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Incentives for Financing the Maintenance of Irrigation and Drainage Systems

Division 45
Rural Development

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Division 45 - Rural Development

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1. Introduction

Irrigation and drainage have made an important contribution to global food production and their importance will only increase to meet the challenge of satisfying the increasing demand for food in the near future. Although their importance is recognised, the performance of irrigation and drainage systems in many countries has been below expectations, which by many managing agencies was ascribed primarily to a lack of adequate funding for conducting appropriate operation and maintenance. Whilst this is the immediate cause of the problem, in fact it is the lack of appropriate management frameworks and incentives to mobilise sufficient funds and to use them effectively.

In the past decades, schemes have been developed and improved in many countries without putting adequate mechanisms in place that ensure the financing of operation, maintenance and improvement of infrastructure. Beside user fees, for many irrigation and drainage agencies an important part of their budget originates from government contributions and subsidies. The fees are often insufficient to cover even the regular O&M costs and the collection mechanisms are often ineffective. These often poor financing conditions ultimately result in a gradual degradation of the infrastructure, declining service levels and a reduced willingness for users to pay their contributions. To bring this vicious circle of degradation process to a halt appropriate incentive structures have to be identified and implemented for adequate financing of system maintenance to ensure reliable delivery of irrigation and drainage services.

After looking at farmers' incentives to pay for irrigation and drainage services. A framework is presented in which the aspirations of the farmer/clients are incorporated into the management system of the irrigation and drainage agencies. One of the important incentives is reliable and cost-effective service provision by the irrigation agencies. Finally the institutional consequences for such approach are presented.

2. Farmer incentives to pay for services

The primary concern of farmers is to produce and secure enough food or marketable crops for subsistence, and once surpassing this level, to maximise their income by optimising their production system. Their production is affected by a number of physical and environmental factors including soil, climate, water supply, pest and diseases; and other non-physical factors including availability of labour and capital, land tenure, financial support, markets, culture and tradition. In subsistence farming, which is in many developing countries the prevalent situation, often the lack of one or a combination of these conditions prevents development beyond this subsistence level. But, assuming other conditions are or can be met, the productivity of the farmer's enterprise will be determined by how well irrigation water is supplied, drainage water is discharged and groundwater levels are maintained.

Provision of irrigation and drainage services allows farmers to enhance their productivity and to secure their crops and investments in technology and equipment. However, simply introducing or increasing irrigation service fees to cover the cost of service provision will not be effective as often this leads to failure just because farmers refuse to pay. Farmers usually have some reservations concerning the irrigation and drainage agency. Especially in existing systems where a service history exists farmers need to get a convincing answer to the follow questions (Sagardoy, 1980):

- to what extent do irrigation fees reduce the income arising from production?
- are all the costs justified and is the existing irrigation organisation efficient?.
- are the funds collected through the fees utilised in the same system?
- are they informed about what they are paying for?
- how large are the contributions they make through other channels like e.g. indirect taxes?
- is there malpractice in the collection and utilisation of fees?

Therefore, farmers will include the following considerations before deciding on payment for services:

- the increment in farm income will substantially exceed the increased cost of service and other additional inputs associated with irrigation and drainage;
- the irrigation and drainage agency is service oriented meaning that the agency is responsive to the needs and aspirations of the water users. This implies that the level of service and its associated cost are agreed upon between the service provider and its clients;
- rights and entitlements (to water, land and infrastructure) need to be clearly defined so responsibilities and duties can be clearly defined and funds (e.g. for maintenance) can be developed. This implies the need for secure land and water rights and a transparent manner for the determination of the costs, charges and fees, and their utilisation under full accountability of the service provider to the users;
- the provision of services is reliable and at the least cost so farmers can obtain confidence in the irrigation and drainage services offered. Only once confidence is established they more likely are willing to invest in “expensive” inputs and technology to enhance their production.
- credit is obtainable at reasonable interest rates in order to finance their investments that enable their increase in productivity
- there is no cheaper (legal or illegal) alternative to obtain water for irrigation.
- they cannot get away with not paying their dues either through community / social sanctions or fines and disconnection by the agency.

These are key issues addressed in this paper and they can be summarised as to what incentives should be put in place to encourage farmers/users,

agencies and governments to finance maintenance of irrigation and drainage systems. They are elaborated in the framework for financial management below.

3. Framework for financial management

Adequate and reliable provision of irrigation and drainage services requires hydraulic infrastructure that needs to be operated and maintained and in the course of its lifetime rehabilitated, modernised or replaced. All these costs associated with service provision must be recovered from the beneficiaries of these services or from society at large through government contributions or subsidies. This framework applies for different governance structures that focus on a direct interaction between the service provider and their clients (see also Huppert and Urban, 1998).

