Food and Agricultural Waste Development Projects

Planning and Management

Edited by
Louis J. Goodman
John N. Hawkins
Tetsuo Miyabara
Food and Agricultural Waste Development Projects
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Preface and Acknowledgments

The key to economic and social growth in all societies, developing and developed, is a better understanding of the complex processes by which projects are identified, approved, implemented, and evaluated. Unfortunately, the majority of development projects have often floundered because of serious problems with project planning and implementation. In addition, too little attention was devoted to the critical relationship between economic growth and social equity until the 1970s.

Strategies for development have become increasingly complicated by the dramatic increases in the costs of petroleum since 1973-74, and the resulting global economic and social problems. There is outstanding need for more efficient international cooperation to solve the worldwide problems of inflation and unemployment. The situation has reached a crisis in many developing countries, where hundreds of millions of people live in poverty with little or no opportunity to obtain adequate food, potable water, health care or other basic needs of humankind. However, problem-solving, policy making, and planning are ineffective and incomplete unless manpower resources and administrative procedures can be created to implement national and local decisions.

Most studies of the problem have found that developing nations simply do not have adequate institutional capacity or trained manpower to plan and implement projects effectively. At the same time, experience demonstrates that traditional (Western) project management education and training programs are not meeting the needs that both developed and developing countries have for project managers who can provide unified control over all phases of integrated planning and management. The unfortunate results are costly mistakes in the United States as well as in other countries. This experience is reinforced by the cruel fact that there has been only a negligible increase in the quality of life of the poor throughout the world, in spite of the billions of dollars expended for development since the 1950s.
In response, the East-West Center and its partner institutions in Asia, the Pacific, and the United States established an international interdisciplinary team of senior scholars and practitioners to design and develop new strategies and curriculum materials to address the problem. The foundation of the curriculum is a series of 31 case histories of development projects from the different sectors, focusing on the policy and administrative-managerial issues and the lessons to be learned from each case. Each case has been researched and written in the conceptual framework of an integrated project planning and management cycle (IPPMC), which is described in Chapter 1.

This book is the sixth and last case book in the East-West Center's series on planning and management. The General Editors and their many colleagues who have contributed to the six books have learned much from this intensive international cooperative effort. The outstanding lesson is that the project manager is a link in a chain that exists in an administrative and political environment. Accordingly, the introductory chapter will focus on the continued need for more effective planning and management of development projects. It will also briefly describe the two food project areas and the utilization of agricultural wastes to manufacture paper that are discussed in depth in the three case histories in Chapters 2, 3, and 4. These cases were selected because 1) the projects cover two increasingly important components of food systems – aquaculture and the recycling of agricultural wastes to create jobs; and 2) there is a continued need for cases that illustrate policy and research issues of economic and social progress and related administrative, managerial, technological, and political factors. Chapter 5 summarizes the case findings, and analyzes a number of broad policy and research issues relating to economic and social development. In addition, it contains an epilogue on the lessons for future development projects.

The writing of this book would not have been possible without the collaboration and cooperation of many senior scholars and practitioners and their institutions in Asia, the Pacific, and the United States. The General Editors wish to convey their warmest thanks and deepest appreciation for the many contributions. Space does not permit adequate acknowledgment of each person and institution involved in this international cooperative project effort at the East-West Center's Resource Systems Institute (RSI), but special thanks are due to the authors of the cases in this book. In particular, special acknowledgment is given to Jim Wang for his critical review of Chapter 1.

A special note of thanks must go to Vicki Nelson and RSI writer-editor Barbara Yount for their advice in working closely with the General Editors in the editing of the manuscript. Thanks are also extended to Regina Santerre, M.A. student in geography from Sri Lanka for her critical review of the technical aspects of Chapter 2; and also to UCLA secretary Peggy Lockwood, RSI secretary Deborah Van Hoosen and research intern Jean Brady for their editorial assistance and preparation of the index. Lorna Emdy and her student assistant Rose Medina are warmly thanked for the patience and understanding they showed while typing the various drafts of this manuscript.
The General Editors and their many colleagues hope the impact of this cooperative project which has produced a basic text and five complementary case books, will result in better planning and management of critical resources so vital to the well-being of humankind.
Introduction

Louis J. Goodman
John N. Hawkins
Tetsuo Miyabara

The ultimate objective of development in all societies must be sustained improvement in the well being of the individual, as well as equitable distribution of the benefits within the society. Inherent in this objective are the problems of employment, income distribution, and proper allocation and distribution of resources. The global implications are profound and complex as evidenced by the increasing attention that national governments and international funding agencies give to these problem areas, including related social, economic, technological, and political issues in both developing and developed countries.

The development strategies of the 1950s and 1960s were primarily focused on increasing the Gross National Product (GNP) of the developing nations. Although the data on the GNP and per capita income of the developing countries indicated impressive economic growth, these figures disguised the critical fact that the benefits of the development programs were concentrated in small sectors of the population creating, in the words of the World Bank's former President Robert McNamara, "islands of affluence in oceans of poverty." Moreover, the gap between the rich and the poor will continue to widen unless major changes occur in development strategies and mechanisms. One positive outcome, however, of the postmortems and analyses of what went wrong in previous development strategies and programs has been the increasing emphasis on development projects for the rural poor.

The major challenge of the 1980s and the decades ahead is to focus attention on the most urgent development priorities of that vast segment of the population living in subhuman conditions, namely, to provide food, clothing, health care, and shelter by raising the productivity of the rural poor. This change in development thinking is the major thrust of a World Bank study that resulted from President McNamara's annual address to the Board of Governors of the World Bank Group in 1973.(1,2)
Yet some 800 million people, according to recent World Development Reports,(3) still live in absolute poverty — a condition of life characterized by unemployment, malnutrition, illiteracy, disease, squalid surroundings, and low life expectancy. Since approximately 20 percent of the world population (4.25 billion as of mid-1978(4) are not receiving enough food, it is increasingly clear that the world food system is not working adequately for many countries. Furthermore, most of the hungry and malnourished people live in developing regions, where population growth rates are among the highest and employment opportunities among the lowest.

This chapter briefly reviews development project areas that could achieve a substantial degree of success in providing both food and employment for the rural poor. The focus, however, is on administrative capacity — the ability to plan, design, implement, and evaluate projects — because most funding agencies do not place enough emphasis on administration.

PROJECTS TO MEET FOOD AND EMPLOYMENT NEEDS

Various programs and projects costing billions of dollars have been undertaken in many Third World countries that are principally aimed at reducing poverty, modernizing the agricultural sector, and accelerating rural development through infrastructural facilities (for example, irrigation, dams, roads, and bridges) and rural services (such as health, education, credit, and family planning). Although the main thrust has been on the development of the rural sector, the overall impact of international assistance and lending programs has not sufficiently altered the overall basic condition of rural poverty and underdevelopment.(5)

A major obstacle to the achievement of developmental goals, as well as to an increase in the flow of capital to developing areas, continues to be a basic inability to identify development needs and projects, to formulate plans, and to implement projects properly. The three case histories selected for this book provide useful examples as to how these obstacles can be resolved. The following sections provide brief discussions of each of these three projects.

Aquatic Food Sources

Fish are an important component of total human and animal food intake. They are nutritionally equivalent to meat in protein, low in saturated fats, and high in essential minerals. Moreover, fish are acceptable to people in some areas suffering from malnutrition where there are cultural inhibitions to the use of other animal foods. At least 850 million people in the Pacific basin, Southeast Asia, the Indian subcontinent, coastal Africa, and South America derive 50 to 85 percent of their animal protein from fish harvested from coastal zones, estuaries, and fishponds.
In 1978 the estimated total world catch of fish was 73.7 million metric tons (MMT) with a breakdown of 35.2 MMT by developing countries and 38.5 MMT by developed countries. These estimates include all aquatic organisms except whales and show a further breakdown of 57.7 MMT for food purposes and 21.0 MMT nonfood fish for industrial purposes. About 86 percent of the total catch is from the oceans and the remainder from fresh water. Some six million metric tons were obtained from aquaculture or fish farming, mainly in fresh water.

Given this brief background, Chapter 2 documents the conceptualization and development of SEAFDEC (Southeast Asian Fisheries Development Center) in the Philippines. This freshwater fisheries station was intended to evolve new and improved techniques for the culture and mass production of freshwater species. Two significant outcomes of this project were the maximum utilization of indigenous resources, including the development of new technologies in fish culture; and the later linkage of SEAFDEC with the Ministry of Human Settlements to develop similar fishery projects in different parts of the country.

Livestock

Animal products are a major part of the world's diet. In the United States, livestock produce two-thirds of the protein, one-half of the fat, one-third of the energy, four-fifths of the calcium, and two-thirds of the phosphorus for human consumption. In the developing countries, animal products are a much smaller although still an important part of the diet; they provide 10 percent of the calories and 20 percent of the protein.

Animals increase the supply of food for humans by consuming resources that otherwise would contribute little to feeding people. These include forages from grasslands and other ranges, plant byproducts, cellulosic wastes, crop residues, and browse. These resources are best suited for use as feeds for ruminants such as dairy and beef cattle, water buffalo, sheep, goats, llamas, and alpacas. Other resources are best suited for swine and poultry. These include roots, nuts, insects, vegetables, fruit crops, garbage, animal wastes, animal byproducts, plant byproducts, and plants with only moderate fiber content. Edible coarse grains may be used by all livestock and poultry when the supply of these grains exceeds the amount needed by humans. In some countries, small animals such as guinea pigs, rabbits, and game animals eat certain feed resources not used by humans. Crop production will continue to yield plant materials inedible by people but acceptable for animals. On most croplands almost one-half of the total digestible energy of the plants is left after harvest. Two-thirds of the world's agricultural land is in the form of permanent pasture, range, and meadow, of which about 60 percent is not suitable for cultivation. Food processing and industrial wastes also can be used by animals.
The case history in Chapter 3 thus examines state and local government involvement in the development of a livestock feed grain, slaughterhouse, and meat packing industry in the North Kohala district on the Island of Hawaii in the United States. It analyzes the difficulties of a government-financed project designed to effect self-sufficiency in meat production, the problem of insufficient supervision and control in project implementation, and the limitations on achieving agricultural self-sufficiency in a rural area. The case history focuses on the problems and politics of planning, supervision and control, and management of a development project in an isolated community located in an island setting.

Mini-Paper Plant

One of the massive problems faced by many developing countries is high unemployment coupled with underemployment. In addition the composition of the population in most of these nations includes large numbers of young people who are now, or shortly will be, joining the labor force, compounding existing unemployment and creating more severe pressures for the creation of additional employment.

An associated problem in many of these countries is the continuing rural-to-urban migration, generated in part by the quest for employment opportunities.

One of the approaches that can help solve these and other developing country difficulties is the generation of industrial activities in rural areas. Such industries could create employment opportunities and new income in the rural areas and, conceivably, reduce the population migration to the urban centers.

There are, of course, inhibiting factors connected with rural industrialization. Rural industries tend to be small in size, unsophisticated in technology, limited in markets, hamstrung by inadequate capitalization and by lack of access to technology, and unresponsive to factor changes. The owners tend to be self-made entrepreneurs with little education or managerial training. In addition, rural areas frequently lack infrastructure that industry needs.

The small-industry segment in many developing countries tends to be owned by nationals, whereas medium-size and large industries tend to be foreign-owned. Hence, the home government needs to ensure that a viable small industry sector exists. Many governments have already recognized this need and have accordingly developed programs to encourage this type of industry.

Small-scale industries tend to be numerous, diversified as to product, and marginal in profit-making capability. Therefore, they are too small to support staff specialists who could solve many of their relatively simple problems of management, manpower, training, purchasing, production, and sales. Specialists or professionals in these fields are in short supply in most developing countries and generally would not be available even if the rural industries could support them.
The case history in Chapter 4 describes the development and implementation of a mini-paper plant in a rural area of India designed to meet a paper shortage and to create jobs, involving both professional and technical personnel. Using locally available but unutilized agricultural resources, such as rice straw or elephant grass, the plant was designed to produce ten tons of "kraft paper" (industrial paper) per day. Highlights of the case study include the project's organizational and funding complexities, the design problems, the technical solutions, and the overall impact on rural development efforts. The case clearly demonstrates the significance of the ways in which meaningful employment can affect people's lives.

**NEED TO IMPROVE PROJECT PERFORMANCE**

Development projects represent an important attempt to accelerate the economic and social growth of both developing and developed countries. Too often, however, the projects have been unable to achieve their objectives because of inadequate planning and poor management. In the case of the United Nations Special Fund projects, final evaluation reports were submitted, on the average, two years after the projects had ended; much too late to be of any use in policy refinement and illustrating the general lack of proper project management procedures. Many projects fail altogether; research shows the main reasons to be managerial problems such as a lack of coordination, inefficient organization, inadequate monitoring, and improper scheduling.(7) Clearly, the managerial role in project management needs a more thorough examination.

Agricultural assistance programs have had varying degrees of success; two of the more notable are the Mexican wheat program and the International Rice Research Institute in the Philippines which helped to spawn the "Green Revolution," both of which spread the seed-fertilizer revolution to a number of countries in Asia and Latin America in the 1950s and 1960s.(8) Unfortunately, many of these programs were accompanied by a host of problems. The greatest handicap was the lack of an appropriate institutional framework necessary to link viable government policies with effective planning and management. The benefits of technical innovations such as high-yielding varieties of seeds are directly related to the potential for effective implementation. Experience clearly shows that administrative capacity and managerial expertise are crucial factors in determining the success or failure of development projects.

In summary, vast resources are being channeled into a wide variety of food development projects in many developing regions of the world. Moreover, both governments and funding agencies are increasingly recognizing that the need to improve and expand food production is of the highest priority. At the same time, administrative capability must be developed through a strengthening of both planning and management of projects. This need is based on experience gained from past mistakes
in development strategies in all sectors. Of equal importance, development projects must be planned and implemented to address the outstanding needs of many countries to establish small-scale industries with multiple purposes of utilizing locally available materials to manufacture goods that would be both import substituting and job creating.

Given its increasingly limited resources, the world can no longer afford inefficient implementation or failures of projects due to mismanagement. Senior officials from both public and private sectors in many countries agree that an action-oriented program must be developed and implemented now for an integrated approach to more effective project management.(9)

**PROJECT MANAGEMENT TRAINING**

Efforts to increase the supply and quality of project managers over the past three decades have centered on the utilization of formal and nonformal education and the development of appropriate curricula. In this context, it has become increasingly clear that, although development is generally pursued through projects that emphasize the technological innovations of increasing productivity, the success of these projects is in many ways related to effective preparation and utilization of human resources, primarily by both formal and nonformal education. Foreign technical assistance programs have of course played a significant role, especially in regard to printing instructional materials, training teachers and administrators, and the provision of expatriate consultants and management experts. However, now many governments see the need to utilize foreign technical assistance primarily as a temporary measure to generate projects and programs.(10)

In Indonesia, for example, educational planners have identified several national educational priorities related to overall development goals and objectives. One of the highest priorities is the development of indigenous programs appropriate to the training of personnel in the areas of administration and project management.(11) In the Philippines, educators have reached similar conclusions and have stressed the fact that an overemphasis on capital accumulation and foreign technical assistance has resulted in a lack of appropriate training for indigenous personnel, especially in such areas as project management.(12) The list could go on.(13)

The overall conclusion seems to be that both academic universities and applied training programs must take a more active role in developing and conducting appropriate training curricula. Otherwise, it will be difficult to provide the kinds of personnel essential to successfully implement the many development projects currently underway. In particular, it will be especially difficult to produce project managers, upon whom the success or failure of development projects depend.

Several problems hinder the development and implementation of appropriate project management curricula. Project management training should increase the capacity for both theoretical analytic
INTRODUCTION

thinking and practical implementation skills. (14) What is lacking, however, are innovative instructional programs that provide coherent and workable instructional strategies for the training of project managers. In a recent bibliography of project management studies, none of the more than 90 citations focused on the educational or curricular features of project management education. (15)

Another problem is that many management education techniques are uncritically transferred from the developed nations to developing areas. A recent Rockefeller report suggested that a major priority in this area is the creation of experimental curricular programs that emphasize genuine cross-national participation. Immediate involvement of participant nations in the design, refinement, and eventual implementation of management curricula is seen as an essential ingredient to the successful adoption of new programs. The report further suggested that gaps existed precisely in the realm of short-term project management education and that an effective way to approach this problem was through the judicious use of case histories. (16) Over the years a wealth of experience has been gained in many countries; as well-documented case histories, they can serve as important instructional and learning devices.

Furthermore, one important dimension not yet sufficiently explored has clearly hindered the development of appropriate project management curricula. That is the necessity to promote "localization in decision making," especially with respect to the development of new curricular models. (17)

In summary, recent studies appear to confirm that:

- The need exists for more effective management education that is specifically focused on development project management.
- Appropriate curricular materials are lacking, including case histories and, consequently, appropriate curricular packages.
- Genuine collaborative project management curricula needs to be developed.
- The need exists for "localization" in developing project management curricular materials and curricular packages.

Management is not an exact science. This fact reinforces the continuing need for curricular materials that emphasize carefully documented real-world experiences. This was the rationale behind the decision to research and write case histories of development projects in an integrated project cycle framework. These cases serve as the foundation for the curriculum. The cases in this volume and the previous volumes on alternative energy projects (18) were selected to satisfy two objectives: to be relevant to management education and training programs; and to use lessons learned from projects in operation to provide useful guidelines for policymakers confronted with the need to develop indigenous renewable resources as the basis for promoting socioeconomic growth in rural areas.
THE INTEGRATED PROJECT PLANNING AND MANAGEMENT CYCLE

In order to clarify the mass of procedures, methods, and possibilities relating to the management of projects, it is necessary to have a framework within which development projects may be viewed. Projects, in fact, reflect an underlying unity of process that remains the same even though the projects differ in individual detail. Projects from all sectors — whether social services, agriculture, industry, or public works — follow a similar path in moving from conception to reality.

The integrated project planning and management cycle (IPPMC) is a conceptual tool for observing and analyzing the unifying process that constitutes the life of a development project (figure 1.1). This integrated matrix has been developed to clarify the major phases and tasks that constitute the entire spectrum of a given project, from planning through implementation, evaluation, and refinement, with the central function of policy providing focus and direction throughout.

The IPPMC is divided into four phases: (1) planning, appraisal, and design; (2) selection, approval, and activation; (3) operation, control, and handover; and (4) evaluation and refinement. Specific tasks may be further identified within these four phases. (19)

Figure 1.1 illustrates the relationships among the phases of the project cycle, the tasks within each of the phases, and the overall dependency on central policy issues. It must be emphasized that the project cycle is an ideal model; not every project will conform exactly to it. The tasks of the cycle, furthermore, are not necessarily sequential — they may take place at the same time or in a different order — nor are all of them necessarily required. For example, the leader of a country might decide that an irrigation system is needed to increase rice yield. He decides to have it built and instructs his subordinates accordingly, thereby bypassing the first two tasks in Phase 1 of the cycle. A continual feedback and dependency relationship does exist among the tasks, however. Each task is dependent upon and is influenced by the others.

There is a two-way flow of information between those responsible for policy and those responsible for managing each of the project tasks. This feedback to policymakers and management's response is an important part of the integrated project cycle. Decisions on project implementation, although in the hands of the manager on a day-to-day basis, are closely linked to the policy framework in which the project operates. Thus, all tasks within the four phases of the IPPMC are tied together by policies emanating from the various authorities concerned with the projects.

The IPPMC framework emphasizes the interdependent and cyclical nature of projects. However, because each task within the four phases of the cycle is distinct and must be examined as an individual entity proceeding in an orderly time sequence, the cycle must also reflect this linear progression.

Some projects, it should be noted, may not proceed beyond the first phase. After the tasks within the planning, appraisal, and design phase
Fig. 1.1. Integrated project planning and management cycle: the four phases.
Source: East-West Center, Honolulu, Hawaii.
have been completed, the information fed back to policymakers, may lead to a decision to scrap the project. In certain cases, however, for economic, technical, or other reasons, it may not be desirable to stop a project once the first phase has been completed.

With this overview of the integrated project planning and management cycle, each of the four phases and their tasks can be examined in turn.

Phase 1: Planning, appraisal, and design. The first phase of the project is planning, appraisal, and design. There are three basic tasks in this phase (1) identification and formulation, (2) feasibility analysis and appraisal, and (3) design of the project.

The first, identification and formulation, involves the actual conception or identification of a project, which may occur in several ways. Basic needs within a country will induce the implementation of projects to satisfy these needs. The planning process often identifies project possibilities for each sector in society. The major source of projects in developing countries, however, will be the existing departments or ministries, including central planning agencies. Projects may be identified by political parties or government officials. In this case, the motivation to undertake a project may be political, such as an attempt to gain the support of particular constituents. In some countries, private entrepreneurs or multinational corporations will identify projects that meet the criteria established by the government.

International agencies have their own procedures for identifying projects. The identification of projects, then, is a process that must take into account various needs, preconditions, and policies if the project idea is to proceed to operational reality.

After a project has been identified, its parameters must be defined. This is part of the task of formulation. The formulation of a project involves developing a statement in broad terms which shows the objectives and outputs of the project and also provides an estimate of the various resources required to achieve the project's objectives.

The second set of tasks in the first phase, feasibility analysis and appraisal, are critical ones which in effect involve two distinct operations. A prerequisite of this set of tasks is the development of preliminary designs for the project. The early designs must be detailed enough so that cost estimates and decisions on various aspects of the project can be made.

Feasibility analysis is the process of determining if the project can be implemented. Appraisal is the evaluation of the overall ability of the project to succeed. Projects will proceed to the feasibility stage only if decisionmakers find them desirable.

While the feasibility analysis and appraisal are being conducted, several critical decisions need to be made. These decisions will determine first, if the project is capable of achieving its objective within the limits imposed by decisionmakers and second, whether it will proceed. Preliminary estimates of the resources required, and basic decisions about size, location, technology, and administrative needs must be made.
Feasibility and appraisal should be approached systematically and deliberately: time spent in researching the feasibility of a project is usually time well spent. Moreover, the findings at this point of the project's life will be useful during other phases of the project, particularly Phase 3.

The determination of project feasibility depends on the accuracy of the information received. Even though the final detailed design of the project can be undertaken only after approval has been given, the preliminary designs form the base upon which future decisions will rest. Most developing countries have to contend with a shortage both of design and of research and development capabilities. The result may be a lack of attention to critical aspects of the project. When decisions have been made on the overall project concept, its dimensions and parameters, it is then possible to determine the feasibility of the project in the terms required by the policymakers and the funding agents.

Some projects may require a pilot study as part of the feasibility process. Pilot studies provide data to enable more meaningful decisions to be made about larger projects. The appraisal process may require a comparative study to determine the merits of one project over another. Although the project identified may be feasible, a comparative study determines whether resources are best used in that project or in some other form.

Many governments and international agencies have imposed rigid procedures to be followed when their funds are required. While actual details vary from project to project and from organization to organization, the trend over recent years is toward more sophisticated and more systematic project-related studies. For example, to receive a recommendation from the United Nations Development Program (UNDP) for industrial projects, prospective borrowers must undertake market analyses that delineate overall national trends in production, foreign trade, consumption, consumer prices, together with details about output type and use, cost of production, and estimated sales. Other agencies have brought in new dimensions to their studies, such as the impact of projects on the social and cultural life of the community, as well as the environmental and ecological impact.

Numerous components of a project can be dealt with in the feasibility report. Studies can relate to the feasibility of the technical, economic, commercial, financial, administrative-managerial, and organizational aspects of the project. Additional political, social, environmental, and cultural factors that affect the project may also be included. Various technical alternatives must also be studied to ensure that the suggested approach fulfills project requirements.

Economic studies examine the overall sector into which the project falls and consider how the project fits into the broader sector and the national planning framework. In addition, commercial studies may be necessary to determine the overall competitive nature of the proposed project. They will examine the market demand for the output of the project, consider the costs of production, and look at all aspects of the project to determine if it is a viable proposition.
Financial studies determine how much capital is required to complete the project, and whether the project can sustain its financial obligations, will have adequate working capital, and can generate enough funds to ensure adequate cash flow.

Administrative-managerial studies determine the adequacy of procedures to control and direct the project. Studies in this area are not always undertaken, even though all projects would benefit from them. Their objective is to find out whether a project that is economically, financially, and commercially sound can be properly implemented by available managerial and administrative procedures. Many countries suffer from a lack of management and administrative capacity needed to direct projects. Related to this problem is the inability to ensure that a project can be administered effectively within a given agency or organization, because administration of a project differs from normal departmental procedures. A careful assessment of the operational methods of existing units is necessary to ensure that a project's unique features can be catered to. Even when a project is conceived and sponsored by an existing department, the department itself may not be the appropriate body to administer the project. This is especially the case when the involvement of a wide group of outside personnel and agencies is necessary, since existing departmental procedures are often unable to provide the necessary flexibility.

Once the feasibility studies have been completed, a meaningful appraisal of the project is possible. Policy- and decisionmakers and lending institutions may carry out the appraisal. They satisfy themselves that the project meets the conditions that will enable it to proceed. Their concern is to determine whether or not the project is the best means of reaching the objectives they have set. They may review the project itself and alternative means of reaching the objective.

Potential lending institutions may undertake their appraisal with a healthy skepticism toward all phases of the project. They attempt to determine whether the project is intrinsically sound and whether all the circumstances that surround it are viable.

The last task within this phase of the integrated project cycle is design. As was mentioned earlier, preliminary design criteria must be established before the project feasibility and appraisal task begins. Once it has been determined that the project will continue, the design task proceeds. Design is a critical function. It establishes the basic programs, allocates responsibilities, determines activities and resources, and sets down in operational form the areas of priority and functions to be carried out. All inputs relating to projects, including personnel, skills, technical input, and so on, must be determined at this point. Environmental factors, social criteria, technological requirements, and procedures must be assessed and included.

The design task also includes the preparation of blueprints and specifications for construction, facilities, and equipment. Operating plans and work schedules are prepared and brought together in a formal implementation plan; contingency plans may also be prepared. Designers must bring together the views of policy- and decisionmakers
and technical experts in such a way that the design reflects the inputs of all those contributing to the project.

Phase 2: Selection, approval, and activation. This phase of the project has two major tasks: (1) selection and approval, and (2) activation. Project selection takes place after the project has been accepted by policymakers and funding organizations as meeting the feasibility criteria. At this point the design function, including the formal implementation plan, has been completed. The project will be well defined, with key elements and inputs clearly identified. The selection of one project for implementation over another is made on the basis of several criteria. Policymakers consider the overall feasibility of the project and the priority of the project area. If a project fulfills a major need or contributes to national or sector goals and is politically desirable, it may be selected for implementation over a competing project that is not politically important. Funding agencies, however, have a variety of techniques for determining whether resources will be allocated to a particular project, such as cost-benefit and other complex forms of analysis. The overall requirement, however, is that the policymakers and the funding agency conclude that the project itself has a priority claim for resources required for the project. Therefore, the selection process is normally a competitive one.

The selection of a project for implementation requires negotiations to obtain formal approval from national authorities, funding agencies, and others contributing to the project. This requires the finalization of funding proposals, agreements, and contract documents, including tenders and other contracts, and the introduction by the government or some other organization of appropriate regulations.

Activation of the program involves the coordination and allocation of resources to make the project operational. Activation is a complex process, in which the project manager has to bring together an appropriate project team, which may include professionals, technicians, and resource personnel. Other contributions to the project may come from other groups, such as outside consultants, contractors, suppliers, and policymakers in other agencies. The outside inputs must be coordinated with the work of the project team. Responsibility and authority for executing the project must be assigned at this point. This will include the granting of authority to make decisions in areas relating to personnel, legal, financial, organizational, procurement, and administrative matters.

During the activation phase it must be ensured that planning for all phases is undertaken so that delays in vital inputs do not occur. Organizational and administrative procedures, together with feedback and response to policymakers' decisions, will have an important bearing on implementation. Concern for detail and proper planning during activation can save a great deal of time and resources during later phases of the project. At this point, the actual work of the project is about to begin.
Phase 3: Operation, control, and handover. Looking at the development project from the outside, the uninitiated observer might mistake this most visible phase for the entire project itself. Yet Phase 3 in fact makes up only a small part of the integrated project cycle. This phase of the project has three sets of tasks: (1) implementation, (2) supervision, and (3) completion and handover.

Implementation involves the allocation of tasks to groups within the project organization. Implementation of the project will be based on procedures set down during the two earlier phases. At this point, a final review of the project design and timetable will be undertaken, and any necessary changes or adjustments will be included. Decisions about the procurement of equipment, resources, and manpower also need to be made. Schedules and time frames need to be established, efficient feedback, communication, and other management information systems must be set up. The responsibility for implementation falls within the jurisdiction of the project manager. The project manager will need to work with policymakers, authorities, and organizations less directly related to the project as well as with policymakers controlling the project directly. His task is a complex one, requiring him to steer the project through many obstacles.

The second set of tasks in Phase 3 is supervision and control. Supervision and control procedures must be activated to provide feedback to both the policymakers and the project manager. Control procedures must identify and isolate problem areas; the limited time span of a project means that fast action is necessary if costly delays are to be avoided. At this point specific management tools, such as the critical path method (CPM), program review and evaluation techniques (PERT), and other forms of network analysis are particularly useful. These control and supervision techniques break down a project into detailed activities and establish the interrelationships between and among the various activities. This allows the project manager to organize the project into manageable components, coordinate all activities, and set a time-sequence schedule for project implementation. Although using such techniques means spending more time prior to implementation, it is time well spent. Not only will these techniques give the project internal coherence, but they will also save implementation time by isolating any problems to the appropriate project component.

In addition to internal control, those providing funding for projects will maintain an independent monitoring and control system for the project. The project manager will therefore have to meet control criteria established by either the government or another controlling agency, or perhaps by the funding institution. This may involve using specified procedures, such as international competitive bidding, for supply contracts. Formal procedures are established by many international organizations for the procurement and control of resources.

