

# Indonesia

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## PRESENT SITUATION

### Introduction

SINCE THE EMERGENCE of the New Order as the ruling government in Indonesia irrigation development has been one of the major development priorities of the country. For more than 20 years, during the first Long-Term Development Plan (LTDP-1), from 1968/69 to 1992/93, massive funds have been invested to rehabilitate and to construct new irrigation schemes. The success of the New Order Government in developing irrigation is well recognized as one of the main contributors in attaining prestigious agricultural development, as it is marked by self-sufficiency in food (rice), in 1984, which had never been achieved before.

Despite the gained benefits, the rapid physical development policy of irrigation schemes created many problems dealing with sharing responsibility with farmers in operation and maintenance (O&M). As a result, many irrigation structures lasted only a short time, the financial burden on the government for O&M becomes heavier, and water utilization is inefficient. These problems have to be overcome in the earliest stage of the second Long-Term Development Plan (LTDP-2), starting in 1993/94.

The country report contains an overview of irrigation development during LTDP-1, and the perspective of development for the coming LTDP-2 by considering all experiences gained during the past and the estimation of future conditions according to the given scenario.

### Present Status of Irrigation Systems in Indonesia

#### *Technical Status*

The policy of irrigation development during LTDP-1 was tightly attached to the commitment of the government to achieve self-sufficiency in food (rice). Within the framework of the policy, the objectives of irrigation development were (a) to fulfill irrigation water demand for intensive lowland rice cultivation, and (b) to expand irrigated areas of lowland rice rapidly. In line with the objectives, the irrigation development program during LTDP-1 focused on physical works to improve service capability of the existing irrigation structures and to build new irrigation structures.

The existing irrigation in Indonesia covers a command area of roughly 4.5 million hectares (ha), comprising 3.8 million ha government-managed irrigation systems and the balance

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farmer-managed irrigation systems. In the areas where gravity irrigation was not technically feasible, pump irrigation systems have been developed for the sake of poverty alleviation. By 1990, 592 pump irrigation units comprising medium and deep wells have been developed with command areas of 30,140 ha (DGWRD 1990). The existing schemes mostly reflect the results of irrigation development during LTDP-1.

To date, the technical statuses of irrigation schemes are attributed to the following factors:

- the irrigated areas are concentrated in Java (2,535,000 ha or 57.8% of the total irrigated areas) comprising 31.5 percent technical irrigation, 10.5 percent semitechnical irrigation, and 15.7 percent simple irrigation (farmer-managed irrigation) (Haerah 1991);
- water demand of 10 river basins in Java and 3 river basins in Madura, Bali and Lombok have already exceeded the potential supply (DPP-DGWRD 1991);
- ineffective utilization of irrigated rice fields as indicated by low cropping intensity ranging from 64 percent (in Kalimantan) to 224 percent (in East Java) (Pusposutardjo and Sunarno 1990);
- the establishment process of newly developed irrigation schemes is very slow because farmers are not capable of developing rice fields by their own efforts due to constraints in finances and land properties rights; and
- the total number of irrigated rice fields in Java is steadily decreasing due to their conversion into industrial and living areas.

All of these technical attributes have to be considered as anticipated problems in LTDP-2.

### *Irrigation Management Status*

Extensive irrigation development programs have been undertaken in Indonesia for more than 25 years. However, sharing responsibility for operation and maintenance (O&M) between farmers as beneficiaries and the government has not been established yet. Among the many factors influencing this situation are:

- the policy of irrigation development during LTDP-1 limited farmers' opportunities to participate in the implementation;
- at the early phase of irrigation development from 1967/1968 to 1982 there were no rules and regulations compelling farmers to share responsibility for O&M of irrigation schemes; and
- the time-framed program on physical works led the government to take over the construction works of the whole system, from main system to tertiary development.

Without any contribution from the farmers, the government was overburdened in carrying out O&M. For example, at present, the state is only capable of providing 50 percent of the real required funds for O&M (Soenarno ?). The results of this are:

- broken irrigation facilities due to improper O&M;
- poor service performance of the system; and

- unsatisfactory management of the system for farmers who try to shirk responsibilities in O&M.

