Journal of Rural Development 5 (December 1982): 181~196

MANAGEMENT OF IRRIGATION SYSTEMS AND WATER CHARGE DETERMINATION IN KOREA

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I. Introduction

Irrigational water development is essential for rice production in Korea. With a long history and tradition, irrigation systems development is still in question with respect to efficiency in institutional management at the operational level. There are 103 semi-autonomous decentralized organizations, called Farm Land Improvement Associations(FLIAs). With the abolition of local government autonomy in 1961, they have been administered under government supervision and control.

In turn, farmers' voluntary participation has been limited to some extent. The lack of farmers' self-reliance and belongingness to FLIAs has become one of the main sources of inefficiency in the management of irrigation systems. This further raises many complaints and even shows a tendency of passive attitudes to irrigation systems management at the local level. Farmers' active participation is currently emphasized from the view point of administrative efficiency.

Furthermore, the organizations are largely structured by the size of irrigated area. This criterion simply assumes that the larger the irrigated area the more administrative and technical works are associated with it. In reality, too small and too large organizations problem arises and small organizations become unable to even perform the basic functions due to lack of staff members.

In assessment of water charges, management costs of irrigation facilities are distributed differently among the benefited farmers with six different rates. On the other hand, irrigation systems construction costs are mostly charged equally with few exceptions. In fact, water charges may be too high if the charge is set high enough to meet all expenses needed in the FLIAs. If the charge is too low, the demand for water will exceed the supply. That is, all farmers will want to have irrigation systems, if water is available at very low cost. In the process of assessment, FLIAs may try to equalize the incidence of irrigation management and to optimize user charge so that the expenses needed equals the farmers' water charge payments.

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This paper focuses on the identification the problems associated with the institutional management aspects of irrigation systems development at the operational level. It further attempts to evaluate the organizational structure and water charge assessment system adopted by the FLIAs.

II. Management of Irrigation Systems

1. Central Level Organizations

Administrative organizations for irrigational water management projects in Korea consist of three organizations: Agricultural Development Corporation(ADC), the Federation of Farm Land Improvement Association (FFLIA), and Farm Land Improvement Associations(FLIAs) as indicated in Figure 1. ADC and FFLIA are central level organizations in charge of survey, design and construction of agricultural irrigation facilities, and of training and education of water management staff members engaged in local level organizations, respectively. FLIAs are an independent farmers' organization, operating and managing irrigation facilities at the local level. There are 103 FLIAs, in the nation as a whole, that manage 9,913i rrigation facilities and 420 thousand hectare, 56.7 percent of the total irrigation area in Korea (Table 1).

ADC is an unique government investment corporation of the Ministry of Agriculture and Fisheries and performs four important missions in agri-