Whatever supervision and control techniques are used, they must take into account the changing patterns that occur during the life of the project. These may include changes within the policy and political
structures, difficulties with procurement, and poor performances by project team members and contractors. In many cases, the overall project design will need to be reviewed. Many technicians are involved in the supervision and control processes, and adequate information flow in all directions – from the project manager and from those within his organization assigned special responsibilities – is essential if these procedures are to be effective. As part of supervision and control, any problems relating to environmental factors must also be identified and appropriate action taken.

Control procedures are useful only if action is taken to correct any deviation. It should also be noted that both personnel and input patterns change naturally as the project proceeds through its four phases. As work on some tasks is completed, other personnel, experts, and contractors move in to begin new tasks. Personnel must adjust to their new environment, and procedures need to be reviewed and updated to meet the changing situation.

Project completion prepares the project for phasing out and handover to another form of administration. This is the third set of tasks of this phase. Project completion consists of scaling down and dismantling the project organization. It also involves the transfer of project personnel to other areas of operation. Assets and other facilities, including equipment and technology, may not be required by the operational project. Provision for their transfer must be made, since it is not always possible to have an automatic transition from the development to the operational stage.

The process of completion may take place over a considerable period. As various parts of a project are completed, however, they may be taken over by a new organization, and handover may therefore be accomplished piecemeal. It is essential that development resource linkages between scaled-down projects and projects in the elementary stages of implementation be planned systematically to ensure optimal use of limited project resources, particularly in the context of broader development programs. The new project, when operational, will have an effect on other aspects of the sector. As the project becomes operational, the new controlling organization must have the necessary skills, personnel, and technical backup. Key personnel working in the development stage will often transfer over to the new controlling organization.

In cases where technical, financial, political, or other factors prevent projects from being completed according to the original terms, handover and termination procedures may have to be implemented at an earlier stage. This may involve considerable loss as far as the project is concerned. In this situation, the objective should be to liquidate the project in a way that will obtain the most benefit.

As a project nears completion, special reporting systems should be set up so that full information relating to the project is available. Completion reports will be prepared for various authorities, including funding organizations and policymakers.

The actual handover of the operation of the project involves finalization of contracts, termination of loan facilities, and so on.
Handover also includes the transfer of the project activity and resources to the new administration. This is a critical task. While the development of the project can be viewed initially as a creative phase, once the project is completed it must be viewed as a long-term operational program.

Phase 4: Evaluation and refinement. The final phase of the project is the evaluation and refinement of policy and planning factors. The first task is evaluation and follow-up. While it is possible to evaluate project results immediately, both benefits and side effects—anticipated and unanticipated—may not become fully apparent until the project has been operating for some time. Evaluation thus needs to cover several time periods. Evaluation normally includes a retrospective examination of whether the project has attained its intended goals within the framework of both the timetable and the budget. However, experience clearly demonstrates that it is necessary to consider evaluation as an ongoing process integrated with each phase of the IPPMC. For example, evaluation procedures must be designed to analyze and propose solutions to problems that may arise during the tasks of activation, implementation, supervision, and control. Ongoing evaluation, which includes retrospective evaluation, should result in a careful documentation of experiences, which can provide insights for improving project planning and project management in the future.

Evaluation of a project can take several forms. These include evaluation by those responsible for implementing the project and by others with an interest in the project, including funding organizations and contractors. Those funding the project will undertake a thorough investigation of its financial aspects, including an effectiveness study of goal attainment. The agency responsible for the project will be concerned with determining whether goals have been attained and whether the expected impact on a sector or on national development will be achieved. The studies should also consider, in addition to impact on the target group, the impact of the project on political, social, cultural, and environmental factors related to the project. An exhaustive evaluation of each phase to determine its contribution to the project in regard to budget, timetable, and other factors is most desirable. In most cases, however, the project as a whole is evaluated; there is little effort made to analyze each phase or each task separately.

International agencies, such as the World Bank and the United Nations, have their own procedures for evaluating projects. These may be useful to policymakers since they provide the opportunity for comparative analysis with similar projects.

Related to and often arising from the evaluation of a project is the need for project follow-up. Follow-up activities may vary from determining how unmet needs can be satisfied to action on project tasks not properly fulfilled. The piggyback or follow-up projects mentioned earlier may come into play at this point. For a project to achieve its full objective, smaller or related projects may need to be implemented
almost immediately. There is then a clear need to relate follow-up action closely to evaluation projects. Follow-up action is one aspect of the project manager's role which could involve considerably more commitment than he initially envisages. If follow-up action means the difference between the project's being fully operational or not, then it is a wise investment to undertake these activities as quickly as possible. Aspects arising from the follow-up procedures may be useful in the future. If the project is successful, guidelines can be set down for the project to be repeated in another setting.

Refinement. The second and last task is refinement of policy and planning. Policymakers and managers will need to refine their procedures in the light of each completed project. Experience should be the foundation on which planning and policy tasks are reviewed. As the essential controlling force, policy procedures must be continually updated to meet challenges in the future. Planning must also be able to meet the new demands of new situations. Refinement of these procedures is an important contribution that the project can make to future development programs.

The IPPMC is a flexible model for all phases of a project, from conception through completion. The cohesive force unifying all the phases and tasks of the IPPMC is the power and authority relationship vested in various policymakers, ranging from top government and political decisionmakers to those in charge of one aspect of the project. The project manager, the staff, and those contributing to the project as consultants or contractors are bound by and exist within the framework of policy decisions. Analysis of these changing relationships through the IPPMC model can provide a comprehensive overview of a development project. It is also useful for providing guidelines for how to address policy issues as a basis for more viable policy formulation and related decisionmaking.

CONCLUSIONS

The IPPMC conceptual framework was developed as the basis for a new approach to planning and management because of past experience with how poor planning and management has resulted in an enormous waste of human and capital resources in development projects from all sectors. This is of particular importance today because the task of promoting national development throughout the world has been further complicated by the international energy crisis and related economic, social, and political problems. The dramatic increases of the cost of imported oil have had a disruptive impact on all sectors of the world economy and society.

The concluding chapter, Chapter 5, will derive the lessons to be learned from each case history to provide insight into more efficient methods of planning and management. In this context, different ways of utilizing agricultural waste materials to address priority problems in
rural areas such as production of indigenous paper and fertilizer, will be analyzed. Chapter 5 will also review and analyze a number of broad policy and research issues relating to food production. Particular attention will be devoted to the need for viable policy guidelines to recognize, develop, and utilize appropriate social, economic, and government institutions to ensure effective projects that upgrade the quality of life using locally available resources.

NOTES


(4) Ibid.


(10) Commonwealth Consultative Committee on South and South East Asia, Special Topic Papers: United Kingdom, Vietnam, Thailand, Philippines, Pakistan, Malaysia, Korea, Indonesia, India, Burma (Manila: Commonwealth Consultative Committee on South and South East Asia, 1970).

(11) Ibid., p. 2.

(12) Ibid., p. 1.
(13) Ibid.; see complete reports in series.

(14) Yat Hoong Yip, Role of the Universities in National Development Planning in South East Asia (Singapore: Regional Institute of Higher Education and Development, 1971), p. 35.


(19) For further reading about the IPPMC model, see Louis J. Goodman and Ralph N. Love, eds., Project Planning and Management: An Integrated Approach (New York: Pergamon Press, 1980).
The Freshwater Fisheries Station of the SEAFDEC Aquaculture Department: The Philippines

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PROJECT BACKGROUND

Three out of five persons in Southeast Asia suffer from either hunger or malnutrition. Despite successes in the hybridization of high-yielding varieties of grain and improvements in the use of fertilizers, present agricultural output is still unable to keep up with population growth. Southeast Asian countries have traditionally used the oceans and fresh waters for their protein and energy needs, increasingly so today.

Harnessing water environments for protein production has mostly involved the fishing of natural stocks. Unfortunately, recent indications show a general depletion in world fish resources due to overfishing, pollution, and destruction of natural habitats. Furthermore, marine fisheries enterprises involve high capital investment costs in infrastructure and equipment, requiring foreign exchange on a continuing basis. Capture fisheries also show indications of decline in catch per unit effort in the waters. Thus aquaculture, or the application of farming techniques to the breeding and rearing of fish and other aquatic organisms directly or indirectly useful to humankind, remains a highly promising option.

Aquaculture is particularly relevant to Asia and the Far East, an area which accounts for approximately 80 percent of the world's total aquaculture production of at least 4 million metric tons. This harvest provides a significant proportion of the protein for the region and contributes heavily to the diet of its population.

*The project background of this case history is based in part on the Project Document of the proposed Freshwater Aquaculture Station of the SEAFDEC Aquaculture Department (1975). All names of persons involved in this case history have been changed for reasons of privacy and confidentiality.
Unfortunately, aquaculture production has fallen short of predicted goals, and its full potential has not been realized. The global development ceiling for aquaculture is estimated to perhaps be as high as five times present yield, or 20 million metric tons per year. Some of the problems that hamper massive production in aquaculture are great diversity of effort, lack of comprehensive national and international direction, lack of clearly defined priorities, and inadequate funding for the more expensive pilot test facilities.

To accelerate the transition of aquaculture from small laboratory exercises to the field, three things are crucial:

1. Flexible organization that is targeted at tapping academic and applied research from many sources, filling research gaps, piloting production processes, and training personnel for eventual large-scale applications;
2. Concerted financial support, to ensure necessary research and development facilities and infrastructure;
3. Recognition of the need for unified effort by all nations in the target region(s), as well as general agreement to participate in such a program.

All these problems point to the most urgent need: for research professionals, managers, trained extension workers, support staff, and other skilled manpower in aquaculture. They also underscore the importance of considering aquaculture on the same level as agriculture and of establishing a program orienting aquaculture to food production on a massive scale.
The Southeast Asian Fisheries Development Center (SEAFDEC) was proposed during the First Ministerial Conference for the Economic Development of Southeast Asia (MEDSEA) in Tokyo, Japan, during December 1966. Recognizing that fish is a popular food among Southeast Asians the conference sought to promote cooperation on fisheries development among member governments, to increase food supply, and to improve nutrition in the region. In December 1967, at a convention held in Bangkok, Thailand, SEAFDEC was conceived as a treaty agreement among several nations in the area. To date, the agreement contains six chapters and eighteen articles, whose major provisions are listed in table 2.1.

Table 2.1. The SEAFDEC Treaty Agreement

Functions
a. Train fisheries technicians.
b. Study fisheries techniques suited to the fisheries of the region.
c. Develop and investigate fishing grounds and fisheries resources, and conduct research in fisheries oceanography.
d. Collect and analyze fisheries information relevant to the region.
e. Disseminate or transfer information and research results to member countries.

Membership
a. Open to all governments of the Southeast Asian region.
b. "Southeast Asian Countries" are Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand and Vietnam.

Organization
a. Three organs compose the center, namely, the council, a secretariat, and departments.
b. The council is the supreme organ of the center and is composed of directors of member countries. It exercises such powers as deciding on plans of operation and working programs, adopting the annual program and budget of the center, admitting new members, and appointing the secretary-general and department chiefs together with their respective deputies. The council holds annual meetings and other special meetings.
c. The secretariat is headed by a secretary-general whose term of office is two years. He represents the council and coordinates the functions of the departments.
d. The departments consist of a department chief, a deputy department chief, and department staff. The department chief is appointed by the council upon the recommendation of the government of the member country, and the deputy chief is appointed by the same upon the recommendation of the government of Japan. The term of office of the two top officials is two years, but reappointments may be made.
Finance
a. Member countries support the operations of the center through the secretariat, which is based in Bangkok, Thailand.

External Relations
a. The center is authorized to conclude agreements and arrangements for cooperation and assistance with governments and organizations external to it.

Terms of Validity
a. The agreement remains in force for ten years and thereafter until all members agree to terminate it.*

Note: Initially, SEAFDEC involved the following member countries: Malaysia, the Philippines, Singapore, Thailand, Vietnam, and Japan. Membership was open to Burma, Cambodia, Indonesia, and Laos. Australia and New Zealand were classified as donor governments.

*The agreement was subsequently extended for an indefinite period of years. At its inception, SEAFDEC had two departments, the Marine Fisheries Training Department based in Bangkok, Thailand, and the Marine Fisheries Research Department based in Singapore.

The activities of the Training Department in Bangkok are geared toward short- and long-term training of technicians from member countries in various aspects of marine and capture fisheries, including the actual operation of large fishing boats and gear. The Research Department in Singapore focuses on research and on the training of technicians and researchers in marine biology, oceanography, fisheries resources assessment, and various other studies. The two departments also collaborate in the collection, collation, interpretation, and analysis of fisheries data in the region.

During the third MEDSEA conference, held in Singapore in April 1968, the Philippines proposed the establishment of a new department of SEAFDEC, to be based in the Philippines and to be known as the Aquaculture Department. The rationale for the establishment of an aquaculture department in the Philippines was described in the draft proposal submitted by the Philippine government as follows:

The role of fish culture in the nutrition and economy of developing countries is recognized around the world. Pondfish culture is widely practiced in Asia, Africa, Central and South America, as a means of producing food and of improving the nutritional level of their people. It has been demonstrated in the Philippines that fish farming could provide the protein requirement of the population. Research work on all phases of fish culture must be carried out at a rapid pace in this region to cope with increasing human need. This will eventually lead to the improvement of the standard of living of fish farmers in the region and produce more fish for all nations of Southeast Asia. The Philippines has extensive fishpond areas, particularly the
brackish-water fishponds. Freshwater fish farming is becoming more and more popular in recent years. In this country, flooded lands are utilized for rice/fish crop rotation quite efficiently. With some more improvement in the engineering and management aspects of such types of fish farming, this can be the showplace in Southeast Asia for this kind of agricultural production. However, it is believed that the success in the development and improvement of fish culture techniques can be attained similar to the success obtained in rice if a research and training department of fish culture is established in this country.

The proposal to establish the Aquaculture Department was approved in principle by the SEAFDEC Council at the 1968 meeting. Subsequently, during its meeting in Singapore in March 1969, the council organized a working group of aquaculture experts from member countries to evaluate and study the proposal; the Japanese government was requested to provide assistance to the survey mission. In July 1970 the Philippine government informed the survey mission that the country was ready to host the proposed department, and formally recommended that the Aquaculture Department be established in the Philippines. The meeting was attended by official observers from the Food and Agricultural Organization of the United Nations and the U.S. Agency for International Development.

In the years 1971 and 1972, various experts commissioned by the SEAFDEC Council undertook a number of detailed studies, thorough consultations, and site visits to examine such factors as the possible organizational structure, financial sources and contribution arrangements, plan of operation, specific location, and work programs of the proposed department. The experts' reports were submitted to the council and were used as guidelines during their meetings. At the Sixth Council Meeting, held at Kuala Lumpur in 1973, the new department's plan of operation and work program were approved, along with those of the Marine Fisheries Training and Research Departments in Bangkok and Singapore (see figure 2.1).

The Aquaculture Department, to be situated in Iloilo Province in the Philippines, was mandated to promote, undertake, and coordinate aquaculture research in Southeast Asia; train researchers and technicians in aquaculture; and disseminate aquaculture information to member countries. Research activities of the department would cover the following areas: 1) the production and securing of fingerlings of desired species from natural sources and by induced breeding; 2) the increase of production, by means of improved design and construction of ponds, impoundments, and the like; improved management and maintenance of ponds and water conditions; improvement of natural fish food; artificial food and feeding; biological manipulation of stocks; and control and reduction of diseases, parasites, and predators; and 3) prevention and control of pollution affecting aquaculture operations.

As the host country, the Philippine government was committed under the agreement to provide adequate sites and infrastructure,
Fig. 2.1. SEAFDEC organizational structure.
services of local staff, and operating funds for the new department, while Japan would provide training and research equipment, some professional staff, and fellowships for trainees and staff from member countries. Likewise, the other member governments would contribute their share to the Aquaculture Department. President Ferdinand E. Marcos of the Philippines issued a presidential decree in September 1973 reserving approximately 40 hectares of the public domain at the municipality of Tigbauan, Iloilo, as the department's permanent site. Other contributors included Canada, through the International Development and Research Center (IDRC), Australia, New Zealand, Denmark, and the United Kingdom.

The department was to be headed by a chief and a deputy chief, who were both to be elected by the governing SEAFDEC Council for a term of two years, subject to reappointment. The chief would be recommended by the host government (Philippines), while the deputy chief would be recommended by the government of Japan. The first appointed chief of the Aquaculture Department was Dean D. K. Villanueva, the former dean of the College of Fisheries of the State University of the Southern Philippines (SUSP); to date (1979), Dean Villanueva is still chief of the department. Assisting the chief in planning and implementation of department programs, both research and administration, was the executive director, Dr. Q.F. Miguel, himself a former vice-president of SUSP, who coordinated the activities of the newly created five divisions of the department: research, training and extension, administration, external affairs, and auxiliary services. Each division is headed by a deputy director (see figure 2.2).

Assisting the chief in the internal policymaking process is the so-called executive committee. Together they evolve management policies and set program priorities in the research, training and extension, and infrastructure development of the department. This committee, which also approves the annual budget and personnel requirements of various units, is composed of the chief, as chairman, the deputy chief, as cochairman, and the deputy directors and program leaders, as members.

The research activities of the department from 1973 to 1976, particularly in its brackish-water fisheries station in Tigbauan, Iloilo, were concentrated on two major species, the sugpo or jumbo tiger prawn (Penaeus monodon Fabricius) and the milkfish (Chanos chanos Forskal). The jumbo tiger prawn, because of its enormous export potential, could improve the region's foreign exchange earnings. Also in its favor were its tremendous attractiveness to SEAFDEC member countries, and the initial hatchery work that had been started in the Philippines in the laboratory of SUSP in Mindanao, the basis of the larger project initiated by SEAFDEC in Iloilo. The milkfish was chosen because the milkfish industry in the Philippines is a multimillion-peso industry, with total investments of US$50 million, employing some 170,000 people in some 175,000 hectares of milkfish ponds. Milkfish, moreover, is widely accepted in the Philippines, Indonesia, and Taiwan. Another reason to examine milkfish was the fact that the major constraint in the industry was lack of stocking fry. The total require-
Fig. 2.2. Organizational structure of SEAFDEC's Aquaculture Department.
ment in 1974 of the Philippines alone was some 1.3 billion fry annually; fry collection from natural grounds amounted to only 500 million a year, or a shortage of 800 million fry. Pond production, on the other hand, suffered from large mortalities.

With these research concerns in mind, we can now turn to how SEAFDEC's Aquaculture Department undertook the project we will examine here, namely, the creation of a freshwater aquaculture station.

PHASE 1: PLANNING, APPRAISAL, AND DESIGN

Importance of Freshwater Aquaculture

Although the Aquaculture Department had initially been developed along the lines of brackish-water aquaculture, in 1973 it was also instructed to explore the desirability of undertaking research in freshwater fish culture. To achieve this goal, the department's chief created a committee to study the feasibility of setting up a freshwater research station as a logical counterpart to the brackish-water station in Iloilo. The committee returned a favorable recommendation, citing a number of considerations, including problems and constraints of freshwater aquaculture in the region, the present state of the industry in Southeast Asia and the world on various freshwater species under cultivation, and the limited number of research institutions engaged in freshwater aquaculture activities. The committee's report cited the importance of aquaculture in Southeast Asia, which made up 16 percent of the world's total fish production. Of the 320,000 metric tons of aquaculture production in Southeast Asia, moreover, 160,000 metric tons of fish were produced from freshwater aquaculture. The committee report continued:

Of the total potential area (5.1 M ha) available for freshwater fish culture in Southeast Asia, only around 213,000 hectares are operational, most of which are even semi-developed. In the Philippines alone, therefore, about 120,000 hectares of freshwater swamplands; 300,000 hectares of irrigated rice fields and irrigation canals; 130,000 hectares of hydroelectric reservoirs and dams; 70 freshwater lakes totaling 200,000 hectares; and extensive marginal lands for freshwater pond system. If only half of the potential area of 5.1 M hectares in Asia is developed, using even traditional methods, fish production from freshwater sources could easily increase to 1.8 M tons, which is equivalent to 1,200% of the present level of production of 160,000 metric tons per annum.

The major constraints and problems besetting freshwater aquaculture, the report concluded, were: 1) dearth of scientific knowledge of production of fish seeds, fish farming operations and management, and management of the freshwater environment for optimum benefit; 2)
lack of manpower for research; 3) inadequate laboratory facilities for research; 4) poor harvest and post-harvest techniques and facilities; and 5) inadequate studies of production economics to attract the business sector.

Under the leadership of Dr. Miguel, the department organized a workshop with nationwide representation to discuss the committee's report. This workshop was attended by leading figures in fisheries development from the government, academic, and private sectors. When the workshop likewise recommended the establishment of a freshwater fisheries station, the report was then formally presented to the governing body of the SEAFDEC Seventh Council Meeting in Manila in December 1974.

Rationale for Establishing a Freshwater Station in the Philippines

In the beginning, there were some apprehensions about the submission of the proposal to the council, for the following reasons: 1) the possible conflict with South Vietnam, a member country at the time that was interested in establishing a regional freshwater station in its own territory. 2) the logistical problem for the Philippines, given that it already had a brackish-water station to host; and 3) the possible duplication of activities with the Philippine Bureau of Fisheries and other institutions in the country.

Nonetheless, the department submitted the proposal to establish the freshwater station to the SEAFDEC Council. Its reasoning ran as follows. First, war was then being waged in Vietnam; to wait for the situation to improve would unduly delay a good project urgently needed by the region. Next, a good project on food production could easily generate financial support from national as well as international development institutions. Finally, the proposed research projects of the freshwater station would complement and supplement activities of other institutions rather than duplicate them. Furthermore, the dimensions of freshwater aquaculture in the region were so huge that mutual, cooperative, and collaborative efforts, by countries and agencies, were vitally needed.

PHASE 2: SELECTION, APPROVAL AND ACTIVATION

Approval of the Council

Before the SEAFDEC Council met to discuss the proposed freshwater station, the Aquaculture Department's chief and executive director personally contacted the members of the council to solicit their support for the project. Villanueva and Miguel stressed the potential of freshwater aquaculture for increasing fish production in Southeast Asia, the proposal's accordance with the department's long-term plan of opera-
tion and work program, the need to fully develop freshwater resources for the protein requirements of the region, and the project's relevance to SEAFDEC's goals in general.

Council members were convinced by these arguments. At the Seventh Council Meeting in Manila during December 1974, the proposal was unanimously adopted as Resolution 11. According to the resolution, the proposed station or project would undertake research and development work to contribute to the optimum utilization of existing bodies of fresh water for increasing fish production in the region. The general functions of this freshwater station would be to: 1) undertake and coordinate research necessary for the development of a fresh water fisheries industry in the region, 2) train researchers and technicians in freshwater fisheries technologies, and 3) arrange for the exchange and dissemination of knowledge and information in the field of freshwater fisheries and related activities to meet the needs of member countries.

Priorities would be to undertake research, training, and extension primarily in the culture of milkfish (which grow in fresh as well as brackish water), tilapia, mullet, and other species which could be produced for mass consumption.

The council indicated that the freshwater station should also look toward the setting up of outreach stations in the region. The Aquaculture Department was accordingly asked to prepare a detailed five-year program for the station to be submitted to the council.

Preliminary Activities and Site Selection

In January 1975, Dr. Q.F. Miguel and engineer Jose Santos were designated by the chief of the department as program director (concurrent to his executive directorship) and assistant program director, respectively, of the freshwater station. Jointly they would take on the responsibility of setting up and developing the station. (Since Miguel was busy with his diverse activities as executive director of the department, Santos, former dean of engineering at SUSP, assumed the day-to-day direction of the preoperational activities of the freshwater station.) Santos was an effective choice for the job for a number of reasons. An engineer by profession, he nonetheless had considerable experience in planning development projects and administering them. At the time he held office at the Development and Liaison Office of the SEAFDEC Aquaculture Department in Makati, Metro Manila, only a hour's drive from the proposed site of the freshwater station in Lake Laguna de Bay. Santos had worked closely with Miguel at the SUSP for many years and had thus formed a good working relationship with him. Moreover, at that point it was necessary to assist Miguel so that he could devote more time to fund-raising missions abroad, on top of his other responsibilities.

When he was designated managing program director of the station, Santos initially made use of some of his Makati staff to assist in planning activities and setting up the station.
The specific location of the proposed station (see figure 2.3) was the so-called Tapao Point and Barrio* Pipindan in Binangonan, Rizal, along the shores of Lake Laguna de Bay. The site was selected for the following reasons:

- The lake is a natural habitat of freshwater fish and is a representative body of freshwater both in the country and in Southeast Asia.
- The project site is only an hour's drive from Manila, the center of the country's population and its main market.
- The site location is elevated and hence relatively safe from floodwater; the elevation permits the flow of water by gravity from a proposed reservoir to the different tanks and hatcheries to be built.
- The area is situated approximately at the center of the lake, accessible to the adjoining communities by motorized timber boats.
- The site location is elevated and hence relatively safe from floodwater; the elevation permits the flow of water by gravity from a proposed reservoir to the different tanks and hatcheries to be built.
- The area is situated approximately at the center of the lake, accessible to the adjoining communities by motorized timber boats.
- The site is located very near an economically depressed barrio called Pipindan, whose people could immediately serve as a target clientele for the transfer of technology packages evolving from the station. In later years, the village of Pipindan could be developed as a model human settlement with lake fishing as its economic base.

Negotiations for the Site and Approval

Negotiations for the acquisition of land started in August 1975 with a written request from SEAFDEC's Aquaculture Department to the Philippine Bureau of Lands for the use of the military reservation at Tapao Point and Barrio Pipindan in Binangonan, Rizal, as the station site. Comments on the department's request were solicited by the Bureau of Lands from various agencies involved in Laguna de Bay development, such as the Laguna Lake Development Authority (LLDA), the Bureau of Public Works, and the Bureau of Public Highways. Because the LLDA exercises legal and technical supervision over the development of Laguna de Bay, coordination with this agency about the proposed activities of the station was necessary. Likewise, clearances from the Bureaus of Public Works and Highways were sought to ensure that the proposed site would harmonize well with long-term national plans for roads and other infrastructure development.

*(A barrio is a small community.*)
Fig. 2.3. Lake Laguna de Bay, showing the location of the SEAFDEC Freshwater Fisheries Station.
In the beginning there was noticeable resistance on the part of the LLDA to the department's request, resistance founded on the misconception that the establishment of the freshwater station in the lake area would diminish LLDA's authority over the lake; it was also feared that programmatic conflicts might also arise in the future. Miguel and Santos conferred at length with LLDA officials and assured them of the project's complementarity with ongoing LLDA activities in the lake. Convinced of the importance of the station, the LLDA's administrator, who was also the head of an engineering battalion of the Philippine Army, not only agreed to the original request but even signed an agreement with the department on August 11, 1975, arranging for the engineering battalion to assist in developing a road system within the station.

Toward the end of August 1975, equally favorable responses were received by the Bureau of Lands from other agencies regarding the request for a station site. Based on these endorsements, the Bureau of Lands forwarded to the Department of Natural Resources (DNR) of the Philippines a temporary permit for the SEAFDEC Aquaculture Department to occupy a portion of land situated in Binangonan, Rizal, as the site for the freshwater station. The DNR supervises the activities of the Bureau of Lands along with those of the Bureau of Fisheries, Forestry, and Mines. The DNR approved the temporary permit, pending the issuance of a presidential proclamation granting the Aquaculture Department the same area as a permanent site for its freshwater station.

The station immediately occupied four hectares at Tapao Point to develop its initial facilities. Finally, after a delay of over a year, on July 28, 1977, the president of the Philippines issued the proclamation granting some 45 hectares at Binangonan, Rizal, as the permanent home of the freshwater station.

Initial Activities and Project Activation

In September 1975 Santos hired two employees, both with management backgrounds, to assist him in implementing initial plans and to follow up important documents for the station. The next month the department leased a large residential house in the town of Binangonan to serve as the office for the administrative staff and a temporary workplace for the research staff. The office was a 30-minute motorized boat trip from Tapao Point, the site of the station proper.

Also assisting Santos was a very competent fisheries consultant, the former fisheries commissioner, who was hired in October 1975. The consultant had a long and rich experience in fisheries research and management and had lived his seventy years in a town in the lake area. At the time of his appointment, he was actively engaged in fish pen culture of milkfish and tilapia in the lake.

Confident that the funding potential for the station was good, the Aquaculture Department's executive director asked the chief to authorize
a trip by a technical team to Japan to look into the latest developments in freshwater fish hatchery and pond designs in preparation for the physical planning of the station. The team would also explore funding support from Japan. The chief sent a team composed of Santos, the fisheries consultant, and an architect, who left for Japan on October 17, 1975. The team was well balanced; Santos was an engineer, the consultant was a lake fisheries expert, and the architect would eventually be selected to design the facilities in consultation with the first two members. Their report on the trip and their exchange of ideas with foreign experts was helpful in defining the programmatic thrust of the freshwater station.

In December 1975 the station acquired two existing small warehouse-type buildings on the site that originally had been leased as storehouses for explosives. Negotiations were made for the sale of the buildings, which were then renovated and converted into a modest biology-chemistry laboratory equipped with water facilities, a chemical storage room, and working space.

The Station's First Programmatic Document

The first programmatic document of the station, completed in June 1975 under the leadership of Santos, outlined a five-year research and development program, including the cost of various components. Assisting Santos in the preparation of the document was a staff composed mostly of management people, with the exception of the fisheries consultant, who provided the fisheries orientation. The research component of the document, which was tentative at first, was revised some time later by senior fisheries researchers from the region.

The document divided the program into the following components:

1. Strategy and Approaches. The basic strategy was to use Laguna de Bay Lake as the medium for research and development activities on fish culture and lake development and conservation. Relatively inexpensive fish-rearing facilities could be found in the lake in the form of pens, fishponds, and corrals. For massive lake fisheries development, it was deemed imperative to provide fingerlings of the desired species to stock pens and fishponds. If the fingerlings were not available, research was to be undertaken to produce them. The freshwater station would therefore undertake mass propagation by natural and artificial breeding of suitable species for distribution to fish-pen operators and pond raisers in the lake. Later, seed stocks would be utilized for release in other inland freshwater lakes, swamps, and rivers in the Philippines and in other Southeast Asian countries, with corresponding follow-up studies. Systematic limnological, ecological, and basic productivity studies would be undertaken to determine the stocking capacity of each natural body of water.