The government, being aware of the existing unfavorable situation, starting in the fourth Five-Year Development Plan (FYDP-4) 1988/89, changed the policy of irrigation development from focusing on the physical works into improving O&M, including irrigation management as a whole. The steps of improvement cover: (a) strengthening and improving the organization of the Directorate General of Water Resources Development (DGWRD) with regard to O&M, (b) clarifying the right, authority, and responsibility of the agencies involved in the implementation of O&M, (c) enforcing rules and regulations on sharing responsibility for O&M between the government and the farmers including the funding of O&M by charging irrigation service fees, and (d) strengthening the function of irrigation committees in monitoring and evaluation of irrigation management performance. Recently, the government turned over the management responsibility for small-scale irrigation scheme (less than 500 ha) to the farmers (water users' association [WUA]).

By focusing the program activities on O&M, it is expected that the required funds for rehabilitation can be minimized, while the service capabilities of irrigation systems are being kept sustainable.

### *Agro-Economic Status*

The effect of irrigation development on the performance of agriculture was remarkable. Reliable and sufficient water supply provided from improved irrigation schemes stimulated farmers to adopt new agricultural technologies. This resulted in an increase in the total harvested areas of rice (especially the area of the intensification program) and secondary crops as well as in steadily increasing yields per unit area.

From an agro-economic standpoint, the status of irrigation can be described as follows:

- investment costs per unit area of irrigated land (for construction of new schemes or for rehabilitating old schemes) are steadily increasing disproportionately to the revenue of food crop farming (Pasandaran 1991);
- degradation of the catchment area of the water source causes high fluctuation of flow discharge which often creates either water-shortage or water-excess problems on crops;
- the financial and social status of rice as the staple food in subsistence farming dictates farmers to grow rice with a high water consumption; and
- although the revenue from secondary crops in irrigated fields increased during the last 7 years, insufficient drainage facilities of irrigated rice-fields hinder farmers from adopting profitable farming practices.

Considering (a) the agro-economic status of the irrigated land, (b) resource availability for developing irrigation schemes, and (c) scarcity of water due to an increased number of different users and their respective requirements, a reconciliation of agricultural development with irrigation development is necessary. This reconciliation process began in the fourth Five-Year Development Program (FYDP-4) by a policy statement of the Ministry of Agriculture on four basic strategies of agricultural development.

These basic strategies are:

- sustaining and improving food self-sufficiency;

- increasing agricultural production in order to provide raw materials for industry and export;
- increasing farm productivity and the value of agricultural products; and
- increasing farmers' income as well as their welfare (Wardojo 1989).

The implementation of these four basic strategies is expected to decrease the pressure on O&M of irrigation systems during the dry season when water shortage is common.

### *Sociocultural Aspects*

Despite all the success in irrigation development, the Government of Indonesia is currently facing a second-generation problem in irrigation development. This problem can be best stated in the interrogative: how can the government motivate the farmers who benefited from irrigation development to participate in sustaining the irrigation infrastructures built by the government?

There are several reasons for the emergence of the problem. First, the villages with irrigation have been experiencing quite a drastic change, culturally. In command areas of farmer-managed irrigation systems (FMIS) of Java for example, the traditional institutions and traditional laws used to manage the irrigation schemes were abolished by the colonial authority to meet the needs of the sugar industry, an industry which then became the backbone of the Dutch economic development.

The decision to abolish the old institutions and traditional laws on FMIS also brought to an end the management capacity of the Javanese peasants, including their capacity to manage the village irrigation systems autonomously. The Dutch colonial authority functioned as landlord making all the necessary decisions related to agricultural activities to allow the sugar industry access to the village agricultural resources—land, water and labor. The *subak* system in Bali remained intact because the physical natural resources of the island were not suitable for sugar cultivation. However, the *subak* system in this island experienced changes as a result of state interventions to increase the efficiency of the island's irrigation systems. Furthermore, the development process itself, in the last two decades, further weakened the peasants' agricultural management capacity. New regulations concerning the structure of village leadership introduced by the New Order Government practically made the village head the single development agent in the village. The village head is also the single decision maker in the village. As a result of all these changes, a strong dependent mentality towards government initiative emerged within the community. For example, peasants do not want to repair broken irrigation canals unless ordered to do so by the officials as they believe that irrigation maintenance is and has been the responsibility of the state.

