

EXECUTIVE SUMMARY  
of the  
Composite Report of the Watershed Assessment Team

1. Introduction

1.1 General

The Team, composed of 8 Indonesian members and 8 expatriate members, worked together from 28 March to 7 May, 1983 to assess the present state of watershed management in Java through a study of completed and ongoing projects. These projects included: the National Regreening Program, the Brantas River Basin Project, the FAO Solo I and II Projects, the Yogyakarta Rural Development Project, and the Citarum I (Panawangan) and II Watershed Project. Field visits were paid to all the above areas to assess the content, structure, operation, constraints and impact of the different programmes and projects. As a result of this exposure the team made an objective assessment of the situation on Java and offers the following suggestions to Government to relieve what it considers to be the major weaknesses in the present ambitious effort to reduce soil and water degradation and increase the productivity of upland watersheds, particularly on Java.

1.2 Problem Definition

The basic problem is one of too many people being concentrated on too small a land base, with the situation in Yogyakarta and Central Java being relatively worse than that in East and West Java. As population pressures increase, cultivation has been pushed further up the hillsides thus bringing steep slopes and vulnerable land under sedentary cultivation with consequent massive increases in erosion. Erosion rates in the Solo basin from sedentary rainfed cultivation with no

conservation measures range from 3 to 5 mm/year on land up to 5% slope to 23 to 38 mm/year on steep land of over 50% slope. These rates of soil degradation in Solo are typical of the prevailing conditions found in all of Java's major watersheds. Viewed against the natural rate of soil formation of about 1 mm/year, these rates are alarming.

Land at present under upland rainfed cultivation in Java can be divided into 4 categories:

- i) Moderate slopes (up to 50% slope) with good soil depth: This class of land is estimated to cover some 1.8 million hectares. The main components of a technology package for this land class, which will result in increasing productivity and improving ecological stability, already exists and is being extended on a limited basis. Work remains to be done in fine-tuning the package to make it more site-responsive.
- ii) Steep slopes (over 50% slope) with moderate to deep soils: This class of land is estimated to cover some 425,500 hectares. At present the technology base is inadequately developed. Some promising technology does exist but requires extensive field testing under Javanese conditions before being widely recommended.
- iii) Steep slopes with poor soil: This class of land is estimated to cover some 863,500 hectares on Java and should be under a permanent vegetation cover. This does not necessarily mean forest trees; fruit, spice or fodder trees would be equally suitable and could be combined with grass in a silvi-pasture system. Much more work is required in this area to develop suitable technology packages for widespread use.

iv) Critical land which is so degraded as to be unable to sustain even subsistence farming: This class of land was estimated in 1980 to cover approximately 1.0 million hectares. It is estimated that critical land is increasing by 200,000 hectares per year while the Regreening Program reclaims some 125,000 hectares per year. Even after rehabilitation, steep land should not be returned to annual cultivation.

A considerable amount of technology for dealing with the first two land classes is in place but additional applied field research is needed to adapt it to local conditions, both physical and socio-economic in Java. While additional applied research is necessary and desirable for these land classes, the central problem confronting the government is the need to develop effective institutional structures to facilitate the dissemination of available technology.

Steep slopes with poor soil should be under some form of permanent vegetation cover, but this does not necessarily imply a forest tree cover. Silvi-pasture with fruit trees, or a plantation crop (e.g., coffee) initially or permanently under shade trees, are possibilities which should be investigated. A vast area of applied research is open here.

With respect to the fourth class, even though such land can be rehabilitated, it is clear that these steep and highly eroded lands should not be returned to sedentary cultivation after rehabilitation. This poses the problem of what to do with the people presently occupying these lands; it would seem they should be given the highest priority for transmigration.

The long-term solutions to the problem of increasing population pressure and concomitant over-use of land are seen as:

- family planning,
- transmigration,
- the creation of additional off-farm employment,
- increasing the productivity of the land within an ecologically stable system coupled with afforestation or reforestation of sites unsuitable for agriculture.

The government has accorded high priority to both family planning and transmigration and is making excellent progress. Within the framework of the up-coming Fourth Development Plan, much greater attention should be given to developing strategies and programs to promote off-farm employment and to increase the productivity and ecological stability of the nation's upland resources. The Watershed Assessment Team was tasked with assessing present conditions and offering constructive suggestions for improvement in this latter area of priority concern.