Adequate pilot projects would be undertaken in limited-size fish pens and experimental ponds. The utilization of low-cost, locally
available materials for supplemental feeding and other aspects of aquaculture would be pursued.

A vital component of the program would be to conduct research and development activities to maintain or improve the ecological balance of the lake, integrating all other aspects besides fisheries.

As improved techniques of seed production and cultivation were developed, substations would be established at strategic locations in the Philippines and elsewhere in Southeast Asia. This would involve the strengthening of research work on key problems concerning specific species. Such work could provide large dividends once it was effectively coordinated within a regional program linked by a network of outreach stations. The program would provide training facilities for pen and pond operators and researchers on freshwater aquaculture.

2. Activity Stages. As planned, the activities in the establishment of the freshwater fisheries station would consist of three stages: 1) preoperational, 2) semioperational, and 3) fully operational. It was envisioned that even in the first two stages, relevant experimentation in lake fisheries and ecology would be undertaken, making use of temporary facilities until the fully operational stage was reached. Target dates for the activities were projected as follows:

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<tbody>
<tr>
<td>Preoperational</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semioperational</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Fully operational</td>
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</table>

The preoperational stage or planning phase included preparation of program documents and work schedules; acquisition of lands from old-time settlers; planning of the physical development of the station through preparation of architectural and engineering designs of the buildings; topographic, hydrographic, and road surveys; and initial land clearing, excavation, reclamation, and general land preparation, including provisions for temporary facilities to conduct urgently needed water studies and experimentation in the lake.

The semioperational stage was the construction of buildings and other infrastructure. Acquisition of laboratory equipment and books and expansion of target research activities were to be undertaken during this period.

The fully operational stage was to occur when construction of facilities was completed, laboratories were equipped, and the station had launched its full research, training, and extension programs.

3. Capital Development. Here is the proposed schedule for construction at the 43-hectare site.
Phase 1 (January-December 1976).

- Road system
- Water system
- Power system
- Hatcheries
- Laboratories
- Dormitories
- Cafeteria

Phase 2 (January-December 1977).

- Continuation of building under Phase I
- Offices
- Library
- Lecture rooms
- Housing units
- Experimental ponds

Phase 3 (January-December 1978).

- Continuation of unfinished projects under Phase 2
- Physical plant
- Recreational facilities
- Experimental ponds

4. Preliminary plan of research and development activities. This covered the five-year period January 1976 to December 1980.

Year 1 (January-December 1976).

- Undertake a physical and socioeconomic base study of Laguna fishermen to find out their existing economic conditions.
- Study the present techniques of pond and pen management and system of operations.
- Research the spawning of various species of freshwater fishes, notably the native catfish, carp, tilapia, and others.
- Establish a seed bank for milkfish fry.

Year 2 (January-December 1977).

- Continue research on the techniques of pen and pond management and actual application of the techniques.
- Medium-scale development of fishponds and pens in Laguna de Bay, with inputs from agencies such as the BFAR, the South China Sea Fisheries Development and Coordinating Program of the United Nations, the LLDA, and the National Pollution Control Commission.
- Experiment with floating-net cages in fish culture.
• Further research on the spawning of selected species.
• Training of pond and pen operators in management.

Year 3 (January-December 1978).

• Continue research on fingerlings of selected species in ponds and pens.
• Assist in the organization of fisheries cooperatives in the lake, and other training and extension activities.

Year 4 (January-December 1979).

• Continue research on fish breeding and production techniques.
• Start activities on fish corrals and expand floating-net fish-cage operations in the lake.
• Establish other freshwater fisheries substations in the Philippines.
• Evaluate overall results of research carried out.
• Undertake a new series of studies involving other techniques of operation that have evolved during the four-year operation.
• Prepare another five-year research program based on the findings of the first five-year period.

5. Funding Requirements and Assistance Arrangements. The five-year program, which was indeed ambitious enough to attract the attention of various agencies, local and foreign, required a total budget of $24 million, of which $5 to $19 million, would come from the resources of the Aquaculture Department. Planned assistance from foreign sources would underwrite the costs of laboratory and training equipment, supplies, and materials that were not available locally, support for expatriate scientists on short- and long-term assignments, scholarship grants to local researchers to pursue further studies, and travel grants to local researchers to attend conferences and seminars abroad.

The contribution of the Aquaculture Department to the station would consist of the following components:

• Project site with an approximate area of 43 hectares.
• Buildings and other infrastructure, to include road, power, light, and water systems; laboratories in biology, chemistry, feeds, wet experimentation, and limnology; hatchery tanks; nursery ponds and seed banks; library; conference and lecture rooms and facilities; and recreational and living quarters.
• The services of staff members.
• Costs for local purchases, repairs and maintenance, research grants, conferences and publications and other expenses.

6. Corresponding Contingency Costs. Corresponding contingency costs included architect's fees, fees for legal documents, and the like. Table 2.2 and 2.3 show the overall budget and funding for the station, as projected by the program document.
Table 2.2. 1976-80 (in US$1,000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>1976</th>
<th>1977</th>
<th>1978</th>
<th>1979</th>
<th>1980</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Capital costs</td>
<td>2,215</td>
<td>4,390</td>
<td>2,018</td>
<td>827</td>
<td>240</td>
<td>9,690</td>
</tr>
<tr>
<td></td>
<td>Recurrent costs</td>
<td>1,080</td>
<td>2,318</td>
<td>3,277</td>
<td>3,613</td>
<td>4,027</td>
<td>14,315</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3,295</td>
<td>6,708</td>
<td>5,295</td>
<td>4,440</td>
<td>4,267</td>
<td>24,005</td>
</tr>
</tbody>
</table>

Note: US$1.00 is equivalent to £7.50.

Table 2.3. SOURCES OF FUNDING FOR 1976-80 (in US$1,000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>1976</th>
<th>1977</th>
<th>1978</th>
<th>1979</th>
<th>1980</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreign exchange component</td>
<td>470</td>
<td>1,903</td>
<td>1,176</td>
<td>787</td>
<td>673</td>
<td>5,009</td>
</tr>
<tr>
<td></td>
<td>SEAFDEC and other contributions</td>
<td>2,825</td>
<td>4,805</td>
<td>4,119</td>
<td>3,653</td>
<td>3,594</td>
<td>18,996</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3,295</td>
<td>6,708</td>
<td>5,295</td>
<td>4,440</td>
<td>4,267</td>
<td>24,005</td>
</tr>
</tbody>
</table>

Note: US$1.00 is equivalent to P7.50

The program document, as originally prepared, was submitted to the chief and Miguel for their study and approval. Subsequently, the document was presented to the SEAFDEC Council in December 1975. Although the scope of the program was highly ambitious, the director of the Philippine Bureau of Fisheries and Aquatic Resources, who was also the SEAFDEC Council's director expressed his support for the projected station. As a result, The Council adopted the program, even though members expressed apprehension about the magnitude of the project, which might not be implemented as proposed because of lack of funding.

PHASE 3: OPERATION, CONTROL, AND HANDOVER

Implementation: Reformulation of the Program and Related Activities

It was obvious at the outset that the budgetary requirements of the freshwater station would not be met, since it was too ambitious for the
resources on hand. Greatly concerned about this, Miguel and Santos held a series of conferences with local and foreign experts to update their program and make it more realistic.

In the meantime, Dr. Benjamin Reynoso, who was with the Department of Entomology, University of the Philippines (UP), and who had had experience in prawn aquaculture, took a leave of absence from the university and was appointed research coordinator of the station in January 1976. Under Dr. Reynoso's leadership, modest research activities were implemented, utilizing the temporary facilities on the four-hectare site at Tapao Point. A simple organizational structure was drawn up (see figure 2.4). The ten personnel of the station in the first quarter of 1976 was integrated with the Development and Liaison Office of the Aquaculture Department in Makati, Metro Manila, about 35 kilometers from the freshwater station site. Santos, now the department's director for external affairs and based in Makati, acted simultaneously as program director of the station. Directly working under him was Reynoso; as research coordinator, and the staff workers. The management flow for research at the time is indicated in figure 2.5.

During this initial stage of operation, the station depended wholly on the Makati office for its financial requirements. The accounting section at the Makati office handled all major disbursements, purchasing, rentals, and other transactions from the station. Santos was given the authority by the chief and Miguel to make small disbursements for the activities of the station. The station was operating on a P5,000 revolving fund for operating costs, not including staff salaries, and an administrative assistant in the station was assigned by Reynoso to make disbursements from the revolving fund. The employees drew their salaries from the Makati office in accordance with Aquaculture Department guidelines.

At the same time as the revised station program was being developed, the recruitment of highly qualified researchers and tech-
Tecicians was necessary. A good number were recruited, including a former chairman of the Department of Botany of the University of the Philippines College of Agriculture who was a nationally known phycologist, and a certain Reynaldo Cruz, who had just returned from the United States after six years of education and training in marine biology and lake ecology. Phycology, the study of algae, is of special importance because of algae's basic role in the food chain.

Fig. 2.5. Research Unit of the Freshwater Fisheries Station.

The Revised Five-Year Program

The station's five-year research program was presented to the department and approved in June 1976. In various aspects the revised program closely resembled the original, except that it was less ambitious in scope. Furthermore, it was emphasized that the freshwater program should complement the ongoing projects of the Aquaculture Department in its brackish-water aquaculture station in Tigbauan, Iloilo. Research projects common to both stations, particularly in ecology, water quality management, feed development, and reproductive physiology, should complement each other. The freshwater station was to be active in production-oriented, not basic, research, and in other development activities, and in training and extension work as well.

The revised program cited the following objectives:

- To optimize the exploitation of aquatic resources through research.
- To promote a rational exploitation of the freshwater environment through a holistic ecosystems approach.
- To increase the productivity of fish farmers through an effective transfer of fisheries technology.

It was proposed, that the station would provide training facilities for pond and pen or cage operators and researchers in freshwater aquaculture, disseminating the developed technology through extension
programs. This was intended to increase technical manpower and thus hasten the development of freshwater aquaculture in the Philippines and the region.

In the context of national development, the freshwater program would complement the ongoing short- and medium-term activities and proposed plans of various institutions such as Central Luzon State University (CLSU), the University of the Philippines College of Fisheries (UPCF), the University of the Philippines at Los Banos (UPLB), and the Bureau of Fisheries and Aquatic Resources (BFAR). This coordination would avoid duplication of effort as well as conserve resources in the execution of various freshwater development projects.

The program was committed to use all practicable means consistent with national policies and to dedicate its overall research and development plans to the long-term productivity and ecological integrity of Laguna de Bay and other inland waters.

As its contribution to the socioeconomic uplift of rural communities in the lake region and in coordination with appropriate government agencies, the station would undertake the development of a model ecological community in the adjoining fishing village of Pipindan, with fisheries and the application of appropriate technology for housing, civil works, and energy generation as prime development thrusts.

A timetable of research activities, personnel requirements, equipment needs, and revised capital development covering the five-year period 1976-80 were also prepared and included in the project document.

Research Activities

Approval of the revised freshwater program did not provide sufficient guarantee of funding. Nevertheless, there were assurances from Santos that funding support was forthcoming. In 1976, the research activities undertaken were organized into four projects: namely, Biology, headed by Reynoso; Ecology, by Cruz; and Phycology and Production, both headed by the senior consultant, who was now working full time as leader of the production project.

The initial staff of two grew to eighteen toward the end of 1976 to cope with expanding research activities. During this time, the following research studies were initiated.

- Single-cell protein production for aquaculture.
- Some aspects of catfish (Clarias macrocephalus) culture.
- Mass seed production of mudfish (Ophiocephalus striatus Bloch).
- Milkfish production (Chanos chanos Forskal) in fish pens.
- Socioeconomic study of small-scale fish-pen aquaculture at Laguna de Bay.
- Biological studies on the freshwater snail (Idiopoma angularis Muller), with some ecological considerations.
- The feeding and biodeposition rates of clams (Corbicula manilensis Philippi) fed with different phytoplankton.
- Bioenergetics of the freshwater snail (*Idiopoma angularis* Muller) in Laguna Lake.
- Preliminary studies of the lake as an ecosystem.
- Observation of the acclimatization of sugpo or jumbo prawn fry (*Penaeus monodon* Fabricius).

**Securing Additional Funds**

A major problem encountered in 1976 was the lack of clearly available funds for the various projects, as top management was still exploring possibilities of funding from various sources. After Miguel returned to the Philippines from his trips to the United States, South America, West Germany, Denmark, and other Southeast Asian countries in mid-1976, he directed Santos to submit a more specific project proposal on the freshwater program to West Germany and Denmark, as there were clear prospects of technical support from these two countries. The assistance being requested included the cost of laboratory and training equipment, expatriate scientists, scholarship and short-term training grants abroad for selected staff, provision of library and reference materials, and third-country training grants.

Dean Santos coordinated the preparation of the proposals. Cruz was specifically instructed to prepare detailed proposals on lake ecosystem studies, as this project was in line with the research priority interests of the Danish International Development Agency (DANIDA). Eventually the proposal to DANIDA resulted in the assignment of two technical experts to the Philippines — Dr. Jen Thorup (Freshwater Biological Laboratory, University of Copenhagen) and Mr. Erik Errboe (a private architect and trout farmer) — in October 1976 to assess the needs of the station. Following the favorable report submitted by these investigators, DANIDA provided for the services of two Danish experts in limnology on long-term assignments of two to three years, and granted short- and long-term scholarships for SEAFDEC researchers in relevant fields in Denmark.

It may be pointed out that the year 1977 began with great expectations for the program. Negotiations with external sources for support of the freshwater program had reached advanced stages. Efforts had also been undertaken to tap the Consultative Group for International Agricultural Research (CGIAR) to financially support the SEAFDEC Aquaculture Department, including the station. Not only had DANIDA approved a technical assistance grant to the station, but West Germany, the United Kingdom, and Japan expressed strong interest in supporting the project.

**Refinement of Research Priorities, 1977**

In late January 1977 the station's research staff prepared still another program of activities for consideration by the department. By and
large, the new program was within the framework of the revised five-
year research program, but with a realization that a large amount of
funds was not forthcoming. Specifically, the redesigned program
included a total of nine projects divided into several studies, and
assigned the following priority:

- Milkfish production
- Rearing of sugpo prawn in fresh water
- Rearing of giant freshwater prawn (*Macrobrachium* sp.)
- Tilapia production
- Carp propagation and farming
- Production of *Caranx ignobilis*
- Propagation and cultivation of kanduli, a local catfish
- Mullet farming
- Socioeconomic studies in pilot barrios

The new ordering of priorities was based on the following reasons:

1. The past experience of the station regarding the uncertainty of
   budgetary releases, even though they had been included in the
   approved program. The consensus of the senior staff was that,
   rather than start a project requiring a big budget that might be
   abandoned or discontinued, less capital-intensive but equally rele-
   vant research projects should be considered first.
2. The need to pursue further the encouraging results obtained from
   the preliminary experiments with jumbo prawn lake farming.
3. The availability of giant freshwater prawn specimens in the lake.
4. Consideration of indigenous species first as opposed to those
   that would have to be introduced from neighboring countries.
5. The growing interest in, and urgent need for, improved techniques in
   tilapia production.
6. The need for socioeconomic studies of the depressed areas along
   Laguna de Bay.

Organizational Changes in the Department, 1977

The new revised work program was approved by the management in
February 1977. Reynoso convened the senior staff to prepare for the
immediate implementation of the work plan.

During the first half of 1977 the administrative, research, and fiscal
management of the station remained as it was in previous years (see
figure 2.2). In June 1977, however, a number of significant changes
occurred. Research coordinator Reynoso resigned to return to the
University of the Philippines, which meant that station activities would
be coordinated by Santos, who at the same time was already saddled
with numerous duties as the director of external affairs.

Meanwhile, the position of research coordinator of the entire
Aquaculture Department based in Tigbauan was abolished and a new
Office of Director of Research was created. Dr. Juanito Alcantara, formerly director of research of the University of the Philippines College of Agriculture, was appointed to the position of research director. Shortly after his assumption of the post in June 1977, Alcantara, in anticipation of the expansion of the operations of the department, recommended the establishment of what he termed an innovative research management procedure. He recommended to the chief a series of special orders for implementation, which the latter approved.

Essentially, the new research management scheme was done through several organizational units: 1) the department's Research Council, 2) the director of research, 3) a Technical Evaluation Committee, 4) support services, 5) disciplinary units, and 6) substations. (see figure 2.6).

The department-wide Research Council, of which the station was a part, was composed of the chief as ex-officio chairman, the deputy chief and ex-officio vice-chairman, the executive director as ex-officio vice-chairman, and thirteen other top administrative and research officials. To date, the council has been responsible for the development of an integrated research program for the department; promotion of multidisciplinary collaboration among the different units in the department; formulation and approval of policies, standards, and rules relating to planning, organization, evaluation, implementation, and coordination of research; setting priorities and determining resource allocation for research; and other activities.

The director of research provided leadership in the systematic appraisal by the department of major problems affecting aquaculture in the region, including the necessary resources and relevant technologies for regional growth. He also facilitated responsive promotion and planning of research programs; and evaluated, coordinated, and monitored all research activities.

The Technical Evaluation Committee screened all research proposals submitted for evaluation, in terms of relevance to program scope and established priorities, feasibility of specific projects, and expected benefits in relation to the functions of the department and to total input cost.

Support services were provided to maximize the productivity of researchers, including the fishery resource unit, the centralized analytical laboratory, the data bank, the documentation and publication unit, the microtechnique service group, the museum, the scientific supply house, and the central wet laboratory and broodstock-hatchery-nursery group.

Disciplinary units and substations included; 1) brackish-water aquaculture, 2) freshwater aquaculture, 3) mariculture, 4) larviculture, 5) aquaculture engineering, 6) natural feed culture, 7) nutrition and feed development, 8) pathology, 9) ecology and systematics, 10) limnology, 11) chemistry, 12) economics, 13) physiology, 14) genetics, and 15) production and development.

The structural planes in the research management process, from bottom to top, are from study units to project to program. Formulation of research proposals could either be interunit or interdisciplinary.
Fig. 2.6. Revised research management system of the Aquaculture Department, 1977.
The decision-making modes in the research management system from top to bottom ran as follows: 1) director of research, 2) program leader, 3) project leader, 4) study leader, and 5) station manager or section head.

In summary, the flow of management information ran as follows: The department's Research Council formulated policies and priorities. The research director disseminated policies and priorities to researchers. The program leaders initiated program plans in consultation with the research director and the project leader and/or station managers and section heads. Existing project leaders might introduce revisions in the projects as they came along, in consultation with the program leader and station manager/section head.

The Presidential Proclamation is Delayed

With the new research management systems made operative, Miguel returned to the problem of securing a permanent site for the station. As was mentioned earlier, a presidential proclamation endorsing establishment of the station and granting it a permanent site was delayed, for unknown reasons. Thus, early in 1977, when the Philippine Department of Natural Resources requested that Cruz be assigned to the DNR as a technical consultant and chairman of the DNR National Mangrove Committee — in addition to Cruz’s responsibilities at the freshwater station — Miguel had agreed.

Essentially, Miguel viewed the reassignment as a mechanism for establishing strong links with DNR, for two reasons. First, the Philippine counterpart fund for the operation of the Aquaculture Department required the prior endorsement and recommendation of the DNR to the Philippine Budget Commission before funds could be released; and second, an urgent approach had to be made to convince the DNR that the presidential proclamation must reserve a larger tract of land, 45 hectares instead of the existing temporary permit for 4 hectares. (The draft proclamation had been submitted a year earlier.) Because of Cruz’s professional affinity with some DNR technical consultants and advisors, most of whom had been his classmates at the University of the Philippines, Miguel though Cruz could do something about the proclamation.

In mid-1977, Cruz initiated a series of meetings with the consultants' group of the DNR secretary for presidential proclamations to thrash out the reasons for the lack of action on the endorsement. One major factor for the delay, Cruz discovered, was the apparent misconception about the ever-expanding programs of the Aquaculture Department with regard to some other national fisheries programs. Other factors involved minor personal matters. Dealing with the first problem was not difficult; Cruz drafted a position paper to show the rationale for expansion of the department's programs to freshwater aquaculture. In mid-July 1977 the DNR secretary finally endorsed the request of the Aquaculture Department to the Office of the President of the Republic of the Philippines. On July 28, 1977, presidential proclamation 1658 was signed by President Ferdinand E. Marcos reserving a permanent site for the freshwater station at Binangonan, Rizal.
Organized for the Permanent Station:
Problems and Progress, 1976-78

Inspired by the presidential proclamation, Miguel conferred with the chief of the Agriculture Department, Dean Villanueva. Presenting the plans of the station, he convinced the chief of his full support of the station in terms of more funds and recruitment of new staff at a level proportionate to that for the Iloilo brackish-water station. Proclamation 1658, Dr. Miguel argued, meant unqualified support by the government of the Philippines for the planned freshwater program.

With the resignation of Reynoso, the first task was to find a program leader who could also serve as station head. This was necessary because Dean Santos, who was officer in charge at the time, had an increasing work load at the Makati office. Some names were considered, but the final choice was Cruz, thanks to his familiarity with the initial operations and current problems of the station. Cruz had also been an administrator and researcher in a private university in Manila and at North Carolina University. Furthermore, he had a good working relationship with the Department of Natural Resources. Initially, Cruz had politely rejected the offer, since his principal interest was research and he didn't want to be saddled with administrative work. Cruz later accepted, however, with the proviso that a full-time administrator be assigned to assist him. Hence on July 1, 1977, Cruz began his job as program leader of the freshwater station. An executive assistant was likewise assigned to the station to assist Cruz in purely administrative matters and to install a management information system for the station.

Some of the problems encountered by the station during this period were:

1. The new research management system was not working well, primarily because of the station's geographical distance from the main station in Tigbauan, Iloilo, where the offices of the chief, research director, and other members of the Research Council were located. Communications, travel, and the flow of documents were unduly delayed as a result. Moreover, the concepts of disciplinary units, supportive services, and evaluation and monitoring procedures were found to be inapplicable, unmanageable, and impractical, largely due to geography.

2. The department research director (Alcantara) at the main station was unsympathetic to the freshwater station's plight, possibly because of his personal conflict with the program leader, as the latter often expressed negative views, along with his staff, on Alcantara's research management policies.

3. The station, with no reliable budget of its own, relied heavily on the Makati office when funds were available; hence it could not plan out its research activities on the basis of resource availability.

4. Procurement of materials and supplies for research and other station activities was centralized in the Makati Liaison Office. This situation caused many unnecessary delays.

5. Personnel recruitment was not among the station's responsibilities.
Fig. 2.7. Revised administrative structure of the Freshwater Fisheries Station.
For these reasons Cruz, with the support and encouragement of Dean Santos, worked for greater autonomy for the station. The station was finally granted its request, and a memorandum was circulated giving the station the flexibility and authority to implement its own research projects. Recruitment of personnel was wholly conducted by the station; that is, its recommendations regarding rank and salaries were almost always approved by top management. Top management supervision and monitoring of the station were placed directly in Miguel’s hands (see figure 2.7).

To implement its newfound autonomy, the station initiated several activities. A program management staff was organized by the program leader and research projects were again revised based on actual budgetary capabilities. The research activities employing the integrated team approach were reorganized under three modified projects: production projects, biophycology nutrition projects, and ecology. A Physical Plant Office was created under the direct administrative supervision of the executive assistant, who now exercised line and coordinative functions for the program leader (see figure 2.8).

Another key change occurred in fiscal management. An amount of 100,000 in a revolving fund was given to the station for its operating expenditures, with the result that the station enjoyed better control over its fiscal management. A monthly allocation of £40,000 to £50,000 was agreed upon as replenishment of funds. A separate account was established with the City Trust Bank of Taytay, Rizal, the commercial bank nearest the station.

In October 1977 an accountant from the Makati office was designated for the station, as well as a head of the property and supply management unit. New financial and administrative procedures were installed for speedy procurement of supplies, materials, and equipment. Separate account books and a clearing account with the Makati office were established, enabling the station to handle its own financial transactions.

The preparation of the monthly payroll, which used to be done in Makati, was assigned to the station, so that the staff did not have to go to the Makati office to get their salaries, as had previously been the case. The accounting clerk got the check representing payment of salaries and deposited the entire amount in the Community Savings Bank in Binangonan, Rizal, where the employees drew their pay at the middle and end of every month.

Changes also took place in personnel policy. Cruz, with the assistance of Santos, was able to convince Miguel – whose influence and control over the Tigbauan Personnel Committee was great – to work for the adjustment of the salaries of all station staff to make them comparable with those of Iloilo personnel. Over some objections, Cruz’s recommendation was finally approved – which boosted the morale of the staff. A series of workshops and meetings were held among the station’s staff with Miguel and Santos to clarify administrative policies from top management. These sessions promoted better and more cordial relations between the scientific and administrative staff – a situation which to date still exists. Work load distribution was rationalized and made more equitable.
Fig. 2.8. Revised organizational chart of the Freshwater Aquaculture Station
An active Personnel Evaluation Committee for the station was formed. Its job was to: 1) assess the station's manpower requirements, 2) screen applicants, 3) conduct preliminary interviews, 4) make periodic performance evaluation, and 5) perform other necessary functions to promote the welfare of station personnel. Procedurally, the Personnel Committee screened job applicants on the basis of their academic qualifications and work experience. The committee decided whom to recommend to the program leader for recruitment and suggested the tentative designation and corresponding salary of the applicant. The program leader evaluated the recommendation and, if in agreement, endorsed the applicant to top management for appropriate action.

In its first year, the Personnel Committee recommended the hiring of thirteen people: one research associate, nine junior researchers, one consultant in statistics, one scientific illustrator, and a fisheries aide. It also approved the transfer of research and engineering personnel from Tigbauan. In a few instances, it denied the requests of some SEAFDEC officials and local municipal officials that their recommendees be hired by the station. In effect, the station started subtly and politely to resist political patronage in personnel recruitment.

As part of its staff development program, the Personnel Committee also nominated a number of researchers for scholarship, travel, and/or training, both foreign and local. Of the current research staff, four are Ph.D.'s, nine are M.S.'s, and thirty-seven have B.S. degrees.)

A seminar committee was also created to spearhead the conduct of various internal seminars and lectures to promote the exchange of information and technical knowledge between the research units.

Research Highlights, 1977-79

Hand in hand with the task of resolving coordination and control problems in the station, research activities were undertaken. Several species of fish were studied during this period, and a major effort was made to develop a model ecological community in which the knowledge generated by the fisheries station could be applied to increasing the livelihood of the people. Modest research results were achieved that were both meaningful and economically feasible. During its short period of existence to date, the station has made substantial progress in various aspects of freshwater aquaculture and has scored some breakthroughs in research and fish production. Among these are:

Prawn farming in freshwater. First in the list of accomplishments is the development of an entirely new technology of farming sugpo, or jumbo prawns, in fresh water. Before the station's successful attempt at growing prawns in fresh water, sugpo could be obtained only from its natural habitat in the coastal estuarine water or from brackish-water ponds.

The components of this new technology were: 1) the successful acclimation of the post-larvae in fresh water, 2) the development of a
stable compound feed utilizing indigenous resources in the lake, and 3) the development of different types of supplemental feeds suitable for prawns under lake conditions.

Lake farming. Exploratory studies on larval rearing, broodstock development, and lake farming were conducted on the Philippine species of the giant freshwater prawn Macrobrachium, with the objective of reestablishing this valued shellfish commodity in the lake. Farming Macrobrachium sp. in the lake had become a desirable goal because of the shellfish's increasing acceptability and market value. Success in this venture would certainly provide the people with a cheaper shrimp protein source.

Basic studies on the biology of Macrobrachium sp., including its larval stages, were undertaken as a prerequisite for intensive larval rearing activities. The indigenous Philippine species can favorably compare with M. rosenbergii, which is currently under massive production in Thailand and the United States.

Tilapia cage farming. The tilapia cage industry in Laguna de Bay has grown through the years, almost always utilizing low-technology, traditional methods. As a result, the harvested fish are small and of inferior quality. Nevertheless, recent developments point to the high potential of the species because of its high reproductive capacity, fast growth rate, and ability to utilize natural and supplemental feeds efficiently. Research at the station therefore focused on breeding for better-quality tilapia, finding economical supplemental feed, and developing better farming techniques.

The station endeavored to improve tilapia aquaculture by the following means:

- Production of tilapia hybrids with improved body length and weight.
- Higher stocking densities of T. nilotica with supplemental feeding.
- Formulation of nutritious and economical tilapia pellets (23.8 percent protein) using ipil-ipil (Leucaena Leucocephala) leaves and rice bran.
- Improved protein content of T. mossambica with varying levels of ipil-ipil leaves in the diet.

Milkfish (Chanos chanos) fry in freshwater. Milkfish fry were acclimated successfully in fresh water with a high survival rate of 88 percent, compared to the commercial scale of only 50 percent survival. The technique, when applied on a large scale, will bring down production costs, since fish farmers can now raise their own fingerlings in fish pens and cages instead of buying them from brackish-water fish nurseries at comparatively higher prices and with higher magnitudes of mortality. Stress during transport under traditional procurement practices would also be minimized, because fry are relatively easier to handle and are sturdier than fingerlings. Lastly, survival rates in fish pens are expected to improve because of the acclimation process prior to stocking.
Carp production. The polyculture of carp in many Asian countries, notably in China, has yielded outstanding results in terms of providing cheap sources of protein. In the Philippines, however, the production performance of carp has yet to be explored. In 1978, the station decided to undertake exploratory studies on these species to determine the possibility of farming them commercially in inland waters. Exploratory experiments were conducted on cage culture of rohu and silver carp.

Ecology of Laguna Lake. In recognition that the problems of the lake were those of an ecosystem in jeopardy, a long-term program of ecological investigation was implemented. Preliminary results of the study provided a reasonably clear picture of the lake ecosystem, with special emphasis on its overall health and fish-carrying capacity.

Preliminary results of the regular ecomonitoring activities in Laguna de Bay indicated that:

- Water quality continues to be favorable for fish production.
- Primary productivity is affected by fluctuations in temperature, light, transparency, and salinity.
- The growth of the blue-green alga Microcystis can be affected by the inorganic nitrogen content of lake water.
- Snails of the genus Stenomelania comprise the most abundant benthic population in Laguna de Bay.

