Technology for Increasing Rural Productivity in Indonesia: Report of a Workshop (1983)

Pages
60

Size
8.5 x 10

ISBN
0309326184

Board on Science and Technology for International Development; Office of International Affairs; National Research Council; Government of Indonesia Ministry of State for Research and Technology

TECHNOLOGY FOR INCREASING RURAL PRODUCTIVITY IN INDONESIA
Report of a Workshop

Jakarta, Indonesia
October 7-15, 1982

Jointly sponsored by

Government of Indonesia Ministry of State for Research and Technology

Board on Science and Technology for International Development
Office of International Affairs
National Research Council
United States of America

NATIONAL ACADEMY PRESS
Washington, D.C. 1983

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

These proceedings have been prepared by the Board on Science and Technology for International Development, Office of International Affairs, National Research Council, for the Mission to Indonesia, U.S. Agency for International Development, under Contract AID 497-79-100-23.

Copies available from:

Board on Science and Technology
for International Development
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418 USA

Residents of Indonesia should request copies directly from:

National Science Documentation Center (PDIN)
Indonesian Institute of Sciences (LIPI)
Jalan Jenderal Gatat Subroto
P.O. Box 3056/JKT
Jakarta, Indonesia

PREFACE

The most serious problem confronting Indonesia is its high rate of population growth, which affects all aspects of life and all social levels. In particular, this problem contributes heavily to the poverty of rural populations which constitute over 60 percent of Indonesia's total population.

Java, Madura, and Bali are the most densely populated islands of the country. In efforts to solve or reduce problems caused by overpopulation in these areas, the government has undertaken a number of measures, including development programs for the river basins of Java, and transmigration programs to relocate inhabitants of Java. River basins are the most crowded parts of the island, and they suffer from the most complicated problems and destruction of resources. Transmigration appears to be a practical way of lessening the burden of the densely populated islands, while associated development efforts seek to better the welfare of the people.

In connection with these transmigration and development programs, a Workshop on Technology for Increasing Rural Productivity was held in Jakarta in June 1979, sponsored by the Indonesian Ministry of State for Science and Technology (MSRT) and the Board on Science and Technology for International Development (BOSTID) of the National Research Council (NRC). The workshop's theme was chosen in accordance with the priorities given in Indonesia's third Five-Year Development Plan (REPELITA III) and the emphasis on alleviating rural poverty of the program of the U.S. Agency for International Development (USAID).

In 1979, workshop participants concluded that rural productivity could be enhanced by disseminating and applying improved genetic resources, cropping techniques, and infrastructural development. They recognized, however, that improved rural productivity depends on successful programs for the sustainable transfer of these technologies and on suitable training, management, and leadership techniques.

The 1979 workshop was the first joint activity held by the MSRT and the National Research Council, and it was but one activity in a program of cooperation between BOSTID and the Indonesian government. Begun in 1968, a series of workshops have focused on food policy, industrial and technological research, natural resources, and rural productivity. BOSTID has jointly sponsored these workshops with the appropriate Indonesian agency and has provided counterpart groups of

specialists from the United States. BOSTID's participation in these activities is made possible through a cooperative project sponsored by a science and technology loan program from USAID to the government of Indonesia. As part of the program, two or three activities, such as panel discussions, workshops, seminars, or provision of small advisory groups are held each year.

FURTHER ENHANCING RURAL PRODUCTIVITY

As a follow-up to the 1979 workshop, a second workshop was held in Jakarta, October 14-15, 1982, to determine what research is required to enhance rural productivity.* At this workshop, two case studies of ongoing integrated rural development programs, sponsored by the government and carried out in conjunction with the Center for Environmental Studies, Bandung Institute of Technology, were used as a basis for discussion. The first case study--the settlement of Ciamis, located on West Java--is representative of the old settlements on the river basins, while the second case study--the settlement of Batumarta, located on South Sumatra in the vicinity of Baturaja--represents a transmigration area, or a new settlement established outside of Java.

Workshop participants had an opportunity to visit Ciamis, but weather conditions forced the group to cancel the visit to the transmigration area of Baturaja and the Batumarta project. Cigaru, an old settlement in a rainfed area of West Java, was visited instead. The information gathered during these visits was used in the workshop discussions.

This workshop was attended by Indonesian and NRC participants with varied backgrounds to encourage a multidisciplinary approach toward finding solutions to the problems facing rural Indonesia. The report summarizes the discussions of the workshop and includes the recommendations of the U.S. and Indonesian participants.

---

*See Appendixes A and B for the Workshop Agenda and List of Participants, respectively. Appendixes C and D contain two documents prepared after the workshop by the Center for Environmental Studies, Bandung Institute of Technology: "A Draft Proposal for a Cooperative Study: On the Application of Action Research for Environmental Improvement of Rural Villages Through Increasing Rural Productivity and Employment" and "The Integrated Development of the Batumarta Transmigration Project: A Target for Action Research."

WORKSHOP SUMMARY

The older settlement of Ciamis and the new transmigration site at Baturaja, where government-sponsored rural development programs are now under way, have a number of similarities and differences (case studies of these areas were reviewed by this workshop). Agriculture is the backbone of community development in both areas, but soil quality and erosion are severe problems. In terms of land holdings, average families in Baturaja have bigger plots than in Ciamis, yet there are no modern inputs to food production, resulting in low yields. This condition is severe from the nutritional point of view; however, it is believed that food consumption for the transmigrants in Baturaja is still better than that found in their place of origin.

Overpopulation and low-income families of low educational level are common to the two villages under study in Ciamis, and these conditions result in health and nutritional problems. Availability of clean water is also a problem, particularly during the dry season.

It has become clear that in both Ciamis and Baturaja agriculture alone is not adequate to provide a family income. Therefore, in addition to the application of the appropriate agricultural technology necessary to supply basic food needs, the diversification of productive activities in off-farm employment is imperative.

The panel discussed at length two possible approaches to improving farmers' incomes in both areas: technology inputs and the organization needed for implementation of the development program. Based on earlier studies, it is apparent that agricultural technologies covering the production (soil nutrients, water, agroforestry, etc.) and postharvest periods (small-scale processing, fermentation, etc.) as well as small-scale, nonagricultural technologies (brick-making, handicrafts, etc.) have the potential to be employed in both places. The details of the technologies applicable to each are specified in this report.

There is need for a mechanism to select technologies that are sound, and suitable locations for their use. As for the organization needed to implement the development program, the panel agreed on the importance of nongovernment intermediary agents in the execution of the program. These agents bridge the communication gap between the formal organization and the communities should a conflict of interest between two parties exist. Intermediary agents also play an important role in stimulating the rural communities to participate actively in the

development program. The panel recognized as well the function of the informal leaders in community development and the linkages between these leaders and the intermediary agents. A system has been formed in Ciamis, involving government institutions, nongovernmental intermediary agents, informal leaders, and rural communities. It remains to be seen whether or not this system will be effective in Baturaja which has a different community structure.

The panel recommended that research proposals be developed for both Baturaja and Ciamis as a follow-up to the meeting. Based on the proposals, the Indonesian Ministry of State for Research and Technology (MSRT) and the U.S. National Research Council (NRC) will define their respective roles in identifying the agents for financial support, providing experts for the projects, and so forth, in the context of the MSRT-NRC science and technology cooperation programs discussed at a November 1982 workshop on scientific manpower development.*

---

*See: National Research Council (1983) Proceedings: Panel Discussions on Science and Technology Planning and Forecasting for Indonesia: Special Emphasis on Manpower Development. National Academy of Sciences, Washington, D.C.

CHAPTER 1

Two Case Studies: Ciamis and Baturaja

CIAMIS

General Description

The Ciamis project area is situated in the Citanduy upper watershed, and its 1,500 hectares (ha) comprise about 70 percent upland and 30 percent lowland. The upland is hydrologically critical and the lowland is low in fertility. The natural ecosystem of the watershed has been disrupted by deforestation, uncontrolled agricultural development, and many other unwise practices, resulting in downstream sedimentation. Its presence often makes economic activity in the downstream area impossible.

Biological resources available in the project area include: rice (both upland and paddy), cassava, maize, coconut, kidney beans, string beans, cowpeas, spring onions, winged beans, peanuts, spinach, taro, peppers, soybeans, tomatoes, fish, fowl and rabbits, cash crops (citronella, white pepper, sesame), tree crops (cloves, coffee, tea, sago, timber, citrus, jackfruit, and rambutan), banana, and pineapple.

A Closer Examination: Cigaru and Segalaherang

The two locations selected for closer examination--Cigaru and Segalaherang--are located on the same upper watershed and have many common development problems.

Physically, much of the land is upland, with more than 50 percent on slopes steeper than 8 percent. Erosion and landslides are common as a result of inappropriate agricultural and inland fish farming practices.

Both villages suffer from overpopulation. The average farm size is about 0.3 ha per farmer, which can barely support a family at a low level of subsistence. Migration, therefore, is common, especially among the younger generation. This seasonal migration pattern does not help establish a more stable farming pattern, and contributes to environmental degradation. Cigaru has, in this respect, more serious

problems than Segalaherang, as the community is more backward and poorer. The level of education is low--in Cigaru no one has attained higher than a primary school education.

Health and malnutrition problems are common in both villages, but again, they are more serious in Cigaru than in Segalaherang. Malnutrition among children is very high (estimated at 30 percent), and infant mortality is far above the national average. Waterborne diseases are also common and are compounded by malnutrition.

Household water is scarce, especially during the dry season. The recent eruption of Mount Galunggung had a serious impact on water supply, since the dust raised has affected the springs. The community has, therefore, dug shallow wells (down to 25 meters), but not all have produced water. Provision of an adequate water supply will become a major problem as long as the water cycle is not improved through better environmental management and the population density continues to increase.

Clearly, agriculture alone cannot support the existing population in this region. With increasing population pressures, environmental degradation will continue in a "downward spiral" of impoverishment as the carrying capacity of the land is surpassed and cannot be increased because of social, economic, technological and political constraints.

Human Resources

A number of activities in the government-sponsored Ciamis project are being directed toward improving the mental and physical abilities of village youth. It is hoped that this will give them a chance to develop as more rounded individuals and will help encourage village solidarity and a sense of its productive potential.

An important part of this project is an experiment in alternative education in the lower grades. The present primary school system does not provide training in skills relevant to a rural, agricultural population. Moreover, the fact that the nearest SMP (junior high school) is beyond walking distance, is a disincentive to continue an education. There is a high drop-out rate at the SD (primary school) level for these reasons. Under a new experimental system, village students can elect, after the third grade (and attainment of basic literacy skills), to get credit by working in skills training programs in the villages in agricultural and rural home industry skills.

The establishment of farmers' groups to manage the various activities is the essential element of the project. This project is seeking to create a more self-sufficient and dynamic village and a socioeconomic system that will sustain environmental interventions in the area and maximize their potential. Organizational efforts are concentrating on making farmers' groups more effective in planning and decision making for their individual benefit and also to encourage the growth of cooperative institutions to undertake activities beyond the reach of individual families and yet which would benefit them and the village in general.

The Role of Community Participation

All the problems just described for the Ciamis project area are recognized by the government. A River Basin Development Authority (PERPDAS) has been established to counter these problems, and to begin a development process that seeks to increase rural productivity and environmental improvement at the same time. Its programs, however, are slow to penetrate the community, so that its impact is limited, its operation is costly, and it is inadequately directed to achieve its objectives more effectively.

The crux of the problem is how to involve the target communities in effective community development programs that release creative human potentials. This is hampered, unfortunately, by a lack of trained manpower, great difficulty in recruiting highly motivated cadres, and, in general, lack of understanding of theoretical and practical knowledge in this field at higher management levels. Community development thus becomes an appendix to physical development rather than an integral part of a total development concept in river basin development. This then leads to ineffective programs and possibly undesirable side effects such as the creation of widening income disparities among villagers, higher urban migration among the poor, and a continuing process of environmental degradation as more of the poor and landless farmers resort to deforestation and overcropping to subsist.