Irrigated areas all over Southeast Asia including Indonesia are always characterized by skewed land distribution which is manifested in the high incidence of sharecropping. As sharecroppers realize that they cannot fully benefit from the increase in agricultural yields they are also reluctant to invest their time and labor to maintain the irrigation facilities within the village. The condition is further worsened as absentee landlordism is currently emerging in irrigated areas, the landlords detaching themselves from village customs and regulations.

Skewed landownership generated inequality of income between landowning and landless peasants which resulted in nobody being responsible for maintaining irrigation facilities in the village. The landowning peasants, particularly those who sharecrop their land, consider that it is the responsibility of their tenants to maintain irrigation facilities. On the other hand, the tenants think that it is the mutual responsibility of both the tenants/sharecroppers and the landowners to maintain irrigation facilities in the village.

Peasant communities in irrigated areas in Indonesia are usually the most monetized communities. Monetization created pressure upon peasants to earn more cash through working in nonfarm jobs in or outside the village. Consequently, peasants have less time to do communal work for the village. Traditional village irrigation (FMIS) maintenance was done through communal work. Peasants' reluctance to voluntarily do communal work negatively affects the village activities in maintaining irrigation facilities at the village level.

The Government of Indonesia established water users' associations for landowning peasants to take part in the O&M of tertiary systems of government-managed irrigation and the village irrigation (FMIS) facilities. Despite the good intention of the government, the organization has so far not achieved the objective set up.

### *Environmental Aspects of Irrigated Areas*

In the last two decades of development in Indonesia, the environment of irrigated areas experienced major changes which might, in the future, affect irrigation development.

The first change in the environment concerns the steady decline of land used for farming. Most of the loss has taken place in Java where expansion in housing and factories in the vicinity of large cities has been more rapid than in the other islands. The Department of Agriculture has estimated that some 55,000 ha of agricultural land (mostly irrigated rice fields) are lost to other forms of land use every year while the Department of Public Works has estimated that 0.3 million ha out of 1.2 million ha of rice fields for which irrigation was provided between 1969 and 1985 are no longer being used for farming (Hardjono 1991). For example, the highly productive coastal plain of Northern Java, from the industrial complex of Cilegon in West Java to the manufacturing zone around Surabaya in East Java, is being rapidly transformed by the process of urban and industrial development. The construction of a toll road from Jakarta to Cikampek in West Java has resulted in the loss of thousands of hectares of rice fields in which considerable investment was made during the early 1970s, when an irrigation network was constructed to carry water from the Jatiluhur Dam.

Although the changes in the function of agricultural land appear at first glance not to have a direct impact on the environment, there are serious hydrological consequences (Hardjono 1991). One serious hydrological consequence is the increased frequency of wet-season floods, particularly in urban areas such as Jakarta and Semarang in Central Java. In the dry season, intrusion of salt water increases along the coastal plain areas.

Another factor contributing to the deterioration of the environment in irrigated areas in Indonesia is population growth. Direct consequences of population growth can be seen in the high rate of land degradation in Java and the outer island watersheds. This is caused mainly by deforestation. The annual deforestation rate in Indonesia is estimated between 600,000 and 1,200,000 ha (Potter 1991). Aside from population pressure, most of this deforestation is the result of other factors such as logging activities conducted by logging companies which receive concessions from the government. The result is extensive soil erosion which may affect the future sustainability of the irrigation systems in Indonesia. In South Sulawesi, erosion of the Bila and Walanae valleys reduced the capacity of Lake Tempe to provide irrigation water in the dry season. Sedimentation is making the lake increasingly shallow with the result that flood inundates the agricultural settlements near the river during the wet season. Increasing sedimentation also shortens the life expectancy of several dams in Java where huge amounts of money have been spent to build them.

Rapid industrialization that is taking place in Indonesia has changed the function of rivers in the country from being sources of municipal water and irrigation water into a waste dump of industrial residues. Some major rivers in Java are heavily polluted by industrial waste so that the water becomes unsafe for human use as well as for irrigation. Meanwhile, the large-scale tapping

of groundwater, pumped up by individual companies for industrial purposes causes a drop of the water table every year (Hardjono 1991). In Central Bandung, according to Joan Hardjono, where factories extracted water by tapping groundwater, the water table dropped 25 meters between 1981 and 1986, while in the heavily industrialized region of Eastern Tangerang, the water table dropped by 0.4 meters a month. Polluted rivers and the drop in the groundwater table will create serious problems in the water supply for municipal as well as for agriculture uses.