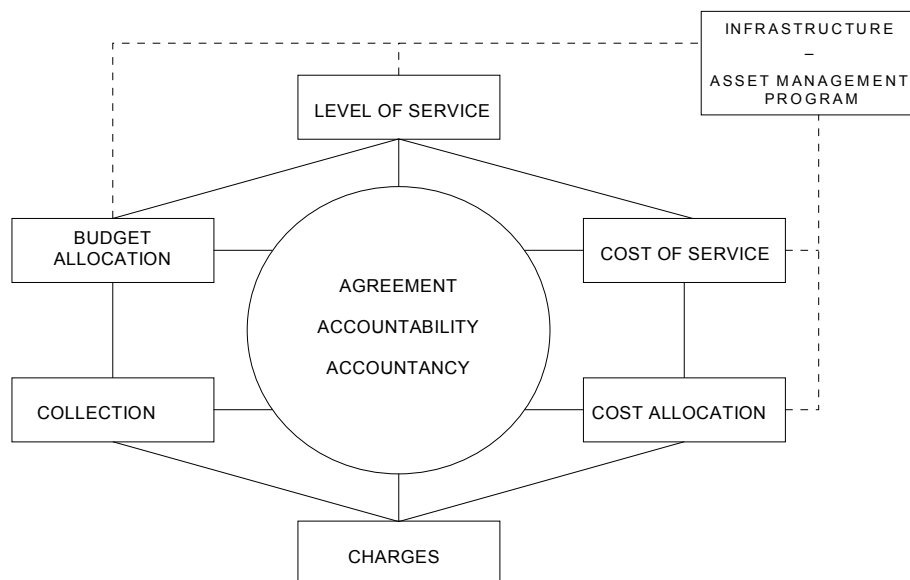


Figure 1. Framework for financing maintenance (van Hofwegen 1997)

3.1 Level of service

Next to the possible incremental benefits that farmers will obtain from irrigation and drainage services, these services must respond to their needs and must be reliable. To meet their aspirations and needs, a level of service with its associated cost and cost recovery mechanisms is to be agreed upon between the different actors. The level of service is a set of operational standards set by the managing agency in consultation with the users and other affected parties to manage the irrigation and drainage system (van Hofwegen and Malano, 1997). The level of service is a result of customisation of the management parameters related to the specific services. The capacity and capability of available infrastructure and its management are important factors in the determination of the service levels.

Levels of service are expressed in service specifications and quality criteria that govern the management of the system. The purpose of specifications like

rate, duration and frequency of delivery is to enable measurement of the achievement of the agreed service levels. The set of rules refer in general to the conditions under which the services are provided like cost or price of service, payment arrangements, and water ordering systems. The quality of service provision can be characterised by a combination of parameters that refer to the reliability, adequacy, flexibility, convenience, cost and security of the provision of services. Each service will have its own set of specifications. These specifications and conditions are part of the agreement between the service providers and their clients.

3.2 Infrastructure and asset management programs

Achieving provision of an agreed level of service is the result of a combination of management input and hydraulic infrastructure. Usually the hydraulic infrastructure allows for a marginal increase in service levels by increasing the management efforts. However there are limits beyond which further increase will mean an additional investment in infrastructure to remove the constraining factors. Replacement, modernisation, rehabilitation or maintaining assets are options every irrigation manager is frequently confronted with. Asset management programs are important tools for technical and financial planning of day to day, medium and long term operations of irrigation and drainage authorities. Asset management programs are plans for the creation or acquisition, maintenance, operation, replacement and disposal of irrigation and drainage assets to provide an agreed level of service in the most cost effective and sustainable

Infrastructure Asset Management

Asset management is about the way in which we look after the assets around us, both on a day to day basis (maintenance and operations) and in the medium to long term (strategic and forward planning). Asset management is directly associated with the current or desired levels of service for the customers, the associated costs in providing these services, and the practices and systems that assist organisations in achieving this in the most efficient and effective way. This involves the following activities:

- Planning for assets and reviewing the current asset stock, based on what customers require
- Creating or acquiring new assets
- Accounting for assets and determining the true cost of service they provide
- Operating and maintaining assets
- Monitoring the performance and conditions of assets
- Assessing rehabilitation, renewal and replacement options
- Rationalising or disposing of assets that are no longer required
- Auditing the way in which assets are managed, and the asset management practices, procedures and systems themselves
- Identifying and working to minimise life cycle costing of new assets

Source: Institute of Municipal Engineering Australia , 1994

manner (Malano and van Hofwegen, 1999)¹. They provide information on the financial consequences of alternative interventions in the infrastructure or the asset base. Asset management is directly associated with the level of service provision, the associated cost in providing these services, and the practices and systems that assist organisations in achieving this in the most efficient and effective way.

3.3 Cost of service

In paying their fees, farmers must be ensured that service is provided at the lowest cost. Transparent mechanisms for financial planning and management are necessary and should be based on the assumption that the system is capable to perform its intended functions within the period that delivery of such service is foreseen. Asset management programs provide information on the cost of service provision for different time horizons, which is directly related to the level of service provided. In principle, these cost have to be recovered from the direct clients but also from other beneficiaries of those services. Beneficiaries do not pay for maintenance but they pay for using services that can only be provided if maintenance is taken care of. Therefore, incentives to contribute to payment for maintenance have to be linked to the services provided.