FIGURE 1 ADMINISTRATIVE ORGANIZATIONS FOR MANAGEMENT OF IRRIGATION SYSTEMS IN KOREA

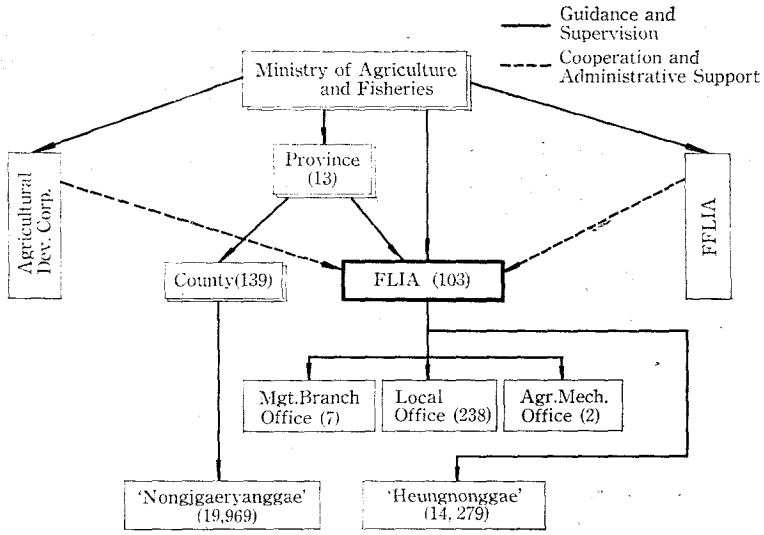


TABLE 1 IRRIGATION FACILITIES AND IRRIGATED AREAS MANAGED BY THE FLIAS, 1982

Class	National Total		Local Government		FLIAs	
Facilities	No. of Facilities	Irrigated Areas	No. of Facilities	Irrigated Areas	No. of Facilities	Irrigated Areas
Total		ha		ha		ha
	68,056	740,803	58,143	320,139	9,913	420,664
Reserviors	17,740	457,816	15,500	145,127	2,234	312,689
Pumping Stations	3,565	88,305	2,236	25,004	1.329	63,301
Pumping and drainage Stations	132	24,474	51	1,623	81	22,851
Drainage Stations	115	—	16	—	99	—
Weirs	17,325	121.910	14,540	108,736	2,785	13,174
Cannals	1,159	9,384	1,090	3,262	69	6,122
Wells	5,910	25,747	5,378	23,220	532	2,527
Tubewells	22,110	13,167	19,326	13,167	2,784	—

cultural development. They are (1) the survey, design and construction of large scale irrigation and drainage facilities, (2) farm land expansion by creating paddy land and upland, (3) land reclamation project, and (4) farm land leveling projects. In addition, it provides FLIAs technical services related to the operation and maintenance of irrigation facilities. Recently, it participates in overseas agricultural irrigation development projects by exporting irrigation technology and agricultural engineers. After the construction of the facilities, they are handed over to the FLIAs for their operation and management.

On the other hand, the FFLIA is a purely private central organization that has 103 member FLIAs in the country. It conducts survey and research projects related to management of irrigation projects and FLIAs administration, in addition to training and education of water management staff members of FLIAs. It also engages in farm land leveling, land replotting and construction of small scale irrigation projects by providing survey, design and engineering supervision. Further, it performs the government's assigned duties related to farm land irrigation projects.

These national level administrative organizations are often in question with respect to the effectiveness for continuing irrigational development and efficiency in operation and maintainance of the existing irrigation facilities. Four alternatives may be considered. They are (1) to integrate FFLIA with ADC and supervise the 103 FLIAs, (2) to establish a large central federation and supervise 103 FLIAs, (3) to integrate the 103 FLIAs to local government organizations, and (4) to sustain the FFLIA and enforce its function.

Alternative one, the integration of government investment corporation and private organization, would almost be impossible. Not because it will result in too large an organizational body, but because it will bring

up the problem of nationalization of farmers' common property. Alternative two, the establishment of a large central federation, may be desirable from the view point of enforcement in control and supervision of 103 FLIAs. However, this would also result in multilateral organizational structure and, in turn, too bigness in organization. It may interfere with the autonomy of FLIA administration. Alternative three, integration of FLIAs into local government, would enhance administrative efficiency of FLIA. However, it is neither possible for local government to take over FLIAs because of nationalization of farmers' common property, nor desirable because it increases administrative works in local government.

In short, alternative one is not feasible in the sense that a government investment corporation can hardly manage FLIAs which are governed under autonomy. Alternative two is also not desirable because it has a possibility toward resulting gigantic organization and larger financial burdens. Alternative three is less desirable, if not impossible, not only because of hindering FLIA's autonomy, but also nationalizing farmers' common property. Therefore, it would be rather desirable to enforce the existing FFLIA's function. This would provide an autonomy in FLIA administration as much as possible and prevent it from the establishment of a big central organization or nationalization of farmers' common property.

Enforcement of FFLIA's function should be made possible to improve the relationship with FLIAs, not to impose too many financial burdens of FLIAs. Such functions to be enforced may include the followings;

(1) supporting functions of government guidance and supervision of FLIAs,
(2) training and education of water management personnel in FLIAs,
(3) establishment of stabilization funds for FLIAs,
(4) survey, design and engineering supervision for constructing small irrigation facilities,
(5) land replotting works related to the irrigation facilities within the FLIA regions, and
(6) supply of agricultural inputs to member FLIAs.