### 1.3 Main Issues

The main issues which the team addressed fell into: technical considerations, human resources development, and institutional aspects, each of which is summarized below.

## 2. Technical and Economic Considerations

### 2.1 Farming Systems Approach

The main theme central to the development of upland agriculture in any watershed is the need to adopt a farming system approach. In its application to Java, the farming system approach consists of a package of technology which generally contains five components. These are: soil and water conservation, cropping systems, livestock, forestry and tree

crops, and economic evaluation. Inland fisheries is another important component of the farming system in some areas of Java and should be included wherever the environmental and water resource conditions permit. In turn, each of these components consists of a number of elements. In any given area the appropriate farming system will depend on the local site conditions and the aspirations of individual farmers. While much work remains to be done in fine-tuning the components and elements to make them more site-specific, it is considered that, in general, sufficient knowledge exists on the major components to enable them to be assembled into effective farming systems applicable to conditions on Java and recommended for adoption by farmers.

## 2.2 Soil and Water Conservation Component

In the soil and water conservation component, the lack of an adequate system of land suitability classification in which the optimum use of land can be based is seen as limiting. The Team also focussed on the different conservation practices which are available to make the point that the present exclusive focus on bench terracing, especially in the Regreening Programme, should be complemented with the introduction of other simpler and hence cheaper measures on some sites. In considering subsidies as an incentive to implementation, the view is endorsed that subsidies for the construction of conservation measures, such as terraces, are fully justified. Information and research results generated through universities and other institutions does not always reach the field, and in the opposite direction, feed-back from the field of problems requiring solution is also slow. Regular seminars are suggested as a way to improve communications. There is also a need for more conservation oriented research, including basic research to compile and analyze data on rainfall, run-off and soil loss, and applied and on-farm research on alternative conservation measures and their effects, and to validate such work under farm conditions.

On the question of the siting of check dams, it is recommended that professional assistance be obtained from engineers of the Public Works line Agencies.

### 2.3 Cropping Systems Component

In considering the cropping systems component, the Team noted that a considerable technological base has been developed by the Solo I and Panawangan projects and from other work in Java and that this technology can be directly transferred to new target areas thereby enabling these projects to concentrate on implementation and expansion. The Team stressed, however, that field based, site specific applied research support from universities and institutes is insufficient to deal with problems and constraints encountered in adapting the general technology package to specific site conditions. Rather than slow down implementation, it is recommended to accelerate on-site research to fill gaps in the technology. A series of "field-laboratories" where such work can be undertaken should be established on sites which are representative of the main agro-ecological zones in Java. Further it is imperative that a workable scheme for the production and distribution of seeds and planting materials be implemented as soon as possible.

### 2.4 Livestock Component

Under the livestock component, the Team stressed the important contribution animals can make to the overall viability of the farming system. In fact, for farmers with minimal land holdings, livestock offers not only supplemental employment opportunities but should be explored as a first source of income, particularly in areas of low soil fertility. The present focus is on sheep and goats; other livestock should be considered in relation to local conditions, as should combinations of different animals. Grass testing should continue, but on a wider base and more emphasis should be placed on trees and shrubs as sources of fodder. Finally, better marketing facilities for livestock should be encouraged; all too frequently local markets are dominated by one or two traders who dictate prices.

## 2.5 Forestry and Tree Crops Component

The Team's analysis of the forestry component indicates that tree planting programmes on steep slopes can be successfully developed but that the majority of upland farmers who have limited land grow only food crops, regardless of slope conditions. A range of options, suitable to local conditions, should be developed and offered to the farmers. Suggestions emphasize the introduction of fruit trees or spice trees instead of forest species or dual purpose species such as Leucaena for both fodder and wood production. These could be grown in association with grass under a silvi-pasture system. This latter implies the incorporation of a livestock component into the farming system. Another leguminous tree, Glyricidia, can be managed on a 3-year coppice rotation for firewood with an annual return (at 1983 prices) of Rp 200,000 per hectare. More applied research is needed to develop upland farming systems on steep land which incorporate tree crops which are both technically sound and socially acceptable.