Microcystis has long been suspected of being responsible for the massive fish kills that had occurred in the lake on several occasions. The phenomenon called "Microcystis bloom" has resulted in the loss of millions of fish. Studies on the prevention of this phenomenon are ongoing at the station.

Stenomelania, on the other hand, are the chief natural food of ducks around the lake. A thorough understanding of the biological attributes of this snail species, more particularly in regard to population dynamics, will aid the lake's duck-raising industry.

Pilot-Testing Activities

Based on the results obtained on prawn lake farming, a proposal for pilot testing was prepared in 1978 to demonstrate the viability of the experiments on a larger scale. The establishment of a one-hectare demonstration farm on the lake was proposed. It was also hoped to identify the concomitant problems in large-scale application of the new technology. The proposal was approved and implemented in March 1979. A sugpo task force was created for the purpose. Sugpo fry, obtained from the SEAFDEC hatcheries in Iloilo and from the wild, were acclimated to fresh water, utilizing the technique developed by the station. An average 74 percent survival rate was obtained after three-day acclimation periods. Fresh clams were used as feed during the period.
Acclimated fry were transferred to the lake in nets (5 x 5 x 2 m) made of hapa, a natural fiber, at a stocking density of 100 fry per square meter. During the first month of rearing, only minimal amounts of supplemental feeds were given, because of the availability of natural food in the lake. When the fry reached a length of 80 to 120 millimeters (at about one month), they were stocked in B-net cages (5 x 10 x 3 m). The stocking density was reduced to 30 fry per square meter. The animals were fed with station-formulated feed for prawn (starter feed, 40 percent crude protein) and fresh clams during the second and third months. This initial pilot test using twenty-five cages was successfully completed in July 1979. Large-scale pilot testing activities on this technology are now in progress. (Highlights of research activities are summarized in Appendix 2.1.)

Development of an Ecological Community

During the year 1977, other issues involving the social and political impact of the station arose in the barrio adjacent to the station. Presidential Proclamation 1658, which reserved the land for the station, aroused deep suspicion and skepticism among the barrio people of Pipindan and the neighboring barrios of Binangonan, Rizal. Barrio Pipindan, site of the station, is relatively inaccessible by land, depressed, and dependent on the marginal income derived from open-lake fishing. The residents feared that the proclamation would dispossess them and that the station would eventually engulf the entire barrio. This was a growing concern that hampered research activities at the station. Petty thievery and harassment by elements in the community were a regular occurrence.

In response, Cruz and his senior staff conducted a series of meetings with townspeople, local officials, teachers, and the like, and held seminars in Barrio Pipindan to explain what the station was all about and to describe the mechanics of land acquisition. The staff also emphasized the future socioeconomic impact of the freshwater station to the community. In addition, support and casual personnel were recruited from among qualified barrio residents. Rapport was thus established and sustained with Barrio Pipindan and the other nearby barrios. A socioeconomic study subsequently conducted on the barrio was well received by the residents.

Since one of the station's objectives was the transfer of developed technology to fish farmers, the station explored the possibility of setting up linkages with other agencies to look at an adjacent barrio as a target clientele for the transfer of new technologies. The concept of an ecological community arose, together with fish farming, as the major development instrument. The station proposed the joint undertaking of the development of the adjacent fishing village of Pipindan with the Ministry of Human Settlements (MHS) and the National Environmental Protection Council (NEPC), which at that time were also in the process of selecting sites for the establishment of model ecocommunities. Preliminary negotiations were made with the two agencies regarding the possible establishment of a model community.
A series of meetings were held by a six-person technical panel from NEPC and SEAFDEC. They worked out the details and means of implementing areas of collaboration, and agreed on the following agenda:

1. To conduct workshops, meetings, and seminars with barrio people to explain the goals and concepts of the ecocommunity.
2. To research and select technologies appropriate to barrio life-styles.
3. To assist barrio residents in implementing the strategies selected to create a more self-reliant community.
4. To train and supervise the application of the freshwater aquaculture techniques developed by SEAFDEC.
5. To monitor and evaluate all site development activities to ensure their consistency with the desired goals.
6. To extend aquaculture techniques and knowledge to communities designated by the Ministry of Human Settlements, in accordance with the agency's aim to help provide the basic needs of man, the foremost of which is food.

The station was asked to prepare an economic profile of the barrio, which was to be used as a primary source by a task group that would draft the memorandum of agreement and the project proposal. The initial site of the ecocommunity project was Barrio Pipindan. The plan was to extend the project to adjoining barrios.

The memorandum of agreement, signed on December 12, 1978, called for the Ministry of Human Settlements, through the National Environmental Protection Council and SEAFDEC, to pursue the ecological development of a pilot human settlement in a municipality of Binangonan, Rizal, using lake fisheries as the principal economic base. The framework of the plan, as formulated by the NEPC and SEAFDEC staffs, was an integral part of the project. Each agency would make available $1,000,000 as seed money for initial operations. The agreement also stipulated that a joint project management staff be organized, consisting of one project manager from NEPC, one coproject manager from SEAFDEC, and two members from each agency to administer, coordinate, and monitor program activities. The technical staff of each agency would provide support and technical expertise in accordance with their defined functions.

SEAFDEC would be responsible for the generation, pilot testing, and implementation of new technologies in fisheries and aquaculture and would critically evaluate their socioeconomic impact in the community.

NEPC would introduce novel technologies to achieve a certain degree of self-reliance in the eleven basic needs of man, namely: water, food, clothing, power, economic base, medical services, education-culture-technology, sports and recreation, shelter, mobility, and ecological balance. It would plan and develop settlements appropriate to the site, employing local resources and appropriate technologies.

The framework plan of the project embodied the following specific objectives:
- Research, development, and field application of appropriate technologies in fish culture
- Maximum utilization of indigenous resources
- Uplift of the residents' standard of living
- Minimal environmental degradation through sound ecological development and management of the project site
- Transfer of technology to surrounding communities.

The project's expected outputs were classified by sector. In the food sector, agricultural plots, vegetable gardens, and orchards were planned, along with the production of staples such as rice, corn, and root crops. Provision was made for fishponds, pens, and cages, and for raising livestock such as pigs, poultry, and ducks. Water was to be provided in adequate supply and collection facilities built; a recycling system for waste water was included. The use of biogas digesters and other conventional and nonconventional energy sources was envisioned. Other areas given attention in the project included clothing and cottage industries, which, along with employment in aquaculture, livestock raising, agroforestry, and other commercial enterprises, would provide the ecocommunity's economic base. Community medical and education services were to be upgraded. Appropriate shelter through low-cost housing schemes (soil-cement and coconut boards, for example), improved transportation and communication systems, and organized sport and other recreation activities were elaborated in the project plan. An "Eco-Brigade Team" was to be formed to work toward an ecological balance in the community.

The project consisted of four phases: 1) research, 2) project planning, 3) project implementation and management, and 4) project monitoring and evaluation.

The Barrio Pipindan ecocommunity project, although conceptually sound and well structured, did not get off the ground, mainly because of organization changes in the Ministry of Human Settlements and the subsequent reprogramming of the ecocommunity project. Using essentially the conceptual framework learned from the Pipindan project, however, a new scheme, called the Bagong Lipunan Sites and Services (BLISS) Program, was developed nationwide. (See Appendix 2.2 for a brief description of the BLISS Program.) In 1980, the Barrio Pipindan project was given top priority for implementation. At present a number of BLISS projects have been established around the country.

Training: Local and International

To impart necessary knowledge and skills in the culture of freshwater species, including the construction and management of pond-pen-cage systems, the station conducted a number of short-term training programs that adopted the following format:

1. Actual participation in ongoing research activities in coordination with study leaders.
2. Research in areas of specific interest to the participants.
3. Practicum on fish pen and cage construction.
4. Field trips to various freshwater aquaculture enterprises.

Since early 1976, international training has been an integral part of the freshwater station's program. Despite limited facilities, in 1976 two participants, a Filipino and a Thai, were taken on to conduct research studies on two aspects of catfish culture. In 1977 the station provided a three-month practicum to international trainees as part of the department-wide International Training Program in Aquaculture Management and Research Methodology. Five of the trainees were from Thailand, two from Indonesia, two from Bangladesh, and one from Singapore. In July 1978 an Indonesian trainee undertook a five-month training course at the station on fish pens, fish cages, and ecosystem studies under the auspices of the German Foundation for International Development. In the same month, a student from the Netherlands started a six-month practicum in freshwater aquaculture as part of the course requirements for his bachelor's degree.

Four International Development Research Centre (IDRC)-sponsored trainees from Egypt, Malaysia, and Sierra Leone undertook a three-month training course on freshwater aquaculture in February 1979. Five Cuban fisheries scientists arrived in May of the same year to start a three-month training course on tilapia cage culture in fresh water. Finally, three Malaysian fisheries biologists spent three months conducting short-term research in tilapia and carp nutrition.

The need for a director for the training program became apparent in view of the increasing number of local and international trainees and fisheries students from various institutions who wanted to work in the station. In 1977 the program leader designated Luiz Mendoza to take charge of station activities related to training. In April 1979 a research assistant was designated training coordinator to assist Mendoza.

Local and on-the-job training. In 1978 student trainees from various local fisheries schools began to conduct off-campus training at the freshwater station. From April to June, students from Southern Ilocos Polytechnic State College (SIPSC) and Central Luzon State University (CLSU) underwent apprenticeship. In December 1978 the station provided practicum training for two students from the Bicol University College of Fisheries. In April and May of 1979, respectively, seven fisheries students from the SIPSC and nine from CLSU started a ten-week on-the-job training course in freshwater fisheries.

Ten participants, local and foreign, in the Workshop on Pen and Cage Culture and Management conducted earlier in Iloilo stayed at the station from March 26 to April 6 to observe actual freshwater aquaculture operations. Eight trainees from the Bureau of Fisheries and Aquatic Resources stayed from April 23 to 27 at the station as part of their training in extension program methodology.

Graduate research. A number of graduate students from universities within the Philippines have conducted their experiments and thesis work
at the Binangonan station under the guidance of station researchers. Their research covered such areas as aspects of the freshwater snail *Idiopoma angularis* Muller, an important food source for freshwater fishes; clams fed with different phytoplankton; physiological aspects of *Microcystis aeruginosa*; and organic matter production and flux in the two rivers that empty into Laguna Lake.

Grants were also made available to personnel at the station to enable them to pursue advanced degrees in foreign and local institutions. Grants were provided for observation trips to research institutions and for attendance at foreign and local conferences, workshops, and seminars. Senior researchers have given a number of lectures and delivered papers at the request of national and international research institutions with whom the Aquaculture Department has developed institutional linkages.

Reports and Feedback Mechanisms

To ensure adequate and proper monitoring of program activities, the following reports are submitted to the main station in Iloilo:

**Research reports.** There are four types of research reports — monthly, quarterly, semiannual, and annual. They are also considered progress or status reports. Progress reports incorporate technical and operational problems and indicate possible solutions. Management uses these reports as a basis for evaluation and planning. Additionally, a terminal report is submitted upon completion of a research project. Each type of report is reviewed on ascending managerial levels. Research findings from stations are consolidated and the report is finally submitted to the SEAFDEC Secretariat at its headquarters in Bangkok, Thailand.

**Station and program reports.** These comprehensive reports, submitted to the chief at the middle and end of the calendar year, include budgetary expenditures, resource allocation, infrastructure development, and recommendations for the improvement and growth of the station, as well as proposals for new research projects.

Researchers, it should be noted, found the number of reports they were required to write a problem. It was argued that monthly and quarterly reports should be done away with, especially for long-term projects. Valuable research time and administrative costs, it was pointed out, could be saved by reducing the number of reports. Occasional delay in the transmittal of station reports to the office of the research director in Tigbauan, Iloilo, caused minor problems, but by and large the reports and feedback system work satisfactorily for the Aquaculture Department and its various stations.
SEAFDEC was evaluated as a regional organization by an international technical group in 1978. Its exceptionally high rating then was principally due to the number of scientific breakthroughs made by the Aquaculture Department in its prawn and milkfish projects, despite the lack of facilities.

The Aquaculture Department also had its own built-in evaluation mechanism, in the Executive Committee and the Research Council based on actual performance in completed and ongoing research, relevance and contribution to fisheries technology evolution and program potential, budgetary considerations, and resource allocations. The fact that research outputs were achieved despite budgetary constraints has been commended by national and foreign scientists who became familiar with the station's work through its open research policy, which encouraged scientists from all sectors to visit the station and review its projects in a healthy atmosphere of free exchange.

The station's success in sugpo lake farming is considered by many fisheries scientists and biologists a milestone in sugpo research. Several highly enterprising pond operators have adopted the technology for the commercial production of prawns in their fish pens in the lake.

After three years of activity, prospects for the Freshwater Fisheries Station appeared optimistic, even with the change of leadership in the SEAFDEC Aquaculture Department in July 1979. Beyond 1979, a number of significant factors were judged likely to bear on the station's future programs:

1. The retirement of Dean D.K. Villanueva and Dr. Q.F. Miguel as chief and executive director, respectively, of the SEAFDEC Aquaculture Department. Miguel's exit, especially, deprived the department of a tireless, articulate, and aggressive fund-raiser and institution builder—and more important, of an enthusiastic supporter of the freshwater program. This circumstance also has implications on the negotiations for external funding support that were initiated by Miguel. Without this long-expected funding, implementation of the station program may be set back.

2. The organizational structure and working relationship between various units of the Aquaculture Department, including the freshwater station, may change with the entry of the new chief.

3. The establishment of the University of the Philippines' system in Visayas, adjacent to SEAFDEC in Iloilo, in the next three years may have profound effects on the fund-raising activities of the freshwater station, considering that the UP project will also have a freshwater fisheries component.

4. The Ministry of Natural Resources, through its Bureau of Fisheries and Aquatic Resources, is extremely keen on a close relationship with the SEAFDEC Aquaculture Department, particularly in training
and extension activities. This points toward greater participation of
the staff in national development programs in freshwater aqua-
culture.
5. The implementation of the Asian Development Bank-Laguna Lake
Development Authority project on milkfish-tilapia fish pen produc-
tion in Laguna de Bay, starting October 1979, which would use
technologies in tilapia and milkfish culture and pen engineering
developed at the station.
6. The takeoff and implementation of the Ministry of Human Settle-
ments' nationwide BLISS (ecocommunities) projects, one of which
was to be established in Binangonan, Rizal, under a memorandum of
agreement signed between NEPC, MHS, and the Aquaculture
Department.

Refinement: Future of the
Freshwater Fisheries Station

Looking toward the future, the freshwater station began making projec-
tions. Consistent and relentless effort, station management believed,
would have to be exerted to complete all viable research projects begun
in 1977 and 1978. Moreover, a broader view of freshwater and
aquaculture had opened up new challenges. Thus in late 1979, the
station drew up a practical plan for the next five years, whose
important goals were:

1. Extend research to include highly promising species for freshwater
aquaculture. Choice species were identified as Penaeus semisulcatus,
P. merguiensis, Macrobrachium spp., Pangasius sp., Mugil sp., Caranx
sexfaciatus, Clarias batrachus, and Anguilla spp. Some are endemic,
while others would be imported because of their aquaculture potential.
Studies for each would include both applied and basic aspects such as
biology, nutrition, hatchery, and their potentials for lake farming.

2. Establish hatcheries in different parts of the country for species
amenable to freshwater aquaculture. Small, functional, village-level
types of hatcheries were planned in strategic areas of the country, with
the application of larval rearing techniques for mass fry production.
These hatcheries would supply both the research and private sectors.
A continuing and reliable supply of fry is critical to progress in
freshwater aquaculture, and dependence on fry caught in the wild gives
rise to numerous difficulties. For this reason, the station deemed
setting up hatcheries for larval rearing of the species in item One to be
of immense importance.

3. Establish a pilot plant for fish and prawn feed production. Economical
and nutritious feeds developed in the laboratory were to be
produced on a semibulk scale and distributed to the various projects and
co-operators of the station.
Although the lake produces a great wealth of natural feeds, some species had absolute requirements for supplemental feeding. Moreover, in intensive farming there is a need to augment the natural supply for sustenance or acceleration of growth of the species. In the absence of commercial feeds that could satisfy the demands of research and industry, a pilot plant for feed production would have to be established.

4. Expand the area for development of freshwater aquaculture to include other inland waters. Existing inland waters such as ponds, springs, lakes, and rivers should be fully developed to maximize fish and shrimp production.

5. Set up demonstration farms in Laguna de Bay. Modules and demonstration farms would be set up in different parts of the lake for cage and pen culture of milkfish, tilapia, prawn, and carp. These projects would enable the station to implement on a commercial scale the various methods of cage and pen culture derived from completed experiments. These farm modules were envisioned as a system or mechanism for packaging specific technologies before mass transfer to fishermen.

6. Conduct ecosystem-based studies of other major lakes in the Philippines: Naujan, Paoay, and Taal. Routine ecomonitoring activities would be conducted to obtain baseline information on the water quality and the physicochemical and biological parameters of other major lakes in the Philippines. Data obtained would be used as a guide for future study and research geared toward fishery production.

Studies on the ecology of other freshwater lakes in the country assumed utmost importance, station personnel believed, when one realized that they constituted a resource base for the thousands of families who live along their shores. Efforts must be made, therefore, to establish harmony between the lake environments and development activities. Increased and sustained lake productivity could be ensured only if an ecological balance is maintained.

7. Conduct engineering research for freshwater aquaculture. New engineering designs and construction techniques would be developed for freshwater aquaculture facilities. Technology for hatchery systems for various freshwater species would also be developed.

Until recently, engineering research for aquaculture has not been given much attention by fisheries researchers. Engineering analysis and design would have to be applied to develop aquaculture facilities if desired goals were to be achieved.

Regarding training and extension, the transfer of technology could be made effectively, the station believed, only if an active and practical extension program were adopted. In coordination with appropriate national and international agencies, technology transfer to end-users in fishing villages would be hastened by conducting joint studies with pond, pen and cage operators in Laguna de Bay and other suitable areas.
As for staff development, improving the technical expertise of station researchers continued to be a concern of top management. A dynamic staff development program was to be continued to upgrade and strengthen personnel skills. Under this program, grants would be given to staff members to allow their participation in national and international training programs, conferences, and field trips.

And in regard to site and infrastructure development, it was proposed that an eight-kilometer road system be built to serve the Tapao Point area. A community-wide drainage system, power lines, and perimeter fencing for security were also proposed. In addition to the existing building, laboratories, and hatcheries worth £5 million, additional buildings would be constructed for physiology and nutrition laboratories, training, production, outreach stations, and auxiliary services. Auxiliary facilities would include an additional six duplex units, dormitory, cafeteria, administrative building, water development, filtration system, cold storage, boat landing, motor pool, and workshops. Seedbanks, fish culture ponds, and a 50-hectare fish pen were also planned adjacent to the station site.

Within the framework of these ambitious plans, assessment of the accomplishments of the station is a continuing process that focuses mainly on which goals of the program have been achieved. The broader regional and national objectives of the program remain to be attained; but within this time frame and given the limited resources available, the station has made major advances in fisheries research and technology evolution.

APPENDIX 2.1.
HIGHLIGHTS OF RESEARCH ACTIVITIES FOR 1977-79

The following are the highlights of the research activities of the freshwater station for the two-year period 1977-79.

Milkfish

1. Milkfish fry are acclimated successfully in fresh water.
   Milkfish fry were subjected to two methods of acclimation: 1) gradual and continuous acclimation to existing conditions, and 2) gradual acclimation by removal of brackish water. The two methods gave high survival values of 88 and 83.6 percent, respectively. Direct stocking in the lake without previous acclimation resulted in 59.3 percent survival.

2. Milkfish in fish pens showed preference for rotifers, copepods, and diatoms, as revealed by gut content analysis and plankton monitoring.

   The intake of the blue-green alga Microcystis by milkfish does not appear to depend on the quantity available, but rather on the absence of other, more desirable species of phytoplankton like
diatoms and dinoflagellates (such as Ceratium), and zooplankton like rotifers and copepods.

The average weight increase in milkfish samples seems to be related to the dominance of certain plankton species in the water. Thus a more significant weight gain was recorded in October to November, when the dominant plankton were the rotifers, copepods, diatoms, and Ceratium— as compared to the smaller weight increase in December and January, when the populations of these species were decreasing.

3. Fish pen production in Laguna de Bay was greatly affected by the ecological conditions in the lake.

A half-hectare SEAFDEC fish pen was used as an experimental area to determine milkfish production. Water quality was monitored both inside and outside the fish pens. Of the many factors that showed fluctuations, turbidity changes were drastic enough to effect the growth of milkfish. The decrease in growth may be explained by the fact that the turbid water limited phytoplankton growth.

4. Growth of milkfish fingerlings in cages was affected by varying water depths and stocking densities.

Milkfish fingerlings were stocked at two, six, and ten per square meter in cages installed at varying depths in the lake. Decreasing weight and length measurements were obtained with increasing depth, with the exception of the stocking density of ten per square meter.

5. Growth of milkfish fingerlings reared in cages to a marketable size was affected by substrate and stocking density.

Milkfish fingerlings were stocked in cages, both with and without substrate. Length and weight measurements were taken initially, and a second measurement taken after two culture months. No supplemental feeds were given during the experiment.

Results showed that both weight and length increased when stocking density was decreased from ten to two per square meter. In addition, faster growth rates occurred in fish stocked in cages with substrate.

Jumbo Prawn (Penaeus monodon) or Sugpo

1. Transport and handling of P. monodon post larvae.

Transport and handling experiments were conducted to obtain maximum survival of both the hatchery-produced and wild fry of P. monodon. Although practical and economical, existing transport practices will require much improvement when applied on a large-scale basis.

Postlarvae (P1)* were transported from Calaca, Batangas, to Binangonan, Rizal, in plastic bags using buri baskets and styrofoam.

*Subscript shows number of days from the start of the postlarval stage (approximately seven days from the time the eggs hatch). For example, P20 shrimp are 27 days old after the eggs hatch.
boxes, both with and without feeding. Results showed that postlarvae transported in buri baskets and styrofoam boxes had 83 and 87 percent survival rates, respectively.

2. Effect of supplemental feeds at varying feeding rates on growth and survival of *P. monodon* reared in the lake.

Acclimated postlarvae (*P*₂₀₋₃₀) were stocked in cages of 20 per square meter, and given three types of supplemental feeds: feed 1—FFS algae cake; feed 2 — trash fish and clams (1:1); and feed 3 — algae cake and trash shrimps. Feeding rates varied at 5, 10, and 15 percent of the body weight.

The analysis of variance showed "significant" to "highly significant" main effects of feed type and feeding rates. The effect of a given type of feed is the same whether the feeding rate is 5, 10 or 15 percent. Peak periods of growth of *P. monodon* given supplemental feeds were attained during the third and fourth months of culture. At the end of the sixth month, *P. monodon* given trash shrimps and algae cake (1:1) grew more than those given clams and trash shrimps (1:1) or those given algae cake alone. The highest survival rate was attained by *P. monodon* given clams and trash shrimps.

3. Effect of supplemental feeding at varying levels of crude protein in growth and survival of *P. monodon* reared in the lake.

Acclimated postlarvae (*P*₁₅₋₂₀) were stocked in the lake in floating cages at a density of 20 per square meter and given FFS algae cake prepared at varying crude protein levels of 30, 40, and 50 percent.

Growth of *P. monodon* was fastest in the treatments given algae cake at 50 percent crude protein level, as compared to the treatments at 30 and 40 percent, and to the control lot without any supplemental feed. Survival was highest in treatments given 40 to 50 percent crude protein levels and lowest in the control lot. Total feed conversion ranged from 4:1 to 5:1, with a tendency to increase through the four months of culture.

4. An economical and stable feed (SEAFDEC FFS Algae Feed 007) was developed for the lake farming of acclimated prawn.

SEAFDEC FFS Algae Feed 007 was developed for the lake farming of acclimated *P. monodon* in Laguna de Bay. The formulated feed was prepared in three different forms: wet and dried algae cake and dried algae pretzel. The dried algae cake was most stable, lasting up to 56 hours under laboratory conditions, and up to 36 hours in lake conditions. Attractability and acceptability tests were also conducted.

A marked increase in relative growth was observed when postlarvae were given the formulated feed as supplement at 1 percent of body weight.
Tilapia Species

1. Tilapia mossambica was reared to commercial size in floating cages in Laguna Lake.

Cage culture of tilapia in Laguna de Bay was effective, practical, and economical. *T. mossambica* fingerlings were stocked at 75, 100, and 125 per square meter. Average weight of tilapia after four months of rearing without supplemental feeding was as much as 59.01 grams. Statistical analysis using a one-way analysis of variance showed no significant difference (p=0.05) in all treatments. Hence, stocking densities in the lake for *T. mossambica* can be as high as 125 per square meter, compared to 2 per square meter in ponds.

2. *T. mossambica* given supplemental feed showed a faster growth rate than did a control lot not given supplemental feed.

Economical and nutritious feeds were prepared for lake farming of tilapia using: feed 1 – chopped snails and rich bran (30:70); and feed 2 – fish meal, ipil-ipil leaves, and rich bran (20:60:60). Feeds were finely ground, pelletized, and given once a day at a level of 10 percent of body weight. Stocking density was 50 fingerlings per square meter. Tilapia without supplemental feed served as control.

When given supplemental feed, *T. mossambica* fingerlings showed faster growth compared to the control without supplemental feeding. Tilapia given feed 2 showed a higher increase in weight (69.73 grams) than those fed with feed 1. Moreover, the feed conversion ratio for rice bran, chopped snails and fish meal was 0.25 kilograms per kilogram of feed, while that for rice bran, chopped snails was 0.12.


Crosses were made between *T. nilotica* and *T. mossambica* coming from different localities. Initially, no distinct differences in body weight, length, and width were noted among the different crossbreds, outbreds, and inbreds. The crosses *T. nilotica* x *T. mossambica* were substantially better than those between *T. mossambica* adults.

4. Growth of *T. nilotica* fingerlings in cages as affected by varying stocking densities.

*T. nilotica* fingerlings were stocked in cages at densities of 50, 100 and 150 per square meter. Fish stocked at 50 per square meter produced the highest mean length and weight, followed by those stocked at 100 and 150 per square meter. Additionally, no significant difference in mean growth rate was found between those stocked at 100 and 150 per square meter.

5. Comparative growth rates of monosexed male and female *T. nilotica* in cages at different stocking densities.

Males and females were sorted manually and stocked separately in cages (1 x 1 x 1 m) in the lake. On the whole, the growth rate of the males was faster than that of the females at all stocking densities (50, 100, 150 per square meter). Among the males, those stocked in cages at a density of 150 per square meter attained the
highest weight increment after both 21 and 41 culture days. Among the females, those stocked in cages at 50 per square meter had the highest weight increment after each sampling date.


* T. nilotica and *T*. mossambica were reared in cages (1 x 1 x 1 m) at three stocking densities: 100, 200, and 300 per cage. Growth rates of *T*. nilotica were faster than those of *T*. mossambica. Fishes of either species grew fastest at lower stocking densities. However, growth of *T*. nilotica seemed to be affected more adversely by higher stocking rates.


*T*. nilotica fry were reared in aquaria and fed with three types of feed: (1) FFS algae cake (ca. 30 percent crude protein); (2) Robina feed; and (3) rice bran and ipil-ipil (*Leucaena*) mixture (90:10). Growth and survival rates of fishes fed with algae cake were significantly higher than those fed with either Robina feed or rich bran and /ipil-ipil.

**Macrobrachium sp., Giant Freshwater Prawn**

1. Larval stages were completed in 41 days.

   This is the first report in the Philippines of successful larval rearing of this species. There are eight distinct stages of *Macrobrachium* sp. which are similar to, but not identical with, the Malaysian prawn.

2. Larval rearing was affected by nutrition and water quality.

   Artificial and natural feeds were developed in the laboratory. Economical and locally available ingredients were included in the diet for maximum survival. At this point, the formulated feeds are all experimental. The most acceptable feed discovered so far consisted of egg yolk, liver, bacon, and vegetables. This feed was passed through a 60, 40, and 20 mesh sieve – decreasing as the larvae metamorphosed from one stage to the other. Other types of feeds, such as raw fish, polluted the water too readily.

   Maintaining the water quality was a critical factor in larval rearing. Hence, there was a need for continuous improvement of the tank system to: (1) control excessive growth; (2) avoid loss of larvae when changing water; and most important, (3) reduce water pollution.

   A double undergravel filtration system was found most effective in maintaining good water quality. Initially, this was accomplished by having a series of three aquaria, where the middle aquarium was utilized solely for changing water. A later improvement was to have compartmentalized aquaria and marine plywood tanks with a separate moveable box for filtration.

3. Fecundity of spawners ranged from 15,000 to 88,000.

   There is a direct relationship between fecundity and body weight. Of the 149 spawners collected from the wild, the lowest
fecundity recorded was 8,000 and the highest was 130,000. The largest and heaviest spawners had a fecundity of 88,200.

4. Males are needed for a higher percentage of hatching.

It took the spawners an average of 31 days to remature in captivity. Males were not needed for females to spawn; however, those without males had a higher percentage of abortions than did those with males. Thus for mass production males were deemed necessary to ensure a higher probability of producing fertilized eggs.

5. High percent survival was obtained in transporting Macrobrachium spawners in styrofoam boxes at temperatures below 20°C with chloroform as anesthetic.

Results of experiments on the efficiency of various types of containers for transport of Macrobrachium spawners showed that styrofoam boxes were best for transporting the specimens from the place of capture to the laboratory.

Observations of the effect of anesthetics on reducing stress and mortality during transport of specimens showed that a higher percentage of survival occurred in the lot treated with chloroform and in the lot treated with sulfuric ether, as compared to the control lot (no anesthetic).

Significantly higher survival values were observed for specimens transported at temperatures below 20°C, as compared to those transported at temperatures ranging from 20 to 28°C.

6. The zooplankton species Moina macrocopa, a substitute for the brine shrimp Artemia salina, was produced, utilizing a common weed, Mallotus ricinoides.