2. FLIA and Its Organizational Structure

A. *FLIA and Farmers' Participation*

Farm Land Improvement Associations(FLIAs) are semi-autonomous farmers' organizations in charge of administering irrigational water management projects at the local level. They originated from irrigation cooperatives established in 1906. As non-profit production organizations with a long history and tradition, they contributed a great deal to farmers' well being as well as rice production increase in Korea.

Major functions of the FLIAs are construction of small scale irrigation facilities and operation and maintenance of the existing irrigation and drainage facilities. Facility construction project focuses on small

scale irrigation facilities such as small size reserviors, pumping and drainage facilities, weirs, canals, etc. within the FLIA's region. Operation and maintenance of the facilities are aimed at improving facilities' own function and safety, extending facilities' life span, and increasing the efficiency of the irrigational water management from the existing facilities.

In addition, FLIAs are in charge of the two minor functions; farm land leveling and farming improvement and agricultural mechanization within the region. The farm land leveling project includes land consolidation by exchange among farmers, land leveling and soil improvement, and expansion of farm roads. The farming improvement and agricultural mechanization project focuses on an increase in rice production so as to achieve national foodgrain self-sufficiency and the introduction and diffusion of farm mechanization. Unfortunately, this function is somewhat duplicated with the Agricultural Extension Service, Ministry of Agriculture and Fishery and Agricultural Cooperatives at the local level.

The FLIAs are an independent and farmers' autonomous organizations in their origin. Soon after national liberation in 1945, they were administered under autonomy until the early period of the 1960's. During this period, a farmers' general meeting was held annually and the president of the FLIA was elected by farmers. Since 1961, the election of the manager and the function of the general meeting has temporarily been stopped by declaring a temporary measure so as to restore a sound management of FLIAs. With the abolition of local government autonomy in 1961, they have been administered under government supervision and control.

As a result, some institutional problems have arisen. First, government intervention in FLIA administration was enforced and the farmers' voluntary participation, in turn, was somewhat limited. Second, autonomy in reality is not allowed, although the Agricultural Modernization Promotion Act(1970) permits farmers autonomy in administration. This is made by inserting a temporary prohibiting election measure in the appendix of the Act until sound management of FLIA can be restored. Consequently, the FLIA has been administered under semi-autonomous organizations for the last 22 years.

In turn, the lack of farmers' self-reliance and belongingness to FLIAs have become sources of inefficiency in operation and management of the irrigation facilities. Furthermore, farmers have tended to show passive and negative attitudes and have raised many compaints due to limited opportunities for participation. Furthermore, there is no way to check the managers' administrative performance, because no audit system is currently available.

Farmers' active participation is currently emphasized from the view point of improving administrative efficiency in the FLIAs. Alternatives for promoting farmers' active participation may be two; one is the removal of the temporary measure taken in 1961 which limits the election of

the FLIA's president and organizing the general farmers' meeting. The other is the appointment of the president by government and restoring the function of the general farmers' meeting. The first alternative may have more disadvantages at the present time. Some of the disadvantages would include higher costs and undesirable impacts associated with the election and financial deficit resulting from the possible reduction of water charge. And, thus, a decrease in maintenance expenditure is expected, while the number of facilities to be repaired increases. On the contrary, this alternative has a strong merit, enhancing the autonomy in FLIA administration.

The second alternative has more merits than demerits. The advantages of partial removal of the temporary measure are to establish the farmers' control and supervision function over the FLIA's administration and to eliminate unsound management factors by adequate government supervision. However, complete autonomy can not be realized and thus future systems improvement is needed.