In view of the limited agricultural resources in this area, it is clear that diversification of productive activities in off-farm employment is imperative. This complex process involves the formulation of new approaches to and methodologies in integrated rural development planning and implementation. The existing theories, methodologies, and modes of implementation are often limited in field situations. Multidisciplinary manpower from academia as well as from the actual intermediary agents must be assembled to develop this knowledge through suitable methods.

Applying Technology to the Problems

Three types of technology (in addition to the basic technical infrastructure of water supply, roads, health, education, housing, etc.) have the potential to contribute to increasing rural productivity in the Ciamis (and Baturaja) sites: (1) agricultural production technology; (2) postharvest technology; (3) and small-scale, nonagricultural technology (brick-making, handicrafts, etc.).

In the Ciamis project, technology has been applied within the framework of a learning process. The introduction of agricultural techniques, such as terracing and multiple cropping is designed to raise farmers' incomes. The introduction of management techniques (so-called "soft technologies") has contributed to the organization of farmers' associations and pre-cooperatives for the purposes of production and marketing. Marketing arrangements must still be strengthened, however, and better technology introduced to process, and

thereby add value to, agricultural products. In Ciamis, less priority is given to production per se than to marketing and processing services.

The Ciamis project hopes to increase farmers' incomes and at the same time preserve the carrying capacity of the land. Most of the land is considered marginal or degraded, and limits to production are, therefore, based on a combination of population density and land degradation. The role of technology is to bring these marginal lands into production, through innovative technologies such as agroforestry, and to reduce the dependence of the population on the limited area of "safe" arable land. In addition, this approach is seeking to meet nutritional and economic needs, while making the best use of available land and water resources.

Most of the population falls below minimal nutritional standards and the poverty level. Family incomes are estimated to be from Rp. 110,000 (U.S. $170) per year for the poorest group to a maximum of Rp. 450,000 (U.S. $650) per year. The farmers' own priorities reflect this situation: their first priority is greater income; the second, better access roads; and the third, a clean water supply.

For the Ciamis project, priority has been given to changing the way the farmers view their problems and analyze their options, and there has been success in this. Farmers are now asking about the implications of technology, such as pesticide use on densely planted crops, terrace maintenance, and marketing of beans and peppers. Some problems are clearly beyond their scope, however, and must be tackled at the local government level (e.g., the potential impact of pesticide use on health and the environment).

The Ciamis project has been successful in teaching farmers new production techniques and enabling them to choose among many new crop possibilities according to their own perceptions of needs. The next phase should be designed to provide them with a greater range of crop production alternatives, together with processing, storage, marketing, and ancillary value-adding activities. These technologies should be strengthened within a framework that stresses the minimum inputs necessary to achieve optimal production and value added.

The strengthening of the agricultural base is seen as a prerequisite for supporting off-farm activities. A safe, plentiful water supply and improved nutrition will help solve pressing problems of infant mortality, incidence of diarrheal disease, and inadequate food supply, which in turn limit productivity.

BATURAJA

General Description

A transmigration program has been introduced in Indonesia in an attempt to provide a better standard of living for new farmers and additional employment opportunities in relatively underpopulated areas. It is also held that the distribution of manpower from densely populated areas (for example, Java and Bali), thereby providing assistance for

the development of the receiving region, will strengthen national stability. How to fit the patterns of new villages into the pattern of regional development still presents problems, however.

In an attempt to increase its organizational capacity to handle transmigration planning, coordination, and implementation, the Directorate General for Transmigration is testing the new organizational patterns in Baturaja, South Sumatra. Project plans call for accommodating 4,500 families on 22,500 ha of farmland. The first transmigration village was opened in 1976-77.

The farming pattern in Baturaja is planned around a holding of 5 ha of dryland farming, which allows for food crop cultivation assisted by draft animals on about 1-2 ha, a house garden of 0.25 ha, and 1 ha of block-planted rubber. The remaining land is set aside for cultivation of cattle fodder.

Various services and facilities, such as agricultural credit and extension services, are provided to support this farming pattern. A seed farm and nursery, multiple-cropping system trials, and demonstration areas for training settlers in proper rubber tapping techniques have also been established. The road network has been improved to ensure marketing channels. To encourage community development in the new villages, more careful attention is given to educational and health services.

A Closer Examination: Batumarta Transmigration Project

The Batumarta transmigration project, located between Baturaja and Martapura is a new transmigration area which has been selected as the new settlement model of an upland farming system. For the most part, this area comprises land that was once cleared for agricultural purposes by its inhabitants, but it has been abandoned for quite some time and is now covered by alang-alang grass and secondary forest. The land is hilly with fairly steep slopes.

The fertility of the soil is low, and decreases if not supplied with nutrients, especially after the third planting season and beyond. Soil acidity is high, the amount of organic matter is low, and the undulating topography as well as the high leaching capacity of the soil due to low organic matter result in high erodibility. The total project area covers 22,500 ha of this common type of soil.

The biological resources readily available in this new area include: rice (upland), cassava, maize, coconut, string beans, tomatoes, fish, sheep, fowl, cash crops (peanut, soybean, mungbean, water spinach), tree crops (cloves, citrus, jackfruit, rambutan), bananas, and pineapple.

Applying Technology to the Problems

The Baturaja project area thus has fundamental problems similar to those of the Ciamis project in maintaining agricultural productivity.

Furthermore, these problems are compounded because the area is outside Java and is, therefore, new to farmers, officials, and researchers alike. The most serious problem is soil quality, and this is particularly pressing because of the limited time (5 years) in which the transmigration sites have to develop. At the end of this period, farmers should have achieved a level of productivity and income not only adequate for subsistence but also for investment in continued improvement of soil and agricultural productivity.

The technologies applied by the inhabitants of the Batumarta project area include: agronomic practices, postharvest processing, storage technology, grading and sorting of food crop products, and soil conservation.

The Institut Pertanian Bogor (IPB), as the back-up institute for this project, acts as a source of technology, which also includes remedial measures for better physical and chemical soil conditions, better technology in agronomic practices and for higher quality seed production, and postharvest technology, especially for commercial commodities and raw materials.

The Central Research Institute of Agriculture (CRIA) has undertaken research on selecting crop varieties for the Baturaja area, and has proposed three types of cropping systems which are being introduced. However, seed supply is a serious constraint, and there is an urgent need to make the kind of selected seed required by farmers available from local sources.

There are also serious postproduction problems. For example, the transmigrant farmers from Java are not familiar with rubber tapping techniques, or cassava processing and preservation, and specialization of function with respect to technology is needed. Rubber must be tapped by expert tappers or the trees will die and the investment will be wasted. Not all farmers have the skill to tap their own trees. In this regard, rubber cultivation offers an opportunity to make a comparative analysis between the two target groups in the transmigration area: the natives and the transmigrants. Because rubber tapping will begin in the Batumarta area this year, it should be possible to compare the rubber business between the indigenous shifting cultivators and the new settlers from Java and Bali. It may be necessary at a later stage to find more sophisticated and integrated common denominators for both shifting cultivators and new settlers using criteria such as cropping patterns adopted, management of farms, motivations to organize, and coordination and marketing (including cooperatives).

There are also opportunities presented by the large area available to transmigrants: the home garden, averaging 0.25 ha compared to 0.1 ha in Java, offers a potential that research should exploit, since it supplies about 50 percent of family food consumption. Postharvest technologies suitable for local crops must be developed, and the productivity of local industry--brick-making, blacksmithing, tempeh- and tahu-making--increased. As in the Ciamis case, increasing income and diversifying production technologies as well as off-farm activities depends on the stability of the agricultural base, which is currently precarious. Unless it can be sustained and improved, the population

will not be able to stay on a permanent basis to apply more modern technologies in the small industry sector.

At the same time, however, the introduction of new technology into a foreign area must be done cautiously, particularly in the case of technology that might lead to changes in the physical and biological ecosystem. For that reason, the influence of technology on the environment should be investigated carefully.

The effort to monitor, evaluate, and measure the economic development of the new settlement area should be extended to its physical and biological aspects. Support activities are needed to monitor and evaluate progress from year to year over the 5-year period. Other studies relevant to the transmigration program include those to determine the impact of transmigration schemes on regional development. The results of these studies will be beneficial to the development of other transmigration areas and projects based primarily on nonirrigated agriculture.

CHAPTER 2

Recommended Priorities for Research on Technologies for Rural Productivity

Research on applying technologies to increasing rural productivity should be undertaken within a framework of continual quantitative assessment of land, water, and biological resources to meet nutrition, health, and employment/income needs, including resource conservation for sustained productivity and growth. Within this framework, the following priorities for research have been identified. This research will be carried out in the Ciamis and Baturaja areas through mechanisms involving trained on-site technologists who will serve as intermediaries between research organizations and farmers, and who will be responsive to the needs and interests of both groups.

PRODUCTION TECHNOLOGY

Soil Conservation and Improvement

Research is critically needed on soil conservation and improvement based on minimal inputs to achieve optimal production. Such research should be aimed at introducing soil conservation practices--improved terracing, contouring, strip clearing, and planting--to maintain fragile soil structure and fertility.

Terracing In Ciamis, currently applied terracing technology may not be the most appropriate, since in dry years (such as the one being experienced currently) the terraces crack and may collapse under heavy rain. Wall stability may be enhanced by using more suitable cover crops (such as Desmodium spp.); contour ridging may be better than high terrace walls in some locations. Some tree species, such as Calliandra, grow well on steep slopes without terracing, and could be used to phase in terracing over time rather than building terraces all at once. Calliandra can shade out alang-alang, while providing fodder, firewood, and construction materials.

In Baturaja, land clearance techniques should be improved, with retention of topsoil, conservation of nutrients (e.g., by burying slashed cover), and perhaps also selective alley clearing and interplanting as well as selective terracing, contour ridging, and bunding to prevent erosion.

Soil Fertility In Ciamis, better use of livestock manure and compost could conserve nutrients, improve soil fertility, and increase output. In Baturaja, research on amelioration of acid soils should be a priority, involving selection of acid-tolerant legumes and their symbiotic rhizobia, testing liming levels for initial and successive applications over an extended period, and use of rock phosphate. Research by the International Bank for Reconstruction and Development (IBRD) and the Central Research Institute of Agriculture (CRIA) indicated that it might be wise to provide a government amelioration grant for the capital improvement of the soil, and this possibility should be pursued as the farmers cannot afford to pay for it themselves.

Before selecting a particular technology a systematic investigation should be undertaken of current and projected crop and livestock production practices along with land and water resource management. Based on this knowledge of the agricultural system, various combinations of crop and livestock management practices and nitrogen enhancement technologies can be tested. Soil erosion and leaching remove much more of the soil's nutrients than do crops; conversely, composting, manuring, and mulching can increase soil nutrients beyond crops' needs. Burning organic matter is wasteful and should be employed only when all other conservation methods are impossible.

Water Management and Conservation

Top priority should be given to field testing water catchment devices (cisterns), simple pumps, and siphons for improved water conservation and distribution throughout the fields of both Ciamis and Baturaja.

In irrigation areas in Ciamis, the introduction of simple waterlifting devices could reduce the drudgery of providing the village water supply, and improve water quality by permitting wells to be flushed. Simple, cheap plastic or free bamboo siphons could improve the way in which water is moved among terraces without breaching terrace walls. In both regions, the use of appropriate technology to improve water supply should be investigated (e.g., solar stills, osmosis membranes, charcoal filters). Use of mulch, ground cover, and compost should be tested as a means of not only improving soil fertility but also of increasing moisture infiltration and retention.