## 2.6 Economic Evaluation Component

An examination of this component shows that the adoption of improved cropping systems on terraced land of less than 50% slope and under demonstration plot conditions significantly increases both employment and returns to labour. Net farm income increased per year from two to six times the pre-development level, depending on the site. By including an animal component in the system the net returns would be further increased. A cautionary note is introduced to underline that all components are interdependent and if one breaks down, the incentive to adopt associated complementary elements will be reduced. The main lesson here for site managers is that the system recommended to any farmer must be in accordance with the ability of that farmer to manage that system. Special training in this area is required by site planners and implementors.

Compared to the lowlands, upland agriculture has received minimal assistance by way of irrigation infrastructure, extension services, credit programmes, road building, and finally research to improve productivity. In consequence, upland farmers have lower yields and are poorer than their lowland counterparts. Beneficiaries of upland development will be not only the farmers directly affected, but include, as well, the downstream farmers who benefit from reduced flooding, improved water quality, and reduced siltation of reservoirs and canals. Just as lowland farmers are not expected to pay the cost of irrigation infrastructure works, equity considerations suggest that the subsidization of upland infrastructural development (terraces, etc.) is appropriate and should be considered as an income transfer from urban and rural lowland populations to rural upland populations, who will not in any case capture on-site all the diverse stream of benefits which are generated by the development works.

On the question of credit, poor farmers with limited resources will be unable to adopt the improved technology without the provision of non-collateral credit. The absence of an institutionalized credit program for upland households constitutes a major constraint to broad based diffusion of upland conservation and productivity increasing technology. As the recommended packages are economically attractive, production credit should be made available without subsidization. Repayment schedules should reflect the time period required to obtain the expected income from the investment.

Projects should be designed to facilitate the evaluation of their impact, which will help in modifying and improving delivery systems. Special efforts should be made to monitor early adopters of a technology package (a farming system) and to incorporate the lessons learned into the evolving programme so as to accelerate expansion.

#### 2.7 Main Recommendations to Relieve Constraints

Recommendations are back-referenced to the original section of the Summary in which they were made.

Farming Systems 2.1-1: Fine-tuning of the components and elements to make them more responsive to local site conditions is required. This can be accomplished through the establishment of "field laboratories" in representative agro-climatic zones.

Soil Conservation 2.2-1: No system of Land Suitability Classification has been evolved on which field-level decisions regarding optimum land-use can be based. A suitable classification system should be agreed to and made operational.

-2 In the Regreening Program excessive importance appears to have been given to bench terracing at the expense of other simpler treatments which are appropriate to certain classes of land and land-use.

-3 Subsidies for the construction of conservation measures are justified.

-4 The two-way exchange of information between universities and other Research Institutes and the field, and in the opposite direction of problems needing solution from the field, could be improved.

-5 There is a need for more research, both basic and applied; the latter at "field laboratories" and on-farm sites.

Cropping System 2.3-1: The lack of adequate research support to solve problems encountered during the implementation of projects and programmes is emphasized. Rather than slow down implementation, it is recommended that applied research activities in suitable field laboratories should be accelerated.

2.3-2 There is an urgent need to establish a workable system for the production of seeds and planting materials.

Livestock 2.4-1: For owners or tenants with minimal land holdings, livestock should be explored as a first source of income.

-2 The present focus is on sheep and goats but other animals should be considered as well, as should combinations of different animals.

-3 Grass testing should continue and be expanded to include fodder trees and shrubs.

-4 Better marketing facilities for livestock are required.

Forestry 2.5 -1: A range of forest tree species and tree crop species suitable to different conditions should be prepared and offered to the farmer occupying steep land.

-2 Dual-purpose species such as Leucaena for the production of both fodder and wood should be used more widely.

-3 More applied research is needed to develop systems incorporating tree crops on steep land.

Economics 2.6-1: Development works on upland sites (terracing, etc.) should be subsidized in the same way as irrigation structures on lowland sites are subsidized (i.e., in neither case are the beneficiaries required exclusively to bear the cost of the structures).