The costs of physical infrastructure and its management are directly related to the level of service it can provide. An increase of service level will automatically mean an increase in management effort, an upgrading of the infrastructure or both. Through consultation, the clients of the services offered or other stakeholders can participate in the process on decision making on the level of service and its associated cost. It is therefore necessary to know the costs associated with the provision of a certain levels of service. These costs are operation, asset maintenance, asset depreciation and return on investment.

Depreciation is usually the largest cost item and is intended to reflect the rate of consumption of the infrastructure. The initial cost and the service life of the infrastructure will determine the magnitude of this cost. Asset management programs provide information on expected maintenance and investments costs. The amount of money annually to be reserved can be determined and included in the cost of service provision and then translated into charges and fees. In deciding on the cost levels consideration should be given to the fact that the planning horizon of farmers is usually much shorter than the expected life of major infrastructural works. Also changes in society, economy and technology often demand a shorter planning horizon. These factors should be taken into account while deciding on what expected investments to include in the investment profiles for cost and price calculations (Moorhouse 1999, Burton 2000).

In order to document the cost of various management functions it is very important to have good records of the actual cost including the variability that

¹ Asset management in the irrigation sector is not yet widely applied though developments have recently been made. For further reading reference is made to Burton, Kingdom and Welch (1996), Burton (2000), Malano and van Hofwegen (1999), Plantey (1999), Moorhouse (1999).

occurs for each type of activity. These activity and asset registers provide the necessary records for informing the financiers to obtain appropriate levels of funding and allow for more efficient planning of operation and maintenance activities.

In a situation where clients fully pay for the cost, the level of service must be balanced against the associated cost in a consultative process with the clients and other stakeholders. They will agree on the level of service and its associated cost. The outcome will be included in a service agreement between the service provider and the client which in irrigation and drainage services can be an individual or group of farmers. These agreements can only be successfully implemented if transparent and effective accountability mechanisms and accountancy systems are in place.

3.4 Cost Allocation

In service oriented managed systems, the payment for the services by the clients should reflect the cost related to the provision of that particular service. If agencies provide only a single service, then all cost made can be assigned to that particular service. However, many water management agencies provide more than one service like irrigation, drainage and flood protection. . This means that these agencies should be able to specify the actual cost related to these different services. A cost accounting system is needed which allows the differentiation of expenses and their assignment to the various management functions for various services. The higher the number of management functions and differences in service levels within one service provider, the more complex and costly the accounting system will become. At all times a transparent accountancy system is required for accountability purposes. Asset registers are an important element in keeping record of operation and maintenance expenditures (Malano et al, 1999a, 1999b, Moorhouse 1999).

Sometimes, in one and the same system, additional costs have to be made for delivery of the same level of service. For example, in the irrigation schemes in Morocco, the farmers in the gravity irrigation part and the lift irrigation part of the scheme receive the same level of service but they have to pay different levels of charges because the pumping cost are allocated to those farmers receiving pumped water. Identical cases can be found in polders in the Netherlands where in the deeper lying parts additional pumping cost have to be made to provide the same drainage service. This illustrates that at a certain level cost differentiation can be applied. To apply this to great detail would involve an administration and accountancy system, which will be disproportionate to the cost of service delivery, hence an optimisation in specification of different services and service levels will have to be agreed upon between the agency and their clients.

After the various costs for particular activities have been assigned to a particular service, the total cost for that service could be determined.

3.5 Tariffs and Charges

The levels of charges or service fees are based on these total costs and a set of criteria to determine the tariffs. However, tariffs are usually linked to

government policies, regulations and procedures due to the social character of the services provided and the monopoly position of the service provider. Sometimes prices are fixed or ceilings are set. If these are insufficient to cover the real cost, subsidies are required or else the system might gradually deteriorate with consequently a decrease in the level of service.

An irrigation and drainage system may provide delivery of certain volumes of water of certain quality to identifiable users and protection against inundation and floods for all individuals, livestock and property within the area protected. These different services benefit different individuals, organisations or institutions in different ways. Accordingly, there are different possibilities to recover the cost for services delivered.

Charges can be based on

- *flat rates* where the total cost are divided on a per capita or per hectare basis,
- *a reflection of the real cost* for providing the service to individual clients,
- *a reflection of the level of consumption* of the services by the individual clients,
- *a reflection of the level of benefit* for the client to whom the service is delivered.

For irrigation, drainage and flood protection services, *flat rates* per area often have the preference as it generates a relatively stable income as they are based on parameters which themselves do not vary very much. The variation in operational cost lies mostly in the variation in expenditures for example in the cost for pumping in dry and wet years. Moreover it is less monitoring and administration so less costly for the agency. However, the use of flat rates in the provision of irrigation services reduces the incentive for the irrigation agency to provide proper water delivery services unless these services are specified and the payment is subject to the provision of these services.