Confronted with these environmental problems, the Government of Indonesia did not remain idle. Various programs, including the enactment of a strict Environment Protection Law were launched. Environmental problems in Indonesia cannot, however, be solved only through the provision of environment protection legislation and commitment from the government due to the many factors which generated the problems. One important factor is unemployment. People invaded the forests because there were no other employment opportunities available for them. Industries are mostly capital-intensive ones, thus absorbing only a few people while there are concerted efforts from both the public and the private sectors to industrialize the rural areas. Modern industries produce products which were traditionally produced by small-scale rural industries. Lack of alternative jobs outside the agriculture sector forced the unemployed and underemployed peasants to move to forest areas to open new land for agricultural activities or to the cities to find jobs.

### **Perspective of Irrigated Land Beyond 2000**

In April 1993, the people and the Government of Indonesia will start phase two of the Long-Term Development Plan (LTDP-2) which is for the next 25 years. As a continuation of LTDP-1, LTDP-2 is still focusing on economic development with the priority to attain a balanced economic structure of the capability and the power of a developed industry, supported by the capability and the power of agriculture. Irrigation development, during LTDP-1, was one of the principal policy options to promote agriculture. Therefore, the national commitment on LTDP-2 is to promote the establishment of a developed industry while maintaining the capability for providing sufficient food and other basic needs.

Referring to the national commitment on LTDP-2, the prospect of irrigated land beyond 2000 will be reflected by the resultant influences of (a) the recent status of irrigated land at the end of LTDP-1, before entering LTDP-2, (b) the effect and the impact of the transitional process from an agricultural to an industrial society, (c) resource limitation, and (d) the increasing pressure for satisfying better environment quality.

Many problems in the development of irrigation systems during LTDP-1 have not been completely solved and have to be carried over to the coming LTDP-2. With the passage of time, these unsolved problems changed their priorities and created other associated problems. Among them are:

- deficit water supply in several irrigation schemes due to limited information (both in terms of quality and quantity) concerning water resources potential and demand;
- unbalanced progress between physical development of irrigation facilities and farmers' capability to utilize the provided facilities in a maximum way, as well as their willingness to share the O&M duties; and
- disagreement among different sectors on resources allocation and utilization resulting from unclear defined land unit concepts either in terms of the characteristics or the administrative boundaries or any form on conformity between the two concepts, at national as well as at regional level.

The policy of industrialization as the basis of future economic development will transform the agricultural society to an industrial one. Dissanayake (1990) noticed that this society transformation changes various aspects of community life. For example, the transformation process changes: (1) product orientation from food into goods, (2) production factor from land into capital, (3) actors from farmers/artisan into factory workers, (4) guiding factor of the economic activity from traditional into economic growth, and (5) the preferred rule in the community life from hierarchical/authoritarian into representative democracy. Attached to these society changes, the present status of irrigated lands and the corresponding irrigation system will also change.

Considering resources limitation, the need of having better quality environment, the attached problems of the existing irrigation system, and the effect and the impact of transformation from an agricultural society to an industrial one, the prospect of irrigated land in Indonesia beyond 2000 will depend on the following: (1) the policy option on agriculture sector development, (2) the status of Java island as the rice production center, (3) the private participation in the management and development of irrigation systems, (4) the adoption of the river basin concept as a land unit in regional development planning, and (5) the policy option in maintaining the functional status of the existing irrigation facilities.

### ***The Policy on Agriculture-Sector Development***

The Directorate General of Food Crop Agriculture (DGFCFA), Department of Agriculture, estimated that by 2018 food (rice) self-sufficiency would require an area of 6,073-7,852 thousand ha. To attain this required area 1,684-3,464 thousand ha of new irrigated land (rice fields) have to be developed. Besides expanding the irrigated land, the cropping intensity index of the existing irrigated land has to be increased by 23 percent, from 152 percent to 175 percent (Haerah 1991) with additional water requirements between 28,308 and 58,195 million cubic meters per year.

Although the estimation of the required irrigated land by 2018 by the DGFCFA is quite realistic, the objective of the policy seems very difficult to accomplish due to land and water constraints. Most of the remaining land (60.3%) is considered as less suitable for irrigated rice fields (marginal lands) or is located in the drier areas of Eastern Indonesia.