-2 The absence of a viable credit program to support upland households constitutes a serious constraint to the rapid diffusion of ecologically sound and productivity increasing technologies. Non-collateral credit should be provided to subsistence farmers with limited resources; otherwise they will not be able to avail themselves of improved technology packages. Repayment schedules must reflect the time period required to obtain the expected income from the investment.

-3 Subsistence farmers require the annual provision of production credit, but as the recommended technical packages are economically attractive, no subsidy element is required.

-4 Projects should be designed in such a way that their impact can be measured and any modifications to improve acceptance and delivery systems incorporated.

### 3. Manpower and Training Requirements

#### 3.1. Introduction

The wide range of social, economic and technical factors involved in the development and implementation of programs for watershed improvement demand that manpower for these programs represent a wide range of knowledge, experience and skills. Not only must disciplines such as soil and water conservation, upland farming systems, forestry, animal science, agriculture economics and rural sociology be represented, but they must be integrated in a coherent plan of action of education, research and extension. The following discussion addresses the training needs for farmers, field technicians and professional staff.

#### 3.2. Potential For Meeting Manpower Needs

In a program expansion such as the one being projected for watershed development, it is important that the potential supply of manpower for program expansion be considered. Studies of educational trends and existing manpower studies indicate that needs for priority programs in agriculture can be met during the coming decade. The following comments are relevant to this point.

##### 3.2.1. Technician level manpower

- a. The government of Indonesia and donor agencies are making a concerted effort to improve the output of agricultural high schools. This includes programs to train teachers and to develop facilities.
- b. Universities are developing a number of diploma (S<sub>D</sub>) program courses "on demand" to meet critical needs. This activity is expected to grow rapidly in the next decade.
- c. Revised World Bank estimates show only a 3% demand/supply gap given a total demand of 146,300 middle level technicians by the end of the Fourth Development Plan.

### 3.2.2 Professional Level Manpower

- a. The student body ( $S_1$ ) of 52 agro-complex faculties in Indonesia has been expanding at a rate of 23%/annum during the past decade and is projected to continue to grow at rates of 8-10%/annum.
- b. The number of graduate ( $S_2$ ,  $S_3$ ) students in agriculture and environmental studies has grown from less than 100 in 1975 to approximately 1000 in 1983.
- c. World Bank estimates show a positive balance in the supply of professional level graduates by the end of the Fourth Development Plan.

### 3.2.3. General Comment

World Bank estimates reflect rapid growth in middle level technicians between 1981/82 and 1988/89, as follows:

Forestry	-	320%
Estate Crops	-	240%
Livestock	-	200%
Food Crops	-	166%

These are areas which will play an important role in watershed development.

### 3.3. Training Needs

In addition to specific subject matter deficiencies, the Team has identified 3 problem areas which relate, at least in part, to manpower and training. They are:

- Too little input of farmers into the technical packages
- Lack of adaptation of technical packages to local needs
- Too little flexibility in the technical package at the field level

Training plans developed by the watershed development projects visited should be adequate to overcome technical deficiencies of the field staff; however, they are not yet achieving the desired results.

The training target groups for the development and implementation of watershed improvement activities are the farm families, key farmers, field level technicians (PPL's and FLP's at the village unit level), middle level extension workers (PEM's at the Rural Extension Center (BPP) level), subject matter specialists (PSSs at District Agricultural Services and watershed sub-centers. Training is also needed for technical staff of related services at sub-district, district and provincial level.

#### 3.3.1. Farm Families

The training need is to increase skills in integrated upland farming systems. The approach of the training should be group learning based on learning by doing. A group of farmers have a greater opportunity to solve their problems by working together on a demonstration farm supervised by field level technicians. In this connection, the role of key farmers who are early adopters and who serve as leaders and organizers is very important. Emphasis should be continued to implement this basic concept of training which involves the farmer in the decision making process needed to select and apply appropriate practices.