Biological Resources

In both Ciamis and Baturaja, there is need to widen the currently limited range of species and varieties available to farmers. In some cases the varieties grown are not the most suitable for the soils and moisture regime (see Table 1 for a list of crops grown in Ciamis).

Particular attention should be given to legumes, such as the winged bean (Psophocarpus tetragonolobus) which may outperform soybeans in home gardens; Acacia mangium, a hardy tropical hardwood grown in Baturaja on a small scale; Stylosanthes spp. for improved soil and

TABLE 1 Crops and Livestock Produced in Ciamis

CEREALS:	Rice (dryland/paddy)
	Cassava
	Maize
	Coconut
PALAWIJA (secondary crops):	Kidney beans
	String beans
	Cowpeas
	Spring onions
	Taro
	Peppers
	Soybeans
	Tomatoes
	Fish
	Sheep
	Poultry
	Rabbits
CASH CROPS:	Citronella
	White pepper
	Winged bean
	Peanuts
	Spinach
	Sesame
TREE CROPS:	Cloves
	Coffee
	Tea
	Sago
	Pine (timber)
	Citrus
	Jackfruit
	Pambutan
	Stink bean

nutrition; legume-grass mixtures of Brachiaria humidicola and Desmodium ovafolium which are good for both soils and sheep; and fast-growing Calliandra for multipurpose uses. In both locations research on nursery techniques, collection and selection of germ plasm, multiplication, storage, and distribution should be undertaken on a continuing basis as fundamental to improved agricultural production and response to changing market and production conditions.

A similar expansion of livestock options should be undertaken. In Baturaja, arrangements should be made to diversify production and diet through fish ponds; aquaculture; raising bees, rabbits, sheep, goats, and water buffalo; and other means. Eel-raising technology is already practiced but needs to be improved. Livestock are not fully appreciated as potential harvesters of nonedible fodder, and this should be given research attention. Mineral licks could be supplied as an inexpensive means of improving livestock nutrition.

Pest Control

Pests (insects, rodents and other mammals, birds, pathogens and weeds) are destroying 35-40 percent of food crops produced in both areas, and this occurs in spite of current pesticide and nonchemical controls. Thus a real opportunity exists to apply integrated pest management (IPM) control technology to provide significantly increased amounts of food without increasing production. IPM technologies use a combination of agronomic practices, natural enemies, and pesticides to reduce crop losses from pests. Some pests can be controlled by planting various combinations of crops (crop diversity); planting crops in different sequences; altering the timing of planting; and employing the appropriate crop rotations, soil tillage, water applications, and fertilizer use. A whole array of parasites and predators existing in nature attack pest populations. These natural enemies, including microorganisms, can be manipulated for improved pest control.

Pesticides should only be employed when absolutely necessary and based on a careful monitoring of the pest population. Monitoring data will help determine when it is economically sound to treat with pesticides. IPM will, however, require a long-term commitment to research and an adequate supply of trained personnel and resources.

POSTHARVEST TECHNOLOGY

Research and testing is particularly needed on how to use or adapt existing food handling, processing, and storage technologies in order to both reduce losses of commodities between harvest and consumption and increase the quality or nutritional value of foods and their potential for marketing outside the community or region.

Three levels of postharvest food processing and utilization technologies have been found suitable for rural Indonesia:

- Subsistence level. These are technologies that can help make "the most of the least" in the existing postharvest food chain. These include on-farm storage, home preparation, small-scale processing, and improved cooking and nutrient supplementation techniques.

- Upgraded level. At a slightly higher level, these are technologies that improve the quality and quantity of food by enhancing the functionality, stability, safety, and nutritional contribution of available food resources.

- Commercial level. These processing technologies can add value to indigenous or introduced foods for marketing outside the household, community, or rural region, eventually reaching cities and export markets.

Research and application possibilities include:

- Solar dehydration, with back-up from gasification and local water or earth heat sinks
- Drying techniques--including the use of salt, sugar, oil, and edible humectants in natural drying
- Fermentations--lactic, acetic, mold, alcoholic, salt stock--particularly upgrading traditional fermentation technologies
- Synergistic applications of preservatives--sulfur dioxide (SO_2) and acid, SO_2 and heat, heat and acid, safe natural products or derivatives
- Minimal cooking methods--soaking, enzymes, fermentations, solar energy
- Integration of slash-and-burn agriculture with charcoal production and its use for gasification to produce nitrogen fertilizer and for water purification
- Rubber stabilization processes
- Cassava storage using damp sawdust or sand boxes
- Production of tropical mushrooms for export or local consumption grown on agricultural wastes (e.g., Volvariella and Pleurotus spp. grown on rice straw or wood wastes)
- Production of stable cassava flours and the introduction of the West African fermented gari process.

RURAL INDUSTRY

Research should be applied to making better use of local materials, or introducing new materials, in construction, furniture-making, handicrafts, and any possible means of adding value to local products. In Baturaja, rubber stabilization is a problem, although the technology is well known. In time, surplus biomass could be used via gasification to generate power, or power and fertilizer (small plants for this purpose are becoming available). Provision of these types of services

and facilities will raise the level of diversity and employment in the Ciamis and Baturaja areas.

RURAL TECHNOLOGY

Priority research areas include improved means of supplying potable water, energy supplies, and sanitation techniques. An array of technologies is available, and selected ones should be introduced and tested in both areas. These include charcoal filters, solar stills, and osmosis membranes which can be manufactured from locally available materials and are relatively inexpensive. In time the production of producer gas/ammonia from biomass could be an important transformation of organic matter surpluses where these are not required for soil quality.

CHAPTER 3

Aiding Technical Advancement Through Community Development

Arbitrary transfer of technologies to rural regions often creates side effects that harm the rural community and its environment. In particular, those effects frequently threaten the low-income target groups who are trying to improve their standard of living.

The negative impact of nonadaptable technologies results, for the most part, from a lack of consideration of physical and social settings when transferring technologies to rural areas. Technology must be made location-specific, taking into consideration both human and nonhuman factors.

Prior analysis of the problem and experience show that the transfer of technology to rural areas cannot be separated from the organization of the development processes, if the transfer is expected to benefit the target groups. However, gaps still exist between development agencies, which are linked with formal institutional structures and their mechanisms, and the rural target groups who will actually implement various technologies in their communities.

SIX-STEP PROCESS

Before the introduction of any technology, rural communities must be prepared beforehand so they are able to apply the technology properly. Adaptation of a technology should become an internal process of change, leading to self-reliance of the community and maximum utilization of local resources. This is done using a six-step process:

- Discuss development and ideas for future development with members of the target group using an intermediary agent. It may take considerable time (perhaps years) for the groups to decide to act.

- Identify cultural/social/economic opportunities and constraints, as well as natural resource opportunities and environmental constraints.

- Determine the possibilities for individual and community development in view of the constraints.

- Formulate policies, programs, and project priorities, and decide what specific actions to take. This requires cost-benefit analyses and the extension of credit, and must satisfy demands that will be made on members of the target group, the intermediary, and the various government agencies and officials.

- Execute decisions made in the above process.

- Evaluate progress and modify actions from lessons learned.

The above process puts responsibility on persons at all levels to spend considerable time thinking through what it will take for an area's development project to start and progress successfully.

THE ROLE OF THE INTERMEDIARY

Nongovernmental (or governmental) intermediary agents must play the role of motivator, catalyst, facilitator, and mediator to communicate the target group's ideas to the outside world. They may also act as a mechanism for solving conflicts between the participants involved in adaptation of a technology.

The intermediary agent must come from the same culture as that of the target group, and he or she must be trained to understand what governmental agencies are striving to do, must believe in the objectives of the programs, must be able to criticize constructively the ideas of persons at all levels, and must be able to lead and get people to do what has been agreed should be done. Further, the intermediary must be supported by superiors with material and monetary resources, transport, and subtle means of recognition which are effective in the local cultural setting. Universities and research institutions can back up the role of the intermediary function and give technical advice.

Care must be taken to ensure that all forms of assistance go through the intermediary, either directly or indirectly, with his or her approval. The members of the target group who emerge as leaders during the preliminary and decision-making processes will become the key persons through whom the intermediary will work. They will communicate and interpret the needs and cultural requirements to the intermediary and to those superiors and technicians who make policy and carry out research pertinent to any project.

The essence of applied research is that it seeks to solve the problems of the people involved. Usually this means doing much of the research with the local target groups in their home setting. If the research and any policy decisions are worked out with the intermediary and his or her key leaders, it will be relevant, and cooperation of the local people will be forthcoming.

CREDIT FOR CAPITAL IMPROVEMENTS

Credit for capital improvements and for operating purposes is necessary. In workshop discussions the use of block grants, which apply to capital development funds that go to civil districts (villages, counties, etc.), was discussed in some detail. These grants are usually given for facilities and improvements that serve groups of people, such as a rubber latex fabrication plant in Batumarta. Frequently, such large capital improvements must be supported by the many individuals in the area doing what is expected of them. For example, if rubber latex processing were financed, latex must be produced by the farmers of the region, and the smallholder rubber trees can only be financed with credit for individual farmers and local agribusinessmen, which must be available both at the beginning and on into the future.

A special rural credit department must be established in the government rural credit bank to serve the transmigrant villages. Local loan agents given this responsibility need to live near the villages, and, above all, they must work through the intermediary and his or her key leaders. Loans must, of course, be made on a sound basis and result in increased earnings so that the loan is repaid and the farmer is better off after having repaid it. This may not be an easy task, but unless it is done in this manner the migrant will fail in his new location, and he and his family will return to Java.

A MODEL OF PROPER TECHNOLOGICAL TRANSFER

Such a model should enhance a synthesis of the microstructure of rural institutions with the macrostructure of the formal government agencies who oversee transfer of technologies. It begins with expansion of microstructure at the community level to create economies of scale and to start a process of vertical integration. In this way, communities are prepared to have more effective command of their resources, so that adaptation of technologies can be used to stimulate local communities to achieve higher productivity and yet maintain quality of life and environment.

PARTICIPATION PLANNING AND INTERACTIVE DECISION MAKING IN ADAPTATION OF TECHNOLOGIES

The process of technological transfer should be internalized within the development process of the rural communities by employing participation and interactive decision making in various aspects of technological adaptation at different levels. The adaptation process involves the learning process, leader selection, and the process of establishing linkages among activities, participants, and institutions.