Compagnie d'Aménagement du Coteaux de Gascogne (CACG), France

CACG provides bulk water supply to farmers and users associations. They are charged according their service contract on a volumetric basis. The water user associations are free to arrange the recovery of the charges to their members. Because the transaction cost for volumetric charges to each member are too high, often the associations charge their members using an area-based fee.

This is different for charges based on rates of consumption. In irrigation schemes the water consumption depends on the amount and distribution of rainfall and the availability of water. In wet years the consumption of water may be very low hence income for the agency might be lower than the real cost. The same happens when during a dry year water is scarce and rationing has to be applied. The occurrence of budget deficits in such cases can only be

compensated through multi-year budgeting combined with the development of reserve funds. Charges can then be based on a progressive rolling average of say 5 years expenditure and income predictions. Again, asset management programs are important tools in making expenditure predictions.

To provide a more stable income for a better financial planning but also to use water prices as demand management tool, a combination of different service charges can be practiced. For example, the management cost of service delivery is covered by a consumption-related rate and the capital cost is covered by flat rates.

Basically, tariffs are determined as a ratio between the total cost for service delivery by the units of service delivered. Progressive or block tariffs may be introduced as a tool to minimise consumption of water or to protect the economically weak groups. Overheads and development of reserves may be added to the tariffs.

An effective and transparent accountancy system is required to monitor the basic parameters for tariff setting as well as any changes in the client base. Asset management programs give the possibility to inform the clients on the medium and long-term development of tariffs and as such can be included in the consultation processes. Moreover, they will serve as a benchmark for accountability.

3.6 Subsidies

Financial autonomy of the managing agency, which is fully accountable to its clients, is a prerequisite for system sustainability. However, often government subsidies are provided to the irrigation and drainage authorities to cover their cost and reduce the financial burden for their farmer clients. If these subsidies are not linked to a clear purpose with clear conditions and targets to be achieved, it reduces the incentive for the managing agency for optimal performance of service delivery and effective and efficient use of resources.

In many countries the charges or fees cannot be set by the managing agency but - for various reasons - are determined by the government. If charges are levied, capital costs are often excluded and consumers only pay (partly) for the cost for operation, maintenance and management. Even these charges are often fixed. These levels are usually lower than the actual cost of delivering the services. The government has then to provide additional funding to cover the deficit in budgets. Subsidies have a great impact on the financial management of water management agencies. Subsidies can be subject to annual approval procedures, which make the level of contribution, and thus the adequacy of budgets, an uncertain factor. Levels of subsidies might change due to shift in priorities of the government. This might result in insufficient O&M funds with consequently a deterioration of the infrastructure and the services provided.

Asset management programs provide medium and long-term investment profiles, which can be used to determine short, medium and long-term subsidy policies. They also provide actual information on asset condition and values and therefore can serve as an important tool for verification of proper use of subsidies.

3.7 Collection of Charges

The charges have to be collected either by the agency or through intermediaries. The collection can be done directly linked to the delivery of services or indirectly through a system of land or other taxes

Ciherang Irrigation Scheme Indonesia

The collection of the irrigation fees in the government administered Ciherang scheme (4.200 ha) suffered many problems in the mid-90s:

- The area based irrigation service fees were administered and collected by the local government tax office through the village head who could take a percentage for commission. This meant in practice there was no relation between payment and service delivery.
- The level of participation and say of the farmers in the determination of the level of the fees and the allocation of the collected funds was limited to one farmer representative in a government officials committee.
- The collected funds would be deposited into one account together with the collections from other schemes. Allocations from this account were not linked to the scheme of origin and the net amount returning to the scheme was reduced considerably due to the various "collection and administration" charges.
- The water user/tenant was supposed to pay the fee so much of the money could not be collected because many of the tenants lived outside the area and cultivated the land only on seasonal contract basis.
- Sanctions for non-payment were not used, also because the services were inadequate

These experiences were taken up and further modifications are now being made under the decentralisation program of government services. The principle is that the farmers through federative water users associations will be given more say in the management of the system and the utilisation of collected funds.

Sometimes charges are collected through taxes and they enter general government revenues. Usually the amount returned from these charges is not the same amount to the scheme where they are collected.

Experience in introducing irrigation service fees in public irrigation schemes in some countries has shown that the lack of capacity of the authorities to collect and manage fees seriously constrains the mobilisation of resources. It often is not the willingness to pay but the willingness to be firm on part of the Government, the willingness to manage and to collect and to carefully register names, holding sizes and values of properties (Gerards, 1992). The indicated lack of incentives can primarily be attributed to the disconnection between budget provisions from the government and the collected fees that entered general revenue and was not returned to the systems they originated from.

Financially autonomy of agencies provides an important incentive to administer and collect the fees. Here service provision, fee collection and resource mobilisation are directly linked to each other. Much attention and cost has to be paid to the process of fee collection. This process has various distinctive actions where accountability demands a transparent process of fixing charges, preparing bills, collecting charges, administrating receipts,

sending reminders, prosecution of non-payers and writing-off of uncollectable bills.

