which fortunately falls almost throughout the year in Japan. In this regard, consecutive long dry spells could be serious limiting factors on the functioning of the pond-fed irrigation system. A long dry spell situation exacerbated by surface evaporation losses and percolation from the ponds could impact adversely on the performance of the system.

General points and lessons about the Sayama-ike LID

(1) In-order to foster irrigation development and interface effectively with relevant institutions i.e. agro-cooperatives, banks, government etc., it is essential for irrigation organizations to be legal entities with strong institutional capacity. The Sayama-ike LID is an irrigation organization empowered under the Land Improvement Law with government policy support.

(2) It is necessary that membership of irrigation organizations must consist of farmers, but it is equally necessary that personalities with influential backgrounds are included in the membership and leadership of such organization. The Sayama-ike draws its strength from the array of its members who include very influential personalities in society.

(3) Productivity of labor, land and water resources can be enhanced through the land consolidation program and establishment of local irrigation associations. Consolidation of land in the LID has resulted
into regular shaped farmland parcels, efficient field operations and use of machinery, organized farming and improved drainage conditions giving rise to higher crop productivity in the district.

(4) Irrigation organizations can expand their revenue base and ensure their sustainability by undertaking multipurpose and/or multi-functional projects. A reservoir constructed as an element of an irrigation project can cater for flood control and even hydroelectric power generation. Irrigation facilities i.e. canals are constructed to serve as rainfall drainage, environmental protection works etc. In this regard, the LID does not have to meet the costs for construction and O/M alone.

(5) Diversification of activities and roles of the irrigation organization is a positive strategy for ensuring their viability and sustainability. The strategy further makes it easier for irrigation organization to adapt and cope in the current competitive, urbanized and industrialized environment. Some of the activities undertaken by the Sayama-ike LID include provision of public services such as recreation parks, sewage disposal and rainfall drainage, environmental protection works including leasing of land etc.

(6) Strong sense of ownership, commitment and responsibility is created among farmers and beneficiaries of irrigation projects as they become attached to them through contribution towards construction costs. This kind of financing arrangement where farmers contribute towards construction cost through loans obtained from banks provide them with the opportunity for investment in infrastructure that guarantees them indefinite ownership.

(7) Effective delivery and distribution of irrigation water based on the Pond-fed irrigation system has been a key factor in the attainment of high irrigation performance during water deficit periods or long dry spells. In water deficit areas where the water source is an off-stream dam, the Pond-fed irrigation system is an effective system for delivering and distributing irrigation water during dry spells or dry seasons. But this may only be possible in areas where precipitation falls throughout the year thereby countering surface evaporation losses.

Lessons and Adoptability of Irrigation Practices in Zambia

Crop production has traditionally been rain-fed in Zambia. See geographical location of the country in Fig. 2. In the recent past, frequent droughts have severely disrupted rain-fed agriculture. The Government with the support of donor countries has been making concerted efforts to promote and develop irrigation through establishment of irrigation projects and construction of irrigation structures such as dams and weirs. The objectives have been to alleviate the impacts of drought, enhance irrigated crop production with emphasis on crop diversification, and ensure national food security and self-sufficiency. A number of irrigation projects have been established but their performance is very low and some of them have fallen into disuse.

In the efforts to promote and develop a basis for sustainable irrigated agriculture and improve performance of irrigation projects in the country, the following fundamental lessons and practices can be adopted from the irrigation experiences and practices of the Sayama-ike LID:

(1) A number of low performance government and donor support irrigation projects have
been implemented in Zambia without a farmer irrigation organization in place i.e. Kaunga Rural Development Project (KRDP). It is evident that in-order to foster and develop irrigated crop production, farmer based irrigation organizations are essential as a means for delivering development based on participatory irrigation management. Irrigation projects in the country face problems ranging from O/M, funding, management, crop marketing, disputes related to land, water and payment of fees etc. Solutions to most of these problems can easily be found within the framework of an irrigation organization run by farmers (Mulenga et al., 2003). There is no doubt that the main objective for irrigation projects in Zambia is the same as it was for the Sayama-ike LID i.e. to enhance irrigated crop production by ensuring high labor, land and water productivity. Therefore it is a lesson that the objective of ensuring high labor, land and water productivity including sustainable irrigated agriculture cannot be achieved in a vacuum but through farmer-based irrigation organizations.

(2) While emphasis on the composition of membership of irrigation organization should be made on farmers, it is also important to include influential personalities from the community. The Sayama-ike LID draws much of its organizational strength and capacity to remain viable and sustainable from its influential members who are also in leadership positions. This is not a cultural phenomenon unique to Japan needless to say that an irrigation organization consisting of poor peasant farmers alone would achieve very little. The capacity of irrigation projects i.e. The Mongu Rural Development Project (MRDP) and KRDP are weak because membership is restricted to the local peasant farmers who also happen to be cattle herders and fishermen (Mulenga, 1999).

(3) Given that irrigation requires reasonably leveled and laid-out land, consolidation of land would give rise to organized farming, efficient field operations and drainage conditions. While irrigation facilities have been provided, productivity and performance in virtually all the projects have been compromised because of lack of land grading and/or improvements towards irrigated land conditions. Most irrigation projects have rough and unlevelled land conditions that do not permit uniform and efficient application of irrigation water. And rightly so, farmers are discouraged and always complain of excessive erosion and inadequate surface drainage. Although this is an expensive exercise, it is equally important to realize that it is not enough to just provide irrigation facilities without investing in improvements towards land intended for irrigation.