APPENDIXES

APPENDIX A

Workshop Agenda

WEDNESDAY, OCTOBER 6

Arrival of workshop participants

THURSDAY, OCTOBER 7

Leave for Palembang (actually impossible due to weather conditions, so itinerary was hastily rescheduled)

FRIDAY, OCTOBER 8

Visit to National Biological Institute, Bogor
Visit to village extension seminar, Bogor

SATURDAY, OCTOBER 9

Visit to Institut Pertanian Bogor

SUNDAY, OCTOBER 10

Leave for Bandung by train in evening

MONDAY, OCTOBER 11

Visit to Institut Teknologi Bandung
Leave for Ciamis in evening

TUESDAY, OCTOBER 12

Visit to Cigaru

WEDNESDAY, OCTOBER 13

Visit to Segalaherang
Leave for Jakarta

THURSDAY, OCTOBER 14

Workshop begins at Indonesian Institute of Sciences (LIPI)

FRIDAY, OCTOBER 15

Workshop continues and concludes in the evening

SATURDAY, OCTOBER 16

Chairman and rapporteurs meeting, LIPI
Participants depart

APPENDIX B

List of Participants

INDONESIAN PARTICIPANTS

Sajogyo, Institut Pertanian Bogor, Bogor, Chairman

S. Adiosoemarto, Lembaga Biologi Nasional (LIPI), Bogor

Affendi Anwar, Institut Pertanian Bogor, Bogor

Poerwo Arbianto, Pusat Studi Lingkungan Hidup, Institut Teknologi Bandung, Bandung

Zulkifli Azzaino, Institut Pertanian Bogor, Bogor

Iding Chaidir, Badan Pengkajian dan Penerapan Teknologi, Jakarta

A. Gunadi, Badan Perencanaan Pembangunan Daerah, Ciamis

Hardjanto, Institut Pertanian Bogor, Bogor

Koesnadi Hardjasoemantri, Kantor Menteri Pengawasan Pembangunan dan Lingkungan Hidup, Jakarta

Hartoyo, Departemen Pekerjaan Umum, Jakarta

Darwin Karyadi, Pusat Penelitian dan Pengembangan Gizi, Bogor

S. Kuncoro, Badan Pengkajian dan Penerapan Teknologi, Jakarta

Maryadi, Balai Pengkajian dan Penerapan Teknologi, Jakarta

K. Mattjik, Badan Perencanaan Pembangunan Daerah Sumatera Selatan, Palembang

Muchdie, Balai Pengkajian dan Penerapan Teknologi, Jakarta

Hasan Poerbo, Pusat Studi Lingkungan Hidup, Institut Teknologi Bandung, Bandung

Rachlan, Badan Perencanaan Pembangunan Jawa Barat

S. Sadjad, Institut Pertanian Bogor, Bogor

I. Made Sandi, Direktorat Tata Guna Tanah, Departemen Dalam Negeri, Jakarta

J. Sulianti Saroso, Departemen Kesehatan, Jakarta

S. Sastrapradja, Lembaga Biologi Nasional (LIPI), Bogor

D. Sembiring, Badan Penelitian dan Pengembangan Perhubungan, Jakarta

Doli Siregar, Badan Pengkajian dan Penerapan Teknologi, Jakarta

H. H. Sitompul, Institut Pertanian Bogor, Bogor

A. Soeharjo, Institut Pertanian Bogor, Bogor

Irlan Soejono, Institut Pertanian Bogor, Bogor

Suharso, Lembaga Ekonomi Nasional (LIPI), Jakarta

Pamugari Sutomo, Balai Pengkajian dan Penerapan Teknologi, Jakarta

James Tarrant, Pusat Studi Lingkungan Hidup, Institut Teknologi Bandung, Bandung

Abas Tjakrawiralaksana, Institut Pertanian Bogor, Bogor

F. G. Winarno, Institut Pertanian Bogor, Bogor

N. Wulijarni-Soetjipto, Lembaga Biologi Nasional (LIPI), Bogor

UNITED STATES PARTICIPANTS

Hugh Popenoe, International Program in Agriculture, University of Florida, Gainesville, Chairman

Robert P. Bates, Food Science and Human Nutrition Department, University of Florida, Gainesville

Harold B. Clark, Gainesville, Florida

William D. Lontz, Lansing, Michigan

David Pimentel, Department of Entomology, New York State College of Agriculture and Life Sciences, Cornell University

Staff

Michael G. C. McDonald Dow, Board on Science and Technology for International Development, National Research Council, Washington, D.C.

APPENDIX C

**A Draft Proposal for a Cooperative Study
on the Application of Action Research
for Environmental Improvement of Rural Villages
Through Increasing Rural Productivity and Employment**

**Proposal prepared by:
Center for Environmental Studies
Bandung Institute of Technology**

INTEGRATED RURAL ENVIRONMENTAL DEVELOPMENT

I. BACKGROUND

1.1 The relationship among the basic elements of the human ecosystem (resources, society, and technology) is today undergoing a rapid change, synergistic in nature, because of the structural interdependency of the elements. This has already led to the far-reaching transformation of different parts of society. Sound and stable resource management, which is integral to human ecosystem balance, has very often given way to a concentration on growth, and environmental stress within the whole system has resulted as a symptom of this imbalance. This stress is a consequence not only of physical damage to the natural resource base, but also of damage to human resources as expressed in mass poverty, malnutrition, and a declining quality of life.

1.2 The depressed levels of income and low standard of living common to the rural areas of developing countries, including Indonesia, seem to be based increasingly on a set of structural disparities in the human ecosystem, i.e., the differences in endowment of resources and the way they are utilized; the differential allocation of capital, skills, and training; the distribution of wealth and income; and finally, deficiencies in the development of the institutional framework from strategy and planning through implementation.

1.3 Given the situation of rising population and expectations for a better life, social and economic development and, hence, the utilization of resources must and will continue. The only way to cope with the deterioration of the environment is to focus on a strategy that minimizes waste and emphasizes resource use for the greatest number of people. In practical terms, this means that scientific research and technological development and their application to resources must focus much more heavily on "protective technologies." These are essentially resource-conserving technologies and those that contribute to the maintenance of the protective ecological system balance.

1.4 Tensions arising from the interrelated dynamics of inadequate production and inappropriate technologies combined with a rapidly

rising population are reinforced by the imperfections of the market. The chain of producer/small grower-middleman-exporter and, conversely, of importer/wholesaler-middleman retailer-consumer/small grower are dominated by elements of oligopsony and oligopoly. The farm population usually finds itself at the short end of the stick, both as producers and as consumers. These aspects of the market lead to distortions in the relative bargaining strengths of the economic groups involved and consequently to serious disparities in the distribution of income.

1.5 The population pressure in some developing countries continues to complicate the design and outcome of development programs. In Indonesia, the policy in this area means linking population control by coordinated and vigorously pursued family planning with the creation of employment opportunities which can absorb surplus labor and improve the quality of that labor to meet the demand for the kinds of skills required by the development transition. It also means improving the present and future health of the population by increasing the production of protein-rich and nutritious foods to improve the quality of life, improving the mental and physical health of the population in the process. Underlying all these goals and directly affecting the achievement of most of them is the issue of sound management and a healthy environment.

II. OBJECTIVES

2.1 In principle, the technical means are available to carry out balanced, sustainable development and to improve the living situation of the rural population in a cheap and cost-effective way. The application of these techniques, however, presents considerable difficulties, both of a social, economic, political character and of an infrastructural character. The intent of the present study is to tackle the issues discussed above as genuine scientific problems of a mixed, technical, and social nature. This implies more interest in the circumstances in which development takes place rather than in development defined simply as aggregate economic growth. Given this intention, it is hoped that the proposed study will permit an analysis of how technologies are chosen, for what purpose, and for whom, and the vital process by which technologies are "fit" into the overall development process in a way that allows them to be self-propagating and supporting.

2.2 The proposed study would be part of an ongoing project of this Center [Center for Environmental Studies (PSLH), Bandung Institute of Technology (ITB)] in integrated rural environmental development. The project aims at a "grass roots," integrated approach to environmental management by focusing on village participation in planning and decision making, organization of farmers and other villagers, and a comprehensive program that includes technical, socioeconomic, and institutional components. The project's results to date have been very promising.

The Center is undertaking the project primarily to understand the processes by which villagers deal with their environment under conditions of severe constraints, e.g., overpopulation, lack of suitable agricultural techniques for their natural resource base and cropping systems, a low level of education, and low capacity for investment. The aim is to find out what combination of institutional, financial, and technical measures will permit villagers to improve their socioeconomic conditions (e.g., income, employment, quality of life), while stabilizing and enhancing the environment (a regional as well as local strategic concern). The Center hopes to derive a set of policy recommendations from the results of its efforts that can be incorporated into the planning and decision-making process at the local, regional, and national levels of government. It also hopes to encourage the formation of new, innovative centers at the regional level, to train people in the organizational, technical, and educational aspects of the techniques that it derives from the project, and to function as an intermediary between regional government agencies and independent village-based enterprises. Finally, it hopes to create a new body of knowledge on these subjects to be eventually incorporated into university curricula to make science and engineering education more relevant to Indonesia's rural conditions and national development goals.

The results so far indicate that a well-integrated program of participatory planning and decision making can achieve significant environmental and socioeconomic improvements rapidly and at a lower cost than conventional approaches. Two factors are central to this approach: undertaking environmental improvements through a strategy of creating sustainable, income-generating opportunities; and maintaining a responsive and flexible approach to interventions and program development. These two factors are relevant to the following activities.

First, it is proposed that NRC/RISTEK [Team for the Formulation and Evaluation of National Major Programmes on Research and Technology] provide assistance to PSLH-ITB to enable it to carry out its program in two villages, and others in the region that become associated with the project, based on its action research methodology and environmental improvement through increased rural productivity and diversified employment opportunities.

As described elsewhere in this proposal, these activities will be of an incrementally, more sophisticated nature, each building upon the material and organizational achievements that went before and also partly dependent upon decisions jointly made by the communities, PSLH-ITB, and local government. While it is possible to plan a detailed program for the lifetime of this project, a rigid commitment to such a program undermines the action research and participatory character of the project. Further, in practical terms it threatens the flexibility of response necessary to sustain self-initiative and enterprise. Therefore, it is suggested that NRC/RISTEK designate a team to work with PSLH-ITB and the field center in Ciamis to cooperate in an ongoing capacity in the choice and development of specific activities for funding.

III. STRATEGY

3.1 It is posited here that a village society--indeed any society--functions as a complex set of interactions involving three main elements: human beings, with their specific traditions, culture, attitudes, and skills; technology, with its different conceptual bases and levels of complexity, management and organization needs, and demands on resources; and the environment, by which is meant the physical resource base and natural ecosystem. Together these elements are highly interactive and a change in one induces changes in the other two, which leads to a changed set of relationships, a modified system, taken as a whole. The human environmental system of any given area is, in fact, the dynamic interaction of these three forces simultaneously, and not just its physical setting, natural or modified.

It is possible, of course, to design a project or an intervention that seeks to deal with only one of these elements. In many development projects, this has been the technological factor. Still, the success of such an intervention in meeting its goals will depend at least as much upon the effects it has on these other two factors and their subsequent response to the intervention as it does on the performance of the technical inputs of the project alone.

Since technologies for manipulating natural resources to achieve increased--and sustainable--productivity and welfare can be devised and used only by human beings, it follows that man must be the focus of any program that seeks to use technologies for those purposes. Logically, this involves the need to identify and encourage those conditions necessary for facilitating and maintaining productive technological development and utilization. Reaching the "take-off" level of these conditions is largely a function of appropriate education, attitudinal change, and village institutional maturity, or what may be called mandiri desa.

What are these conditions? They are a mix of human, technological, and environmental factors whose parameters are largely site-specific, but whose general characteristics can be summarized here. They include, first, knowledge of the most efficient, yet environmentally sustainable, use of natural resources. This entails the development of a local body of skills appropriate to the mix of available natural and cultivated resources and the demand for goods and services that is, in turn, a dynamic function of the changing socioeconomic situation. A second condition is an understanding of the possibilities and paths to stable, yet dynamic, village institutional development as a necessity for both integrated rural development and environmental management. An important aspect of this understanding is investigating the proper balance between village-wide cooperative mechanisms and the encouragement of private initiative and entrepreneurship.

Institutional development involves the management side, e.g., organizational modes for carrying out and maintaining improvements to the farming system, or decision-making mechanisms for labor and capital allocation and relations with other government levels. The structural and operational characteristics of such institutions can have great

impacts on the nature and direction of social and economic development, for example, land and wealth distribution (equity), levels of participation in planning and decision making (power), the encouragement of attitudes of private initiative, and the balance between personal and social responsibility.

While the unit of analysis for planning and formulation of specific interventions should be the village, necessarily units must be integrated within a larger strategy for regional development in order to coordinate activities relating to infrastructure, marketing, and the environment (e.g., watershed management). Hence, a complementary effort must be the improvement of the capacity of local government, i.e., kabupaten and kecamatan, to work with village-level institutions in the framework of interactive planning, decision making, and implementation (including the latter's dissemination and evaluation aspects).