3.8 Budget Allocation

Once the charges have been collected, budgets have to be allocated to the different activities of the managing agency. Asset Management Programs provide information of budget needs for individual assets for the different planning horizons. They also enable the determination of shortfalls in the budgets and need for additional allocations through for example subsidies, loans or credits.

Sustainability requires needs based budgets. As the needs will change in time, so the budgets will. Therefore flexible budgeting systems are required. For year to year budgeting the critical question now becomes - *What are the actual needs?*

As mentioned before, the budget needs are to cover for routine O&M, major repairs, rehabilitation, modernisation or replacement. Asset management programs are based on an assumed lifetime of the assets, assuming operation and maintenance as required. This means that for different reasons, the lifetime of assets can either be longer or shorter. Also, some assets might require relatively more or less maintenance than assumed. Regular assessment of the asset condition should enable financial planners to estimate the required funds to keep the asset in functioning condition. If major interventions are required on a number of assets, and this would lead to an undesired peak in expenditures, priorities have to be set. Each asset has to be evaluated based on its condition, risk of failure and the consequences of failure. The condition and risk characteristics of each asset are known and documented in the asset register. Based on a cost and risk analysis, alternatives can be evaluated and the priorities can be set².

Because income and expenditures are varying, multi-year planning is necessary. This demands multi-year budgets based on a management plan of all assets. Detailed information on cost of assets during their lifetime has to be available. Asset management plans should therefore become part of the routine financial management procedures.

3.9 Loans and capital reserves

In case of replacement, modernisation or upgrading of the assets, capital for new investments is required. In asset management programs predictions on the investments can be made and fees can be adjusted beforehand to generate the necessary capital before it is needed. This allows a more flexible financial management of the agency. However, from farmers' point of view, charges include reservations for investments that they might never get the benefit of as these investments are beyond their planning horizon. Another approach is to finance these investments through (commercial) loans on the free market - if government regulations so permit - and include the amortisation of the loan in the fees. In this way the need and level of investments can be decided upon in consultation with the clients to see

² Burton (2000) introduces a rapid asset appraisal based on serviceability of the assets.

whether the investments lead to a better service and an improvement of the productivity of clients activities. Moreover, the clients have direct benefit of their own contribution.

Unfortunately, in many countries the agencies do not have the authority to commit themselves directly to loans. This can often only be done through the national government, which seeks assistance from national or international donors. The terms for engaging in loans and for repayment often lead to a situation where client needs are not fully understood and financial considerations prevail above the service requirements.

To cover unforeseen expenditures or lower income financial reserves are very important. Especially in government managed systems reserves are not with the managing agency but with the treasury. To provide for unexpected operation and maintenance costs during the financial year, e.g. due to disasters, droughts or floods, the governments should have funds available.

4. Institutional consequences

4.1 The Irrigation and Drainage Agencies

The main task of the irrigation and drainage agencies is to provide an adequate water delivery and water removal service at least cost within the constraints imposed by the system infrastructure, the government policy and the environment surrounding water management and agriculture. There are a number of organisational scenarios that apply to irrigation and drainage organisations around the world. Their task will be basically the same, regardless of what type of organisation is in place. However, the structures to finance maintenance and the incentive structures for utilising the financial means effectively can differ importantly. In this context, it is useful to provide a classification of organisations along the nature of the legal and financial links with the users and the Government and their specific incentives for financing maintenance. Figure 2 illustrates this classification between (Lee *et.al*, 1997).

- independent entities,
- private services,
- public or semi public bodies and
- government administered systems