#### 3.3.2. Extension Workers

##### a. Field level technicians

The training need is for increased comprehension and skill in upland farming systems, increased skill in communications, and increased leadership capability. This can be achieved through revision/improvement of curriculum and teaching methodology in SPPs (Agricultural Schools for Development), SMTPs (Secondary Agricultural Vocational Schools), BLPP (Agricultural In-Service Training Centers), and BLK (Forestry Training

Centers). Subject matter on upland farming systems, soil and water conservation, social communication, and agricultural extension should be included in the curriculum. Teaching methodology should place emphasis on adult education. The use of a field laboratory is also very important in reinforcing skills in the technical as well as in the social fields. In order to meet the demand for field level technicians with higher qualifications, diploma programs should be initiated for field personnel. These training programs should be designed to improve technical knowledge and sharpen observational skills of the extension workers.

b. Middle level extension workers

The training need is for developing skills in management (M.B.O., productivity, motivation, leadership), for increasing comprehension and analytical skills needed to incorporate problems of watershed management in agricultural extension programs at the BPP level, and for increasing skills in guidance and supervision techniques. This training need can be fulfilled through in-service and upgrading training in BLPP, BLK, and on-the-job training supervised by the PFS. To meet future demand for higher professional qualifications for the PPM, S<sub>0</sub>, S<sub>1</sub> training should be offered.

c. Subject matter specialist

The training need is for developing improved comprehension and skill in watershed development, increased skills in action research, and increased comprehension and skill in extension program development and evaluation. The training need can be fulfilled by BLPP and BLK and by workshops and seminars by P<sub>3</sub>RPDAS. Future graduate/post graduate training should be offered through in-country as well as fellowship programs. This training should prepare the PFS to more effectively incorporate appropriate technical packages in extension programs and to provide stronger technical support to field technicians.

3.4. Recommendations

3.4.1. Pre-service Training

1. The curricula of training institutions (agricultural high schools, universities and training centers) should be adjusted to give more attention to the needs of field personnel in watershed development. This would include greater emphasis on:
  - a. upland mixed farming systems
  - b. basic soil and water conservation practices
  - c. agricultural extension methodology
2. Field and classroom contact between P3RPDAS staff and students of training institutions should be increased through class visits to watershed development areas and the use of P3RPDAS staff as guest lecturers for seminars and workshops.

3.4.2. In-service Training

1. A comprehensive training program for field technicians, key farmers, professional staff, managers and policy makers similar to that projected for Citanduy should be developed for each watershed area. However, the following factors should be given stronger emphasis:
  - a. Key farmers and field personnel should be involved in a continual learning process through more effective use of demonstration farms and experimental areas as field laboratories for training purposes. This practice would also increase field contact among field staff, specialists and researchers, and should broaden the extension workers' knowledge of improved practices and sharpen observational, practical and analytical skills.

b. As the pre-service curricula are adjusted to include some of the technical subjects presently taught through in-service programs, more attention should be given at the project level to field as opposed to classroom training.

2. A participatory extension approach similar to that used in the Kali Sendang (FAO Solo II) pilot area should be used for farmer training. This includes:

- the use of farmers' meetings to motivate participants
- the use of demonstration plots to provide farmers an opportunity to see and to practice new farming skills
- the use of farmer action groups to decide what practices will be implemented on their individual farms

### 3.4.3. General

1. The level of formal education for watershed development staff should be improved. As farmers become better educated, there will be a need to increase the quality of formal education at all levels. This will also provide incentives for field staff who may otherwise feel themselves to be in a dead-end situation.
2. A technical committee should be appointed to develop training programs for watershed development personnel and to coordinate training programs at the SPP, Project, Training Center, and University levels.
3. Consideration should be given to broader involvement of training institutions in watershed development projects, especially those institutions providing graduate training for professional staff. Such cooperation would not only promote graduate study and research activities in the area but would also provide a channel for feeding field problems into the program of instruction.

#### 4. Institutional Aspects

##### 4.1 Beneficiary Participation

This concept is clearly implied in the Pancasila State Ideology as well as the Basic Policy Guidelines (GBHN). Experience both in Indonesia and abroad has shown that unless the ultimate beneficiaries are actively involved in the planning and implementation of development projects, the projects are unlikely to achieve their goals. Although the village (desa) remains a viable administrative unit, experience indicates that hamlets (dukuh, kampung) have greater viability as social organizations for effective participation in development activities at the real grassroots level. At village and lower levels, voluntary farmers' organizations are non-existent. As an alternative, the Village Self-Reliance Group (IKMD) seems a viable alternative but should include non-formal leaders and representatives of upland farmers' groups and other farmer interest-groups to facilitate representation of perceived needs and means for their satisfaction.