3.2 Choice of technology. Creation of jobs in developing countries with the use of advanced technology is very expensive. At the same time, such technology may not be designed to provide jobs and, in fact, usually is not. More important is the destructive effect of many modern technologies on local developing world cultures, unaccompanied by any socioeconomic balancing mechanism. When modern technology is applied to development programs, the user receives a whole system of values which includes a certain attitude toward nature, society, work, and efficiency.

The concept of "technology" should not be viewed simply as a tool or configuration of tools and related processes that exist independent of context. A simple glance at the variety of traditional farming technologies around the world tells us that each has evolved from particular ecological and resource constraints and opportunities, each entails a certain organization and division of labor and tasks often extending to the wider community, and each embodies a certain set of customs, beliefs, and procedures--a vernacular knowledge. Hence, technology should be viewed more properly as a package consisting of a tool and its related processes designed to utilize resources, including human resources, for human benefit. These related processes include the organization of labor to utilize the tool for maximum productivity and a system of "education" associated with its creation, use, and maintenance as well as its links to other tools and the tool's place in society's system of goals and values.

Technical progress inevitably involves the balancing of risks against benefits. The function of technology assessment should be to forecast the range of possible effects of technology on society's choices before options are foreclosed by default. Evaluating any technology almost necessarily means discussing its social and political implications and, in the last analysis, touches upon a society's scale of values. Based on this, the development of any alternative technology should comply with the following boundary constraints considered critical to Indonesia's national development. It should be nonpolluting, widely affordable, and labor generating. It should entail minimal, one-way (no recuperative) exploitation of natural

resources; be compatible with local cultures and widely comprehensible; be functional for decentralized operation; and be intimately connected to existing forms of knowledge and nonalienating to the worker. The fact that few modern technologies embody such characteristics, or so it is asserted, is less the difficulty of creating such means than it is in asserting social goals as the primary element in the framework for the development of technology.

In the following section, we examine the conditions in which technological development may occur, which may contribute to a greater balance in this issue of means and ends.

IV. METHODOLOGY OF INTEGRATED RURAL ENVIRONMENTAL DEVELOPMENT

4.1 How to induce the process by which villages become capable of dealing with complex technologies and productive systems is a difficult one. On the one hand, long experience with the conventional approach to village development, in which planning, the allocation of financial and physical resources, and management are all determined and controlled by the central government, seems to do little to catalyze a villager's self-development, without which sustained productivity is unlikely. Indeed, this approach puts enormous strains on the limited manpower and financial resources of the government without necessarily obtaining the desired long-lasting results. Finally, such an approach greatly increases the likelihood of mismatched programs, interference with other projects, and diversion of resources. On the other hand, a totally laissez-faire approach may lead to increased polarization between rural rich and poor, inability to meet desired social and economic objectives, and increased environmental degradation, a situation that has been observed frequently in many countries. This is largely due to historically and culturally based differences in the bargaining strengths of social classes. Likewise, an overly cautious approach which advocates waiting for a village to reach a certain level of institutional maturity and educational and economic development before introducing thoroughly tried and tested technologies also has certain drawbacks. The process of institutional maturity is a learning process. It involves taking certain manageable risks and stimulating or catalyzing the development of attitudes, organizations, and skills which might otherwise find it difficult to surface due to traditional structures, ignorance, or the understandable perception of a hostile social and economic environment. In this case, technologies and new institutional mechanisms rarely can be judged truly tried and tested without first testing them in a real rural setting. Even in those instances in which old and traditional technologies are involved, e.g., windmills, composting, or simple irrigation schemes, compatibility with local farming practices and skills, the presence of certain inhibitions and negative attitudes, and the willingness to cooperate in maintenance of inputs cannot simply be assumed ahead of time. Finally, the introduction of new technologies often induces a process of change that may have unforeseen--positive or negative--effects on the village.

4.2 The human action model. The alternative suggested here is what may be called the human action model. This model utilizes techniques of participatory planning and interactive decision making and education and a continual process of monitoring and evaluation to maintain a proper "fit" between social, economic, and technological development.

This project is essentially designed, organized, and implemented at the village level in cooperation with local government bodies and their larger regional-level strategies and plans. Implicit in this approach is the recognition that manageable uncertainties exist in any situation involving stimulation of rural people to move in a new direction. But project designs that proceed on the basis of a broad consensus as to the progressive steps involved in moving in this new direction--an integration of the socioeconomic, environmental, and institutional aspects of a set of problems--may be in a better position to deal with these uncertainties.

The human action model is an attempt to deal with two obstacles to project implementation that were mentioned earlier: (1) a lack of knowledge of the causes of village underdevelopment and of their potential to be more productive, and (2) a lack of knowledge of those technologies and organizational modes that will work in dealing with these problems. As defined here, the human action model is not yet susceptible, if ever, to a "cookbook" approach to implementation. It is continually being defined and shaped by the interactive processes that it comprises. The mechanism through which the human action model is informed and continually adapted by its field feedback is derived from the sociological field of applied social research, i.e., action research. This is the model's mode of implementation.

4.3 Action research. Action research, in its purest form, proceeds on the premise that the "target group" being investigated is the basis upon which "interventions" are carried out. Direct interaction and dialogue with the target group will yield appropriate sub-goals, methods, and feedback for the research and associated activities and interventions. There is usually an overreaching strategy and purpose for the researcher's efforts, but these are chosen so as not to interfere with the heuristic process of enabling the target group to solve its own problems.

Action research attempts to wed accepted scientific method as practiced in the basic and applied sciences to human situations in which the parameters of both dependent and independent variables cannot be precisely determined. Further, it entails a recognition that there are serious ethical and practical issues associated with treating essentially social policy problems in a purely detached, experimental or mechanistic manner, i.e., without the participation of the subjects of the experiment in design, planning, and implementation.

Action research is experimental, however. Whether it be the application of technology, the setting up of new organizational or management systems, or the testing of social or economic policies, action research attempts to assess the validity of certain hypotheses, usually of a policy nature, as well as associated methodologies. These methodologies include any related to implementation of policy or

intervention (which can really be viewed as experimental hypotheses), as well as the internal methodologies of the experiment, i.e., the research design.

The essence of action research is that the entire experiment includes the participation of the target group, even in many, if not all, aspects of the research design. Clearly, this puts importance on the need for careful and appropriate monitoring and evaluation of the research. Monitoring and evaluation should be gradually and increasingly entrusted to the target group as their capability and confidence to undertake this task grows. The researcher's role increasingly becomes that of ombudsman or mediator to prevent the self-monitoring and evaluation from becoming either biased, myopic, or self-serving. There do not appear to be many hard-and-fast approaches to research design, implementation, monitoring, and evaluation in the field of action research. Nevertheless, careful documentation of methods and results is particularly desirable since the researcher is very much part of the experiment.

Action research has not been widely utilized outside of small group situations, in part due to its fluid and continually adapting nature. Nevertheless, it appears to have some promise as an approach to examining the policy and implementation aspects of integrated rural environmental development for the following reasons. First, a policy research group cannot afford to rely simply on a passive, academic research approach because the urgency of the problems involving these "critical land" areas demands immediate action. Second, while there is ample evidence of the many shortcomings of the conventional approach to rural development ("top down," for short), there are still many unknowns in designing and implementing a program or project that emphasizes the role of village participation in the design and management of interventions and activities affecting them. Nevertheless, the nature of these unknowns and possible solutions to them would likely be inadequately understood by an academic research effort that did not attempt specific intervention. Likewise, it is doubtful that the above questions of procedure and management would even be raised at all through the conventional project approach which rarely reaches beyond the level of conducting technical feasibility studies.

Central to the implementation of action research is the recognition that goals and means emerge from a dialogue between the researcher (or local government planner) and the target community. This process of participatory and interactive decision making has both horizontal as well as vertical aspects (see Figure 1). Horizontally, it occurs as consensus building among community groups for certain actions. Consensus is reached through a wide range of techniques including brainstorming, game playing, guided discussion, formal and informal surveys, and open dialogue, as well as the formation of farmers', workers', women's, and other task force groups.

This process is an essential part of the evolution of a suitable village management system, without which higher technological development or environmental management is unlikely. The alternative is technological and economic exploitation by outsiders or more

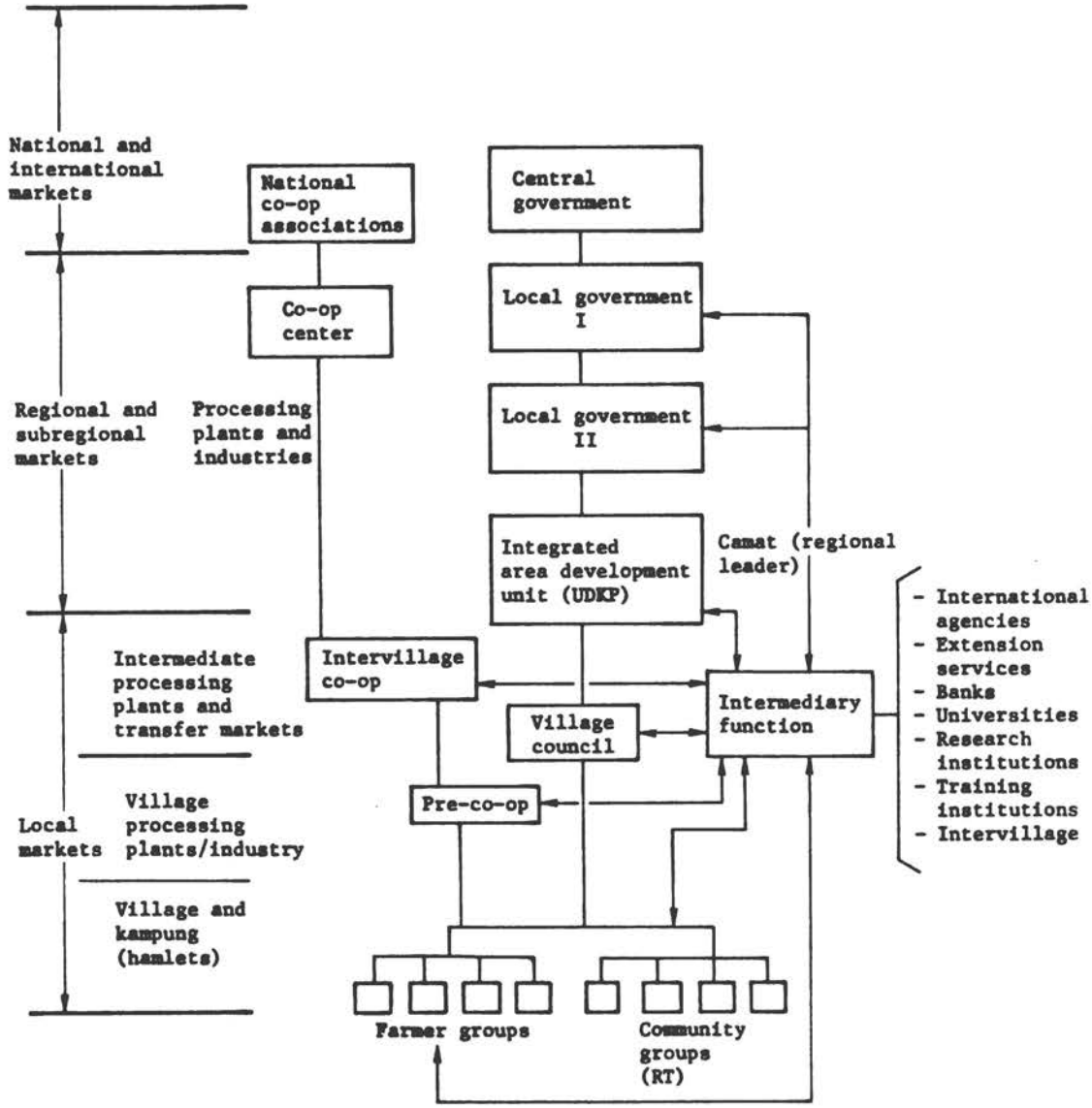

FIGURE 1 Theoretical model of integrated horizontal and vertical development and the role of the intermediary function.

powerful groups. The latter is a likely source of long-term social instability in the village setting.