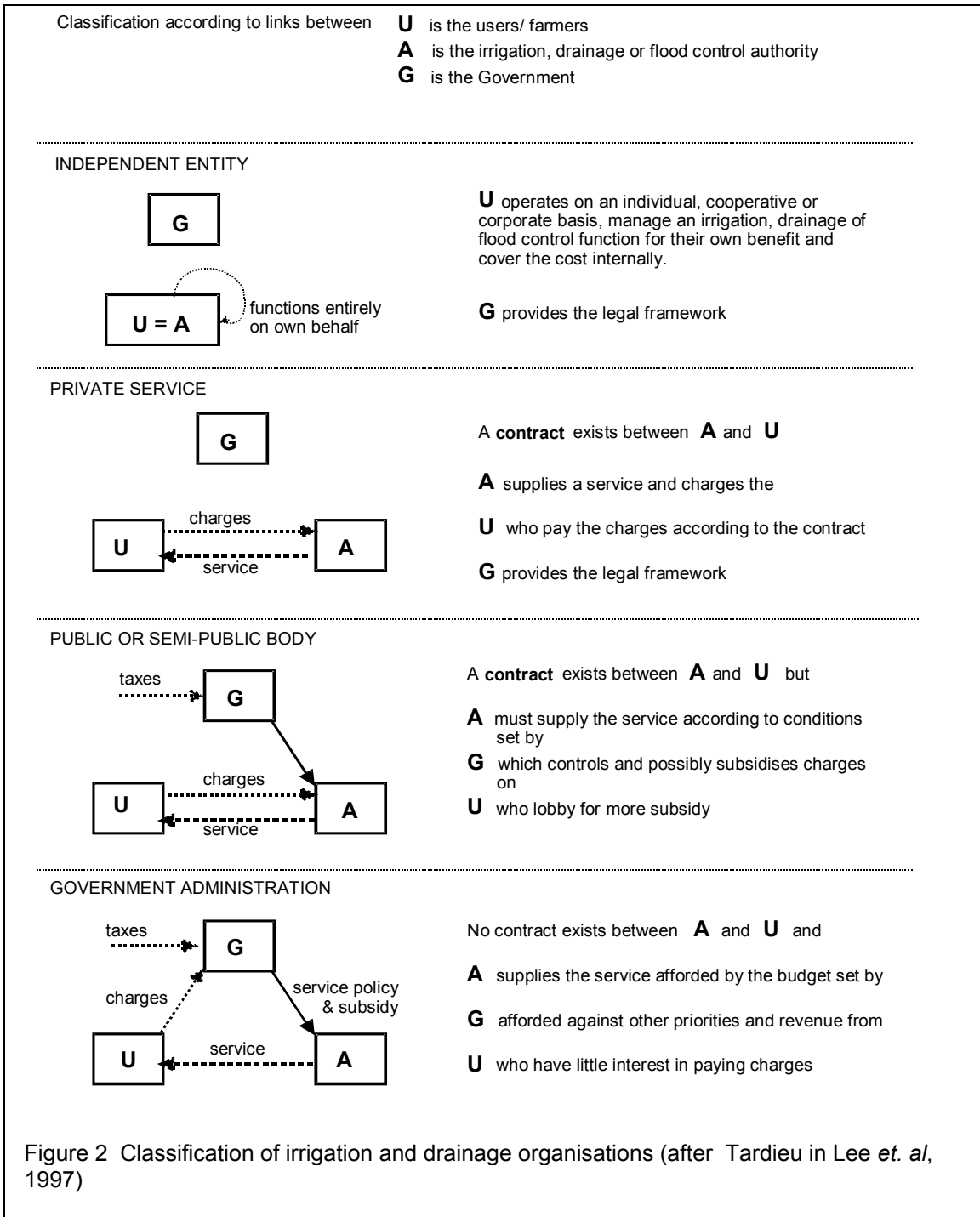


Figure 2 Classification of irrigation and drainage organisations (after Tardieu in Lee *et. al*, 1997)

The *independent entity* operates on an individual, cooperative or corporate basis. It develops and manages the irrigation and drainage facilities for its own benefit and recovers all the cost internally. Independent entities can be small-scale tubewell schemes, private farm systems and large-scale plantation or state farm systems. Government has no direct involvement in the provision of the service but provides the legal framework that regulates the land and water rights and the environmental standards. For such entities irrigation and drainage is considered as one of the inputs in their overall production system and the associated costs will have to be recovered from the sales of products. Consequently, maintenance will be done at lowest possible cost and only

when considered essential to maintain or enhance the profit margin. This often goes at the cost of the long-term sustainability of such schemes. There is mounting evidence from the USA and Australia that such entities neglect long term maintenance in order to keep irrigation costs as low as possible, with uncertain implications for sustainability and funding of rehabilitation in future (Turrall, 1998).

Communal systems have an additional incentive set through the social control within the community that often relates irrigation system maintenance to other communal activities (see Mura system in Japan).

A *private agency* can provide irrigation and drainage services to users under a direct contractual relation. In this case, the Government has no intervention in the contract between the service provider and its clients, but may set the regulatory framework for it. A private agency operates under private law and is characterised by a full cost recovery operation. Proper

tariff setting and the collection of service fees are essential for its survival. Because these organisations operate under monopoly conditions, robust legal frameworks and agreements between the service provider and the government are needed to compensate for the lack of government control that should guarantee the interest of society to be taken care of. An alternative is a structure, where the clients and other interest groups are the main shareholders and member of a governing board and as such approve the operational and financial plans and account of the service provider. Such measures are necessary to ensure the provision of agreed services is at least cost.

The *public or semi-public body* is controlled by Government and supplies a service according to conditions set by the Government, which controls and often subsidises the charges on the users. Such entities can only perform if they are financially autonomous and have a direct service relation with the farmer/clients. This means that farmers directly pay their fees to the agency and that the agency has full responsibility of utilising these funds within the scheme itself. An example of such set up is the ORMVAM in Morocco (see box ORMVAM).

The Mura System in Japan

In Japan farmers are already for centuries completely responsible for the operation and maintenance of their irrigation facilities from diversion works to field ditches. They establish irrigation associations (Land improvement districts-LID), manage the systems and collect fees from their members, which cover all OMM cost. They are also involved in construction or rehabilitation projects, which are conducted by central or local government.

The basis of the LID is the Mura, a sub-unit of administrative villages. The Mura deals with every kind of cooperative activity needed for daily normal and spiritual life in the region. A Mura collects fees for their activities as road and irrigation and drainage canal maintenance, traditional festivals and funeral ceremonies. This means that also non-farming residents pay for the maintenance of irrigation systems. Decision making is based on consensus and violation of the will lead to sanctions by other members (Mura-hachi-bu) of which the exclusion is the most serious.