A problem posed to the researchers was the reported absolute requirement that Artemia be used as feed in larval rearing. A substitute feed was necessary, since Artemia is not locally available and therefore very expensive.

Moina macrocopa was isolated from lake water and found to be highly acceptable to larvae at late stages of development. Stems, leaves, and branches of the weed, which is commonly called kilap, were utilized as substrate materials for large-scale production. Branches proved best in nonaerated cultures because they supported early growth of Moina.

7. The best type of "green water" for larval rearing contained Chlorella.

The use of Chlorella ellipsoidea to produce "green water" for larvae was better than that of Scenedesmus and Euglena. The survival percentage of larvae was highest and the nitrite content of the water lowest with Chlorella "green water." Gut examination revealed that Chlorella was assimilated by the larvae, unlike the other two algal species.

8. Lake farming of juveniles was demonstrated to be successful with the use of clams (Corbicula manilensis) as supplemental feed.

The optimum level of supplemental feeding was 10 percent of body weight. The mortality rate was a maximum (50 percent) when given chopped, boiled clams at 30 percent of body weight. The higher level of feeding resulted in a considerable amount of leftover food, which polluted the water.
Growth of juveniles in floating enclosures showed a 400 percent increase over the control group when given clams as supplemental feed. Other types of formulated feeds utilizing cheap components (e.g., ipil-ipil leaves, algae protein, and fish meal) were prepared with rice bran as binder.

**Carp Production**

1. Comparative growth of rohu (*Labeo rohita*) and silver carp (*Hypothalmichthys molitrix*) in cages.

   Growth of silver carp, both in length and body weight, was faster than that of rohu carp. Silver carp reared in cages were twice as long and weighed four times as much as rohu carp.

**Lake Ecosystem**

1. Water quality of the lake is still favorable for fish production, despite increasing siltation from surface runoff.

   Monitoring activities for one year (October 1976 to October 1977) at the twelve selected stations show the following parameters:

   **Temperature (°C).** Lake temperature ranges from 2.5°C to 32.3°C. This temperature reading was found to be favorable to 23 species of fish in the lake, of which the most common are catfish (*Arius manilensis*) and snakeheads or murrels (*Ophicephalus striatus*). Additionally, the temperature range of the lake suggests the possibility of a successful culture of *Macrobrachium* sp.

   **pH.** In the lake pH values range from 7.6 to 9.3. Most freshwater species require this range for survival. This range is also suitable for the production of phytoplankton, which serve as food for plankton-feeding fishes common in the lake.

   **Dissolved oxygen.** The average value of dissolved oxygen in all stations in the lake ranges from 6.1 to 9.4, values that are often higher than the saturation value during the daytime. This value for dissolved oxygen is high enough to counterbalance any small amount of toxic pollutants that may enter the lake; fish can tolerate certain levels of toxic pollutants if the concentration of dissolved oxygen is high.

   **Mineral salts.** The lake has a substantial amount of mineral salts essential to fish and phytoplankton. It has a level of 37.597 mg/l total hardness content (in terms of CaCO$_3$). Water hardness content in the range of 37.113 mg/l is lowest in the East Bay.

   **Specific conductance,** a rough estimate of the total mineral salt content, ranges from 282 to 2,700 μ mhos/cm. The seasonal increase in the content of mineral salts is due to the inflow of water from Manila Bay through the Pasig River.
The salinity of the lake, with a range of 0.141 to 1.35 parts per thousand is not harmful to freshwater species.

Turbidity. Turbidity seems to be the major problem in Laguna Lake. When the water becomes turbid at certain times of the year, algal production decreases and photosynthetic activity is hindered. These factors result in decreased secondary production by planktivorous fishes in the lake. On the other hand, when the water becomes less turbid and sunlight penetrates deeper into the lake, photosynthetic activity is enhanced and production of fishes like milkfish is favored. The months of May to December are suitable for algal production and milkfish culture in the lake.

Nutrients in the lake. The nutrient quantity is high enough to support a dense population of suitable fish. The lake has a total inorganic nitrogen content (nitrate, nitrite, ammonia) ranging from 309 to 1,081 mg/l and a phosphate content between 60 and 223 mg/l.

2. Succession of algae in the lake was monitored.

The dominant phytoplankton found from July to August were the blue-green algae, followed by the diatoms, green algae, and euglenoids, respectively. The populations of blue-green algae and green algae gradually decreased and disappeared in September through October, when diatoms became dominant. There was a decline in the diatom population and an increase in the density of rotifers and copepods in November and December.

The most common blue-green algae were Microcystis aeruginosa, Gleoetheca sp., Oscillatoria sp., Anabaena spp., and Lyngya sp. The most common green algae were Chlorella sp., Pediastrum sp., Scenedesmus sp., Staurastrum sp., and Spandylus sp. Diatoms of the genera Melosira, Cyclotella, Nitzchia, Fragillaria, Surirella, and Cymbella were abundant. Euglenophyta in small quantities were also found in all stations.

3. Microcystis growth was affected by the inorganic nitrogen content of lake water.

There were two periods of Microcystis "bloom." The first, which resulted in algal bloom and fish kills, started in June and reached its peak in mid-August. The second, characterized by moderate cell density, occurred in September, reached its peak in mid-October, and gradually declined in November through December.

The growth of Microcystis seems to be independent of the increase and decrease in values of temperature, light transparency, and salinity. Its occurrence, however, seems to be closely related to the inorganic nitrogen content of lake water.

4. Snails of the genus Stenomelania comprise the most abundant benthic population in Laguna Lake.

Sampling for bottom fauna at the twelve selected stations in the lake revealed the abundance and dominance of mollusks of the genera Stenomelania, Corbicula, Melanoides, and Idiopoma.
APPENDIX 2.2. A BRIEF DESCRIPTION
OF THE BLISS PROGRAM

On January 8, 1979, President Marcos issued Executive Order 517, declaring the adoption of the Bagong Lipunan Sites and Services (BLISS) concept as a major strategy for development. The program is an offshoot of the human-settlement-ecocommunity concept generated by the Ministry of Human Settlements, and deals with the improvement of housing and land resource utilization. A more strategic aspect of the program, however, is in developing the community's economic base and in teaching the values of cooperation and self-reliance.

BLISS sets the foundation for a model human settlement by locating it in a site with better and more facilities, or by upgrading the existing community. It then develops an efficient system for production and marketing to improve the people's means of livelihood. The resulting higher incomes can then support the community's additional basic needs.

BLISS is implemented in both rural and urban areas. Rural BLISS involves the development of three types of model or demonstration communities: (1) neighboring community (50 to 100 families); (2) agroindustrial community (100 to 500 families); and (3) watershed-based community (500 or more families, such as the proposed SEAFDEC-NEPC ecocommunity project in Barrio Pipindan). The Urban BLISS Program in Metro Manila (and eventually in other urban centers) involves the construction of clusters of walk-up apartments.

An example of the Rural BLISS project in operation involved a small fishing village of Tadlac in Los Banos, Laguna de Bay, not very far from the Freshwater Station, which was introduced to BLISS through a low-cost housing project. With some impetus from the government, the residents were able to use part of their income from fishing for a housing investment. By setting aside one-half kilogram of fish per day, residents are able to handle their housing obligations of P 120 (US$16) a month.

The BLISS program is currently nationwide and involves all aspects of community development. The overriding policy of the program is the immediate operation in areas where development problems are very great, with plans to expand the strategy to outlying areas.
The Development of a Beef and Feed Grain Industry in North Kohala, Hawaii: The United States*

Jim Wang
Tetsuo Miyabara
Louis J. Goodman

In 1970, Castle and Cooke, a major corporation in Hawaii, announced the phasing out of the Kohala Sugar Company, the major employer of residents in the North Kohala district of the Big Island of Hawaii. Immediately the state government took action, forming the Kohala Task Force, a committee composed of key government officials and businessmen. The government authorized the task force to assist private enterprises in developing projects that would create jobs for the area. One project assisted by the task force was Hawaii Biogenics, an integrated feed and livestock project. Proposed by a group of businessmen from Iowa, the project was designed to grow its own feed, fatten the cattle of local big-island ranchers in a feedlot, butcher the cattle, and fly the market-ready carcasses to Oahu. This plan would not only create jobs, but also help make the state self-sufficient in beef production. At that time Hawaii's consumers were paying $70 million annually for imported beef.

The Kohala Task Force gave Hawaii Biogenics a $1 million state loan and other assistance, but the project developed serious problems. The two principal owners had serious disagreements because one did not disclose the fact that he was being sued on the mainland for fraud, tax evasion, and bad debts. Financial problems arose because of undercapitalization, poor planning, high salaries, bonuses paid to owners, large travel and entertainment bills, and inappropriate purchases (such as a brand new Cadillac for the feedlot). The result was that the project promoters had spent the $1 million loan prior to the actual construction of the feedlot and had no operating capital.

The state provided the promoters with more money and imposed a restrictive purchasing system. Nonetheless, debts continued to amass. Soon the debt became public knowledge: over $2 million. Creditors

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*This case is based on material from public documents and newspaper articles which are cited.
began to foreclose, the state was accused of (among other things) a coverup, and the project promoters were threatened with criminal law suits. Finally, Hawaii Biogenics was put into bankruptcy. More problems arose, including charges of government incompetence, failure to be accountable, and poor handling of the project in general. The County of Hawaii and the Hawaii state legislature conducted audits and investigations. At this time, cattle are using the feedlot, but feed is still being imported. Moreover, the project is still losing money, creditors are owed $3 million, and the state wants to find a private investor to take over the project.

PROJECT BACKGROUND

Background of the North Kohala Sugar Community

North Kohala, the subject of this case study, is located on a peninsula in the northwestern portion of the island of Hawaii, commonly known as the big island (see figure 3.1). Geographically, North Kohala is a part of the peninsula formed by the volcanic Kohala Mountains, elevation 5,480 feet, one of the oldest of the five volcanic systems in the Hawaii island chain. In the early 1970s, about 70 percent of the total land was used for agriculture, almost exclusively sugarcane and cattle ranching. Another 26 percent was forest reserve, with the remaining land in residential, industrial, and commercial use.

For about a hundred years, sugarcane was the main economic base of North Kohala. The Kohala Sugar Company was founded in 1862 by the Rev. Elias Bond and Samuel H. Castle, who initially purchased 3,282 acres of land, which subsequently expanded to about 20,600 acres, of which about 14,000 were in sugarcane. By the early 1970s the company produced over 44,000 tons of sugar and employed a labor force of 564 persons (out of a resident population of 3,300), with an annual payroll of nearly $4 million. In addition to the Kohala Sugar Company, independent growers cultivated sugarcane on small parcels in North Kohala.

While the Kohala Sugar Company was the predominant employer in North Kohala, about 47,000 acres, or about 70 percent of the land in the district, was used for cattle ranching and grazing by two large ranches, Kahua Ranch and Parker Ranch. Kahua Ranch had more than 30,000 acres of grazing land and about 20,000 head of cattle. The northern end of the vast Parker Ranch (over a quarter of a million acres) extended into North Kohala, where it had about 10,000 head of cattle.

As for the resident population’s socioeconomic characteristics, the 1970 community profile study showed that only about 50 percent of the residents in North Kohala age 20 and above had a high school education, and a surprising 23 percent had attended only up to the sixth grade. Household income was concentrated between $5,000 and $14,999 with 62 percent of the households in this range. About 14 percent had incomes of $3,000 to $4,999, and 7 percent received less than $3,000. There were very few households in the upper income brackets, with only 3 percent reporting income of $15,000 or more. Thus Kohala in 1970 was a rural Hawaiian community, composed of persons of moderate
Fig. 3.1. Hawaii and North Kohala.

income, who derived their livelihood predominantly from agriculture and ranching.\(^{(1)}\)

The Closing of the Sugar Plantation

Unfortunately for North Kohala residents, sugar has not always been a consistent and predictable profit-making industry in Hawaii. The real motive behind the overthrow of the Hawaiian monarch and the annexation of the islands as a U.S. territory was the need to seek firmer protection against competition abroad and duty-free status of Hawaii sugar growers. Since passage of the 1875 Reciprocal Treaty, Hawaii's sugar industry has been preoccupied with seeking preferential treatment for its sugar against foreign competition. From 1934 to 1974, Hawaii's sugar was protected (and regulated) by the Sugar Act of Congress against the wide fluctuations of the world price for sugar, a product subject to worldwide supply and demand pressures. In addition, production costs, particularly labor costs, had risen steadily since the end of the Second World War. As a consequence, much of the sugar production in Hawaii was mechanized, decreasing the number of jobs. Thus sugar industry employment in the cane fields as well as in the mills in the state of Hawaii was 14,630 in 1960 and declined to 9,600 by the mid-1970s, a decrease of 34 percent during the 15-year period. For North Kohala, sugar plantation employment stood at more than 800 in the 1960s and declined to 564 by 1970.

The mechanization of sugar planting and harvesting meant that the sugar industry also had to scientifically devise ways to increase the total yield per acre of land utilized. The increase in average yield per acre from 6 tons to over 10 tons was made possible by the following methods: consolidation of operations by phasing out many inefficient and unprofitable plantations, a greater degree of mechanization, and improved technology. Most sugar operations in the early 1970s were only able to provide a 2 percent return on the investment. It became increasingly profitable for the sugar industry to make land available for development rather than keep it in agriculture. The Kohala Sugar Company in North Kohala was producing more than 44,000 tons in 1972, as compared to 36,000 tons in 1863. But despite the increase in yield, the Kohala Sugar Company was operating at a deficit of about $1 million per year.

The unprofitable operation of the Kohala Sugar Company reflected the problems of the sugar industry as a whole in Hawaii; it was frequently caught between depressed prices and rising production costs, as seen in Figure 3.1. For the three-year period from 1974 to 1976, the spot raw sugar price fluctuated from a high of almost $1,200 per ton to a low of below $200 per ton. At the same time, raw sugar cost per ton has been consistently on the rise in terms of labor, material, and other related costs.

It was against this background that the closure of the Kohala Sugar Company was made public on March 1, 1971 by its parent company,
Castle and Cooke, two years before its originally scheduled phaseout in North Kohala. Although it had spent over $6 million to devise ways to cut costs, improve operating efficiency, and increase sugar yields, the company was faced with a number of uncertainties for the future. The mood of Congress was such that it might not renew the Sugar Act and extend federal subsidies, the cost of labor continued to rise; and the cost of installing expensive antipollution equipment as required under federal environmental protection legislation was an additional burden. The most immediate impact of the closing of the Kohala Sugar Company was the job displacement of some 500 workers and the possible cost to the state of some $3.7 million in unemployment compensation and welfare assistance to those unemployed for the first year after the company's closing.

**Fig. 3.2.** Monthly average New York spot price for raw sugar.


The decision to close the plantation in Kohala, as it was explained by the management, was purely an economic one. The president of Castle and Cooke told the International Longshoremen and Warehousemen's Union (ILWU) at a stop-work meeting on March 3, 1971, that the cost factors had made it impossible to continue operating at a deficit. The ILWU unit chairman, however, expressed what was apparently the attitude of most workers: that it was a matter of mismanagement,
including the inexperience of supervisory staff and the overirrigation that often washed away the best topsoil. As an argument against the company's decision to close the operation on account of unprofitable operations, the workers pointed out that the independent growers nearby had done much better.

Government Response to the Closing

Under strong ILWU pressure and in response to the concern expressed by Hawaii County elected officials, the impending economic disaster for North Kohala became the focal concern of the 1971 session of the state legislature. At first, the State Department of Planning and Economic Development (DPED) proposed an amendment to the state's Depressed Areas Redevelopment Act, enacted in 1961 and designed to provide state aid to neighbor counties where unemployment reached 7 percent or more for a period of 12 consecutive months (Hawaii Revised Statutes, vol. 3, sect. 20l). In order to make North Kohala eligible for state assistance, the following changes were suggested: to declare smaller districts within a county depressed when a major industry closes and when unemployment reaches 6 percent or more for six consecutive months. The DPED proposal recommended that the governor be authorized to expend an overall $750,000 over a five-year period to aid depressed North Kohala by attracting new business to the area.

By mid-March the legislature had narrowed its options to two distinct approaches to providing aid to North Kohala. A senate version would involve mainly study by the DPED of ways and means by which the North Kohala community could be given relief in the impending disaster. The house version, on the other hand, called for a task force in which both union officials and the company's management would participate "to recommend a plan of action to save the Kohala Sugar Company and the community." In the negotiation sessions at the legislature, there was a strong preference for the house version by the union (the ILWU), by the company's management, and by county officials. The end result was the passage of the enabling instrument, House Concurrent Resolution 60, which authorized the governor to form an acting task force to save the Kohala Sugar Company. Acting with deliberate speed, Governor John A. Burns appointed a 12-member Kohala Task Force in mid-June.

Representing the state government:
  Lieutenant governor, chairman of the Task Force
  Director of Department of Planning and Economic Development (DPED)
  Director of Department of Land and Natural Resources
  Chairman of the Board of Agriculture

Representing the Hawaii County government:
  Mayor of Hawaii County
  Director of research and development
PHASE I: PLANNING, APPRAISAL, AND DESIGN

Project Identification and Formulation

Initially, most ideas about action programs to provide new industries, which in turn would provide jobs for the North Kohala community, emanated from three subject panels of the Kohala Task Force: (1) sugar, (2) other agricultural activities, and (3) nonagricultural activities. The panel on sugar focused on the possibility of the purchase by Hawaii County of the Kohala Sugar Company, the cost of roughly $5.2 million to be jointly financed by the county, state, and federal governments. The proposal was motivated primarily by the realization that by the time the sugar plantation was finally phased out in 1975, there would be no time to create 500 jobs to replace those lost in sugar employment.

In the nonagricultural or industrial panel there was discussion of the feasibility of a feedlot and slaughterhouse operation in North Kohala. Much of the enthusiasm and publicity centered on the concept of using former sugar land for sorghum growing, which would be closely tied to the contemplated feedlot operation in the area. Fred Erskine, then the chairman of the state's Board of Agriculture and chairman of the Kohala Task Force panel on other agricultural activities, frequently aired his optimism in public. In August 1971 Erskine told a reporter from one of the Honolulu dailies that North Kohala could become the site of a major industry in grains and feedlots for fattening the island's beef cattle. (3)

Erskine's enthusiasm was based on several factors. As was mentioned earlier, there was a good deal of local cattle in North Kohala. Parker Ranch ran about 10,000 head of cattle on 26,000 acres, Kahua Ranch ran 20,000 head on about 30,000 acres, and there were several other small independent ranchers in the district. These ranchers faced two basic problems: the extremely limited feedlot facilities for fattening cattle, and the high cost of importing grain from the mainland to
feed the cattle. In 1971 the only feedlot in Hawaii was the Hawaii Meat Company’s facility at Barber’s Point on Oahu, operated as a subsidiary of the Parker Ranch. It was the practice of Parker Ranch to ship its calves at 650 pounds weight to the Hawaii Meat Company feedlot at Barber’s Point, where they were fattened to 1,000 pounds "with the carcasses grading 70 percent choice." Before 1966, Kahua Ranch also maintained a small feedlot on Oahu for its calves, but because of the cost of the operation, Kahua decided to close its feedlot and ship the cattle to the Hawaii Meat Company facility instead. From the point of view of sound business operations, the general manager of the Kahua Ranch believed, a feedlot in Kohala would be ideal if feed grains could be grown in the area.(4) In 1971 ranchers in Hawaii were importing 70,000 tons of feed grains annually at a cost of about $90 to $150 per ton, according to Erskine.

After considering these factors, Erskine and members of the task force formulated the development concept: North Kohala would become a center where cattle could be pen fed from the feed grains locally grown, then slaughtered after fattening, and their carcasses shipped to the markets in Honolulu. A project based upon this concept was vividly pictured by members of the Kohala Task Force.

In fact, the key element — that of growing adequate feed grains such as corn and sorghum — was more than a vision in 1971. Metcalf Farms Hawaii was conducting an experiment in growing blight-resistant hybrid seed corn on the island of Kauai. Richard Metcalf, a Wisconsin corn farmer, had successfully planted hybrid seed corn on Hawaii sugarcane land in the winter of 1970, which then seeded many cornfields in the Midwest for the 1971 spring season. It was done despite the high cost of land and shipping because most of the mainland winter corn had been blighted in 1970. Essentially the Hawaii experiment was an emergency measure to relieve the plight of the corn farmers in the Midwest. Metcalf selected Hawaii in his worldwide search for a suitable place to grow seed corn. The experiment also led Metcalf to the planting of sorghum (especially <i>sorghum vulgare</i>, whose green forage can be utilized as energy feed for livestock) on vacant sugar land. However, the sorghum planting met with a series of natural problems: insects, plant disease, and birds. All of these problems contributed to a very low yield for the sorghum farming on Kauai.

Even though Metcalf Farms had experienced serious problems in sorghum growing in Kauai, it nevertheless pursued the opportunity that existed in North Kohala by proposing a feed grain operation. The Kohala Corporation was the successor to the old Kohala Sugar Company, and was formed to seek productive uses for the company's assets, including the land. Under a joint venture by the two companies, sorghum would be grown on 7,000 acres of former sugar land. In August 1972 the joint venture began its sorghum grain growing experiment on about 400 acres of vacant sugarcane land in North Kohala. By November of that year, Metcalf Farms dropped out of the joint venture because it was faced with bankruptcy proceedings regarding its operations on Kauai.
In a report requested by the Hawaii County Council, John Farias, then director for the county's Department of Development and Research and a member of the Kohala Task Force, submitted a brief report from Dr. John R. Thompson, superintendent and associate agronomist with the University of Hawaii's College of Tropical Agriculture, on the subject of feed-grain production in Hawaii. Agronomist Thompson pointed out that Hawaii annually imported 100,000 tons of feed grain (mostly corn, sorghum, barley, and wheat). Thompson gave two major reasons for supporting the idea of locally-grown grains for cattle feed. One was the high cost of feed grains, which tended to prevent a greater utilization of them by ranchers; and the other was the possibility of a shipping strike, which might shut off the importation of grains on which cattle must be fed. A considerable portion of the brief report was devoted to sorghum production in Hawaii. Thompson recommended green forage sorghum as the most suitable for cattle feeding because the forage type contained sufficient energy value, comparable to that of corn. The report also touched on the experiments conducted by Metcalf Farms Hawaii in Kauai, without pointing out the production problems experienced by the company. John Thompson's recommendation was that if 16,000 acres of land could be made available for sorghum production in North Kohala, at the rate of two tons per crop and three crops per year, there would be enough feed grain produced to meet the needs of the total number of cattle in Hawaii, or even to export the surplus.

By February 1972 it became clear that the Kohala Task Force had reached its decision: feed grains, especially sorghum, would be the most suitable crop to take the place of sugar for North Kohala. In other words, the planting of sorghum would become the largest land user, to replace the sugar crop. In its 1972 report, the Kohala Task Force indicated that perhaps as many as 10,000 acres, including the drier 3,000 acres of land on Parker Ranch near Kawaihae, would be used for feed grain growing if water was available. The task force optimistically projected the employment of 300 people in the feed grain operations. But while optimism was high, the Kohala Task Force was apprehensive about Metcalf Farms' problems with its experiment with grain production in Kauai. To find out about the Metcalf experiment, the Task Force dispatched a five-member fact-finding mission to Kauai "to determine if yield problems were the result of Metcalf's internal difficulties or whether the crop itself was not feasible." Although the investigative mission (which included three of the state's leading agricultural experts) found that sorghum grain showed promise as a feed grain, it also noted that there were many technical problems that needed further experimentation and research.
Force had to go to the legislature for specific funding on the action programs it had so far considered. An interim report was prepared that included enabling legislation for the session's consideration. Both the task force and the legislature were concerned about the sugar company's scheduled layoff of workers.

The big-island delegation to the legislature, particularly those representatives and senators who occupied important committee chairmanships, were eager to provide leadership in getting legislation through the 1972 session so that new industries could be launched in North Kohala before the closing of the sugar company in 1975. The company planned to lay off 66 workers the following year and was scheduled to lay off a total of 397 workers by 1976.

The influential ILWU was very anxious to see early formation of as many new industries as possible so that large-scale unemployment in North Kohala could be averted. On March 6, the task force submitted its report to the legislature requesting specific funding for planning and development of North Kohala.

The key leader in the legislature responsible for putting the task force's recommendations into a proposed bill was Jack Suwa, chairman of the House Finance Committee. Two committees in the House are considered to be powerful key committees: the Finance Committee and the Judiciary Committee, particularly the latter. It often serves as a "traffic cop" for bills originating in other standing committees, and the chairman of the Finance Committee wields an enormous amount of power over the passage of legislation in the Hawaii state legislature.

Within two weeks of the task force's submission of its recommendations, the Finance Committee had drafted and guided through committee a bill that was adopted unanimously by the House: the basis of Act 197, relating to planning and development for North Kohala. Act 197 contained three major provisions for planning and development of North Kohala. In section 1 of the act, the legislature declared that a serious economic situation existed in North Kohala that threatened its well-being; it found the various recommendations of the task force, such as feedlot, meat-packing, and slaughterhouse operations (among several other projects), to be feasible, and gave a green light to proceed with studies in order "to determine the technical and economic feasibility of these and other potentially viable industries." In section 2, the legislature authorized a sum of $100,000 for the governor to conduct these feasibility studies. Then, more important, the legislature authorized $3.7 million for planning and development of any new potential industries for the area. And finally, it also appropriated $850,000 for developing an irrigation system to bring water to the dry area of North Kohala as an essential infrastructural element needed for viable industries to be established. Thus the state committed itself to a total of $4,650,000 for the economic development of North Kohala. Hawaii County, not mentioned in Act 197, also pledged a total of $1,800,000 as its share of the joint state-county effort to avert an economic disaster in North Kohala.
Discussion in the legislature of Act 197 indicated that feed-grain production was expected to be the major new industry to be established. It was mentioned that 10,000 acres would be put into use for growing sorghum. Once grain production became successful, it was expected that this would then lead to a host of related industries for north Kohala: feedlots, heifer replacement, hog farms, slaughterhouse, meat-packing plant, rendering plant, and even leather tanning manufacturing.

Background Studies

With the funding by the state legislature under Section 1 of the Act 197, the Kohala Task Force contracted John and Les Guthrie, experts on sorghum growing, for a feasibility study. Issued in November 1973, the Guthrie report analyzed the economic feasibility of an integrated farming and feedlot operation in North Kohala by examining soil conditions, fertilization, irrigation, weed control, farming procedure, feedlot construction cost, annual operation cost, and recommendations for an integrated operation. The report recommended yellow corn production as most suitable to Kohala's climate and soil, and said sorghum was least likely to be successful. The feasibility study emphasized the integrated approach: grain production must be supportive of feedlot operation, which in turn depended on feeder cattle supply and market efficiency. Its concluding recommendation was that the venture could achieve "unqualified success" if the operations were accompanied by superior management and planning.

In late 1972 the College of Tropical Agriculture of the University of Hawaii made a proposal for an applied research and development program on feed production, feed handling, and beef feeding. The proposal called for the establishment of an experimental station in North Kohala to conduct long-term research on plant varieties and agricultural techniques, as well as problems of pest control and irrigation. The experimental station would also engage in the following research activities: "to develop and evaluate feed harvesting, processing and storage techniques"; to conduct economic feasibility studies of beef cattle feedlot operation; and "to develop a total management system for the feed livestock economy in Kohala."(8) The proposal would need funding amounting to $100,000 per year for the three-year period from 1972 to 1975.

For several months, the Kohala Task Force did not take any action on the university proposal for grain research and an experimental station. The seeming lack of initiative on the part of the Kohala Task Force generated some resentment and anxiety among Hawaii County officials. In early March 1973, Mayor Schinichi Kimura made a move that was intended to speed up the research work on an alternative agricultural industry for North Kohala. He presented the Kohala Task Force with the proposal that Hawaii County funds be used to enable the university's College of Tropical Agriculture to establish an experimental station on feed grain research. Upon initial approval by the task
force, the county appropriated $100,000 to the university to enable it to begin the necessary research and experiments.

Proposal by Hawaii Biogenics, Ltd. for an Integrated Livestock and Agricultural Complex in North Kohala

Both the University of Hawaii's College of Tropical Agriculture and the Guthrie feasibility reports concluded that an integrated feedlot and farm complex could be successful in the North Kohala area. Based on these studies and on the desires of the beef and dairy industries in the area, an initial effort was made to launch the project by local business concerns. Minutes of the farm loan division of the State Board of Agriculture showed that in a meeting with the Bank of Hawaii in early November 1972, officers of the Kohala Corporation, Kahua Ranch, and others had tried to jointly pool their experience, capital, and resources to provide an integrated feedlot and grain-growing operation in the area. The minutes also indicated that the parties evidently had failed to reach an agreement and that the project was abandoned by local business concerns.

It was at this juncture that the Kohala Task Force members thought of turning to outsiders to propose such a project. A member of the task force who was also its president approached Richard Metcalf of Metcalf Farms, who in turn contacted Jack Caple, general manager of the El Pac Ranch in Viola, Wisconsin. El Pac Ranch (which was subsequently purchased by Pampered Beef, Inc.) had maintained a feedlot operation for its bull calves; thus, the techniques used at the El Pac Ranch appeared suitable for, if not similar to, the feedlot and grain operation contemplated for North Kohala.

The president of the Kohala Corporation made the initial contact with Jack Caple of the El Pac Ranch by visiting the operation in Wisconsin. After the visit, Caple was invited to visit North Kohala with a view to getting Caple interested in the Hawaii project for an integrated feedlot complex. Caple was very much interested in the project, and upon his return to Wisconsin, he initiated two important moves: (1) the formation of the then unincorporated Hawaii Biogenics with his close friends and associates, and (2) the preparation of a feasibility study for a feedlot complex in North Kohala, which served as the basis for his subsequent application for funding from the Kohala Task Force. It seemed obvious that once the Kohala Task Force approved his application, Caple would then proceed to incorporate Hawaii Biogenics in Wisconsin. It was also probably obvious to Jack Caple that he most likely would have no problem in obtaining the task force's approval.