### ***The Status of Java Island as the Rice Production Center***

At the end of LTDP-1 Java as the rice production center provided shares 68.4 percent of the national rice production. The status of Java island as the rice production center will change as this island will become more industrialized during LTDP-2. As the agriculture and the industry sectors require the same resources of land and water, conflict on natural resources utilization may not be avoided. The conflict is underway as indicated by the high conversion rate of rice fields into settlement areas, urban expansion, industrial areas, and other nonagricultural uses (Jezeff 1992). Besides reduced rice field areas, rapid development of urban areas attached to industrial development will change the existing farming system from rice-based cropping into semiurban farming (Higgins et al. 1988).

In term of water balance, the DGWRD predicted that the ratio of demand to supply in Java and Madura by the year 2000 will reach 121 percent. Within this value of demand to supply ratio, it is impossible to keep the irrigated rice fields sustained.

### ***Private Participation in the Management and Development of Irrigation Systems***

Since 1987/1988 (the fifth Five-Year Development Plan - *Pelita V*), the policy in water resources development is to develop water resources in a planned and coordinated manner, taking into account the projected requirements and interdependencies of all the sectors of economic and social development which depend on the enhanced availability of water of suitable quality to meet their respective goals. Within this broad framework of policy, the government:

- facilitates private sector and community participation in water resources development and, to this end, strengthens the government's capacity to identify opportunities to regulate and to support private and community initiatives;
- institutes and gradually enforces the transfer of responsibility for O&M of infrastructure to the beneficiaries, based on contributions from them; and
- balances the distribution of resources for the development of physical infrastructure, its operation and maintenance (O&M) and improved administration of services to the public.

To facilitate the implementation of this policy the government decreed several regulations, dealing with water resources development, with irrigation, water pollution control, swamps, and with rivers. All of these regulations mention clearly the right and the responsibility of farmers, water users' associations (WUAs), or private enterprises in sharing the management and the development of water resources as a whole, including irrigation systems.

One of the policy implementations is turning over the O&M responsibility from the government to beneficiaries (farmers' groups - WUAs) in accordance with regulation No. 23/1982. Considering the present capability of WUAs in O&M, the transfer of management responsibility is only for irrigation schemes equal to or less than 500 ha. The policy for transferring O&M responsibility will be expanded to larger areas. Another example of privatization of water resources development is the establishment of two semigovernment enterprises with the assigned authority to manage river basins.

### ***The Adoption of the River Basin Concept as a Land Unit in Regional Development Planning***

The concept of the river basin as a land unit will be adopted in future regional development planning. Reasons for adopting this concept are:

- to encourage and to secure multipurpose and integrated water resources development based on formalized planning and with due regard to water balances and water quality requirements in the country's river basins, and in close coordination with land use plans and policies; and
- to maintain a clear separation of approaches between water resources development and user-sector development, and to ensure that user-sector development is consistent with water resources development.

Of the total 90 river basins, 6 river basins in Sumatra, 12 river basins in Java, one river basin each in Madura, Bali, Lombok and Sumbawa, as well as 3 river basins in Sulawesi have already negative water balances. These river basins with negative water balances are located in existing irrigation areas. By studying the water balance in each river basin, possible areas for rice field expansion can be identified.



## Concluding Remarks

The future prospects of irrigated lands (rice fields) in Indonesia will be determined by the policy on food self-sufficiency. For reasons of national security and national economic stability the attained condition of self-sufficiency on food, with a certain value of either a negative or a positive balance between supply and demand, will be maintained for at least until the first decade of the next century. To achieve self-sufficiency on food, 2-3 million ha of new rice fields have to be developed. Besides expanding the existing irrigated rice fields, massive investment is also needed to increase the cropping intensity from 152 to 175 percent. This massive investment is required to:

- improve the physical infrastructures of existing irrigation schemes to be more compatible for crop diversification farming;
- improve O&M of the irrigation systems by strengthening the institution of WUAs and to enforce the sharing of responsibility on O&M according to their right in utilizing water; and
- increase the assurance in providing water by developing conjunctive irrigation pumping systems in gravity irrigation schemes.

The higher the increase in cropping intensity the fewer the required new irrigated rice fields.

Due to rapid industrial development in Java, its status as the center of national rice production cannot be maintained any longer. The remaining irrigation systems in Java have to be modified in such a way that they can facilitate the requirement of semiurban farming mixed together with rice-based farming. Strong pressure of efficient water utilization dictates the composition of those two farming systems.