In short, the second alternative may be realistic. This would encourage farmers active participation in the FLIA administration. Farmers' participation would be made through the election of delegates. Then, the delegates will participate in the decision-making process. The areas of participation would include the review of planning facility construction, water charge assessment, budget determination, etc. Furthermore, it would be desirable for the delegates to have the right of recommending the president's dismissal and request for inspection of FLIA's administration, if necessary.

B. *Organizatonal Structure of the FLIAs*

The organizational structure of the FLIAs is largely determined by the size of irrigated areas within a region. For example, a small size FLIA, irrigated area 2,000–3,000 ha, has only three sections with 17 to 24 staff members. Medium size association has a bigger size organization and a larger number of personnel. The irrigated area 8,000–16,000 ha has three departments and eight sections with 57 to 102 persons. On the other hand, large size association has five departments and seventeen sections with the authorized personnel 160–240 persons. In addition, the large size association, irrigated area more than 28,000 hectare, has three different branch offices under the headquarter-branch office, local office, and agricultural mechanization office (see also Figure 1).

Thus, the size of irrigated area is a major factor determining both size of organization and number of personnel. The larger the irrigated area the bigger the size of organization and, in turn, the larger the number of personnel. This criterion simply assumes that the the larger the irrigated area the more administrative and technical works are associated with it. This would, in turn, raise a crucial problem in determining both optimum

size of organization and number of personnel from the view point of the nation as a whole.

First, area size factor alone can not correctly reflect the total amount of work that will determine the size of organization and number of personnel in an FLIA. Second, area size criterion has resulted in too many small size organizations that could hardly enhance the economy of scale effect. Small size FLIA has difficulty to even perform the basic functions such as general affairs, planning, management, development, etc., because of shortage in staff members.

The standards for determining the size of organization and staff members must take into account various factors such as number of farmers, type and number of irrigation facilities, capacity of each facility, length of channel, geographical peculiarities, to name a few, in addition to the size of irrigated area. These factors will determine the total amount of work that the FLIA performs. Basically, the FLIA performs two types of work, administrative and technical works. Administrative work includes general administration, planning and publicity, and finance. Technical works are irrigation and drainage, operation and maintenance, and construction of various facilities.

Administrative works may largely be determined by the number of farmers. Technical works for irrigation and drainage management may be proportional to the size of irrigated area. Technical works for operation and maintenance and construction of facilities may be determined by the size of reserviros, pumping stations, weirs and length of channel, to name a few. The amount of work for each work type can be measured in physical unit, say, million tons of stock water in reservior, hundred Hp of pumping station, hundred km of channel length, etc.

The total amount of work measured in physical unit would provide a criterion for determining size of organizational structure and number of personnel. For the purpose of determining the optimum number of personnel for a given FLIA, per capita standard work volume needs to be measured. Per capita work volume can be estimated by dividing the total work volume by number of personnel, providing that a certain size FLIA is assumed to have an optimum number of personnel.[1] Then, the optimum number of personnel in an FLIA can be measured by correlating the coefficients obtained with the total volume of work in physical unit.[2]

[1] Otherwise, no way can we calculate the optimum number of personnel in a FLIA even if total volume of work is known, because we can not judge what amount of work is the optimum volume for one person.

[2] Fortunately, the number of personnel of a medium size FLIA in Korea is very much the same as that of Japan where the type of facilities and irrigation areas are similar. Accordingly, one can assume the medium size FLIA has the optimum number of personnel.

III. Water Charge Determination Models

1. User Charge Principle

User charge is, by its own nature, characterized as follows:

(1) charge is subject to the amount of benefits accrued from the irrigation project,
(2) charge is aimed at obtaining the expenditure required for the project,
(3) charge is assessed to those farmers who received the benefits of the project,
(4) charge assessment can be discriminated in case of with project, and
(5) it is applicable to the private goods that are characterized by rival in consumption, i.e., to the case where exclusion prinicple can be applied.