There is a gap between District Government (Kabupaten) and the beneficiaries. To help bridge this gap it is recommended to activate the UDKPs at the sub-district level (Kecamatan) level and to involve the Rural Extension Centers (BPPs) and Field Extension Workers (FLPs) with the aides (Mantri) of the Camat, not only in planning but also in implementation.

##### 4.2 Institutional Arrangements

To achieve beneficiary participation as suggested above, there are three management principles which should be observed. These are:

- i) Decentralized management: Because of the wide variations in agro-climatic zones and social and institutional environments which characterize Java, a structure which places responsibility and authority at the lower levels of government is the only practical way to manage the diverse conditions and specific needs

of upland watersheds. Additionally, the multiple choices which will become available for the development of these areas rule out a monolithic approach as in the BIMAS programme, and makes local decision-making an essential ingredient for success.

- ii) Unified Management: The second principle which should govern institutional arrangements for watershed development flows logically from the justification for decentralized management. If the responsibility for watershed development is most appropriately placed at provincial or lower levels of government, officials at those levels need to be vested with sufficient authority, including effective budgetary control, to insure the unified and coordinated management of the various human, technical and financial resources that are required for successful introduction of improved practices. The resources required for watershed development (e.g., research skills, extension, and credit) reside within several technical ministries. All of these resources must be mobilized and allocated in an integrated manner if a sustainable process of upland development and watershed conservation is to be achieved.
  
- iii) Budgetary and Credit System Flexibility: The final principle essential to the successful execution of a watershed development program is the need for budgetary and credit systems that are sufficiently flexible to accommodate the inevitable variations found in any effort to introduce technology in diverse agro-climatic zones and to farmers with varying income levels, sources of employment and attitudes towards risk.

These principles are examined in relation to three ongoing programmes/projects with the following results.

a) National Regreening Programme.

An examination of the organization reveals certain weaknesses.

The separation of the planning-supervision function and the implementation function in very different institutions means that neither the regional government nor the line agency can effectively be held accountable for the results of the program. This institutional separation also disperses limited skilled manpower between units with overlapping and essentially competing jurisdictions.

In sum, planning is overly centralized. The separation of planning and implementation in different institutions and the predominance of one functional ministry are obstacles to unified management. The use of targets set by central government to drive the system and the application of nationally standardized inputs despite tremendous agro-climatic variations even on Java are detrimental to both decentralization and flexible budgeting. Significant institutional and procedural modifications of the present P3RPDAS program are required if the management principles articulated by the Assessment are to be effectively applied.

b) Citanduy II Project

The Citanduy II project is widely expected to demonstrate an improved approach. By decree issued by the Minister of Agriculture, the function of the P3RPDAS was augmented and personnel were seconded from various Directorates General in order to accomplish integrated planning and supervision of all agricultural activities in the watershed. Apparently the seconding of personnel from central agencies, locating them in the basin, and supporting them with a ministerial decree has not yet been accompanied by the transfer of sufficient authority to make this system fully effective. Regional government has been vested with the responsibility for expansion of upper watershed activities and hence coordination between regional government and P3RPDAS

is essential. However, the formal mechanisms created outside the regular government structure to ensure coordination have been ineffective.

Project design gave careful attention to balancing the positions of three implementing ministries. To accomplish this, project activities were funded through multiple budgets and coordinating teams were established at two levels. Experience thus far with the Project indicates that mechanisms established outside the regular government structure, such as the Basin Coordinating Team, are not effective at coordination and integration of operations. Such mechanisms seem to be more effective at the national level for dealing with policy issues and administrative bottlenecks. Further, the funding of Project activities through 24 different budgets has been a major handicap to unified management and timely delivery of inputs and services. For these reasons, Project Citanduy is unlikely to provide a convincing model of institutional arrangements for future replication, but based on experience gained in Citanduy it is possible to propose a better system.

c) Yogyakarta Rural Development Project

Many of the problems mentioned above are less severe in the Yogyakarta Rural Development Project. Management and financial authority are clearly located in the provincial planning board (BAPPEDA); thus decentralization is achieved at the provincial level. By virtue of authority given through Law No. 5/1974 and Presidential Instruction 27/1980, the BAPPEDA effectively coordinates agencies involved in implementation through the Agriculture Technical Development Centers and effectively controls the entire project budget. This financial control is accomplished through a consolidated budget.