(4) Diversification of activities can play a major role in ensuring sustainability of irrigation projects. The projects MRDP and KRDP are two of the projects that are adequately equipped with agricultural equipment, machinery and irrigation facilities. But much of this equipment including irrigation facilities are very much under utilized because of the project’s activities that are restricted to local irrigation related activities only. And during non-irrigation periods, these facilities just lay idle when they can actually be used for generating extra revenue for O/M etc. thereby making the projects more financially sustainable and independent. For a poor country like Zambia, revenue based on membership fees is not enough to sustain O/M activities etc. of an irrigation project or organization (Chipeleme and Siakantu, 1988).

(5) One of the outstanding problems facing irrigation projects is lack of a sense of ownership, commitment and responsibility among farmers. It is clear that farmers should be afforded the opportunity to contribute towards the cost of construction, even in a small way, in-order to make them develop a sense of ownership and belonging. Contribution towards construction cost does not have to be restricted to funds alone but it can also be done through labor as long as it provides the farmers with an investment opportunity in the project that also provide for indefinite ownership (Mulenga et al.,
The above lessons are adopted in the next paper which focuses on the MRDP and the need for effective Water User Associations (WUAs). However, important features on LIDs derived from the Sayama-ike LID are highlighted for comparative purposes.

**Comparative features for organizing irrigation associations**

Establishing effective WUAs is a prerequisite for sustainable irrigation. A framework proposal is presented in Table 1 for organizing effective WUAs in Zambia based on comparative analysis with LIDs in Japan.

**Discussion**

(1) In pursuit of sustainable irrigation development and food self-sufficiency, regional based irrigation organizational structures similar to the Land Improvement Districts are vital for delivering development for irrigation as well as increasing productivity of available labor, land and water resources.

### Table 1. Proposal for organizing WUAs in Zambia derived from comparative analysis with LIDs in Japan

<table>
<thead>
<tr>
<th>Item</th>
<th>LIDs in Japan (eg. Sayama ike LID)</th>
<th>Current WUAs in Zambia</th>
<th>Improvement of WUAs in Zambia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Law and administration</td>
<td>Land Improvement Law.</td>
<td>Not enacted.</td>
<td>WUA Law should be enacted.</td>
</tr>
<tr>
<td>Membership</td>
<td>Beneficiary farmers (entitled as members of LID). President and the board of directors (elected among representatives). Representatives (elected by local units of farmers irrigation associations).</td>
<td>No farmer organization.</td>
<td>WUAs should be organized under the WUA Law by beneficiary farmers. Organization structure of WUAs should consist of the president, board of directors, and representatives elected from farmers.</td>
</tr>
<tr>
<td>Irrigation management office</td>
<td>LID employs staff for O/M of irrigation system such as manager clerks, accountant operator and mechanics.</td>
<td>Local government engineers from ministry of agriculture manage all irrigation systems.</td>
<td>Local government engineers should cooperate and assist farmers in managing irrigation system. Need for government intervention to ensure beneficiary participation.</td>
</tr>
<tr>
<td>Financing of construction costs</td>
<td>70 - 80 % subsidized by government. 20 - 30 % covered by LID.</td>
<td>Full cost covered by government and foreign support agencies.</td>
<td>Full cost covered by government and foreign support agencies.</td>
</tr>
<tr>
<td>Financing operation and maintenance costs</td>
<td>Full cost recovery by member farmers through membership fees and water charge based on paddy field acreage. Also allowed to pay part of fees by labor.</td>
<td>All costs covered by government and foreign support agencies. In a few cases, farmers contribute with labor.</td>
<td>All cost should be covered by member farmers through membership fees and water charge based on field acreage. Farmers should also be allowed to pay part of the fees by labor.</td>
</tr>
<tr>
<td>Ownership</td>
<td>LID owns all irrigation system.</td>
<td>Government owns all irrigation system.</td>
<td>Should be transferred to WUAs.</td>
</tr>
<tr>
<td>Responsibility</td>
<td>LID is responsible for the management of all system.</td>
<td>Local government is responsible for the O/M.</td>
<td>Should be transferred to WUAs.</td>
</tr>
<tr>
<td>Water deliver system</td>
<td>Systematic</td>
<td>Perfunctory</td>
<td>Should be systematic</td>
</tr>
<tr>
<td>Diversification of activities</td>
<td>Positive.</td>
<td>Negative.</td>
<td>Should be adopted for implementation by WUAs.</td>
</tr>
<tr>
<td>Decision making</td>
<td>Meetings of board of directors and representatives.</td>
<td>Local government under the ministry of agriculture.</td>
<td>Should be a collective WUAs’ responsibility.</td>
</tr>
</tbody>
</table>
Sustainable irrigated agriculture is not attainable merely by providing irrigation facilities and infrastructure but through farmer-based water-user or irrigation organizations with policy support at government level.

Irrigated agricultural development requires government’s lead in planning and implementation particularly with regards to provision of incentives and partial financing of construction costs. The planning aspect in irrigation includes identification of suitable land for irrigation so that farming communities do not continue to rely on rain-fed crop production. This is the essence of land consolidation, which can only be implemented or driven effectively by government.

It is necessary for farmers and beneficiaries to contribute towards costs for construction in order for them to develop a sense of ownership, commitment and responsibility. This could be achieved by farmers contributing through labor, funds, material etc.

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