Vertically, the participation process is located in the mutual planning and decision-making effort between village institutions and local government. This is clearly critical once a village's economy (with its infrastructural, marketing, and educational needs) begins to move beyond the subsistence or low-level equilibrium stage toward regional economic integration. The results of action research are really aimed at understanding management and planning processes and the

policies that both shape and determine the effectiveness of the development process as a whole. This aspect is very important. The more local levels of government can learn about what works and what does not work (and why), the more responsive they may be to local village needs. Also, it is becoming increasingly apparent that continuing poverty and rural stagnation may be due as much to mistaken and inappropriate national government policies as to traditional social and economic relationships or the misuse of resources at the village level. Very often, these policies have been developed in the absence of good information on local conditions and along purely sectoral policy concerns.

V. PROGRAM

5.1 Technological input. In the first phase of the development process, priority was given to changing the way the farmers manage their natural resources. The project has been successful in teaching farmers new production techniques and enabling them to choose crop possibilities according to their own perceptions of needs. Together with those technology inputs, organizational/management inputs were extended. Both kinds of inputs are of vital importance for self-propagating and supporting further development.

If, in the first phase of the project, emphasis was given to raising the income of the populace as a precondition for further efforts, in the second phase the priority should be shifted so as to increase rural productivity in a framework of continual quantitative assessment of land, water, and biological resources to meet nutrition, health, and employment/income needs, including resource conservation for sustained productivity and growth. Within this framework, the following priorities for research have been identified.

5.1.1 Production technology to optimize achievements made so far:

- Field testing of soil conservation practices, such as terracing, cover crops, contour plowing, and strip cropping, appropriate for each location at the farmers' level.

- Investigation of soil fertility improvement, such as the use of amendments (lime and fertilizers), nitrogen conservation practices, a conservation and recycling crop farming system, and nutrient recycling (manure and compost).

- Field testing of water catchment and distribution, study of water movement, and improved infiltration through higher levels of organic matter.

- Identification of potential biological resources at the local level and improvement of plant and seed collection, distribution, and storage; livestock, bee, and fish selection and multiplication.

- Research on cultivation using a combination of agronomic practices, natural enemies, and pesticides to reduce crop losses from pests.

5.1.2 Postharvest technologies:

- Research and testing of the existing food handling and on-farm or bulk storage and processing, emphasizing drying, fermentation and synergistic application, infrastructure and marketing.

5.1.3 Rural industry:

- Encourage the development of processing techniques (food industrial materials) to add value to the agricultural produce, services, and facilities.

- Investigate potential technologies of low-cost potable water, energy, and sanitation.

Through participatory planning and interactive decision making, the choice of interventions to be made should be such as to reduce as much as possible the great differences in job opportunities common to traditional agricultural practices, such as spreading them throughout the seasons. Activities should be ordered in such a way that they will be of an incremental, more sophisticated nature, each building upon the material and organizational achievements that went before. This will build up villagers' skills and organizational capacities to absorb and manage new technologies on their own, while maintaining their sense of self-sufficiency and encouraging the growth of local institutions.

5.2 Conceptual plan for institutional development. At this time, the Integrated Village Environmental Development Project in Cigaru and Segalaherang has yielded enough experience to permit some speculation on the nature of further development of the upper watershed. This is an attempt to present the current thinking of PSLH-ITB in the further development and elaboration of its action research. At this stage of the research, the focus is shifting to dealing with issues of horizontal expansion and further vertical integration of function and structures, while maintaining the integrity of the village development process itself. Two forms of further development are especially strategic:

1. Building up forward and backward linkages, such as generation of critical inputs and market penetration, based on the central inputs already in place, such as terracing and agroforestry.

2. Expansion of the physical area that can be sustainably productive.

These activities, not novel in themselves, should be based on the same concepts introduced in Cigaru: ecodevelopment, self-reliance, and community-based development.

5.2.1 Increased productivity, self-financing, and self-reliance as a basis for further development. The Ciamis Project has shown until now that it is possible to increase the productivity of hill farming in the upper watershed to about seven or eight times that of traditional rice cultivation in the area. Moreover, since dryland rice cultivation uses the limited amount of fertile, relatively flat land in the upper watershed areas, these productivity increases are likely to be much higher for secondary crops grown on improved slopes, marginal land subject to shifting cultivation (possibly a much greater area than presently tilled land). Income surpluses generated from increased productivity can be mobilized to make upper watershed development a self-financing proposition, assisted by external inputs through a credit system. Making such a financing concept work will depend on self-reliance. Until now the project in Segalaherang-Cigaru has been based on community involvement and institution building at the kampung (hamlet) level aimed at making the community self-reliant. It has generated the establishment of farmer associations and KUBEs (embryonic cooperatives) at the kampung level. These have become effective instruments in the management of kampung resources and development activities, but they are limited in their abilities to set up vertical linkages to get access to external agencies. At this stage, these institutions lack the necessary knowledge and legal status to make use of these external resources. Marketing abilities are also still limited, which puts certain constraints on production levels.

It is self-evident that expansion of the terracing and integrated farming area cannot be sustained only by community self-reliance at the kampung level without coming to grips with problems of marketing, transportation linkages, credit facilities, etc. On the other hand, vertical development and integration of linkages (social, economic, political, and administrative) are hazardous propositions, which cannot be expected to come about without external assistance sympathetic to the village community's needs. Existing practices of induced development "from above" to speed up the establishment of these vertical linkages without first preparing the communities have resulted in costly operations or outright failures. Depending only on the private sector to assume the role of change and development agent, linking the village to regional and national structures, without preparing the communities first, will undoubtedly create a dependency situation which can also be exploitative, as has happened in many instances.

5.2.2 The role of the intermediary function in the development process. PSLH-ITB's team in the field has acted in effect as an intermediary agent, which fulfills several functions at the same time: motivator, catalyst, communicator, and intermediary among village groups, between these groups and the village and local government bodies, and between community and research institutions and

universities (see Figure 2). It has helped the village community carry through a process of change at the early stages in its development, getting themselves organized to utilize their resources more effectively and efficiently. It is this stage in the development process that sets the stage for further actions of a more complex nature. But it is a crucial stage, and one that can be compared with laying down the foundation for the forthcoming structure.

The idea of institutionalizing the "intermediary function" in the development process has come out of PSLH-ITB's experience in the field. It is only a logical step from an ad hoc group to one that can be conceived as having a permanent function of helping other village communities go through the same process of change. Moreover, this is a necessary step if we are to prove the replicability of such an approach and create the necessary expansion of such development to permit the achievement of PSLH-ITB's goals for the whole watershed region. However, how can such an intermediary agent be financed in such a way that it can act as an independent body, sensitive to local needs and politics, adaptable in its mode of operation to the unique local conditions during the early stages of the development process, but politically strong enough to have access to decision making at higher levels of government in order to create the necessary positive climate under which such a development process, at the village level, can take place.

The idea of a "nonprofit, nongovernmental technical service organization" with a board of regents or trustees consisting of members of local government, the village communities and local communities, and universities seems to have merit in terms of acceptance by all parties in the development process. The local or regional development bank can also be made a member of the board, where appropriate. The hardest part of this institutional development is to conceptualize how to make its "intermediary function" truly independent in the development process, so that it can act as an effective mediator in resolving inevitable conflicting interests. Obviously, a dependency on funds coming either from government, commercial, or banking sources alone can jeopardize this function and cause the "intermediary function" to lose its credibility in the development process. Therefore, it is necessary that the community also be able to contribute to the income of the "intermediary function."

Experience in the field has proven that it is possible to get contributions from the farmer in a form that is "culturally acceptable." Payment of fees for consultancy services based on contractual agreements is a mode of operation that is likely to fail, in part due to the inequality of management and financial expertise at such a level. But entering into a crop-sharing operation, whereby the "intermediary function" takes a share of the output but also incurs the same risks as the farmer, is something that the farmer can readily understand and respond to. In a way, this is a mode of operation very akin to the traditional middlemen, who provide loans to farmers with high interest rates and other unfavorable loan conditions, which the latter must accept because no alternative exists.

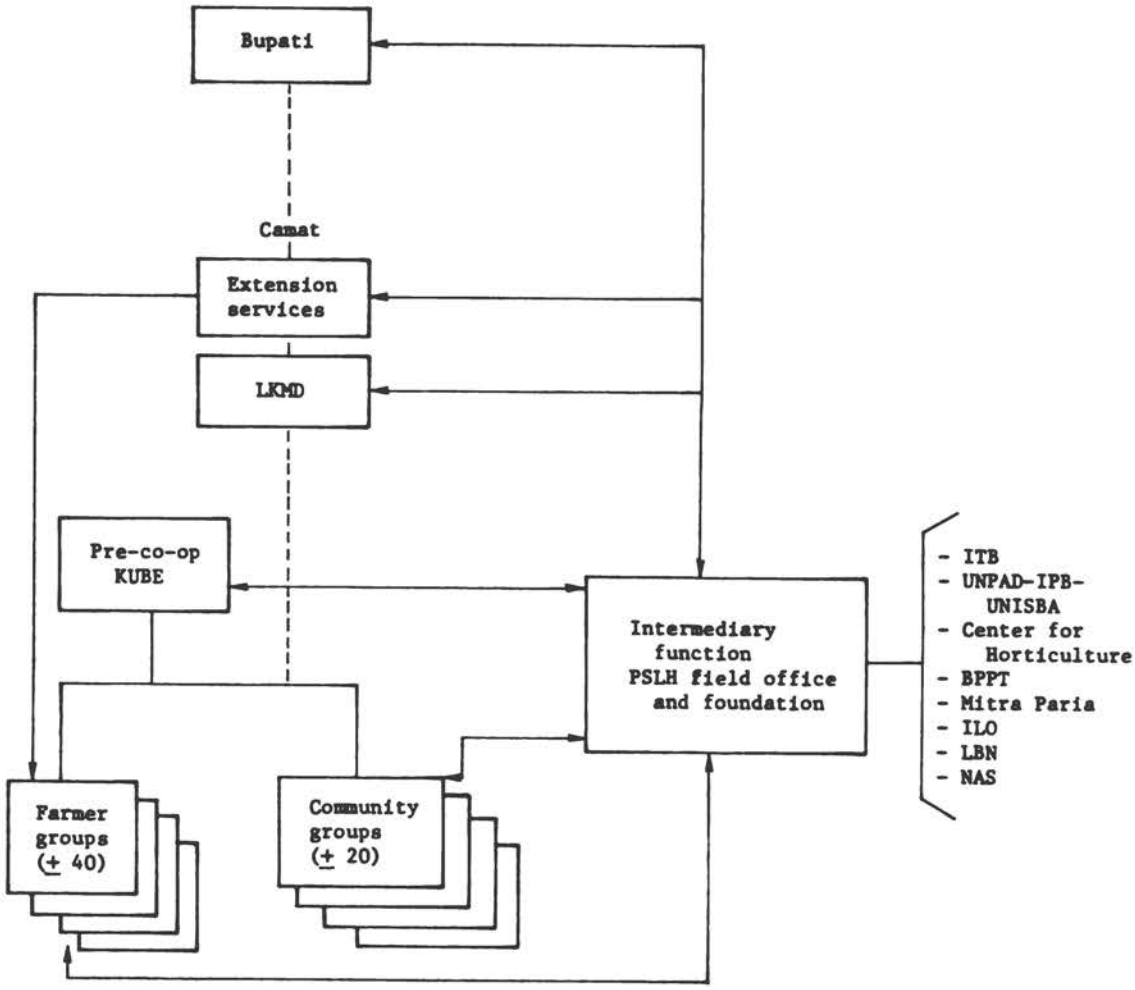

FIGURE 2 Project's situation as of November 1982.