Source: M. Satoh, 1998.

In all these types of arrangements the provision of service may be carried out under formal “contracts” or informal “customer agreements”. Formal contracts usually are made between the agency and its customers and must be consistent with the limitations imposed by Government regulators. Customer agreements normally rely on service targets imposed by government or established by mutual consultation between the agency and customer.

The ORMVA de la MOULOUYA (ORMVAM) in Morocco

The Regional Agricultural Development Bureau of the Moulouya (ORMVAM) is established in 1966 as a public authority with financial autonomy under supervision of the Ministry of Agriculture. It is amongst others responsible for the management of four irrigation schemes with a total area of 71.000 hectares. Water charges are collected by ORMVAM and are used to cover their expenses. Because government fixes the level of the charges budget shortfalls are covered by subsidies.

To improve the service delivery and financial performance of the scheme ORMVAM embarked on a process of performance oriented management by increasing the autonomy of ORMVAM. The commitment of ORMVAM came about because of external pressure from the Government of Morocco as it initiated a national programme to improve the efficiency of operations and the management capacity of all ORMVAs as part of an overall rationalisation of public administration. The objectives of this programme were to increase the efficiency and effectiveness of the management of water resources and to improve the level of services provided to water users.

Rehabilitation and modernisation of the system where necessary, a shift in administration and management system from public administration to private corporate management, and a change in operation and maintenance procedures were some of the interventions made to enhance system performance.

To improve the collection of fees a more reliable service provision and better accountability system were necessary. Farmers have to pay charges, which consist of repayment of a part of the investment cost, and a payment for operational cost based on the volume of water delivered. Different prices are fixed for gravity delivery, pumped water and pressurised water per cubic meter delivered at the outlet. Farmers only pay for the volume of water received. The allocation and delivery of water is done in consultation with the farmers. A fixed discharge of 20 l/s or 30 l/s is in turn delivered to farmers for an agreed duration at an agreed time at a designated turnout. Recording the duration of opening of (on-off) turnouts that deliver a constant discharge monitors the supplied volume. After delivery the farmers sign a receipt for the volume received for billing purposes. If the delivery is not in accordance with the allocation, farmers can claim the remaining volume during the same irrigation cycle or get priority in the next cycle.

Farmers are billed twice a year. If farmers do not pay, they will after some reminders be excluded from the irrigation cycles. Only after paying their dues they can be reconnected. During the introduction of the more strict payment approach, the farmers having an outstanding debt were disconnected until they agreed upon a repayment schedule, which included interests and fines and a payment of water charges before delivery until the full debt was paid back.

Source: van Hofwegen 1996

The majority of the irrigation and drainage schemes across the world are still *government administered*. Traditionally, the financial management of most of such government irrigation and drainage agencies is input driven and based on the government budget allocations that are not related to the actual performance of the service provider and the long-term cost of sustainable service provision. This results in inadequate levels of maintenance and investment in infrastructure. Furthermore, the budget allocation is often determined on an annual basis considering only maintenance cost rather than considering the life cycle cost of the infrastructure in which other events such as rehabilitation and modernisation would also occur. Moreover, because the link between the level of funding and the performance of the service provider is often missing the service provider does not have any incentive to improve its service delivery performance discouraging the farmers to contribute to the maintenance of these systems.

Sustainability of irrigation and drainage service provision requires an output driven nature of the budgetary process. The budgets of the authority must be based on the short and long term needs to deliver the agreed level of service, hence the financial management strategy of the agency must be focused on the identification of resources required for the sustainable provision of this service. Under this concept, all the agency's plans must be evaluated in relation to the desired level of service. This implies that the financial consequences of different options for service levels should be understood. In this context, asset management programs become essential tools. They help the agency in conducting an extensive forward planning of the changes required in the infrastructure to improve the service provided, to reduce the overall cost of service provision and in defining the medium and long-term financial consequences of these changes (Malano and van Hofwegen, 1999)

One important aspect is to determine how the additional income generated by the irrigation and drainage should be distributed between the farmers and the service provider to guarantee that operation and maintenance costs are covered. Subsequent economic monitoring can help determine the real capability of farmers to contribute financially to the management by buying water in some way. In this regard, changes in the process of agricultural goods and inputs and in crop yields could lead to changes in the price of services aimed at ensuring financial equilibrium for the management entity while providing a sufficiently attractive income supplement for the irrigator (Verdier and Millo, 1992)

4.2 Government

The Government has a number of economic, social and environmental objectives for the country, which the irrigation system and/or drainage systems are supposed to fulfil. These could include amongst others increased food production, employment generation, generation of foreign exchange or alleviation of poverty. Some of these objectives will involve direct interactions between the Government and the irrigation and drainage authority. Some will also involve the farmers and other stakeholders. Especially government involvement is required on issues that will include levels of subsidy in the establishment period of a project, marketing and prices for agricultural production, credit and financing, cost recovery from farmers and water users

associations as prosperity increases, and financing of the operations of the authority.