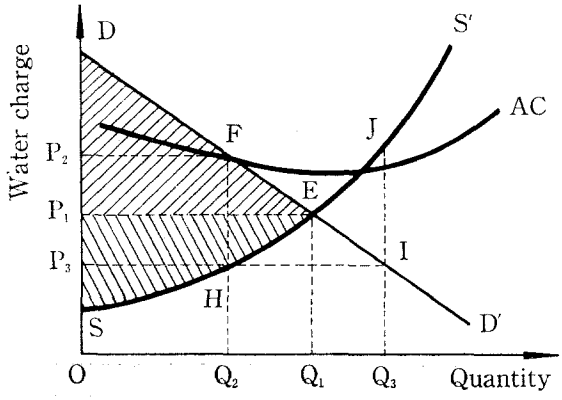
Pecuniary obligation is a common similarity between user charge and all other taxes including objective taxes, fees and fares. Although fees and fares are often called as user charges in a broad sense, there are some differences as indicated in Table 2.

Theoretically, the concept of user charge is justified by the three criteria, efficient resource allocation, equal distribution of charge, and adequate method of obtaining the budget. Resource allocation efficiency is enhanced by setting up the charge where marginal benefits are equal

TABLE 2 A Summary of Differences by Assessment Methods

Types of Assessment	Differences
1. User Charges	a. Levied on individuals who receive irrigation benefits
	b. Different rate of charge according to the degree of benefits received
	c. Part of the expenditure required, not all, are charged
	d. Adequate method for collecting the expenditure required
	e. Applicable to the private goods which are characterized by rival in consumption, ie., exclusion principle is applicable
2. Taxes	a. Levied on the public as a price of public services
	b. Charge is determined by the ability to pay
	c. Adequate to the case where exclusion principle is not applicable
3. Objective Taxes	a. Difficult to assess the benefited individuals
	b. Accordingly, charge is levied on public citizens
	c. Charge is assessed on the basis of the ability to pay
4. Fees	a. Levied on individual or corporation that uses public facilties
	b. Fees are often charged together with user charge
5. Fares	a. Collected as a price of public service
	b. All or more than the expenditure required are charged

FIGURE 2 MARGINAL COST PRICING



to marginal costs.[3] Equity is obtained by determining the charge level according to the degree of benefits received. Finally, revenus criterion is justified by assessing the charge to the benefited farmers.

In determining user charge, three models are often used. They are marginal cost pricing, average cost pricing, and the charge discrimination model.

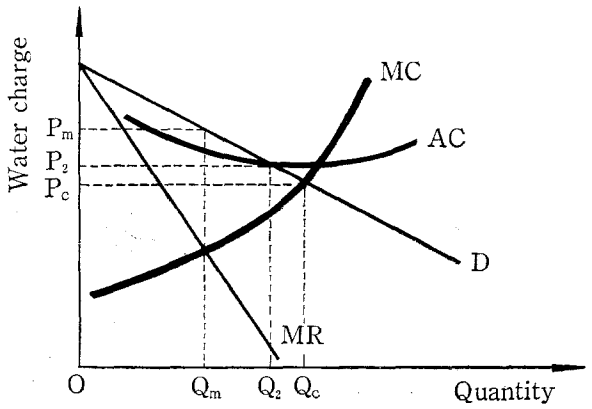
2. Marginal and Average Cost Pricing

Water charge has to be determined in such a way that interests of both the benefited farmers and the irrigation facility management body, FLIA, can be maximized. The amount of charge should be determined by equating marginal cost and marginal benefit. When the water charge is equal to marginal cost of water supplied, the equilibrium of demand and supply will be enhanced. This would lead to an efficient resource allocation in irrigational water development. The marginal cost pricing will guarantee the total consumer surplus and producer surplus will be maximized and then the efficiency of resource allocation will be enhanced (Figure 2).

Marginal cost pricing is very useful when there is a need for equating the FLIA's costs and farmers' water payment, thus, keeping a balance in budget. It also is applicable when economic feasibility can hardly be attained due to the nature of large investment requirement or decreasing cost industry. However, when the demand exceeds supply, marginal cost pricing can not reach the equilibrium condition. Marginal cost pricing reduces management efficiency particulary when budget deficiency is subsidized by government finance.