The Nongovernmental Technical Service Organization (NGTSO) envisioned herein can begin crop-sharing operations at the level of 30-40 farmer groups (PSLH-ITB is now working with 24 of them). This level can be achieved easily within one year, using grants from development banks to finance credits to the farmer groups, which can be revolved locally to expand operation with other farmer groups within the area. These "grants" are high-risk "threshold projects," designed to prepare farmer groups to organize themselves in order to become eligible to get credits from the banks on their own. The function of the NGTSO is to motivate farmers to organize themselves into working groups to terrace their land, each group having a membership of 20-25 farmers with a combined land ownership of about 5 ha. Within one year it should be possible to channel credits, technical assistance, seeds,

fertilizers, etc., and achieve a return on the investment to be revolved for a second and perhaps a third time within the same working groups until they are prepared to link themselves up to ordinary credit and extension service systems. During those years, the NGTSO may become a member of the groups and get its share of the crop. It also prepares the farmer groups to establish embryonic cooperative movements, to train cadres, and to provide general technical, marketing, and management assistance to them and to the community as a whole in their development efforts. All kinds of external inputs can be channeled into the village from government bodies, research institutions, and universities through the NGTSO who, as intermediary, understands local needs and has trained personnel to get the parties involved in a creative and productive dialogue.

When farmer groups, farmer associations, and KUBEs are firmly established, crop-sharing arrangements between the NGTSO and the farmer groups can be terminated. The farmers can then get their credits and technical, marketing, and management assistance from a village unit cooperative (KUD) through the KUBE and government extension services. The outstanding shares of the NGTSO can be sold (or given over) to the KUBE, where the cadres created by the NGTSO can perform the same services through the KUBE and can be financed by those shares. The NGTSO then moves to another area to assist other communities in setting up the same institutions and to engage them in crop-sharing operations.

After a certain size of operations has been achieved, the NGTSO assists the farmer associations and KUBEs in forming a KUD. At this level, certain agricultural products must have reached a volume of output which makes it possible for the KUD to invite private entrepreneurs to enter into a joint venture arrangement in agricultural product processing. At later stages in the development process, a division of labor and specialization between villages can be introduced, taking advantage of the different characteristics and resource endowments of village environments in order to achieve still higher levels of productivity. Dispersed agricultural processing operations in small plants and home industries, utilizing labor-intensive but productive methods, can precede the establishment of bigger and more centralized processing units under a joint venture arrangement among KUD-NGTSO-private entrepreneur, so that some of the added value in processing stays at the lowest community levels. Initial processing at the village level, of course, also helps the goal of retaining agricultural waste at the kampung level with added economies in production, such as lessening transportation costs to central plants, decreasing waste products at the central plant which could easily become an environmental problem at that scale of operation, and utilizing waste products at the kampung level for organic farming, adding further to an overall level in productivity. In all these operations, the NGTSO can be of assistance to the cooperatives and communities, obtaining its "fees" in the form of shares in the processing plants. The idea of the NGTSO as shareholder in a mixed enterprise between cooperatives and private entrepreneurs is also to strengthen the bargaining position of the cooperatives, where the NGTSO can act as advisor to the cooperatives and exert its weight on decision making as a shareholder.

An overview of the operation of the NGTSO is given in Figure 3. It is a two-way process: (1) expansion of area for farming, especially environmentally critical areas in the upper watershed, and (2) vertical expansion and integration of operations and institutions.

5.2.3 Integrated development: a synthetic view. A productive "greening program" as part of erosion and flood control is an important part of the upper watershed development, seen from the point of view of the sectoral departments in charge of it. The programs cannot be successful, however, without the support of the village as a whole. The greening program must, therefore, be viewed as part of the total development concept, which is dynamic in nature in space and time.

The entry point at which villagers become motivated and mobilized necessarily differs from village to village. It may be terracing and integrated farming in one village if it has already been prepared for it, or it may be a water pumping system or nutrition and child care in another area. It depends upon what the community perceives as its major problem at that time. For the NGTSO, the entry point is the venue through which a community can be motivated to become involved in participatory planning and interactive decision making, the processes that start a chain of events and actions which later develop into a network of interdependent activities.

Integrated development at the grass roots level forms the building blocks, or the microstructure, on which upper watershed development rests. The superstructure, or the meso- and macrostructures, is already there and may contain powerful forces detrimental or sympathetic, alien or neutral to the microstructures. The role of the NGTSO is to mediate in the process of integrating micro-, meso-, and macrostructures.

Resources are already being made available for all kinds of programs directed toward development of the whole river basin. But it has been observed in various circles that there are serious obstacles in using those resources efficiently and effectively. The feeling at this time is that integrated village development is an expensive operation, the cost of which cannot possibly be borne by the government alone.

Integrated village development, as has been advocated by PSLH-ITB, is seen as a way to mobilize local resources to match programs from above. Preliminary estimates seem to indicate a huge potential for financing this effort with far fewer resources than are now being expended through government-run projects. The key to this concept is increased rural productivity and the self-reliance of rural communities, developed in such a way so as to retain as much added value as possible within the village in order to accumulate capital for local development. Superstructures developed through these activities are designed to be supportive of grass roots processes, and not coercive mechanisms (as may be the case in "top down" development) nor exploitative (as in centralized production operations by the private sector). The essence of the concept advocated above is to create a new synthesis of "top down and bottom up development," which is not seen here as a dualistic phenomenon. Rather, it is a structural continuum

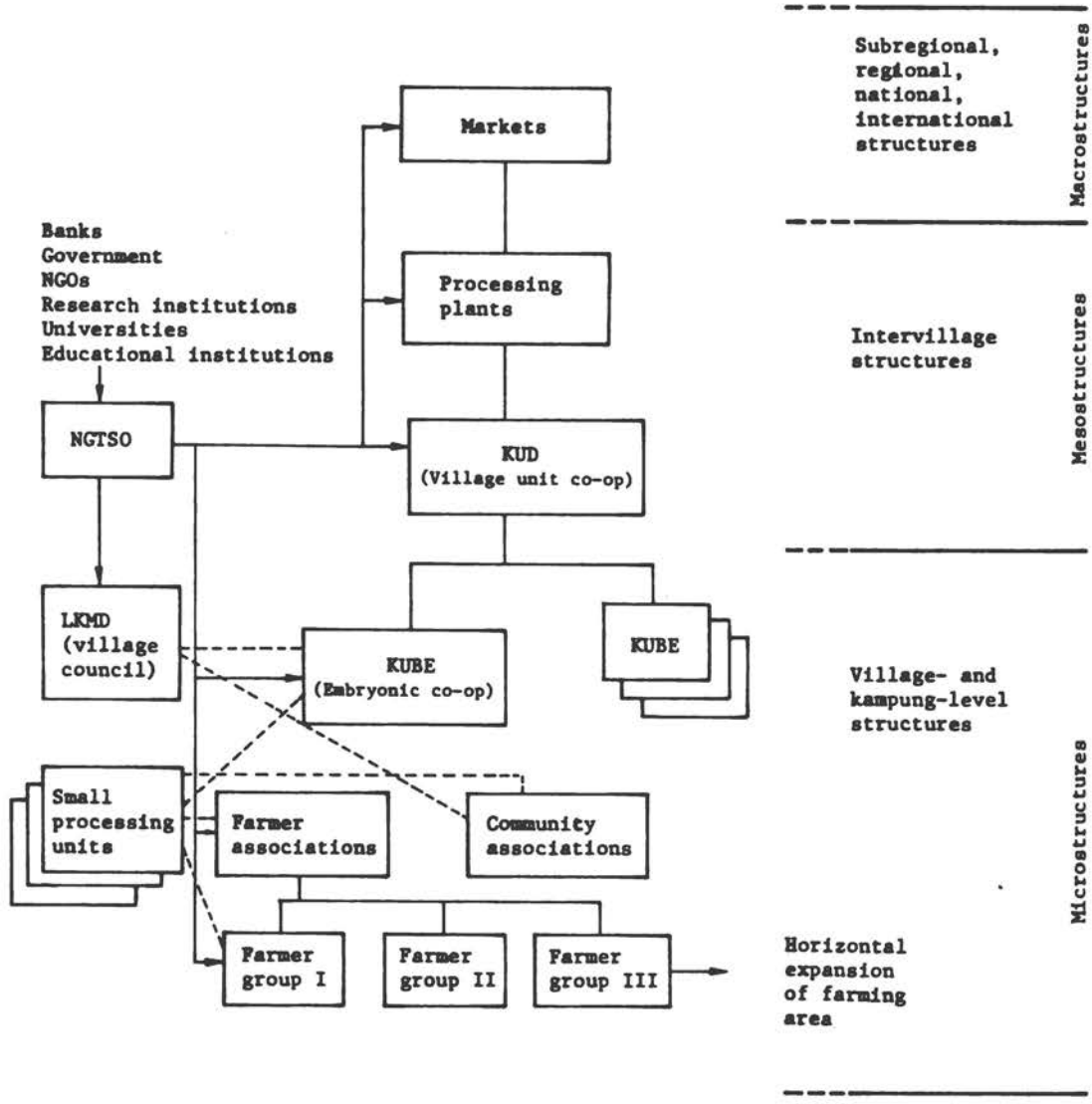

FIGURE 3 Role of the NGTSO in horizontal expansion of farming area and vertical development and integration of micro- and macrostructures.

in time and space, socially, economically, politically, administratively, and physically developed through participatory planning and interactive decision making on various levels, using the National Development Guidelines (GBHN) as a platform for resolving conflicting interests. Growth with equity and environmentally sustainable development are two principles that are highly significant in this respect, and that are contained in the document.

5.2.4 Concluding observations. In retrospect, what has been presented above is a conceptual model for upper watershed development (see Table 1). In many ways, it is still speculative and untested, and

TABLE 1 Institutional Development: Tentative Program for Upper Watershed Development in the Citanduy Area

1982/1983	• Tryout of crop-sharing concept on upland farming: ± 400 ha, 2 subriver basins • Consolidation of institutions and linkages • Training of cadres
1983/1984	• BAPPINDO "threshold projects" • Escalation of crop-sharing operations: ± 1,500 ha, 4 subriver basins • Vertical integration and establishment of seed farming system, extension system, credit co-op, marketing
1984/1985	• Crop-sharing operations increased to ± 2,500 ha/3,000 ha • Establishment of processing plants on village and regional levels

there is no empirical evidence to fall back on. Therefore, a new methodology has to be devised and tested in the field to acquire new insights and knowledge. The entire project should be seen as a learning experience for all parties involved. The project is ambitious, but the alternative is to accept defeat.

VI. MANPOWER AND ORGANIZATIONAL SET-UP

6.1 The Center acts as a mediator between the villages, the local government, and other interested nongovernmental groups or universities. The following is a list of several project components, the various parties involved, and the possible funding agencies.