Government has several roles to play in relation to irrigation and drainage.

- to utilise irrigation and drainage development and management as a tool for social and economic development;
- to ensure that the negative effects of irrigation and drainage do not harm the interest of society;
- to create an enabling environment for effective operation and maintenance of irrigation and drainage systems;
- to contribute in the maintenance of the schemes in the form of subsidies as one of the stakeholders.

The provision of both irrigation and drainage services occurs largely under conditions of monopoly. It is therefore obvious that some form of consensus is required among the irrigation and drainage authority, the farmers/clients, the government, and other affected parties, about the type and form of service to be provided. This consensus must be achieved on the basis of the desire of users to obtain this service, its associated costs, their willingness to pay for it, and the existence of an appropriate legal framework that will ensure the enforcement of rights and obligations of the participants.

To encapsulate these incentives, service oriented management of irrigation and drainage systems is a prerequisite. The ability of the irrigation and drainage organisation to respond to the needs of its customers reflects its level of “service orientation”. Output orientation is a key feature of service oriented management in that the actual price that farmers pay is inextricably linked to the provision of service. This ensures that users become fully aware of the cost associated with the provision of the service. They can make informed decisions on the level of service they can afford and are prepared to pay for. This interactive process is critical to ensure the necessary commitment from the interested parties. Moreover it should facilitate the balancing of appropriate “trade-offs” between improvements to the main system in timing and extent, options for alternative investment and improvement at the farm level to achieve desired levels of reliability and flexibility in water delivery systems.

In discharging its functions, a service oriented irrigation and drainage authority must meet several accountability criteria including liability associated with performance of its functions, and political and social responsibility embodied in the effectiveness of the organisation in meeting the expectations of the government, and the farmers (clients).

The ability to enforce the agreed service standards is crucial to ensure its delivery and compliance with its specifications and conditions by the parties involved. This can take various forms including service agreements with legal contractual status between service provider and recipient. These agreements give a detailed description of services to be provided, payment in return for services, monitoring and verification of service provision, consequences of failure to comply with agreements by both parties and rules for arbitration of conflict.

Reliable service provision requires a set of incentives and commensurate accountability throughout the management structure (Murray-Rust and Snellen, 1993). Large irrigation agencies, particularly those where salaries, promotions, and other incentives are not linked to performance, are highly resistant to change and there are few examples of such changes occurring as a consequence of internal debate and planning. Where changes occurred, it has tended to come from the outside.

Failure to clearly define responsibilities between service providers and their clients for achieving objectives appears to lead almost inevitably to lower levels of performance. Accountability requires that there be specified targets or contracts of transfer of management responsibility which enable all parties to determine whether the agreed level of service has actually been achieved and to assess causes of failure to meet the terms of this contract.

Therefore, in crafting institutions, special attention needs to be paid to incentives, both positive and negative, through accountability of users as well as managers. An integrated approach based on the whole system, and not fragmented between user groups and government departments is essential. Single irrigation systems managed by system-specific organisations that are financially and organisationally autonomous and accountable to their customers, generally perform better and are more sustainable over the long term. Water users associations in parts of systems, partial turnover of O&M for entire systems, or shared management through joint farmer-government committees are not likely to become stable and effective institutional mechanisms for managing irrigation systems unless there is a clear provision for mutual accountability between users and managers (Merrey, 1996).

5. Summary and conclusions

Financing maintenance means to introduce the right incentives to the various actors so that they will ensure a continued functioning of the infrastructure at the agreed level of service. The following incentives are to be incorporated in the management arrangements between farmers, irrigation and drainage authorities and government:

1. The payment for service should be outweighed by the benefits obtained from it in the form of increased productivity, farm income, and improved livelihood.
2. A direct link should be established between the provision of services and payment. This has to be established through the development of service agreements that include the specifications and conditions of service and the accountability mechanisms to apply.
3. Such direct link should establish a mutual dependency between the service provider and its clients. Revenues from service provision should remain within the service organisation. The organised users should have the final say in the use of these funds. Asset management programs are effective tools to use in the financial planning and they provide a transparent basis for managers and users for decision making on

maintenance, rehabilitation and modernisation and the setting of tariffs and charges.

4. These links can only be established effectively if the irrigation and drainage authority is financially and organisationally autonomous. This should be accompanied by a change from supply to output oriented budget systems.
5. Enforcement of arrangements is elementary to sustain service provision. The service provider must have rights to sanction violations and non-payment. On the other hand the users must have access to sanctions if the services are not in accordance with the agreements. The ultimate resort of the judicial system should be able to handle such cases.
6. Deviations from the principle payment for service- service for payment should be embedded in subsidy arrangements between the government and service provider. These subsidies should be linked to a clear purpose with clear conditions and targets to be achieved so that it does not reduce the incentive for the managing agency for optimal performance of service delivery and effective and efficient use of resources.

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