His preliminary feasibility study was ready by June 1973, at a personal cost of $50,000, according to Caple. The preliminary feasibility report listed as collaborators several dairy experts from Michigan State University, ranchers in Wisconsin and Texas, and Richard Metcalf of Metcalf Farms Hawaii. Caple also listed a host of local ranchers, including officers of the Parker and Kahua Ranches, meat operators,
and dairy businessmen. Based on the feasibility study, Caple prepared a project proposal for an integrated livestock and agricultural complex and filled out state loan and grant applications. On June 4, 1973, Caple submitted his application to the Kohala Task Force for state funding; and on June 13, Fred Erskine, acting chairman of the task force and chairman of the Board of Agriculture, provided all members of the task force with a summary of Caple’s preliminary report and his funding application. On June 14, at a public hearing in North Kohala, the task force approved the project in principle with a great deal of publicity and fanfare, hailing it as a new beginning for the demoralized and depressed North Kohala community.

The Proposal by Hawaii Biogenics

The key to the Hawaii Biogenics plan was the establishment of an integrated feedlot and grain-farming complex for the purpose of raising beef cattle, dairy heifers, and dairy beef. Corn and sorghum grain would be grown around the feedlot. In the first stage, the plan called for the construction of a baby and weaner barn, a gan barn, and three 1,000-foot-long cattle shelters. With this capital construction, the plan, as submitted by Hawaii Biogenics, would be able to provide the following, based on 90 percent capacity:

- 8,100 head ranchers’ cattle per year, from 400 to 1,000 pounds.
- 4,000 head Holstein steers from birth to 1,000 pounds.
- 3,000 head Holstein heifers from birth to 400 pounds.
- 1,000 pigs farrowed and raised to 180 pounds.

Also included was an aquacultural facility for producing 100,000 pounds of fresh catfish. Within ten years, from 1973 to 1983, the total completed complex would be able to feed and shelter 40,000 ranchers’ cattle, 7,100 dairy beef, 7,100 replacement Heifers, and 27,000 hogs. By then, in the optimistic view of promoter Jack Caple, Hawaii would be able to considerably reduce its imported beef and replacement heifers, as well as become self-sufficient in producing the needed feed grains. As a part of the integrated complex, facilities for slaughtering, rendering, and processing beef and hogs were included in the total design. Consultation with the ranchers in the North Kohala area seemed to indicate that the Hawaii Biogenics facilities would custom-feed the ranchers’ cattle; when fattened the animals could be slaughtered and marketed from the area to reduce freight costs.

The land needed for the integrated complex was about 10,000 acres, with a large proportion of the total used for growing the following crops:

- Sorghum silage: 20 tons per acres per year
- Sorghum grain: 4.2 tons per acre per year
- Pasture: 500 pounds of grain per acre per year.
A breakdown of the land use of the integrated complex as presented by Hawaii Biogenics is shown in Table 3.1.

The financial requirements of the plan were estimated at just under $3 million:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms (based on 2,000 acres)</td>
<td>$313,500</td>
</tr>
<tr>
<td>Custom cattle feeding</td>
<td>702,941</td>
</tr>
<tr>
<td>Dairy beef</td>
<td>590,399</td>
</tr>
<tr>
<td>Custom heifer raising</td>
<td>311,160</td>
</tr>
<tr>
<td>Swine</td>
<td>81,000</td>
</tr>
<tr>
<td>Catfish</td>
<td>87,000</td>
</tr>
<tr>
<td><strong>Estimated total capital costs</strong></td>
<td><strong>$2,086,000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Estimated Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>$73,990</td>
</tr>
<tr>
<td>Custom cattle feeding</td>
<td>239,920</td>
</tr>
<tr>
<td>Dairy beef</td>
<td>207,559</td>
</tr>
<tr>
<td>Custom heifer raising</td>
<td>155,740</td>
</tr>
<tr>
<td>Swine</td>
<td>78,021</td>
</tr>
<tr>
<td>Catfish</td>
<td>77,581</td>
</tr>
<tr>
<td><strong>Estimated operational costs</strong></td>
<td><strong>$832,581</strong></td>
</tr>
</tbody>
</table>

**TOTAL $2,918,581**

In evaluating the proposal, members of the Kohala Task Force considered job creation extremely important. The Kohala Corporation had notified the task force in early 1973 that the sugar company had to terminate all of its operations by the end of 1975. Layoffs of sugar workers were to be 166 in 1973, 178 in 1974, 152 in 1975, and 1 in 1976. The total number of workers to be layed off was 397.

Hawaii Biogenics had indicated that according to the implementation of their plan, the job creation rate would be as follows: 35 workers in 1973, 84 workers in 1974, 117 workers in 1975, and 171 in 1976. In other words, Hawaii Biogenics would employ a total of 407 workers, which was more than the number of workers being laid off by the sugar company. The job creation proposed by Hawaii Biogenics at that time was a major factor in the Kohala Task Force's decision to give informal approval to the proposal.

**PHASE 2: SELECTION, APPROVAL, AND ACTIVATION**

The Program of Hawaii Biogenics

As was just noted, the overall proposal of Hawaii Biogenics had been approved in principle by the Kohala Task Force. Later, at a public hearing held in June 1973, Caple presented the program for the integrated feedlot and grain complex.

Initially, Hawaii Biogenics would begin producing feed grain in North Kohala. The objective was to raise enough grain locally so as not to be
### Table 3.1. Projected Land Use for Hawaii Biogenics (In Acres)

<table>
<thead>
<tr>
<th>Description</th>
<th>Dairy Beel Program</th>
<th>Dairy Heifer Program</th>
<th>Custom Feeding 8,000 Head</th>
<th>Swine 100 Sow Farrow and Finish</th>
<th>Aquaculture Program</th>
<th>Beef Need</th>
<th>Swine Need</th>
<th>Total Need</th>
<th>Present Need</th>
<th>Future Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site for facility, including shops, offices, and confined buildings</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>*</td>
<td>**</td>
<td>2</td>
<td>2</td>
<td>35</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>Liquid manure storage</td>
<td>8</td>
<td>2</td>
<td>15</td>
<td>*</td>
<td>**</td>
<td>1</td>
<td>None</td>
<td>25</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Rain and forage storage processing</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>**</td>
<td>14</td>
<td>None</td>
<td>9</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Site for crop land for grain and forage production</td>
<td>2,076</td>
<td>375</td>
<td>1,000</td>
<td>110</td>
<td>**</td>
<td>125</td>
<td>140</td>
<td>3,561</td>
<td>5,660</td>
<td></td>
</tr>
<tr>
<td>Pasture for dairy heifer cull program</td>
<td>960</td>
<td>2,800</td>
<td>--</td>
<td>--</td>
<td>**</td>
<td>--</td>
<td>--</td>
<td>3,760</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>Total acres per program</td>
<td>3,059</td>
<td>3,188</td>
<td>1,032</td>
<td>11</td>
<td>0</td>
<td>128(25)</td>
<td>112</td>
<td>7,390</td>
<td>9,255</td>
<td></td>
</tr>
</tbody>
</table>

Note: Dairy beef program is 4,000 head of baby bulls raised to 1,050 pounds on 90 percent grain ration, 10 percent silage. Acreage based on raising the grain and assuming a 20 percent cull rate to put on pasture.

Dairy heifer program is 3,000 head of baby heifers raised to 650 pounds on grain and silage, then pastured to springing heifers.

Custom feeding of 8,000 head per year on a silage and grain ration.

Swine based on 100 sows, 6.5 pigs per litter, 1.6 litters per year.

Aquaculture program based on modules of 100,000 pounds of fresh fish per year for each species raised.

Present needs based on combination of dairy beef, heifers, 8,000 per year custom-fed beef, 100 head sow and finish operation, and one-quarter module aquacultural facility.

Future needs based on 10-year need of dairy beef, dairy heifers, 4,000 head per year beef custom-feeding operation, 2,000 sow operation and feeding, four full modules of aquaculture. Future needs for crop land based on increased production of the following: corn - 8 tons/acre/year; corn silage - 60 tons/acre/year; pasture - 1,000 lbs. beef/acre/year.

* No additional acreage needed if integrated with either Dairy Beel, Dairy Heifer, or Custom Feeding Programs.

** No additional acreage needed if integrated with either Dairy Beel, Heifer, or Custom Feeding Programs.
dependent upon importation of feed from the mainland. Instead of sorghum, Hawaii Biogenics had decided to grow blight-resistant corn for silage and feed. Experienced ranchers and feed-grain growers, primarily those at Kahua Ranch and Metcalf Farms, indicated that corn had been the most widely used feed for fattening cattle. At the beginning, Hawaii Biogenics would need 1,800 acres of well-irrigated land, to be leased from the State and from the Kohala Corporation, to grow corn. Silos for storing the silage would be crucial in the operation's success.

The cattle-feeding program involved three stages of development. First, a beef-feeding operation was needed for the cattle belonging to the big-island ranches; under contract for a fee, the operation would fatten their cattle to 1,000 pounds or more. Initially, available cattle barns and shelters could handle 10,000 to 20,000 head.

The second aspect of the feeding program involved the purchase and/or feeding under contract of Holstein bull calves at Kohala feedlots. The dairy industry on the island of Oahu produced at that time 4,000 bull calves and 4,000 heifers per year from a total stock of about 10,000 head of Holstein milk cows. The mortality rate of heifers raised for replacement was high. Hawaii Biogenics would either purchase or feed the calves under contract after injecting them with colostrum and flying them to North Kohala from Oahu.

The third aspect would be the feeding by Hawaii Biogenics of dairy heifers from birth to 400 pounds (the milking age); Hawaii Biogenics would then fly them back to Oahu dairies for milking. Again, by contracting with Hawaii Biogenics, 4,000 to 5,000 head could be fattened in North Kohala. Eventually, Hawaii Biogenics would have the facilities for a slaughterhouse operation in Kohala for fully grown beef. The prime cuts would be shipped to Oahu by the same charter planes that brought calves to Kohala. Hawaii Biogenics estimated that eventually enough beef could be produced — a figure of 2.5 million pounds per year was cited — to make Hawaii self-sufficient and no longer obliged to import meat from New Zealand and the mainland.

In order to begin these operations, Caple then reviewed their cost. Hawaii Biogenics needed funds to build a number of cattle barns, grain and silage storage facilities, equipment, and offices. A breakdown of the funding needs is as follows (for the first year):

<table>
<thead>
<tr>
<th>Costs</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of physical facilities</td>
<td>$1,404,500</td>
</tr>
<tr>
<td>Equipment</td>
<td>207,000</td>
</tr>
<tr>
<td>Working capital funds to cover first year deficit operating cash flow</td>
<td>274,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$1,885,000</strong></td>
</tr>
</tbody>
</table>

Additional funds would be required for other activities, but Caple anticipated that revenue earned by the project would pay for any future expansion. He then closed his testimony by stating that he and his partners would contribute $500,000 for construction, but the rest would have to be lent to the company by the state and county governments.
Financing of Hawaii Biogenics

After considering the financing needs of the company, the Kohala Task Force assisted Caple in obtaining the necessary loans. Three funding sources were lined up for the necessary loan package of $1,885,500: (1) private banks would lend $385,000 under provisions of the Small Business Administration's (SBA) guaranteed loan program; (2) the state government would lend up to $1 million; and (3) Caple and his associates would guarantee a $500,000 equity contribution.

For the SBA portion of $385,000, bank officials met in January and February of 1974. At two of those meetings, state officials and other knowledgeable persons were asked to participate in the discussion. Thus, in addition to Bank of Hawaii officers, representatives of the state farm loan division of the Board of Agriculture, the Small Business Administration, Kahua Ranch, and Kahua Beef Sales took part in the financing discussion. They examined the proposal submitted by Hawaii Biogenics and approved it, with the exception of three secondary operations: hog raising, alquacultural (catfish) raising, and the slaughterhouse. It seemed that both representatives of Kahua Ranch did not feel the slaughterhouse operation was feasible for Kohala at the time.

The loan request for $385,000 under the Small Business Administration was thus approved. In addition, the bank also extended Hawaii Biogenics a $250,000 line of revolving credit against whatever inventory, including livestock, it possessed. A key stipulation of the agreement was that Caple and associates had to pay at least $500,000 in cash for their equity in the company. This amount would have to be credited as the company's working capital before the loan was released.

The key to the entire financing package requested by Hawaii Biogenics was the state-county government loan for $1 million. Act 197, section 3, authorized the governor to spend as much as $3.7 million for planning and development for North Kohala. Subsequently, the governor gave the Board of Agriculture sole responsibility for adopting rules and regulations on funding the various projects approved by the Kohala Task Force. On January 18, 1973, the Department of Agriculture promulgated its Regulation No. 1 on the North Kohala Loan and Grant Program for the purpose of providing guidelines for the administering of loans and grants.(10) These regulations were intended to financially assist the growth and development of North Kohala. Under the regulation, "an individual, partnership, association, company, or corporation who is presently engaged in or who intends to engage in business enterprise in the North Kohala area" would be qualified to apply for a direct loan or grant under section 3 of Act 197. Application for the loans and grants had to be made to the Department of Agriculture, which would then transmit it to the Kohala Task Force for consideration and approval. In reviewing the applications, the task force was to give priority to the ability of the project to both create jobs for the residents of North Kohala and expand the economic base of Kohala. The task force recommendation, which had to be made by a two-thirds affirmative vote of all its members, was to be submitted to the governor through the Department of Budget and Finance for review and scrutiny.
Hawaii Biogenics' application for a $1 million loan was reviewed by the acting chairman for the Kohala Task Force, Fred Erskine, who was also the chairman of the Department of Agriculture, in a March 13, 1974, memo to the then acting governor, George Ariyoshi. Erskine's review centered on the claim by Hawaii Biogenics of the creation of employment under the feedlot proposal: an initial hiring of 35 persons from Kohala and additional increases over the next three years to an eventual total employment of 407. The terms for the state loan, as recommended by the Erskine memo, expressed the consensus among bank officials, representatives of the state Department of Agriculture and the Small Business Administration, and Kahua Ranch. Specifically, the $1 million loan, matched by the county of Hawaii on a two (state) to one (county) basis, was for 20 years at 5 percent interest. Additionally, several stipulations were made of the borrower. The borrower would have to put $500,000 in cash into the company for stockholders' equity; not more than $5,000 per year would be spent annually for travel, entertainment, and promotional expenses; and cash for salaries, including bonuses to stockholders, were limited to $42,000 per year.

Erskine's memo recommending approval of the $1 million loan was dated March 13, 1974. It was approved by Acting Governor Ariyoshi two days later, on March 15. No indication was given of the extent of the "systematic review" by the Department of Budget and Finance that was required by Regulation No. 1 on the North Kohala Loan and Grant Program before approval by the governor.

Note must also be made here of the county's responsibility in the loan programs related to the development of and planning for Kohala (see figure 3.2), in particular, the Hawaii Biogenics project. Hawaii County's participation was governed by the participating agreement concerning the processing and administering of loan funds approved by the Kohala Task Force. In May 1973 a participating agreement was reached between Erskine and Shunichi Kimura, mayor of the County of Hawaii. The agreement contained the following provisions: (1) any loan and grant approved by the Kohala Task Force must be submitted to the county for approval, and the county then would be obligated to provide its matching portion of the loan or grant on a two (state) to one (county) basis; (2) the state was responsible for remitting to the county its portion of payments in principal and interest, and the state must obtain approval of the county in making any alteration on the terms of the loan; (3) neither party was to be liable to the other for any loss "not due to its own negligence"; and (4) the state would be responsible for monitoring the company's activities and financial transactions.

The organizational structure for funding projects for the development and planning for North Kohala focused on the Kohala Task Force. But in practice it was the Board of Agriculture, through its chairman, Erskine, and the chief of the Agricultural Department's farm loan division, Richard Morimoto, that made many of the decisions on loans (and their monitoring) for approved projects for North Kohala. Although the County of Hawaii participated in the funding, it nevertheless relied almost exclusively on the judgment and expertise of the Board of
Figure 3.3. Flow of Loan Authorization for Hawaii Biogenics.

Agriculture and its farm loan division. And the division, because of insufficient personnel, merely treated loans and grants for Kohala projects in the same manner as its regular farm loan program. It should be pointed out that the Board of Agriculture is a committee of agricultural experts appointed by the governor, to set policies for the Department of Agriculture. The members of the Board of Agriculture are voluntary, non-state employees, except for the Chairman, who is also the Director of the Department of Agriculture.

Activation

In order to give an adequate description of the funding of the project, which is crucial to subsequent events, we must now backtrack in time. In June 1973, after the project had been approved in principle and thus been given fairly strong assurances of state support, Jack Caple and Kenneth Butters, Sr., an investment adviser, officially incorporated their company in the state of Iowa. During the incorporation, the organizers of Hawaii Biogenics met to authorize the issuance of what is known as restricted common stock (that is, stock not subject to registration with and regulation by the Security and Exchange Commission). Two hundred thousand shares of this stock with a par value of $1.000 per share were distributed as follows:
Kenneth L. Butters, Sr., president and director: 59,333 shares
Jack Caple, vice-president and general manager: 58,334 shares
Iowa law firm represented by David L. Brodsky, secretary and director: 25,000 shares
Richard Metcalf, consultant and president, Metcalf Farms: 58,333 shares
TOTAL 200,000 shares

These shares of stock were issued to the above officers for their legal, organizational, planning, or consultant services. In essence, the original capitalization was not in cash, but only on paper. On September 4, Hawaii Biogenics was recognized as a corporation doing business in the state of Hawaii. Not until 1976, however, when an audit was made by Patrick Okawaki, was the legal question raised as to whether "any laws of the State were violated when the 200,000 shares were determined to be issued without sufficient consideration being paid in." (15)

In addition to the 200,000 shares of restricted common stock issued to the promoters of the company, sales of additional stocks were made to investors in Iowa and other Midwestern states at $1.00 per share, or in the form of corporate debentures convertible to common stock at $4.00 per share. By 1974, the actual investment by stockholders was $185,000, according to one audit. The company's effort to raise additional capital from the money market in Chicago produced nothing. In short, Hawaii Biogenics was not able to proceed without borrowing the needed working capital from somewhere, despite its claims that the company had $500,000.

It must be reemphasized that a key stipulation of the Small Business Administration Loan was that the company possess $500,000 in working capital. The adequacy of funds was not examined closely when the state's $1 million loan was approved. It was simply assumed that the organizers would line up $500,000 in equity from other investors. Thus as of March 1974, Hawaii Biogenics had on paper the following financial arrangements:

Bank of Hawaii Small Business guaranteed loan $385,000
State-county government loan 1,000,000
Owner's equity 500,000
TOTAL LOANS AND EQUITY $1,885,000

PHASE 3: OPERATION, CONTROL, AND HANDBOVER
Initial Activities and Critical Problems

On March 24, 1974, groundbreaking ceremonies were held in North Kohala for the construction of the Hawaii Biogenics office building and
oxygen-free Harvestore silos, which were funded under a grant of $160,000 from the task force. The storage silos were needed to determine the feasibility of storing high-moisture corn and alfalfa silage, given North Kohala's environmental conditions. It was considered a special project that would eventually be integrated with the Hawaii Biogenics feedlot program. Participating in the special project were the University of Hawaii's College of Tropical Agriculture, the Kohala Corporation, the State Department of Agriculture, and A.C. Smith Harvestore Company. The project was to be completed over a three-year period as a demonstration for possible statewide benefit. Again, the county of Hawaii participated in the grant of $160,000 on the basis of two (state: $106,667) to one (county: $53,333).

Throughout the rest of the calendar year 1974, actual construction work for the Hawaii Biogenics program proceeded smoothly. The office building was completed; additionally, construction of the feedlot was begun and corn was being planted at the rate of 40 acres per week. In March 1975 construction began on the warehouse-workshop and the first long barn. Some initial feedlot testing of the silage grown on the experimental breeds showed encouraging results. Hawaii Biogenics also entered into a very promising commercial venture with Pioneer Seed Company to produce a large crop of hybrid corn. The venture came about because the corn-growing areas on the U.S. mainland suffered heavy rain and hot spells during the summer of 1974, resulting in a poor crop. To meet anticipated shortfalls, several companies decided to grow winter corn in suitable areas. Hawaii was chosen as one area, and subsequently a contract was drawn up with Hawaii Biogenics. In addition to these achievements, Hawaii Biogenics could also point out that as of March 1975, it employed 28 full-time workers, 11 temporary ones, and 15 probationary laborers. Twenty-seven other workers were involved in the Pioneer Seed Company contract. On the surface, then, the project was being implemented smoothly and positively.

From beneath the apparent success, however, considerable turmoil suddenly erupted. There was a disagreement between the two key officers of the corporation, Jack Caple and Kenneth Butters. Butters, the president of the corporation, was quietly but vigorously trying to remove Caple from his position as vice-president and general manager. The disagreement arose because Caple had failed to inform Butters and the other corporate officers that he (Caple) was being sued in connection with his cattle-raising operation in Wisconsin. Pampered Beef Company, the Wisconsin firm that had purchased Caple's El Pac Ranch, alleged that fraud had been committed. Ironically, it was on the basis of this very operation that Caple had earned the reputation of being an expert organizer and successful pioneer in livestock raising. Since this lawsuit could damage the credibility and good faith of Hawaii Biogenics, Butters felt Caple should have informed the management group.(16)

Some time in early 1975, Butters learned of other lawsuits against Caple. There were several liens and a state tax delinquency charge in Wisconsin and other lawsuits in Minnesota.(17) Already disenchanted, Butters now decided Caple must be removed. During the spring of 1975,
Butters made several attempts, but failed. Butters then withdrew from an active role in Hawaii Biogenics and moved back to the Midwest.\(^{(18)}\)

Against this backdrop of internal management dissension, an audit of Hawaii Biogenics was conducted by the firm of Peat, Marwick and Mitchell. The audit, part of the state's routine monitoring procedures, was conducted simply to comply with terms of the loan agreement. The results, made available in January 1975 to John Farias, who had replaced Erskine as chairman of both the Kohala Task Force and the Board of Agriculture, were a complete surprise—Hawaii Biogenics was approximately $1 million in debt. Evidently the company had spent the entire state loan, and now did not have cash to pay for the feedlot and barn construction, vital machinery, and operating costs. The auditors were unable to determine precisely how the debt had been accumulated, because Hawaii Biogenics had recorded all purchases to a single charge account. Nonetheless, the audit indicated that money intended for construction and equipment had been diverted to pay for travel and entertainment, consulting fees to major stockholders, bonuses to stockholders, and overly generous salaries. There were some legitimate unanticipated expenditures, such as inflation and the cost of an environmental impact statement, but there were also indications that certain purchase agreements and contracts had been unwisely negotiated, resulting in overspending. Finally, there was an overall indication of mismanagement.

As a result, Farias wrote a letter to Caple, notifying him that certain requirements were being made of the company. First, the company had to make a complete disclosure of all its expenditures since the start of the project. Second, a complete list of all equipment purchases had to be submitted to the Department of Agriculture for inclusion in their security agreement. In the letter, Farias also noted that Caple had signed a loan agreement with the Department of Agriculture promising that Hawaii Biogenics would: 1) provide $500,000 in equity capital before accepting the $1 million loan, 2) limit entertainment and travel expenses to $5,000 annually, 3) limit bonuses and salaries paid to stockholders to $42,000 annually, or $3,500 per month, and 4) submit any deviations from the original proposal to the Kohala Task Force for approval. Farias closed the letter by stating all the loan provisions had apparently been violated; Hawaii Biogenics was expected to honor all its commitments.

Despite the attempts to impose accountability, cost overruns continued in March 1975. Subsequently, under pressure from Farias, Hawaii Biogenics agreed to add to its board of directors three highly qualified members selected by the Kohala Task Force: Monte Richards, Gordon Lent, and Richard Frazier. Each new director was a resident of Hawaii, prominent in the business community, knowledgeable in dealing with state and country officials, and experienced in local livestock raising and agricultural conditions. Financial problems continued to plague the company throughout the spring of 1975; as a result, the Kohala Task Force demanded that Caple adopt a purchase order system that would allow the state to monitor Hawaii Biogenics' expenditures.\(^{(19)}\) According to a state legislature report, Caple felt the system was unduly
restrictive and that the state was interfering with his business and harassing him. (20) Throughout the spring, relations remained tense and the overall business situation deteriorated. As was previously mentioned, Butters, unable to remove Caple as general manager, had returned to the Midwest. Additionally, the first corn crop fell short of anticipated yield because of varietal and soil preparation problems. This led to an increase in production costs and ultimately forced Hawaii Biogenics to import feed, an event that undercut the project's fundamental assumption that a self-sufficient, integrated livestock complex could be successfully built in Hawaii. The crop shortfall also resulted in a net loss of $100,000 in the Pioneer Seed Company contract, which had been heavily counted on to provide Hawaii Biogenics with some much-needed operating capital.

By the summer of 1975 the financial situation of Hawaii Biogenics was critical. The facility was not scheduled to open until November; the $1 million state loan had been spent; and outstanding debts far exceeded any cash on hand. The anticipated SBA loan of $385,000 and the $250,000 line of credit had been denied because Hawaii Biogenics' major stockholders had not contributed the stipulated cash equity of $500,000. Despite the company's financial problems, various businesses allowed Hawaii Biogenics to continue increasing its debt through the purchase of goods and supplies on credit. Credit was extended because the merchants "assumed that they would eventually be paid since the company was receiving State funds and the company could have taken advantage of that fact."
(21) The overall result was that by the summer of 1975, Hawaii Biogenics was bankrupt, and the magnitude of its indebtedness was believed to be well in excess of $1 million.

Attempts to Voluntarily Reorganize

After an assessment of the overall situation in early September 1975, the Kohala Task Force and other state and county agencies decided that a voluntary reorganization of the company would be the best strategy. The purpose of the reorganization would be to bring in a new management group capable of making the feedlot profitable, and to simultaneously convince all creditors not to initiate bankruptcy proceedings against the company. Convincing all creditors not to foreclose was the most delicate task. Most creditors were willing to hold off on legal actions because Hawaii Biogenics had insufficient assets to pay off all debts. But some creditors believed that the cattle lot operation was not feasible, and they wanted to cut their losses. Then in late September it became public knowledge that the Hawaii Biogenics debt totaled over $2 million. Over $1 million was owed to the state, while Pioneer Seed Company, Castle and Cooke, Aluminum Products of Hawaii, and several other private creditors were owed a total of $1.1 million. The extent of the debt made negotiations difficult.

However, the Kohala Task Force managed to work out an acceptable plan. The plan contained three components. First, for a period of 18 months, there would be a moratorium on payments to major creditors. After 18 months, when the company began earning a profit, a schedule
of payments would begin. The creditors were agreeable to the moratorium, although some were skeptical and might foreclose if further problems arose. Second, a new board of directors would be formed, to include three members chosen by the ranchers using the facilities, three selected by the creditors, and three chosen by the Kohala Task Force. All parties agreed that new management and new directors were necessary for the viability of the company. Third, ownership of the company would ultimately be transferred from the Caple-Butters group to the ranchers.

The third component of the plan proved the most difficult to resolve. Part of the problem involved the changes in ownership of the company since the initial incorporation in 1974. Table 3.2 reveals the stockholder situation at the end of September 1975.

Table 3.2.
Ownership of Hawaii Biogenics

<table>
<thead>
<tr>
<th>Stockholder</th>
<th>Number of Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. and Mrs. Jack Caple</td>
<td>441,416 shares</td>
</tr>
<tr>
<td>Mr. and Mrs. Ken Butters, Sr.</td>
<td>259,008 shares</td>
</tr>
<tr>
<td>Iowa law firm represented by</td>
<td>100,000 shares</td>
</tr>
<tr>
<td>David L. Brodsky</td>
<td></td>
</tr>
<tr>
<td>31 minority shareholders</td>
<td>415,519 shares</td>
</tr>
<tr>
<td>Total outstanding shares</td>
<td>1,215,943 shares</td>
</tr>
</tbody>
</table>

SOURCE:

As can be seen from the table, the major shareholders were the same as at the time of incorporation, although Mr. and Mrs. Caple had obtained a larger proportion of the total shares. The major change, however, was that 31 minor shareholders, including a number from Iowa and some former employees of Hawaii Biogenics, had paid approximately $141,000 for their stock. This might pose a problem in any reorganization, because these people had invested their own money in good faith.

To carry out the ultimate transfer of ownership, the Kohala Task Force first had to gain control of the major shareholders' stock. The Caple-Butters group was willing to relinquish its stock, and offered all its shares to the state for a total of $1.00. In return, they demanded that the state relieve them of liability for the $1 million loan they had cosigned. Additionally, they required that the state ensure the minority stockholders would "be looked out for and protected."(22) (Caple had sold Biogenics stock to small investors at $1 per share. Small purchases ranged from 400 shares to 5,000 shares.)
The Kohala Task Force, with assistance from the state attorney general's office, considered the situation. The dilemma seemed to center on one major point: Caple, Butters, and the other company officers wanted to protect themselves from any potential lawsuit brought against them by the minority stockholders. In this regard, the minority stockholders could sue the officers of Hawaii Biogenics for breaches of duty and for culpability in "management misdeeds." Thus until the minority shareholders could somehow be satisfied, thereby relieving the officers of liability, Caple and Butters would not voluntarily agree to the reorganization.

The state had several options. It could agree to the Caple-Butters offer and purchase all the minority shareholders' interest at an agreed price per share. However, this strategy would, in effect, put the state in a position of "buying off" Hawaii Biogenics management to avoid potential problems and scandal: it would appear to be a payoff for mismanagement. The state also had the option of invoking Chapter 10 of the Federal Bankruptcy Act, which would put Hawaii Biogenics in receivership with a court-appointed trustee. The trustee would reorganize the company and, if warranted, he could investigate and bring suit against the former management for fraud, violations of the federal security acts, and other illegalities.

In the end, the state decided on a compromise offer. In a letter to Butters, the state attorney general offered the majority stockholders $1.00 for their interest in Hawaii Biogenics. The state would relieve the Hawaii Biogenics officers of their liability in the $1 million loan. Additionally, at some time in the future the state might try to satisfy the minority shareholders. Finally, the attorney general wrote that if these terms were unacceptable, the state was prepared to file bankruptcy proceedings against Hawaii Biogenics under Chapter 10 of the Federal Bankruptcy Act. The effect of this action could be a complete investigation of all management activities to date and the declaration of Hawaii Biogenics as an insolvent corporation, which would deny all shareholders any interest in the reorganized company. In December the major shareholders agreed to the state offer.