In the coming LTDP-2, the rights and responsibilities of farmers, WUAs, and other private organizations on the management and development of irrigation systems as well as on the development of water resources have been legally defined. This means that more opportunities will be offered to the private sector and the community to participate in the management and development of irrigation systems with shared benefits corresponding to their contributions.

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## VISION STATEMENT

1. The role of agriculture in the Indonesian national economy will relatively decline in the next century. However, agriculture will still be essential, and its scale will be similar to the present, or even should be increased, to ensure sufficient amounts of food in both quantity and quality terms for the majority of the people, supplying raw materials for the growing industries, and providing sufficient income and employment opportunities particularly for rural people. Therefore, its capability or power to exchange with the nonagriculture sector should be increased through increasing the efficiency in overall agricultural systems through seeking better institutional settings, improved technology, and improved or increased capacity of farmers' organizations to bargain with both private and public sectors.
2. Guided by the need to provide sufficient food for the people, Indonesia, as a large populated country, should minimize the risks and uncertainties in its food supplies at affordable costs, particularly costs associated with national stability. Therefore, various adjustments in the agricultural and food policies should be made to face the foreseeable problems of the near future. This notion implies that there will be an additional 90 million people by 2018, the increase of income per capita will be about the same as Thailand's current income level, and there will be a growing concentration on the urban population. Both food availability and food accessibility should still be considered as a high priority in the national policy agenda. This is due to the fact that even with the same level of income as Thailand, the share of rice expenditure in the household food budget will still be high.

Accordingly, rice self-sufficiency will still be a major food policy issue. But at the same time, due to increased per capita income of the people that will open new demand opportunities, the food policy should be broadened, i.e., diversification in consumption should also be promoted. It means that the spectrum of food production should be broadened without sacrificing the capacity to produce rice. In other words, agricultural diversification should be a major policy but should not be interpreted as competing with the policy of rice production.

3. The largest proportion of almost all food production in Indonesia is in Java which is a highly urbanized region covering only about 7 percent of the total area of Indonesia. Most irrigation and its complementary infrastructure in Java are almost developed. Due to land limitation in Java, the expansion of irrigation in this island will not be feasible. Therefore, to meet future demand for food and other agricultural products, the outer islands should be developed based upon their own resource capacities to produce various food and agricultural products.

Since the majority of land resources in the outer islands are dry land, peat and swamp technologies including irrigation that are appropriate for those resources require serious attention for appropriate future agricultural development. This land resources development should be able to compensate for the decline of irrigated land in Java due to land conversion to meet demand for other uses like housing, industry and other purposes. This implies that mechanization will become an important policy issue for increasing both the area of agricultural land and the capacity of farmers to intensify their utilization of land. In addition, to be able to cope with future food problems, short-duration varieties, postharvest technologies, and pest and diseases management should also be further developed hand in hand with irrigation.

4. The perception of irrigation development and management should be changed, i.e., irrigation development and management should not be separated from overall land and water resources development. Therefore, the allocation, distribution and utilization of water resources should be to manage water resources efficiently, justly and fairly. A watershed or a river basin is proposed as an appropriate unit of management to be responsible for allocation, distribution, utilization and conservation of water resources sectorally, spatially and temporally. This perceived change calls for changes in legal, institutional and operational issues for managing water resources. Even though some legal aspects of water resources development have been developed in Indonesia, extensive and intensive research on these areas are called for, in order to determinate what the legal and operational base of decision-making should be.
5. All changes in legal and institutional aspects of water resources in Indonesia should refer to UUD 45, the constitution of Indonesia. Since the state owns water resources according to the constitution, any changes in this aspect such as decentralization, privatization, and so on are both bound and promoted according to this constitution. Up to now, private institutions such as water users' associations are responsible only for operation and maintenance of tertiary irrigation of less than or equal to 500 ha. Planning, building main infrastructure, and legal and institutional development are mainly the responsibility of government agencies, especially in the Ministry of Public Works through coordination with the National Planning Agency. In the foreseeable future, to some degree, more decentralization in decision-making processes, implementation, and control and monitoring seems necessary. The decentralized organization that should be developed must fulfill the requirements that are mentioned in the earlier paragraph.
6. Future economic development should not only expand and deepen the agriculture sector, but should also create new opportunities for rural people. In this respect, irrigation will be an obvious means to expand production of agricultural commodities. Parallel to this, other dimensions of water resources development should be able to support the growth of agricultural industries that are located in the villages. Therefore, off-farm production employment opportunities should increase. Accordingly, local market demand for both agricultural and nonagricultural products should expand. Of course, investment, regulation/deregulation, price and other complementary policies should be directed to the above goals.
7. Farmers in developing countries such as Indonesia are mostly small farmers. Their capacity to adopt technologies to adjust to changes in the economic environment and to pursue long-term strategies are limited. On the other hand, they face an economic environment that becomes more and more competitive due to higher involvement in international agricultural markets. This implies that the government as the representative of the people should be able to help farmers to increase their welfare without disturbing the health of the economy. Therefore, some government assistance is necessary to be implemented through various policies such as price, investment, research and extension, credits, market development, information accessibility and welfare policies. More attention should also be given to landless farmers and the rural poor. Water resources development such as irrigation development, pricing policies, and others should also be able to improve their welfare.
8. Irrigation development and other water resources development activities usually occupy a large land area. This will change land use patterns, having far-reaching environmental implications which implies that irrigation development should be