[3] When water charge equals marginal cost of water supply, an equilibrium of demand and supply is obtained. This condition guarantees that the total consumer surplus and producer surplus become maximum and efficiency in resource allocation is enhanced.

FIGURE 3 AVERAGE COST PRICING



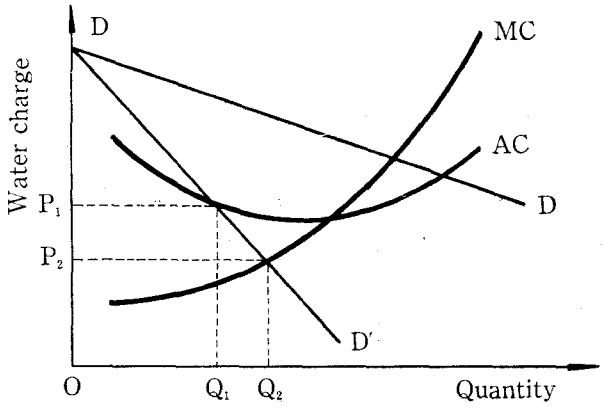
Water charge determined by average cost pricing is very consistent with the acquisition of the expenditure needed for irrigation projects. When the water charge is set by the average cost of water supply, total revenue equals the necessary expenditure (Figure 3). Thus, average cost pricing is often justified if there is a necessity for obtaining the expenditure required by independent project account. Average cost pricing is applicable to the cases where revenue must be sufficient enough to cover expenditure, capital borrowing is inevitable and profit accumulated can be utilized without difficulty, if necessary. In addition, this method can enhance cost minimization rather than marginal cost pricing. However, it would result in low level of efficienty in resource allocation.

3. Charge Differentiation Model

Water charge would be too high if the charge is set high enough to cover all expenditure needed in the FLIAs. On the other hand, if water charge is set too low, demands for agricultural irrigation water will be tremendously increased. That is, all farmers will require to construct irrigation facilities if water is available at very low cost. Accordingly, a dual charge system may be desirable. Low charge may be applied to those farmers who receive water supply from the existing irrigation facilities. High charge is assessed to the areas where irrigation facilities are newly constructed. This dual charge system improves both efficiency of resource allocation and distribution of water costs.

In case of irrigation facility construction, charge differentiation may be desirable by taking into account change in land site classes. Different charge rate with project should be applied for the period of repayment of the long-term loan made available for construction of irrigation facilities. In application, a high charge rate is adopted in the areas where the

FIGURE 4 CHARGE DIFFERENTIATION MODEL



price elasticity of irrigational water demand is low. On the other hand, a low charge rate is applied in the area where the price elasticity is relatively high as indicated in Figure 4. For example, the former case is the transformation of forest land into paddy land, while the latter case is the irrigated area transformed by partially irrigated land. This charge discrimination with the project increases the efficiency of resource allocation by maximizing total surplus, compared with the average cost pricing.

As indicated before, the FLIAs are in charge of two functions. One is operation and management of the existing irrigation facilities. The other is the construction of irrigation facilities. In fact, management of the existing facilities results in the same amount of benefits that accrue to all farmers in the FLIA region. However, the construction of irrigation facilities gives farmers different amounts of benefits within the project unit area. This implies that the former is the without project case, while the latter is the case of with project as far as the costs incurred are concerned.

In construction of irrigation facilities, 30% of total fixed costs was made available by long-term loan from the government under the condition of installment payback basis for thirty years. The remaining 70% of total fixed costs was funded by a direct fiovernment subsidy.

IV. Water Charge Assessment

1. FLIA's Charge Assessment System

Water charge assessment in a FLIA region is primarily based on the two principle, user charge principle and charge discrimination principle. The user charge principle focuses on the amount of benefits the farmers receive

from irrigational water management. It is sometimes called a benefit principle in a broad sense. Charges levied on are to meet the expenditure required in operation and maintenance and construction of irrigation facilities. The charge discrimination principle is to assess a different charge to the benefited areas where the amount of benefits received are different.