Program Component	Funding	Task Force
6.1.1 Baseline studies		
• Quality of land, water and other resources		
• Life-style studies	Until 1984	PSLH-ITB
• Monitoring and evaluation	PPLH	
6.1.2 Production technology		
• Soil conservation/improvement		BPPT/Pert IPB/Unpad
• Soil fertility		
• Water management		
• Biological resources		ENVI-BIOTECH
• Pest control		
6.1.3 Postharvest technology		
• Crop handling	Community and private	ENVI-BIOTECH
• Storage		
• Processing		
• Marketing	BAPPINDO	
6.1.4 Rural industry		
• Construction materials	P.U.	BPPT
• Handicrafts	Community and private	
• Services, facilities	BAPPINDO	
6.1.5 Rural technology		
• Potable water	(Dutch)	ENVI-BIOTECH
• Energy	ILO	PSLH-ITB
• Sanitation	Community and private	ENVI-BIOTECH

STUDY PROGRAM:

INTEGRATED RURAL ENVIRONMENTAL DEVELOPMENT

Program Studi Pembangunan Lingkungan Pedesaan Terpadu

Steering Committee:	Prof. Ir. Hasan Poerbo, PSLH; Pepunas/Butsarmas
	Prof. Ir. Sayogyo, IPB; Pepunas/Butsarmas
	Prof. Dr. Sulianti Saroso, Depkes; Pepunas/Butsarmas

PSLH:

Project Officer:	Dr. Poerwo Arbianto, PSLH
Project Manager:	Dra. Julinah Trihadiningrum, PSLH
Field Coordinator:	R. Rachlan, B.A., PSLH
Monitoring and Evaluation:	Dra. Widanarto, PSLH
	Ir. Suzanna, PSLH

Yayasan Bina Lingbungan Pedesaan Terpadu (YBLPT):

Project Manager:	H. Mansur
Assistant Project Manager:	Ir. Billy Hindra
Field Manager:	Ading Gunadi, B.A.
Field Staff:	Ir. Koswara
	Yusuf Sanmarbis, B.Sc.
	Tatan
	Herman
Consultants:	D. Killgore, Ph.D. (Agriculture)
	Herbagiandono, B.Sc. (Agriculture)
	Dra. Yudistira (Anthropology)

APPENDIX D

The Integrated Development of the Batumarta Transmigration Project: A Target for Action Research

BACKGROUND

Several goals central to any transmigration project are:

- A population movement to achieve higher levels of welfare and prosperity
- Achievement of higher levels of living in the longer run in the new settlement area, relative to the settlers' origins
- Promotion of social transformation through programs of agricultural and rural development.

The MET-IPB [Institut Pertanian Bogor] monitoring study at Batumarta has indicated that the slow progress observed has been due to a lack of joint and concerted efforts by government agencies in the region. As a consequence, the growth of various sectors, e.g., economic, social, and administrative, has been retarded.

In the economic sector, some of the bottlenecks have been low soil fertililty and inadequate inputs of production factors resulting in low farm productivity. Both a weak organizational life and a lack of appropriate technology have added to the failures mentioned above.

An insignificant response to price fluctuations on the part of the settlers has been recorded, perhaps caused by insufficient subsistence-level needs at initial stages and the quick emergence of spatial monopsonistic phenomena, leaving only a tiny market share to the farmers.

Socially, the emergence of new community structures was slow, leading to indecisiveness where firm joint communal activities were required. Heterogeneity of geographic origin as well as slow progress in group formation may have been the causes.

This document was prepared by the Center for Environmental Studies, Bandung Institute of Technology.

In the administrative sector, local government involvement had been rather poorly planned so that concerted efforts by the project and the local government administration hardly occurred.

Very few joint programs, if any, have been designed together, for instance, to:

- Set up an agricultural production scheme including standardization of farmland acreages, selection of crops to cultivate, utilization of available labor, etc.
- Formulate a basic needs program including training and extension in health care, housing, nutrition, energy utilization, etc.
- Stimulate the growth of need-satisfying organizations and new institutions through (target) group motivation.

All, in fact, are conducive to a successful social transformation. Such a comprehensive approach in the action research envisioned seems to be required.

ACTION RESEARCH GOAL

It has been recognized that the goals of an action research would comprise:

1. Searching and, through limited tryouts, examining joint planning procedures, coordinated implementation, and integrated area development.
2. Formulating operational steps toward the realization of an integrated development of the settlement area, also in harmony with the larger region in which the settlement area is located.

ACTION RESEARCH PRINCIPLES

Several principles are included in the notion of Action Research:

- Comprehensive knowledge of socioeconomic problems relevant to the locality as well as administrative insights are needed to formulate a strategy for development.
- An understanding and application of the systems approach are necessary.
- Social research is conducted via a process of learning while doing.
- For the process of experimentation, the needed supply of "hardware" should be granted.
- Administrative decentralization in planning, executing, and financing matters should be allowed for limited time periods.

In formulating the overall strategy and in the process of program implementation, certain activities cannot be avoided, such as:

1. Monitoring of development in its complexity.
2. Formulating a long-term development perspective for the area.
3. Implementing short-term (2-3 years) projects to strengthen the basis for long-term plan implementation.
4. Maintaining a strong consensus on concepts, approaches, ideas, and operational steps to be taken.
5. Intervening in urgent cases--at times quick corrections are needed to prevent unnecessary deviations.
6. Agreeing on the implementations of small-scale tryouts.

ACTION RESEARCH SCHEDULE

With the research goals and principles indicated above in mind, an attempt has been made to outline major activities in a schedule covering a period of 5 years.

Year 1

With regard to agricultural productivity, more intensive investigations into possibilities of improving soil fertility will be conducted. This also implies tryouts in selected plots for liming and phosphatizing, the results of which will become apparent in the same planting season.

Tryouts with regard to terracing will be carried out with the help of small groups.

Water availability for various purposes such as drinking, sanitation, sprinkling, and fish ponds, will be surveyed in greater detail.

Calorie, protein, and crucial vitamin intake among settlers by status and cultivated landholding will be further scrutinized. It may also add to information regarding percentages consumed and percentages sold of the harvested crops, or even percentages of food purchased.

In the socioeconomic sector, other aspects such as preparing the foundation for healthy crops and appropriate credit system will be examined. Informal leadership involvement will be designed. Strategies to counterbalance monopsonistic practices by middlemen have to be developed in collaboration with the local/regional cooperative office as well as with the Indonesian People's Bank. Administratively, procedural structures and processes have to be formulated and agreed upon with the local government agencies and with the private sector.

Year 2

In the agricultural sector, cropping pattern experiments with food crops as well as perennials will be started on farmers' plots that have been treated with lime and phosphorus. Comparative research is to be

undertaken using selected terraced areas and "untreated" ones, where lime and phosphate have been applied and where they have not.

Marketing problems at the end of Year 2 and presumably continuing well into Year 3 will be studied, and questions relevant to marketable surplus, storage, and marketing channels will be dealt with.

Social organizations will have to be created or strengthened in the settlement area, starting with the co-ops in Units I and II, but not excluding others of dormant capabilities and potentials. Stimulating the growth of such organizations is part of the action research at this stage.

The performance of the rubber business will be more thoroughly examined since larger areas and more farmers will have the opportunity to derive incomes from this sector.

While, as it is assumed, economic opportunities grow, the expansion of cultivable plots (2-4 different locations) will be recorded to learn about the farmers' inclinations to do so.

The attraction that the settlement area may have on a second wave of new migrants (by using sample units, if needed) will be measured with the help of relevant local government agencies.

Year 3

The intensive cropping pattern research will continue using different food and second crop combinations, both on limed and phosphate-treated soil, as well as terraced versus nonterraced trial plots as in the preceding year.

Similarly, research on marketing problems, and the performance of co-ops, banks, and credit facilities will continue.

Postharvest practices will be scrutinized to understand fully their impact on farmers' activities in the agricultural sector.

Three years after the rubber businesses come into operation, it will be time to assess their impact on the total farming system comprising food crop and perennial crop cultivation.

As the settlement area may have been transferred to the project (to the regional administration), close observations will be made of the facilities and services gained (or perhaps lost) in the post-transfer period. Some recording of available facilities is now available.

An assessment of tax potential (IPEDA) will be made on the basis of farmers' performance in the field in order to provide the local government with more precise information and data. For further area development, a projection of regional income sources will be made.

An evaluation of the improved or at least expanded infrastructure and the further integration with the surroundings and older settlements of indigenous people will be made, particularly through the use of markets and other facilities, extension services, and joint social organizations.

Year 4

A comprehensive report of the previous 3-year period of action research will be presented and discussed in the first quarter of the fourth year in order to outline further activities up to the end of years 4 and 5. Consequently, no budgetary commitments are due before Year 4 of the action research program.

However, if the research budget is in one way or another connected to a loan, the total action research budget could be committed for a 5-year period, subject to a review in the fourth year after commencement.

The action research team commits itself to preparing a manuscript worthy of publication in Year 4, and, in the case of a 5-year commitment, a second report after termination of the 5-year action research period.

The action research report should clearly indicate operational steps at various stages of the integrated development of the transmigration settlement concerned.

Appropriate manuals for cropping pattern implementation, cooperative development, and improved market operations will be developed.

The major elements and mechanisms of an appropriate farming system (on upland) for the region is to be clearly indicated and described.

ORGANIZATION

The action research team working in the Batumarta area is subordinated to a supreme Steering Committee at the ministerial level, which may convene at certain times of the year to review the progress of the research team.

For handling the day-to-day operations, team and sub-team leaders will meet regularly, i.e., weekly or fortnightly (to be decided by consensus). Whatever the interval, however, regularity and continuity in action research are even a more stringent requirement for the researchers involved. A strong commitment by each should be the condition on which the team can operate effectively.

Some of the basic expertise needed is as follows:

- 1 soil scientist
- 1 agronomist and seed specialist
- 1 farm management expert
- 1 area development expert
- 1 rural sociologist
- 1 marketing expert
- 1 ecologist/human ecologist.

The entire research team is to consist of a three-tier organization (see Figure 1). Besides the core team of three members with expertise as indicated above, there will be a field staff, constituted on the basis of emerging needs and more ad hoc in nature.

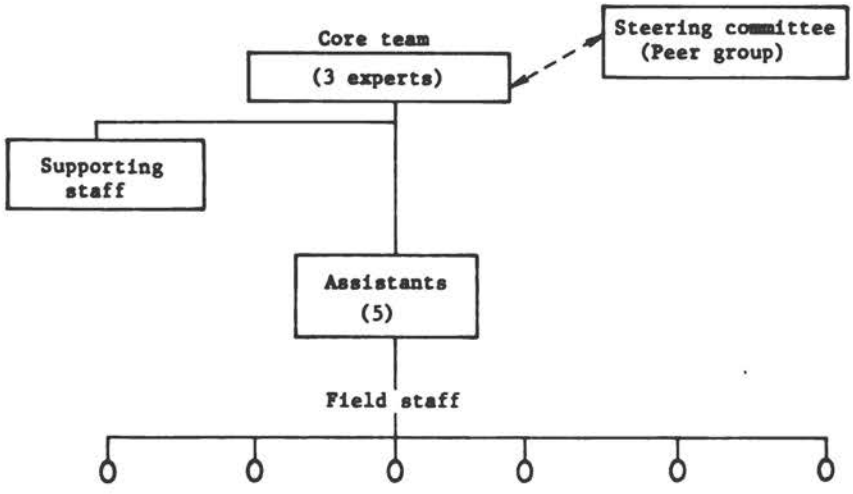

FIGURE 1 Organizational structure as a Project PSP-IPB.

For periods up to 1 year, honorary field staff may be recruited from local government officers, such as a variety of extension workers and animators. They will form a link between the service organization concerned and the public or client.

To maintain good communications between core team members and the field staff, a group of assistants is needed to act as liaison officers in case core members cannot go into the field.

It is difficult to foresee how many field staff members there will be at any given time; however, for budgetary purposes it may be fixed at a maximum of 120 man-months per year.

The core team members should commit themselves to a 2-year service term and assistants to a 1-year term. The field staff members will not be employed for longer than a 1-year term, though employment is renewable after the maximum and also for shorter periods.