carefully planned in accordance with the specific characteristics of each island. At the same time, the growing population, urban sprawl, and so on, will demand more land and will have significant impact on the existing irrigation. Increased irrigated land conversion as is currently occurring in Java is a case where surrounding environments decrease the irrigated land. In addition, within the irrigated land itself, the environmental problems may appear in the future in the forms of salt water intrusion, eutrophication, waterlogging, and groundwater pollution, particularly when groundwater pump irrigation expands.

9. Vision. Irrigated agriculture in Indonesia will continue to play an important role in:
- i. guaranteeing food security;
  - ii. supplying raw materials for the growing industrial sectors;
  - iii. providing sufficient income and employment opportunities; and
  - iv. establishing farming systems which are environmentally sound.

*Note:* IRRIGATION IS ONLY THE MEANS, NOT THE END.

## MEANS TO ACHIEVE THE VISION

### Policy

*An income-oriented policy balancing production needs with expanding incomes for the farmers to*

- improve pricing policies towards more efficient resource allocation;
- improve technology to increase farm productivity;
- select subsidies to stimulate productivity and to increase/maintain income;
- improve terms of trade between agricultural and nonagricultural commodities; and
- achieve economies of scale of farm production.

*Reduce regional disparities, particularly between the eastern and western parts of Indonesia through*

- infrastructure development;
- decentralization
  - devolution
  - deconcentration
  - delegation; and
- transmigration.

*Reinforcing legal and regulatory functions with the objectives:*

- conflict management;
- deregulation/debureaucratization;

- promoting growth and equality; and
- irrigation management and integrated water resources management.

*Government investment and management in irrigation*

- improve performance for maintaining the service capacity of the existing irrigation facilities (O&M);
- diversification of water use through the improvement of irrigation systems; and
- broaden the scope of management from water use management to water resources development management, including management of the upper watershed.

*Institutions and organizational development*

- turnover of irrigation schemes less than 500 ha;
- provision of mechanisms and conditions for more active participation of water users' associations;
- improvement of market structure and strengthening of rural cooperatives; and
- increasing accountability, coordination and collaboration of all institutions in charge of water resources management.

## **Laws and Institutions**

*Water rights and transfers*

- establish and reinforce operational rules to implement the existing laws and regulations governing water use.

*Irrigation systems ownership*

- no change.

*Water resources planning and monitoring*

- strengthening the existing mechanisms for planning and monitoring of irrigation systems.

*Irrigation systems management*

- increase participatory management by WUAs.

## **Information/Cooperation Needed (\* = Collaboration with International Organizations)**

*Demand and supply projections of rice and other related commodities*

- level and growth of per capita consumption of rice and other related commodities; and
- level and growth of production of rice and other related commodities.

*Rate of depletion of irrigated land in Java*

*Actual and potential increase in production through improvement in irrigation*

- \* Trend in commodity prices in international markets*
- \* Trend in demand for rice and other related commodities in the international market*
- \* Trend in technological development*
- \* Trend of socioeconomic changes at the village level*

*River basin water balance in Indonesia*

- \* Trend and impact of global climate changes.*