Procedures for water charge assessment are indicated in the FLIA's budget and assessment guidelines. First, the amount of water charge levied on last year is reviewed. Second, whether the farmers have the ability to pay is judged on the basis of current year yield survey. Third, judgement is made on the amount of budget required for the current year. Fourth, additional funds requirement is estimated with regard to depreciation, retirement and stabilization funds. In addition, the ways of preserving the facilities' own function and possible extension of facilities' life span are taken into account.

Water charge is exempted in the area where natural disasters such as serious drought, typoon, etc. have taken place. Three standards for exemption are currently utilized: (1) when the damaged area is less than 50%, no exemption is allowed; (2) when the disaster area is more than 50% but less than 100%, 50% of water charge is exempted; and (3) when damaged area is 100%, 100% charge is exempted, thus no charge.

In reality, operation and management costs are levied on with six different rates by initial site class, while project construction costs are mostly charged equally with few exceptions. Furthermore, all costs incurred in the FLIAs are charged and accounted independently by the irrigation project unit area.

In principle, water charge can be differentiated in the case of with project. If this is the case, it would be quite reasonable for planners to assess different water charge rates by the initial site conditions. Not only because the benefited area results in an increased yield, but also because the change in site class would increase land prices. Stated differently, charges in site class with the project would reflect the changes in cropping patterns and, in turn, result in a yield increase as well as land price increase.[4] The initial site conditions that are commonly classified are the six classes in Korea, first through sixth class: forest land, miscellaneous land, orchard land, upland, partially irrigated land and fully irrigated paddy land.

2. Remedies for Water Charge Assessment

Operation and maintenance costs are largely accounted for general management costs of the FLIAs. In actual assessment, the general manage ment costs are charged differently by original land site class. An example

[4] Charge discrimination by the quantity of water supplied is almost impossible in application for the time being because of no water charge attached in each plot.

TABLE 3 CHARGE DISCRIMINATION OF THE GENGERAL MANAGEMENT COSTS BY SITE CLASS IN KYUNGBUK FLIAs IN 1981

Site class	Charged areas (ha)	Amount of charge (kg)	Area ratio (%)	Total charge (%)
1	19,256	32.8	37.6	50.1
2	10,491	26.5	20.5	22.0
3	9,916	23.0	19.3	18.1
4	3,773	16.9	7.4	5.1
5	3,192	11.1	6.2	2.8
6	4,639	5.3	9.0	1.9
Total	51,267	—	100.0	100.0

* Based on the weighted average of total 354 project unit areas of the 17 FLIAs of the Kyungbuk province surveyed on may 1982. It excludes the long-term loan cost which was made available for project construction.

Source: Kim, Bong-Koo et. al. 1982, p. 42.

of the charge discirmination of the general management costs is clearly indic0ted in Table 3. Here, charge levels per tanbo (0.1 hectare) are quite varying depending upon the initial site class. For instance, 32.8kg in kind were charged for site class 1, forest land, while only 5.3kg were levied on site class 6, irrigated paddy land. Charge discrimination of O and M costs is clearly a misapplication of the benefit principle, raising the problem of unfair cost burden among the benefited farmers. In fact, operation and maintenance of the existing irrigation facilities accrue the same amount of benefits to all farmers within the FLIA region. Charge discrimination assumes basically the effect of changes in both land site class and cropping pattern which is resulted from with the project. However, O and M costs have nothing to do with the project construction. Instead, they focus on the preservation of existing facilities and water distribution.

Furthermore, the charge discrimination of O and M costs perpetuates unequal distribution of water management costs among farmers. Accordingly, the permanent discrimination excludes the possibility of becoming paddy field after a certain period, say, 5–8 years. In essence, O and M costs are general administration cost for water management. Thus, equal assessement by land acreage is highly desirable.