While problems are minimal in this project, this is probably a reflection of the small size and tight administrative structure of the special province, and some doubt must remain as to the wider applicability of the organizational arrangements.

#### 4.3 Institutional and Budgetary Recommendations

The experiences to date with the above projects are sufficient bases for the following recommendations:

1. Provinces, districts (kabupaten) and subdistricts (kecamatan) should be re-emphasized as the fundamental units for the organization of upper watershed management in both planning and implementation, in line with the concept of decentralized management advanced by the Assessment Team. An alternative, organizing by watershed, is conceptually attractive, yet there are no functions presently being performed in the National Regreening Program or in the upper watershed component of Project Citanduy that could not be performed equally well on a provincial or district basis.

2. Management of watershed management activities should be strengthened through a Presidential Decree that would establish special supervisory bodies at the national, provincial, district, and subdistrict levels. This is needed to further specify the policy of decentralized but unified management mandated in UU 5/1974 and KEPRES 27/1990 because it would authorize operational management lower than Kabupaten (i.e., Kecamatan) and mandate an inter-agency approach to watershed development at all levels of government. See Figure No. 4.3. The coordinating bodies that now exist at the national and provincial levels under the National Regreening Program might be utilized, provided they are vested with sufficient authority. Such bodies should be established at lower levels as well, and they should be strengthened at all levels through the proposed Presidential Decree (KEPPRES). The proposed Presidential Decree should vest these supervisory bodies, particularly at the provincial and district levels, with sufficient authority to insure unified management of watershed development interventions within their jurisdiction, including control over all budget resources, including those budgetary resources traditionally allocated to technical line agencies.

3. Watershed development programs require financial arrangements different from most of those currently in use. The necessity of a farming systems approach and the nature of the task which involves adaptations to conditions at the lowest operational level imply that a watershed program should not be structured like most INFRES programs. Most of the INPRES programs (DATI-I and DATI-II excepted) give too little discretion and initiative to the local level in allocating funds to particular projects, locations and items within given types of expenditure. Flexible budgetary procedures at the field level are essential to enable local decision-makers to effectively respond to the inevitable variations found in any effort to introduce technology to varying agro-climatic zones and to farmers with varying income levels, sources of employment and attitudes toward risk. To achieve this budgetary flexibility, one possibility would be to combine the special INPRES Penghijauan and Reboisasi funds with INPRES DATI-I funds. By channeling these funds through the "ditetapkan" component, adequate flexibility as well as control could be achieved. If this cannot be done, other ways might be found to increase flexibility such as relaxation of target setting at the national level.

A second point on this structure of financial systems for watershed development which the Team feels should be emphasized is the need for a unified budgetary system. Multiple funding channels as in Project Citanduy have several adverse results. Lack of synchronization in arrival of financial authorizations (DIPs) means late deliveries of inputs or services and occasional postponement of activities for an entire season. Additionally, there is no way of ensuring that the development and operational costs of a function is comprehensively covered and no one is encouraged to feel an overall sense of responsibility for a particular function when so many agencies are contributing to its running. Above all, unified management is ineffective if not impossible without financial control, and financial control can be achieved only with installation of a unified budgetary system under the direct control of a watershed supervisory body.

4. Consideration might be given to reorganizing the PORFAS Centers in ways that would attach them firmly to the regional governments, perhaps under the general supervision of the EAPPEDA as exemplified in the Jogja Project or under the new Environmental Bureaus (Biro Lingkungan Hidup) that are to be established within provincial and district governments. The reorganized centers would continue to receive technical guidance from the Directorate General of Reforestation and Land Rehabilitation, Ministry of Forestry, as well as from appropriate Directorates General, and the Agency for Agricultural Research and Development (AARD) within the Ministry of Agriculture.