While these dramatic attempts to voluntarily reorganize the company were occurring, construction of the Hawaii Biogenics facility continued, sustained by four emergency loans approved by the governor. These included three $18,000 loans to meet operating costs and a $185,000 loan to help pay for continued construction. With the support of these loans, Hawaii Biogenics was prepared to begin the cattle phase of its operation in November 1975.

Involuntary Reorganization

By December it appeared that the project would begin generating revenue and that the Kohala Task Force had successfully negotiated the voluntary reorganization plan. Subsequent events, however, were disastrous. First the task force learned that Kohala ranchers, the anticipated customers, were reluctant to use Hawaii Biogenics' facility, which was
now open and could fatten up to 1,000 head of cattle. Ranchers feared that if the company eventually failed, they might be ill-treated when they had to return to the only other feedlot operation in the state, Hawaii Meat Company. The president of Hawaii Meat publicly assured ranchers that no reprisals would be taken against deserting customers who later returned. Nonetheless, ranchers were still wary and creditors were concerned that Hawaii Biogenics would have few customers and thus would fail.

Then in mid-December opposition to the reorganization plan was openly expressed by Richard Frazier, the local agricultural expert appointed to the Biogenics board of directors by the Kohala Task Force. At a public meeting, Frazier issued a paper entitled, "What the Public Has Not Been Told about Hawaii Biogenics and its Sponsor, Kohala Task Force." Among the charges made by Frazier were that the Task Force required Biogenics to spend over $140,000 on maintaining full employment despite production cut-backs, that the task force never met with the Biogenics board to discuss the reorganization, and that unless an additional $1.1 million was loaned to the company, there would be no chance of its survival. The most devastating charge, however, was that the proposed reorganization plan was no longer valid because it was based on outdated information. This charge implied (and an audit confirmed) that it would take much longer than 18 months for Hawaii Biogenics to begin repaying creditors.

Anxious creditors, already skeptical about Hawaii Biogenics' viability, now reconsidered their conditional offer to accept the voluntary reorganization. By early January 1976 the Kohala Task Force realized that some creditors would foreclose on Hawaii Biogenics, thereby discrediting the state-sponsored initiative. The only alternative was to petition the federal district court for an involuntary reorganization of the company.

Thus on January 16, 1976, the state and two other creditors brought suit against Hawaii Biogenics under Chapter 10 of the Federal Bankruptcy Act. In the petition the state charged Biogenics management with entering into unfavorable contracts, purchasing excess and unsuitable equipment, violating loan provisions, and being unable or incompetent to execute contracts with potential customers. The state petitioned the court not to liquidate the company, but to mandate reorganization. The state argued that "a new management team with a fiscally sound reorganization plan can best protect the public and private interests." The state closed by requesting that Richard Frazier be appointed as the receiver, to assume overall management of the company and reorganize it. The court deliberated on the petition and then accepted all the state's requests. In addition to mandating reorganization under Frazier, the court prohibited all creditors from bringing legal action against the company during the reorganization.

Failure of the Involuntary Reorganization

Frazier initially voiced optimism about successfully reorganizing Hawaii Biogenics, believing that operations could be made profitable
within six months. He noted that additional loans totaling $1.1 million would be necessary, but he hoped part of the amount could be raised privately. The loans would be used to pay salaries and operating costs to purchase feed for anticipated cattle, and to expand planning so that locally grown feed and silage could eventually meet internal needs. The loan would also be used to build a second barn. Frazier emphasized that the second barn was crucial to Hawaii Biogenics' survival. He had recently received standing orders from local meat companies for 7,000 head of market-ready cattle a year, and the second barn would make possible this level of production.(28)

Soon after being appointed receiver, Frazier removed Caple as general manager, but retained him as administrative assistant, reasoning that his experience in feedlot operations was necessary to continue the project. Some members of the Kohala Task Force, however, felt that Caple was largely responsible for Hawaii Biogenics' problems and that he should be removed altogether. There was also a feeling that Caple's continued association with the project might damage its credibility. Nonetheless, Frazier retained Caple to supervise feedlot operations, while he concentrated on the reorganization plan.

While Frazier worked on the plan, the Hawaii state legislature conducted an investigation of Hawaii Biogenics. The legislature had originally allotted the funds for Hawaii Biogenics through the Kahala Task Force, and now some accountability was demanded. Legislative inquiry had actually begun in September 1975, when the drama of Hawaii Biogenics began unfolding on the front pages of Hawaii's newspapers. Some headlines, for example, had read; "Biogenics' Debt Tops $2 Million"; "Kohala, State Aides Argue Responsibility - Biogenics Aide Says State Erred"; "Effort to Rescue Biogenics Fails: Bankruptcy Next."(29) Under pressure for public disclosure of any mismanagement of government funds, the state senate's Government Operations Committee inspected the company and interviewed Jack Caple and others.

During the interviews, Jack Caple told senators that Hawaii Biogenics would need an additional $1.7 million to break even.(30) He then criticized the Kohala Task Force, charging that he had to "educate those in power on the ways of agriculture." Caple also complained of bureaucratic red tape, officials monitoring his every action, problems in getting a simple permit to build a lean-to for feeding operations, and the inflation that had forced him to build a feedlot with a capacity of 2,000 head of cattle instead of 7,000. Caple closed the interview by stating, "It would have been easier to go to a bank, lay out all our plans and then after the bank approved our loan, it would have been up to us to survive or die."(31) Reportedly, Caple had gone to a local bank in January 1974, but his loan application was rejected.

Interviews with other cattle ranchers indicated that the planning for Hawaii Biogenics' integrated feedlot operation with a slaughterhouse was inadequate. There was insufficient capitalization, no economical transportation to the market (which was on the most populated island, over 200 miles away), and a lack of skilled personnel. Ranchers also told the senators that a similar project had been attempted but had not been successful due to the problems with locally grown feed. Finally the
cattle ranchers emphasized that Hawaii Biogenics' scale of operation, based on unproven principles, was indicative of poor planning. Conceding the poor planning, senators still found indications of mismanagement, if not illegal conduct. Thus, to document and verify exactly what had happened, the state senate funded an independent audit. The auditor was to finish the report in late 1976.

In May 1976 Frazier completed his reorganization plan and presented it to the Kohala Task Force. The plan for reorganization centered on four specific actions to be approved by the state and county. First, Frazier suggested that the present group of majority shareholders, the Caple-Butters group, be bought out at a negotiated price, perhaps $25,000, and that they be relieved of loan liability in return for relinquishing all legal and financial interest in the project. Second, a new corporation was to be formed that would continue the operations of the project. Third, Hawaii Biogenics' creditors would be given shares in the new company to cover their claims, and the minority shareholders would be given stock in the new company equivalent to their old stock. Finally, a new board of directors would be formed to represent the new interests.

The Kohala Task Force rejected the plan for several reasons. Task Force members objected to the proposal to buy out the major shareholders for $25,000 and release them from loan liability. Several of the task force members believed that the major shareholders should receive nothing until the creditors had been paid, especially since the shareholders were promoters and had invested almost nothing in the company. Frazier argued that his plan would be the most cost-effective and simplest way to get rid of the original group.

The proposal to provide minor shareholders with equivalent stock in the reorganized company was also unacceptable because it devalued the new company. Task force members argued that creditors should be paid completely before any minor stockholders were considered: the stockholders had taken risk as an inherent part of any investment, whereas the creditors were simply doing business. Frazier contended, however, that the minor shareholders had put money into the company in good faith and should receive stock in the new company on a dollar-for-dollar basis.

Finally, there were procedural objections to the reorganization plan. Task Force members stated that Frazier had not prepared a complete financial statement, including a proper appraisal of the company's liabilities and assets.(32)

Frazier revised the plan, but still could not reach full agreement with the Task Force and other State officials. In addition to this impasse, he could not get the State to release funds for the second barn, which was essential to his financial plans. A $200,000 loan for the barn had been promised and approved by the governor, but was being held up by the Department of Agriculture until a detailed loan expenditure plan was submitted. Since Farias, the chairman of the Department of Agriculture, was also chairman of the Task Force, it appeared that the delay was being used to coerce Frazier into compromising on the reorganization, a strategy contrary to the loan promise.
As a result of these problems, Frazier resigned as trustee. Publicly, he cited the impasse between himself and the Kohala Task Force. Later he revealed that his reorganization plan had been unacceptable because there was too much animosity toward Jack Caple; the state wanted to hold Caple liable for Hawaii Biogenics' failure. When Kenneth Butters, the other major shareholder, heard of the failure of the reorganization plan, he wrote an angry letter to the governor and others involved, stating that the reorganization problem was a "minor Watergate." He threatened to tell his side of the story if Biogenics went bankrupt.

Following Frazier's resignation, Francis Pacheco, an independent sugar grower, was appointed as trustee to attempt another reorganization of the company.

Government Audits of Hawaii Biogenics

As has already been mentioned, the Hawaii state senate contracted an independent audit of the Kohala Task Force, including Hawaii Biogenics. In November 1976, the audit was complete: it covered Hawaii Biogenics' management and fiscal activities from April 1973 to April 1976. The auditor, Patrick Okawaki, found ten major incidences of misjudgment, mismanagement, or possibly illegal conduct. These can be discussed in terms of three broad areas.

First, there were certain irregularities in the incorporation of the company. During the inception of Hawaii Biogenics, 200,000 shares of stock were issued to Butters, Caple, and two other major shareholders for "little or no consideration." In other words, the original shareholders paid little or nothing for their stock. The auditor questioned whether Hawaii or Iowa law had been violated. A related question involved the total cash contribution of all stockholders. In the state loan agreement, stockholders were required to pay the company $500,000 in cash for their equity. To show compliance, Butters and Caple submitted a report that erroneously claimed a $166,000 loan as an equity contribution. This meant that Caple and Butters had violated the terms of the Hawaii state loan.

A second major area of concern was management's poor judgment in rewarding major stockholders. For example, total salaries plus bonuses paid to major shareholders were not to exceed $3,500 per month, according to the terms of the state loan. However, salary contracts with the major shareholders for 1974 amounted to approximately $6,650 per month (see table 3.3).

Other examples of poor judgment in rewarding major shareholders included providing them with over $34,000 in travel and entertainment, when the budget called for only $5,000, and paying them large consulting fees, such as an additional $31,503 to Jack Caple. Table 3.4 shows the total amount of funds provided to each major shareholder. It should be emphasized that the total amount was not overly large. However, since the company was earning nothing, and since the major shareholders were the very ones approving the salaries, bonuses, and enter-
tainment expenses, it appeared that they were enriching themselves with government money.

Table 3.3.
Hawaii Biogenics' Salary Contracts with Major Shareholders

<table>
<thead>
<tr>
<th>Year</th>
<th>Jack Caple</th>
<th>Ken Butters, Sr.</th>
<th>Mrs. Jack Caple</th>
<th>Richard Metcalf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>$36,000</td>
<td>30,000</td>
<td>10,800</td>
<td>3,000</td>
</tr>
<tr>
<td>1975</td>
<td>$40,000</td>
<td>30,000</td>
<td>12,000</td>
<td>9,000</td>
</tr>
<tr>
<td>1976</td>
<td>$40,000</td>
<td>30,000</td>
<td>15,000</td>
<td>4,500</td>
</tr>
<tr>
<td>1977</td>
<td>$40,000</td>
<td>30,000</td>
<td>18,000</td>
<td>4,500</td>
</tr>
</tbody>
</table>

TOTAL $79,800 91,000 89,500 92,500


Table 3.4.
Funds Provided to Hawaii Biogenics Major Shareholders, 1974-75

<table>
<thead>
<tr>
<th>Source of Funds</th>
<th>Jack Caple and El Pac Ranch</th>
<th>Kenneth Butters, Sr.</th>
<th>Richard Metcalf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash redemption of debenture</td>
<td>$31,398</td>
<td>$ --</td>
<td>$4,063</td>
</tr>
<tr>
<td>Travel and entertainment</td>
<td>19,438</td>
<td>7,856</td>
<td>1,033</td>
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<tr>
<td>Consulting fees</td>
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<td>2,000</td>
<td>3,000</td>
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<tr>
<td>SUBTOTALS</td>
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<td>$9,856</td>
<td>$8,096</td>
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<tr>
<td>Salaries</td>
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<td>25,000</td>
<td>--</td>
</tr>
<tr>
<td>TOTALS</td>
<td>$127,482</td>
<td>$35,356</td>
<td>$8,096</td>
</tr>
</tbody>
</table>

The third major area of concern dealt with fiscal control. The auditor found Hawaii Biogenics' accounting procedures inadequate. During certain time periods, no precise record of purchases was kept and all expenditures were charged to a single expense account. Later, when records were maintained, several categories of purchases were merged and then separated, making an audit impossible. In sum, the auditor commented, "there was apparently a total lack of control over the purchasing of goods and services."(36)

Following the audit, the state took no criminal action against Hawaii Biogenics' major shareholders. Moreover, since Francis Pacheco, Biogenics' new trustee, was still attempting a reorganization, the state did not try to recover the loan money. Dissatisfied with this inaction, the county of Hawaii, which had provided one-third of the loan, began its own investigation, including both an audit by the accounting firm of Ernst and Ernst and an in-depth probe by the Hawaii County Council. The investigation was to examine not only the overall management of Hawaii Biogenics, but also the state's conduct in monitoring the project.

The county audit was completed in August 1978. It generally confirmed the findings of the state audit, but added information about the state's relationship to the project and provided a more thorough background on the company's management and its possibly illegal actions. Several major points were made in the audit.

First, there were several instances of unethical business conduct. And while there was insufficient evidence to accuse Caple or others of illegal acts, the investigators claimed that Caple and the rest of Biogenics' management "were willing to bend the truth to their own advantage."(37)

Second, there was considerable discrepancy in reports of the stockholders' equity cash contribution. The investigators found that stockholders contributed only $222,000, but were required to guarantee a minimum of $500,000. Moreover, when Hawaii Biogenics contracted a special report to demonstrate compliance, the report preparers listed a $166,000 loan from Pioneer Seed Company as an equity contribution, despite Pioneer Seed's written denial.

A third major finding of the audit concerned violations of the terms of the $1 million loan. There were several instances of Hawaii Biogenics management violating the loan provisions, including failure to submit audited financial statements, the borrowing of large amounts of cash from other sources, and the overrewarding of major stockholders. The auditors also charged that the state, through the Department of Agriculture, was aware of these violations but did not foreclose on the loan as it was authorized to do.

Investigation by Independent Attorneys
Appointed by the Hawaii County Council and its Aftermath

Although the auditor's report made by the firm of Ernst and Ernst was considered a part of the overall investigation of the Kohala Task Force
projects, including Hawaii Biogenics, little progress was made initially in getting the in-depth probe by the county council itself underway. In mid-October 1977 the chairman of the council's Agricultural and Tourism Committee the newly elected Republican member James Dahlberg, was able to get the committee to vote unanimously for an investigation to determine whether the county's $1.8 million contribution to the Kohala Task Force had been "prudently spent."(38) The county council subsequently endorsed the proposal for launching the investigation by an ad hoc Committee, with Dahlberg as chairman.

For several months the ad hoc committee was caught in a "power play" within the county council regarding leadership problems. By the end of 1977 the power struggle resulted in a reorganization of the county council under a new chairman, who was reportedly an opponent of the formal examination of the Kohala Task Force contemplated by a vocal minority on the council. One of the first things that the new council chairman demanded of the ad hoc committee was the formulation of a set of guidelines on which the probe would be based. Then there was the matter of how much the council should appropriate for another investigation. After about two months of acrimonious debate among the feuding councilmen, the chairman proposed that the probe be conducted by three independent attorneys, to be named by him. Appointed as attorneys were Stanley Roehrig, former representative to the state legislature; Andrew Wilson, former deputy county prosecutor; and Sylvester Quitiquit, of the law firm of Cook, Choi, Yuda, and Quitiquit. By mid-March 1978, as the gubernatorial campaign began to heat up, the attorneys recommended a five-point guideline, which the council approved. The five points were:

1. To determine whether there were "improper financial transactions."
2. To suggest remedies for civil suits if there were "improper" financial dealings.
3. To determine if there was "sufficient evidence" of criminal wrongdoing.
4. To recommend laws to protect the state or counties from misuse of public funds.
5. To suggest ways to "remedy" the ongoing task force projects. (39)

The guidelines were accepted by the ad hoc committee and the investigation began. After five months, the three independent attorneys, under contract with the Hawaii County Council for $50,000, delivered a massive report on September 15, 1978. The report was damaging to the Kohala Task Force in general, and proposed three specific actions regarding Hawaii Biogenics. First, the report recommended that the events surrounding the Pioneer Seed Company dealings and the stockholders' equity contribution be referred to prosecutorial authorities. Second, the report recommended that the county request the Hawaii Biogenics' trustee to initiate a full investigation possibly leading to court action against the major stockholders. Finally, the report recommended that the county fully investigate the conduct of
state officials with regard to their continued disbursement of public funds after learning that Biogenics' management had violated loan provisions.

The fate of the Kohala Task Force, established in 1971 by Governor Burns for the specific purpose of generating "a plan of action" to save the Kohala community from economic disaster, was much in the air soon after the release of the preliminary report by the three independent attorneys. On November 21, 1978, without any fanfare and advance publicity, members of the Kohala Task Force voted to recommend to the governor that the task force be disbanded, after seven years of existence.

The dissolution of the task force in no way served as a deterrent to the county council's efforts to institute possible criminal actions against a number of the task force's projects, including Hawaii Biogenics. A council resolution of January 12, 1980, directed the county's prosecuting attorney's office to look into possible wrongdoing by the officers of Hawaii Biogenics. The position of the county prosecutor was that unless there was an appropriation of $200,000 by the county council, it would be impossible for his office to conduct any further investigation of the Kohala Task Force projects, even though an additional 90-page report on criminal misdeeds had been submitted by two of the attorneys (the report has not been made public — not even to councilmen — and is locked in the prosecuting attorney's office).

Anxious to have the investigation of possible criminal wrongdoing started, the county council initially authorized $200,000 for such a purpose, but later rescinded that authorization for budgetary reasons.

After the Hawaii County Council rescinded its authorization of $200,000 for investigating alleged criminal misdeeds in Kohala Task Force projects, it requested the Federal Bureau of Investigation and the Internal Revenue Service of the federal government to take over the investigation. The response of the FBI was that it had no jurisdiction in the first place and that, furthermore, there was a statute of limitations on these cases making the investigation moot. The Internal Revenue Service did not respond.

PHASE 4: EVALUATION AND REFINEMENT

There has been no overall evaluation of Hawaii Biogenics' operations by the State of Hawaii. Several audits have been conducted by consulting firms, but they have only pointed out the financial problems and flagrant mismanagement, not systematically analyzed the company's operations. The Kohala Task Force was responsible for monitoring the company's operations, but its scarce time was spent trying to resolve the company's financial problems, not evaluating the overall project. By 1978, when it was apparent to all that Biogenics had failed, the Kohala Task Force was planning to disband and did not have the time or money to carry out a comprehensive evaluation. After the Task Force disbanded in 1980, the state government deemed an overall study to be a
waste of money. What follows then, is the authors' evaluation of Hawaii Biogenics.

Planning Strategy

From the perspective of development and planning, the first step in the review might well be an examination of the nature of the overall strategy or model for the state and county governments' involvement in financing a diversified agricultural project. In other words, what was the nature of the Kohala Task Force, established in 1971 when the North Kohala community was faced with the sudden announcement by Castle and Cooke that it was going to terminate its sugar operations, which employed some 500 workers? The initial strategy behind the formation of a task force to deal with the problem of economic disaster for North Kohala was to plan actions to save the sugar industry and the community, and to provide alternatives, preferably diversified agriculture, for possible future growth. Thus a very important factor emerged in the task force strategy: some type of crash program had to be launched in order to help the community avert impending economic disaster. Crash programs imply that decisions, financial as well as managerial, must be dictated by political and social considerations. Actions or considerations of a political or social nature invariably mean quick, if not risky, decisions.

It was also very evident from the outset that the task force's action-oriented strategy gave priority to the urgent need for the creation of jobs for the soon-to-be-displaced sugar workers, even if this created situations that might be detrimental to the financial solvency and stability of a development project. In the final analysis, the job creation strategy did not accomplish its purpose. More than 500 sugar workers had lost their employment by the time the plantation closed its operations. The development projects financed through the Kohala Task Force, of which Hawaii Biogenics was only one, created a total of only 110 full-time jobs. By 1978, Hawaii Biogenics had generated only 16 full-time jobs. Moreover, of the total 110 jobs created, only 35 were actually filled by former North Kohala sugar workers. Thus, in retrospect the job creation strategy of the Kohala Task Force — which dictated most of the managerial and financial decisions for its projects — proves to have been shortsighted.

Another aspect of the Kohala Task Force strategy was that its projects were basically a joint venture between the state and county governments on one hand, and between the governments and a privately owned enterprise on the other. It was really a pioneer endeavor, a first-time experiment in Hawaii on such a scale, involving close to $7 million of public funds; the largest and certainly the most ambitious project was Hawaii Biogenics. There was no previous guide to follow when the Kohala Task Force plunged into these development projects by disbursing state and county funds. It was therefore not surprising that county officials issued demands on state agencies to provide information on the operations of the task force projects.
Resolution of Conflicting Development Goals

It should be emphasized, however, that political and social goals often conflict with private goals. In this project, the political goals of employment generation and self-sufficiency conflicted with the goal of private profitability, and this inherent contradiction was not closely examined; nor was any attempt made to integrate the goals. Had the project been a purely private enterprise, more caution might have been exercised, perhaps starting first with a pilot operation and then increasing the scale to one of profitability. If the project had been recognized as a government enterprise generating public benefits, then the state could have considered its contribution as an economic development grant. The costs in terms of government funds then could have been evaluated against the benefits in employment and self-sufficiency. In any case, the project demonstrates the danger of not clearly recognizing conflicting goals and resolving them prior to approval.

Decision-Making Process of the Funding Agency

Related to the lack of an overall strategy for state and county governments' involvement in the Hawaii Biogenics project is the composition of the Kohala Task Force. The membership was a mix of state government executives, county officials, members of the business community, representatives of the union most involved in North Kohala, and a representative of the community at large, namely, the president of the North Kohala Community Development Association. As a group, the task force could best be described as "enthusiastic amateurs," not experts in joint ventures between state and county governments and a private concern eager to promote a new industry in an area where private industry had experienced problems and unprofitability. It was quite evident, as is clear in this case study, that the Kohala Task Force gave inadequate time and consideration to its decisions about project funding and approval.

It must be borne in mind that task force members, on the whole, were busy individuals in their own work and were also politically appointed by the governor. The decision-making mode of task force members was to rely on the judgment of the chairman and a few key members, since they themselves lacked both the time and the prior staff work or analysis for serious deliberation on projects, loans, and so on. Whatever staff analysis the task force had been able to obtain came from the Department of Agriculture's farm loan division. But the farm loan unit was understaffed to begin with. It also lacked the expertise and experience to develop both a monitoring procedure and a regularized reporting system on loans extended to the Hawaii Biogenics project.
The irony in the case of Hawaii Biogenics was that the design for the project — the establishment of a grain feedlot and beef industry complex — was not wholly unrealistic. First, the idea of growing feed grain, corn and sorghum, was tested as feasible on another island by another private concern, Metcalf Farms. Then, almost at the very beginning of the Kohala Task Force's formation, a University of Hawaii agronomist submitted a report to the County of Hawaii in support of the idea of locally grown grains for cattle feed, and also made scientific calculations regarding the number of crops needed per year on a certain acreage to produce enough feed grain to be locally self-sufficient. It was obvious that the task force wanted to be sure that the operation was really feasible. It thus contracted a full-scale feasibility study (the Guthrie report) by two experts on feedlot and beef cattle operations. In addition, the College of Tropical Agriculture of the University of Hawaii came forward with a proposal, later contracted by the county, to experiment with the economic feasibility of developing a comprehensive system for a feed livestock economy in North Kohala. When Hawaii Biogenics entered the picture, it too submitted a feasibility study to support its application for loans from the state. This last feasibility study was based on the findings of the Guthrie report, but included activities such as aquaculture — the portion that was considered too ambitious by the task force.

In short, the original concept for an integrated feedlot and cattle complex, as presented by Hawaii Biogenics and approved by the Kohala task Force, was rather sound, not merely based on promotional gimmicks. What went wrong with the original project design was the lack of production and market research and the lack of realistic financial estimates when the project was supposedly in the process of being reviewed — this was the candid admission made by the task force in its 1976 report. The overall consideration of the task force had been to take rapid action on projects that apparently would yield jobs immediately. In fact, it might be concluded, the overriding concern about job creation obscured the need for careful examination of Hawaii Biogenics' financial standing at the outset by both the state government and the Kohala Task Force, an important point made in one of the subsequent auditors' reports.

Implementation Problems

The Hawaii Biogenics project encountered many problems in the implementation stage, mostly financial and managerial, that finally led to the attempted reorganization by the state and subsequent bankruptcy proceedings. The basis of Hawaii Biogenics' financial problems was its insufficient capital for operating the feedlot and cattle complex. This was not discovered until the first audit was made on the company's operations. Evidently, a sizable number of shares — 200,000 total — were
issued before incorporation to the company's original organizers, without being paid for in cash, but merely put on paper. The insufficiency in the original capitalization resulted in the company's inability to show that it had the required amount of working capital to secure loans for the Kohala Task Force. The matter of insufficient equity contribution by the stockholders was not considered by the task force when it recommended that the state approve a $1 million loan for Hawaii Biogenics. Cases of mismanagement also occurred during implementation, when excessive salaries and travel expenses were provided for the company's officers. There was neither systematic record-keeping nor appropriate accounting procedures, as are generally required for any business transaction. Equipment was purchased with state funds, but used sporadically and not accounted for.

It was at this juncture that the state and the task force began to interfere with management by insisting on the addition of qualified local ranchers and businessmen to Hawaii Biogenics' board of directors. Up to this point, the state and the task force had failed to provide procedures for monitoring the various projects, the disbursement of loan funds, and the enforcement of loan requirements. The laxity in monitoring projects resulted in cost overruns and the accumulation of debts by the company. By the time the state forced Hawaii Biogenics to declare bankruptcy and placed it under trusteeship by court order, the entire project had become a scandal with heavy political overtones in the midst of a heated gubernatorial campaign. The 1976 election also produced a significant change in the composition of the Hawaii County Council, whose majority often was made up of a coalition of Democratic dissidents in coalition with the minority Republicans. The political power shift in the Hawaii county government finally brought about the full-scale investigation of Hawaii Biogenics' operations, along with the other Kohala Task Force projects.

CONCLUSION

As of 1981, the operations of Hawaii Biogenics are being continued under the management of a court-appointed trustee; 3,000 cattle are fed in its feedlot and about 200 acres are devoted to producing corn for feed. However, the future of Hawaii Biogenics is still uncertain. Having invested close to $2.6 million of public funds in the operations, the state is looking for a buyer to take over. It may be concluded that the original idea for an integrated feed grain and cattle industry for North Kohala is sound. The single most significant lesson to be learned from this case study is that no matter how good a development design is, the implementation of the project depends on a system of rigorous analysis and appraisal of proposals, sound management practice in operating the project, and a scrupulous monitoring procedure that will continuously evaluate a project's progress. The tragedy of Hawaii Biogenics and the Kohala Task Force as a whole is that an enormous amount of political and social consideration was given to project approval without paying
much attention to project monitoring, evaluation, and control, so that in the end very little of the original objectives were achieved. On the other hand, perhaps an inherent incompatibility exists between the urgent political need for job creation in an economic crisis area and sound business practices.

With the benefit of hindsight, it may be argued that the "task force" approach was not appropriate in the Kohala situation, in which political and social considerations often tended to assume prominence in decision-making with respect to loan application approval and monitoring rules. Perhaps a different organizational structure for financing and monitoring might have produced different results in the case of the Hawaii Biogenics project. For instance, a better model might be a state development corporation, with proportional capital contributions by the state and member-county governments to undertake all financing of development projects such as Kohala. Such a publicly owned financing corporation would provide the initial capital for private enterprises to initiate projects in economic disaster areas within the state. The corporation would have the necessary expertise to process loans and manage projects and would develop established procedures to do so, in much the same way as a legal corporation. Such a strategy would mean that less attention would have to be given to political considerations in approving projects and loans.

A state development corporation would be hesitant to approve loans unless the project proposal were analyzed and appraised thoroughly; it would see to it that the management is sound and that there are rigorous monitoring, reporting, and evaluation procedures established to ensure project success. Even with such rigorous examination and control, projects financed through a state development corporation would involve substantial risk, otherwise they could be privately funded. The development corporation could evaluate the risks within the context of public benefits.

NOTES


(3) Hawaii Business, vol. 18, no. 6 (December 1973), p. 23


(12) Memorandum to George Ariyoshi, acting governor of Hawaii, from Frederick Erskine, acting chairman, Kohala Task Force, "Request for Approval for $1,000,000 Through the North Kohala Loan and Grant Program to Hawaii Biogenics, Ltd.,” State of Hawaii Archives, March 13, 1974.

(13) Ibid., p. 4.


(18) Ernst and Ernst, "Audit," p. 5.

(20) Hawaii State Senate, Special Committee Report No. 6, 1977, p. 5.


(30) "Back to the Old Drawing Board," Hawaii Business 22, no. 6: 49-62.


(35) Ernst and Ernst, "Audit, (11) p. 16

(36) Ibid.
(37) Ibid.