On the other hand, the current assessment system is an equal charge of project construction costs to the benefited farmers, regardless of the amount of benefits received. The equal assessment by acreage is neither correct nor consistent with the equity criterion. Project construction is characterized fly the nature of the project. Equal distribution of the construction costs ignores the differences in the amount of benefits that farmers receive by the charges in land site class. Therefore, equal charge among farmers by land acreage is too far away from the equity criterion.

Consequently, remedies for water charge assessment are required

TABLE 4 A SUMMARY OF ASSESSEMNT IMPROVEMENT FOR IRRIGATIONAL WATER CHARGE IN KOREA

Water Charge	Present System	Improved System
(1) General charge	a. Charge discrimination by initial site class	a. Equal charge by acreage
	b. Assessed by project unit area	b. Assessed by FLIA region, except for pumping station area
(2) Special charge	a. Equal charge or partially different charge by site class	a. Charge discrimination by initial site class
	b. Assessed by project unit area	b. Assessed by project unit area
Type of charge	Single water charge	a. General water charge b. Special water charge

in order to (1) equalize the incidence of irrigation management and to (2) optimize user charge so that the interests of the benefited farmers and the FLIAs can be maximized. Introduction of dual charge system is desirable as indicated in Table 4. They are general charge for O and M costs distribution and special charge for longterm loan repayment.

Specifically, general charge covers (1) general administration cost, (2) operation and maintenance costs of irrigation facilities and (3) depreciation costs and retirement funds. General charge is equally assessed to the whole irrigated areas except for pumping station areas. Equal assessment is justified, not only because of equal benefits accrue thereof, but also because of the same quantity of water supplied. If further eliminates unequal distribution of water management costs. On the other hand, special charge is consisted of (1) long-term loan repayment and paddy field leveling cost and (2) repairment costs for various irrigation facilities. In assessment, the long-term loan repayment should be charged differently by land site class. Special charge should be independently assessed by the project unit area, not by the FLIA region. Assessment discrimination by the land site class is consistent with the project construction because the benefits vary depending upon initial site conditions. It should be applied for a limited time period, say, a 30 year installment payback period.

V. Summary

To improve administrative efficiency in the FLIAs, national level organizations were reviewed. However, neither integration of existing central level organizational bodies nor the establishment of a new federation is desirable. Further, it is not possible for local government to take over the FLIAs because of nationalization of private property. Thus, it would

be rather desirable to enforce the FFLIA in a way that the relation with the FLIAs can be improved.

The decentralized, semi-autonomous form of organization needs to be vitalized by broadening the opportunities for farmers' active participation. This has been proved from the fact that the lack of farmers' self-reliance and belongingness to the FLIAs becomes a main source of inefficiency in the management of irrigation facilities. Farmers' participation can be improved by a partial removal of the temporary measures taken in the early 1960s with the minimization of undesirable impacts, government supervision and control. In doing so, it would be desirable for farmers' delegates to preserve the right of recommending the president's dismissal and request for inspection of FLIA's administration, if necessary.

The size of irrigated area is the only factor determining the decentralized organizational structure and the number of personnel. It alone can not correctly reflect the total volume of work that the FLIA performs. In addition, the factors that must be taken into account are the number of farmers, type and number of facilities, capacity of each facility, length of channel, dispersion of facilities, to name a few. For a given FLIA, either per capita work volume measured in physical unit or the staff members must be known to determine the optimum size of organization as well as the optimum number of personnel.

In assessment of water charges, management costs are distributed differently among farmers by the six initial site classes. It is clearly a misapplication of the benefit principle and, thus, results in an unfair cost burden among farmers. On the other hand, project construction costs are equally charged by acreage. It is neither correct nor consistent with the equity criterion. Project construction is characterized by the nature of with project. Accordingly, equal distribution of the costs ignores the differences in the amount of benefits that farmers receive by the change in site class. In principle, charge rates can be differentiated in case of with project. In application, it is recommended that general charge for O and M costs be assessed equally by acreage and special charge for long-term repayment be differentiated by the initial site class, taking into account changes in cropping patterns.

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