5. Consideration should be given to placing regreening extension workers (PLPs) under the administrative authority of the implementing units, the district level agencies (dinas), with technical guidance from the Research and Development Agency, Department of Agriculture, and the similar agency in the Department of Forestry when it becomes operational.

## 5.0 Summary

### 5.1 Planning Considerations

Watershed development is essentially a component element of any regional development and by its nature is an example of integrated rural development. In general a watershed is a well defined physical region with natural physical boundaries.

In order to improve the utilization of the natural resources and the productivity and the stability of the watershed, an integrated development plan must be developed based on the physical and environmental conditions, i.e., the sustained capability of both land and water resources.

In the first phase, an integrated watershed development plan at the macro level must be developed based on primary data and information on the physical and environmental conditions.

It is recognized that socio-economic and political aspects are likely to be the overriding factors in the final decision on macro land utilization in any watershed area. Macro planning should be carried out by the Planning Board (BAPPEDA) at provincial and district levels and must be followed by more detailed planning at the sub-watershed level. This level of planning should be carried out at district and sub-district levels.

Further micro-planning at the operational or village level requires much more detailed and specific information. It must be able to respond to the type and level of management at the field level. This planning should be carried out at sub-district and village levels.

Based on specific guidance from the National Government/BAPPENAS, the planning of any watershed development program should be under the direction of the BAPPEDAs I and II, with the involvement of all line agencies, such as P3RFDAS, Agriculture (Food Crops, Livestock, Estate Crops and Fisheries), Public Works, etc. This planning process should consider the proposals and aspirations generated by sub-district and village institutions.

The implementation of a watershed development program will logically follow the administrative boundaries of province, kabupaten, kecamatan (UDKP) and village, in accordance with Law No. 5 of 1974 (Autonomy of Provincial Government). In many cases the boundaries of the kecamatan coincide with the physical boundaries of sub-watershed units.

The Minister of State for Population and Environment, BAPPENAS, and the Ministry of Home Affairs (including provincial governments) all have very important roles in coordinating the planning, implementation and monitoring/evaluation of watershed development programs and also the maintenance of stable ecosystems and productivity of the upper watershed regions.

The line Ministries directly or indirectly concerned with the watershed development program (that is to say the Ministry of Agriculture, Ministry of Forestry, Ministry of Public Works, Ministry of Finance), as well as all line agencies in the provincial government, must be directly involved in the design and implementation of the program. Improved and better management from the national level through the provincial level to kecamatan and desa levels must be developed and embodied in a Presidential Decree.

## 5.2 Technical Considerations

The development and application of a farming systems approach is central to the successful execution of upper watershed development programs. The alternative packages of technology must be appropriate to the physical and socio-economic conditions at the micro level. A farming system approach embraces very complex issues because of the subsistence level of farmers and their very limited resources.

The role of research and development by the Agency for Agricultural Research Development (AARD) and other research institutions for the generation of appropriate technology (components or complete packages of technology) at representative field laboratories, and also provision of base line data, is very important. The assembled packages of technology must be further verified by on-farm trials, and finally must be demonstrated under actual field conditions through demonstration farms with active participation of the community and representative farmers.

The active participation of farmers/beneficiaries is very important for the success of any watershed development and management program.

### 5.3 Human Resources Development

Because of the complexity of training needs for watershed development staff and the need for unified programs of instruction, a technical committee (coordinated by the Agency for Agricultural Education, Training and Extension/AAETE) should be appointed to coordinate training activities in this area.

Institutional arrangements should be made to involve a broader range of university staff and graduate students in watershed development. This would increase research and graduate studies on watershed problems and feed-back field information into educational programs.

The field laboratory proposed under the technical section should be used by extension personnel as a teaching-learning laboratory for field workers.

### 5.4 Institutional Aspects

Since watershed development is a multidisciplinary and cross sectoral process, it is essential that management systems from the national to the provincial, kabupaten and kecamatan levels should be established by Presidential Decree. The administrative Unit (province, kabupaten, kecamatan) should be given the authority and responsibility for management of watershed development, both with respect to planning and implementation.

Figure 4.3  
DIAGRAM TO ILLUSTRATE THE  
PROPOSED ORGANIZATIONAL STRUCTURE

Bodies for Coordination of  
Watershed Development based on Presidential Decree