India has been facing an acute shortage of all types of papers, especially in specialty and kraft papers. The per capita consumption of paper in India is only about 1.2 kilograms per annum, compared to 205 kilograms in the United States, 94 kilograms in the United Kingdom, and 57 kilograms in Japan. The consumption of paper per capita is an indication of a country's industrialization and development; it is used for writing, printing, newsprint, wrapping, and packaging (including boards for cartons), and as specialty paper for miscellaneous purposes, such as electrical insulation and tissue in surgical dressings, handkerchiefs, towels, and so on. In 1972-73 India produced approximately 0.8 million metric tons of paper and paperboard, while production projections at the end of the Fifth Five-Year Plan (1974-79) were of the order of 1.2 million metric tons. These projections, however, were expected to fall short of demand, which had been estimated to be running at almost 100 percent more than supply, necessitating imports. In India, import duties are heavy and the government does not encourage the importation of paper unless it is absolutely essential. Thus there is considerable unfulfilled demand, and production capacity in the paper industry throughout India still needs to be installed rapidly and on a priority basis. Therefore the Indian government, as an industrial policy, has encouraged the establishment of paper plants to reduce the shortfall between demand and supply. This shortfall has often caused paper to be sold at fairly high rates, despite the periodic partial price controls introduced by the Indian government. It is in this context that the paper industry offered and continues to offer good entrepreneurial opportunities in India.
The Indian government’s general industrial policy has been to encourage the setting up of small-to medium-scale industrial units dispersed throughout the country in order to generate additional employment and development opportunities, particularly in rural areas. To motivate industrial units to locate themselves in the underdeveloped rural areas, the government has declared a number of such regions throughout the country "backward areas," where attractive incentives have been offered for the setting up of industries. The rationale for this policy is to reduce the concentration of industries in the overstrained urban areas and to develop the rural areas, where traditionally about 80 percent of India’s 623 million people live. Right from the time of Mahatma Gandhi the Indian government has continually attempted to encourage the establishment of labor-intensive industries in underdeveloped rural areas in order to increase employment, economic growth, and social stability. The incentives offered for industries that locate themselves in these "backward areas" include an outright cash subsidy from the government in proportion to 15 percent of the fixed assets employed, income tax deductions for up to ten years, lower rates of interest for financial loans, cheaper electrical power rates, and interest-free sales tax loans. This policy has resulted in the opening up of the rural areas of India to private, joint-sector, and public-sector industries.(3)

ACRONYM KEY

ICICI Industrial Credit and Investment Corporation of India
IDBI Industrial Development Bank of India
IFCI Industrial Finance Corporation of India
KSIIDC Karnataka State Industrial Investment and Development Corporation
LICI Life Insurance Corporation of India
MMSA M.M. Suri and Associates (P) Ltd.
SIDCS State Industrial Development Corporations

Paper Technology Environment

Paper technologies have come a long way since Ts'ai Lun, a Chinese government official, first made paper in A.D. 105 by pulping fish nets and old rags. Later Lun used plant fibers which proved sufficiently elastic in tension as the raw materials for paper. These raw materials were boiled, beaten into a mash, stirred into a pulp, and spread on a straining frame or basket, forming a thin tissue. The resultant paper was then pressed with heavy weights.(4) Rags were difficult to process in large quantities, however, and new technologies were needed to meet increasing demand for paper products of different quality for various uses.

Until the mid 1800s, paper was used basically as a means of recording communications. During the so-called Industrial Revolution of the 19th century, paper became much more abundant when methods
were discovered that isolated and purified wood fibers. Since then, paper-making technology has advanced to the extent that paper in a wide range of qualities is now manufactured for a tremendous variety of uses.

Today technologies for manufacturing paper in developed countries are based primarily on wood pulp, which requires large-scale consumption of forest trees as raw material and thus depletes natural resources. Raw materials and feed stock have posed a great problem for large papermaking units in countries such as India, creating a need for smaller, compact mini-paper-plants that can utilize available agricultural and industrial wastes. Rice, wheat, and maize straw, banana fiber, and grass, all agro-based materials, and used jute, waste cotton rags, and other castoffs can conveniently be utilized as raw materials for smaller paper plants, the technology for which has been further developed out of necessity in the past few years. Various organizations in the Indian private and public sectors (5) have helped develop techniques for use in environments like India's. This technology is suitable for paper plants having a capacity to produce from 2.5 to 30 metric tons of paper per day and is adapted from the technology for manufacturing paper from agricultural fibers used in small-sized plants in the Western agricultural countries such as Germany, Holland, and France.

Today, because of the high cost of labor, small paper plants are no longer viable in developed countries. Large paper plants in these countries now use wood pulp because it can be manufactured more economically on a bigger scale. But small paper plants using agricultural waste are appropriate to developing countries like India, where research is constantly being undertaken to improve and adapt the technology to suit local conditions.

The Project and the Promoters

Because of the shortage and high price of paper in India and the government's projections of additional capacity requirements in the paper industry, a few investors, under the leadership of A. Basu, decided in September 1974 to begin the manufacture of paper under overall government policy guidelines, that is, to have a small-to-medium-sized paper unit using the indigenous technology of agricultural-waste-based raw materials in a backward area of the country.

Basu had a distinguished record as an administrator and manager. He had started his career in the army as a commissioned officer, rising to the post of instructor for officers in the tactical wing of the Armoured Corps. Subsequently, he left the army to gain business management and administrative experience in the Royal Calcutta Turf Club; he was the first Indian to become its secretary, in 1968. Basu had traveled extensively in Southeast Asia, the Far East, Australia, and New Zealand. His administrative interests led him to explore the possibility of becoming an entrepreneur and starting an industry in the seller's-
market environment of India. In 1974 he contacted a well-known Indian consulting organization, M.M. Suri and Associates (P) Ltd., who suggested that Basu could, with their help, establish a profitable paper project based on agrowaste in a backward area. They gave him a brief proposal, on the basis of which he retained their services as consultants to put up a suitable paper project. The company he promoted for this purpose was named Kabini Papers Ltd.

The Consultants

M.M. Suri and Associates (P) Ltd. (MMSA), a research, management, and "turnkey" consulting firm formed in 1968, has helped put up a number of new industrial units on a "turnkey" basis. The term "turnkey" implies responsibility right from the start of a project up to the satisfactory beginning of production or operations. This responsibility includes making the project report, assisting the promoters in dealing with financial institutions and getting loan approvals, preparing all civil works such as building construction, ordering equipment and supervising its construction and installation, providing technical know-how in a detailed form, helping to recruit and train personnel, and starting production at established quality and equipment-capacity standards. To do this, MMSA employs about sixty persons, including mechanical, electrical, civil, and chemical engineers as well as specialized technologists. Besides turnkey consultancy, the firm also undertakes assignments in improving the ongoing operations, products, organization structure, systems, market penetration, and similar areas of units already in operation, with a distinct emphasis on implementing accepted recommendations.

MMSA has carried out research and development in both the process and equipment design of agrowaste-based small-to medium-scale paper plants. For one client MMSA set up a small filter-paper-manufacturing unit at Poona for which they fully designed and developed the paper machine. MMSA worked closely with the Hand Made Paper Institute in Poona to develop process expertise in various types of papers, and also set up their own speciality paper project in North India to manufacture high-density electrical insulation paper from agrowastes, waste paper, rags, and other materials. MMSA felt that the concept of mini-paper-plants using appropriate indigenous technology and available agrowastes in the countryside was in direct agreement with national policies and could therefore be promoted through entrepreneurs with the support of the concerned State Industrial Development Corporation (SIDC). SIDCs have been formed in each state of India to assist entrepreneurs in setting up industries in the small-to medium-scale range. This assistance is many-faceted, covering development of industrial estates, assistance to entrepreneurs in making project reports through an approved list of consultants, sanctions for loans of up to Rs 6 million and participation in the equity of new industrial ventures in the state. In general the SIDCs act as the coordinating agency to help entre-
preneurs meet all government requirements in a convenient manner. These agencies have had some success in developing a suitable infrastructure to assist entrepreneurs in establishing industrial units. Financial loans for large-scale projects are handled by national-level financial institutions, but the SIDCs help in all local matters of land allotment, water, power, raw materials, and so on. Because MMSA is registered with the SIDCs, it often gets referrals from the SIDCs for entrepreneurs who need consulting services.

PHASE 1: PLANNING, APPRAISAL, AND DESIGN

A Basu wanted MMSA to analyze and identify specific project parameters, location, and objectives and give a concrete shape to the project proposal so that it could be presented for appraisal to the Karnataka State Industrial Investment and Development Corporation (KSIIDC), and to the appropriate financial institutions.

Identification and Formulation

MMSA determined that India produced approximately 800,000 metric tons of paper and paperboard during 1972-73, of which about 150,000 metric tons were of kraft paper varieties. The term "kraft paper" covers a range of industrial papers of high strength, which have found increasing use in wrapping, flexible packaging, and other types of packaging. The strategic role played by kraft paper in a developing country like India is well established. It meets the requirements of exporting units manufacturing fertilizers, engineering and consumer goods, food products, and the like, in addition to satisfying local industries need for storage and protection of various items, including foodstuffs. Production projections at the end of the Fifth Five-Year Plan (1974-79) were of the order of 1,200,000 metric tons of paper and paperboard. The demand projections for kraft paper were of the order of 350,000 to 450,000 metric tons per year, whereas the expected production capacity was only 250,000 metric tons per year, which showed that a wide gap existed between demand projections and production capacity. Moreover, the quality of kraft paper produced hitherto in India had not been very satisfactory. There appeared to be no standards for quality, supplies were irregular, and prices were exorbitant because of the ever-increasing gap between demand and supply.

MMSA therefore determined that A. Basu and his copromoters should begin the manufacture of kraft paper, which the Indian government was encouraging and for which there was a ready demand. They envisaged a mini-paper-plant, based on the appropriate technology available to MMSA, using rice straw, waste jute, and cotton rags in the proportion suitable for the product, with the feed stock requiring about 75 percent rice straw. In place of waste jute and cotton rags, banana fibers could be used, thus providing a reasonable amount of flexibility in
using available agrowastes. They suggested a 10 metric-ton-per-day plant as the smallest economical unit, considering the limited resources for investment by the promoters. Such a project would cost approximately Rs.10.3 million, generating a sales turnover of Rs16.5 million. MMSA also recommended that, in keeping with the Indian government's policy of developing industries in backward areas, and to take advantage of the attractive incentives offered, the project should be set up in a rural area of the country.

Basu, the main promoter and entrepreneur, agreed that such a project appeared promising, and together with MMSA he reviewed possible areas where the mini-paper plant could be located.

Plant Location. The following features were identified as important in deciding on a suitable plant location, based on the various factors MMSA used in identifying small industry locations.

- Availability of raw material – rice straw or other agricultural straws, and sources of longer fibers such as cotton rags, jute, banana fiber, and so on.
- Proximity to consuming centers of the product (in this case, kraft paper).
- Availability of continued and uninterrupted supplies of water, coal for steam generation, and electrical power in adequate quantities.
- Transport facilities by road, rail, and air.
- Effluent disposal facilities.
- Acceptability and availability of technical personnel, including skilled and semiskilled industrial workers.
- Availability of incentives for industrially backward areas.
- Proximity to academic and research organizations.

Among the various sites considered, the area of Nanjangud in the Mysore district of Karnataka State appeared to be the most suitable (figure 4.1). MMSA collected district-wide data on the agricultural area under rice cultivation and the average availability of rice straw in the state of Karnataka, which is shown in table 4.1.

As table 4.1 shows, rice straw is readily available in most of Karnataka. MMSA had worked out the requirements of rice straw to be only 4,600 metric tons per year, which is about 16 to 17 percent of available rice straw in the Mysore district. Availability of used jute bags, waste cotton, and cotton rags, which would form 25 percent of the total feedstock, amounting to about 1500 metric tons per year, also posed no problem in the state of Karnataka. The industrial area of Nanjangud, in the backward district of Mysore promoted by the Indian government as well as the KSIIDC, therefore adequately met all the aspects identified as important in deciding on a suitable plant location. Mysore, Bangalore, and other major cities were connected by various transports and communication facilities and offered an excellent launching spot for the product from the proposed unit. The government-
sponsored industrial area offered adequate infrastructure facilities, such as water and electrical power. The proximity of the plant to Mysore, a major city in Karnataka, promised the availability of technical personnel, including skilled and semiskilled workmen. Academic and research institutions in Mysore and Bangalore could be of great advantage to the proposed unit. The effluent could be treated and used as an irrigant in the agricultural fields surrounding the industrial area in Nanjangud. Hence the location of the proposed paper plant in the Nanjangud industrial area of Mysore District, Karnataka State, was found to be highly suitable.

Table 4.1. Area Under Rice Cultivation and Availability of Rice Straw in the State of Karnataka

<table>
<thead>
<tr>
<th>Site No.</th>
<th>District</th>
<th>Cultivated Land (Rice)</th>
<th>Availability of Straw</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bangalore</td>
<td>34,213 hectares</td>
<td>46,500 metric tons</td>
</tr>
<tr>
<td>2.</td>
<td>Bellary</td>
<td>28,410</td>
<td>38,000 metric tons</td>
</tr>
<tr>
<td>3.</td>
<td>Bijapur</td>
<td>13,849</td>
<td>18,800 metric tons</td>
</tr>
<tr>
<td>4.</td>
<td>Chickmagalur</td>
<td>3,457</td>
<td>4,600 metric tons</td>
</tr>
<tr>
<td>5.</td>
<td>Chitradurga</td>
<td>45,168</td>
<td>61,300 metric tons</td>
</tr>
<tr>
<td>6.</td>
<td>Coorg</td>
<td>32,985</td>
<td>44,800 metric tons</td>
</tr>
<tr>
<td>7.</td>
<td>Dharwar</td>
<td>45,799</td>
<td>62,200 metric tons</td>
</tr>
<tr>
<td>8.</td>
<td>Dharwar</td>
<td>111,334</td>
<td>151,000 metric tons</td>
</tr>
<tr>
<td>9.</td>
<td>Gulbarga</td>
<td>54,140</td>
<td>73,500 metric tons</td>
</tr>
<tr>
<td>10.</td>
<td>Kolar</td>
<td>23,299</td>
<td>31,800 metric tons</td>
</tr>
<tr>
<td>11.</td>
<td>Mandya</td>
<td>55,502</td>
<td>75,600 metric tons</td>
</tr>
<tr>
<td>12.</td>
<td>Mysore</td>
<td>55,047</td>
<td>89,600 metric tons</td>
</tr>
<tr>
<td>13.</td>
<td>North Canara</td>
<td>86,998</td>
<td>118,000 metric tons</td>
</tr>
<tr>
<td>14.</td>
<td>Raichur</td>
<td>43,961</td>
<td>59,500 metric tons</td>
</tr>
<tr>
<td>15.</td>
<td>Shimoga</td>
<td>48,930</td>
<td>66,200 metric tons</td>
</tr>
<tr>
<td>16.</td>
<td>Tumkur</td>
<td>66,200</td>
<td>66,200 metric tons</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>1,120,186 hectares</td>
<td>1,499,790 metric tons</td>
</tr>
</tbody>
</table>

Project Objectives. MMSA explained to Basu that the proposed kraft paper project would meet the following objectives easily, as they were, in fact, based on the project's strengths:

- Provide an attractive industrial venture in the core sector, encouraged by the industrial policy of the Indian government.
- Help to meet the ready demand for kraft paper in the area surrounding the mini paper plant. The project size of 10 metric tons per day of machine-glazed kraft paper would mean that this product could be easily marketed in the state of Karnataka itself, thus minimizing marketing costs.
Fig. 4.1. Nanjangud and Mysore in Karnataka State.

- Develop the rural area by utilizing locally available and previously unused agricultural wastes and natural renewable cellulosic materials, such as grass, based on the new indigenously developed technology.
- Increase employment in the backward rural area by using the labor-intensive technology system for manufacturing paper, in line with the government's industrial and rural development policy.
- Generate an irrigant by suitably treating the effluent of the mini-paper plant to help augment agricultural production in the area.

MMSA explained that, besides the promise of attractive returns on investment, the proposed project also fell in line with the government's industrial and rural development policies and would contribute to the
social good of the community in which it would be located. Basu then asked MMSA, as project turnkey consultants, to prepare a detailed project report to establish the feasibility of the proposed plant at Nanjangud.

Feasibility Analysis and Appraisal

MMSA started work on the detailed project report, which would serve as the basis of the project's feasibility analysis and subsequent appraisal by the KSIIDC and the financial institutions. The detailed project report covered product potential and raw material availability, methodology of manufacture, plant location and facilities, personnel requirements, project phasing and network analysis, capital outlay and scheme of finance, working capital and margin money requirements, cost of production, profitability, cash flows, and balance sheets in accordance with the information required by the financial institutions. The report did not elaborate on environmental and administrative factors, as these criteria were not required to be covered; major emphasis was given by the lending institutions to financial viability. Work on the detailed project report was completed in November 1974. The total project cost was projected at Rs10.325 million, as is shown in table 4.2.

Table 4.2. Capital Cost (in millions of rupees)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>0.140</td>
</tr>
<tr>
<td>Buildings</td>
<td>1.016</td>
</tr>
<tr>
<td>Plant and machinery</td>
<td>5.003</td>
</tr>
<tr>
<td>Miscellaneous fixed assets</td>
<td>1.284</td>
</tr>
<tr>
<td>Machinery spares and stores</td>
<td>0.200</td>
</tr>
<tr>
<td>Contingencies</td>
<td>0.744</td>
</tr>
<tr>
<td>Other capital expenses</td>
<td>1.379</td>
</tr>
<tr>
<td>Margin for working capital</td>
<td>0.559</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>10.325</strong></td>
</tr>
</tbody>
</table>

On attaining full production, 3,000 metric tons per year of kraft paper would give a sales turnover of Rs16.5 million, based on a conservative price of Rs5,500 per metric ton. The detailed project report worked out the cost of production, profitability, cash flows, and balance sheets. Estimated profitability of the project for the eight productive years is shown in table 4.3.

The project was to be financed according to the financial pattern shown in table 4.4.

The proposed paper plants would give direct employment to about 170 persons. An indication of project viability is given by the selected ratios shown in table 4.5.
Table 4.3. Annual Gross and Net Operating Profits
(in millions of rupees)

<table>
<thead>
<tr>
<th>Productive Year</th>
<th>Gross Profit</th>
<th>Net Profit Before Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>0.938</td>
<td>(-) 0.006</td>
</tr>
<tr>
<td>Second</td>
<td>5.066</td>
<td>3.280</td>
</tr>
<tr>
<td>Third</td>
<td>4.941</td>
<td>3.183</td>
</tr>
<tr>
<td>Fourth</td>
<td>4.845</td>
<td>3.139</td>
</tr>
<tr>
<td>Fifth</td>
<td>4.688</td>
<td>3.036</td>
</tr>
<tr>
<td>Sixth</td>
<td>4.562</td>
<td>3.065</td>
</tr>
<tr>
<td>Seventh</td>
<td>4.436</td>
<td>2.993</td>
</tr>
<tr>
<td>Eighth</td>
<td>4.301</td>
<td>2.910</td>
</tr>
</tbody>
</table>

Table 4.4. Financial Pattern
(in millions of rupees)

<table>
<thead>
<tr>
<th>Share Capital</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td></td>
</tr>
<tr>
<td>Promoters, including KSIIDC</td>
<td>1.800</td>
</tr>
<tr>
<td>Public</td>
<td>0.740</td>
</tr>
<tr>
<td>Term Loans</td>
<td>5.500</td>
</tr>
<tr>
<td>Capital Subsidy (for backward areas)</td>
<td>1.187</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10.427</td>
</tr>
</tbody>
</table>

Table 4.5. Selected Ratios
(in productive years)

<table>
<thead>
<tr>
<th>Description</th>
<th>First Year</th>
<th>Third Year</th>
<th>Fifth Year</th>
<th>Seventh Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Debt to share capital</td>
<td>1.48:1</td>
<td>1.18:1</td>
<td>-.88:1</td>
<td>0.59:1</td>
</tr>
<tr>
<td>2. Turnover to capital investment</td>
<td>0.53:1</td>
<td>1.60:1</td>
<td>1.60:1</td>
<td>1.60:1</td>
</tr>
<tr>
<td>3. Net operating profit to sale percentage</td>
<td>-</td>
<td>19.29</td>
<td>18.40</td>
<td>18.13</td>
</tr>
<tr>
<td>4. Net operating profit (after taxation) to share capital</td>
<td>-</td>
<td>0.26:1</td>
<td>0.29:1</td>
<td>0.26:1</td>
</tr>
<tr>
<td>5. Net operating profit (after taxation) to capital investment</td>
<td>-</td>
<td>0.09:1</td>
<td>0.11:1</td>
<td>0.09:1</td>
</tr>
</tbody>
</table>

Basu, on receipt of the detailed project report from MMSA, submitted it to the KSIIDC in Bangalore for appraisal, as a prelude to getting a commitment from the KSIIDC for equity participation in the proposed paper plant. After a number of meetings between KSIIDC, Basu, and MMSA, within a period of six weeks KSIIDC had given its consent in writing to subscribe to the promoter's share equity of the project to the extent of Rs500,000 and to further underwrite at least Rs250,000 worth of shares from the public issue.
This heartening support from KSIIDC spurred Basu and MMSA to take up the approval of the term loan and underwriting of the public issue with financial institutions. The leading national financial institution to which application was made was the Industrial Finance Corporation of India (IFCI), with copies to the Industrial Development Bank of India (IDBI) and the Industrial Credit and Investment Corporation of India (ICICI). Copies were also endorsed to the Life Insurance Corporation of India (LIC) and the Unit Trust of India (UTI), institutions which promote the underwriting of new industrial ventures in India.

The problem. The application for financial assistance was made on March 31, 1975, in the detailed format required by Indian financial institutions. Unexpectedly, IDBI raised certain doubts about the size of the project. On one hand, government policy was to encourage small units in the rural areas to increase the overall employment potential; on the other hand, however, IDBI was concerned that the project should be a fairly large one, because that would mean greater financial viability. In the interinstitutional meeting of the financial institutions, IDBI raised this point and suggested that the plant capacity be increased from 10 to 15 metric tons per day. This naturally meant a higher project cost and, therefore, a higher promoter's equity. Basu and MMSA were convinced of the viability of the 10-metric-tons-per-day paper plant, which was substantiated by the detailed project report prepared by MMSA. The 15-metric-tons-per-day plant project cost would be around Rs 16 million, which would mean that the promoters would need to put in approximately Rs700,000 more in addition to the earlier planned promoter's equity of Rs1.2 million. Fund availability had constraints with the promoters; therefore, this was a difficult situation for them, as it stretched their ability to go ahead with the project. In addition, IDBI raised various other technical points regarding the method of pulping and papermaking, which were appropriately answered by MMSA. On the question of size, however, IDBI experts appeared reluctant to approve the project unless its production capacity was increased.

The solution. Since the project report made by MMSA treated all factors in a thorough manner, Basu and MMSA were confident that it clearly established the financial viability of the 10-tons-per-day project, in spite of the pressure from IDBI for a larger project. Basu and MMSA then approached a consortium of banks in the state of Karnataka. The banks, of which Canara Bank was the leader, critically appraised the project. They were impressed with the project's overall summary of projected profitability and cash flows (table 4.6). They agreed to finance the project and underwrite the public issue, provided IDBI refinancing was made available to the banks. Under the refinancing terms, all banks refinanced the term loans they gave to industrial projects with the IDBI at a concessional rate of interest, provided the projects were found to be in conformity with the industrial
policy of the country and provided the financial guidelines laid down by IDBI were met. This meant again going back to IDBI, which had earlier not cleared the 10-tons-per-day plant proposal. There were only two alternatives for financing the project. The first was to yield to IDBI pressure and somehow arrange the additional promoter's equity for increasing the size to 15-metric-tons per day. This, of course, was not immediately possible, since the promoter's equity for even the 10-tons-per-day plant had been arranged with some difficulty. The second alternative was to pursue the matter rigorously with IDBI through the consortium of banks who had approved the financial viability of the 10-tons-per-day proposal.

Supported by the bank consortium's preliminary approval and recommendation, Basu and MMSA met the chairman of IDBI. They explained that since the project's viability was clearly established in the project report and in the appraisal done by the banks, IDBI should, in view of the overall government policy of encouraging smaller industrial units, agree to refinance the proposed 10-tons-per-day project.

The chairman of IDBI asked his project division experts to look into the matter afresh. The IDBI experts analyzed the feasibility of the project in detail, basing their decision on the project report prepared by MMSA as well as on a review of other related factors covering the economic, technical, administrative-managerial, social-political, environmental, and commercial-financial factors. Their appraisal of each factor ran as follows:

1. Economic relevance. The project was found to fit in with the priorities set by the industrial policy of the Indian government because it sought to produce kraft paper, a basic commodity in short supply. The project parameters also complied with the government's desire to develop industrially backward areas through labor-intensive projects to increase employment and the economic well-being of the rural masses.

2. Technical soundness. There was considerable discussion on the methodology of manufacture to determine the project's technical soundness. A salient technical feature was a design innovation in the machine-glazing cylinder of the paper machine. The new cylinder would be much lighter and would be fabricated rather than cast, a much more economical process. MMSA's Anil Lal, who had done original work in designing paper machines, was able to explain the technology of manufacture and discuss its parameters to the satisfaction of the IDBI experts. The IDBI experts found the presentation of the project proposal in the MMSA report well conceived and considered the project technically feasible.

3. Administrative-managerial competence. A. Basu, the promoter of the project, had an excellent record as an administrator and manager. He possessed the initiative, drive, and administrative-managerial background to provide the leadership necessary for running the project successfully as the managing director of the company.
<table>
<thead>
<tr>
<th>Description</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Fourth Year</th>
<th>Fifth Year</th>
<th>Sixth Year</th>
<th>Seventh Year</th>
<th>Eighth Year</th>
<th>Ninth Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of working days</td>
<td>150</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Percent output to installed capacity</td>
<td>60</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Production (quantity) in metric tons</td>
<td>1,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
<td>3,000</td>
</tr>
<tr>
<td>1. Net sales (exclusive of excise duty)</td>
<td>5,500</td>
<td>16,501</td>
<td>16,511</td>
<td>16,500</td>
<td>16,500</td>
<td>16,500</td>
<td>16,500</td>
<td>16,500</td>
</tr>
<tr>
<td>2. Gross operating profit before depreciation,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interest (on term loans and deferred payments),</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sole selling agency commission, and tax</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Depreciation</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
<td>0.747</td>
</tr>
<tr>
<td>4. Interest (on term loans/deferred payments)</td>
<td>0.422</td>
<td>0.379</td>
<td>0.337</td>
<td>0.295</td>
<td>0.253</td>
<td>0.209</td>
<td>0.167</td>
<td>0.125</td>
</tr>
<tr>
<td>a. Commission on sales</td>
<td>0.275</td>
<td>0.253</td>
<td>0.253</td>
<td>0.253</td>
<td>0.253</td>
<td>0.253</td>
<td>0.253</td>
<td>0.253</td>
</tr>
<tr>
<td>b. Managing director's commission</td>
<td>0.055</td>
<td>0.165</td>
<td>0.165</td>
<td>0.165</td>
<td>0.165</td>
<td>0.165</td>
<td>0.165</td>
<td>0.165</td>
</tr>
<tr>
<td>5. Amortization of technical expertise</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
<td>0.100</td>
</tr>
<tr>
<td>6. Operating profit before tax (2-3 to 6)</td>
<td>(-) 0.006</td>
<td>3.280</td>
<td>3.183</td>
<td>3.139</td>
<td>3.036</td>
<td>3.065</td>
<td>2.993</td>
<td>2.910</td>
</tr>
<tr>
<td>7. Tax</td>
<td>- 2.252</td>
<td>2.221</td>
<td>2.108</td>
<td>1.944</td>
<td>2.114</td>
<td>2.016</td>
<td>1.910</td>
<td></td>
</tr>
<tr>
<td>8. Net profit after tax (7-8)</td>
<td>(-) 0.006</td>
<td>1.028</td>
<td>0.962</td>
<td>1.031</td>
<td>1.092</td>
<td>0.951</td>
<td>0.977</td>
<td>1.000</td>
</tr>
<tr>
<td>9. Development rebate reserve</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
<td>- - - -</td>
</tr>
<tr>
<td>10. Net distributable profit (9-10)</td>
<td>(-) 0.006</td>
<td>1.028</td>
<td>0.962</td>
<td>1.031</td>
<td>1.092</td>
<td>0.951</td>
<td>0.977</td>
<td>1.000</td>
</tr>
<tr>
<td>11. Gross cash flow (11+10+3+6)</td>
<td>0.841</td>
<td>1.875</td>
<td>1.809</td>
<td>1.878</td>
<td>1.939</td>
<td>1.698</td>
<td>1.724</td>
<td>1.747</td>
</tr>
<tr>
<td>12. Preference dividends</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Amount</td>
<td>- 0.140</td>
<td>0.070</td>
<td>0.070</td>
<td>0.070</td>
<td>0.070</td>
<td>0.070</td>
<td>0.070</td>
<td>0.070</td>
</tr>
<tr>
<td>b. Rate - 9.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Equity dividends</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Amount</td>
<td>- 0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
<td>0.300</td>
</tr>
<tr>
<td>b. Rate - 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4.6 (Continued)

<table>
<thead>
<tr>
<th>Description</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Fourth Year</th>
<th>Fifth Year</th>
<th>Sixth Year</th>
<th>Seventh Year</th>
<th>Eighth Year</th>
<th>Ninth Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Retained profit (11-(13+14))</td>
<td>(-) 0.006</td>
<td>0.588</td>
<td>0.592</td>
<td>0.661</td>
<td>0.722</td>
<td>0.581</td>
<td>0.607</td>
<td>0.630</td>
</tr>
<tr>
<td>16. Net cash flow (12-(13+14))</td>
<td>0.841</td>
<td>1.435</td>
<td>1.439</td>
<td>1.508</td>
<td>1.569</td>
<td>1.328</td>
<td>1.354</td>
<td>1.377</td>
</tr>
<tr>
<td>17. Funds available to pay interest (9+4)</td>
<td>0.416</td>
<td>1.407</td>
<td>1.299</td>
<td>1.326</td>
<td>1.345</td>
<td>1.160</td>
<td>1.144</td>
<td>1.125</td>
</tr>
<tr>
<td>18. Interest coverage (17+4)</td>
<td>0.986</td>
<td>3.712</td>
<td>3.854</td>
<td>4.495</td>
<td>5.316</td>
<td>5.550</td>
<td>6.860</td>
<td>9.000</td>
</tr>
<tr>
<td>19. Cash available for debt service (12+4)</td>
<td>1.263</td>
<td>2.254</td>
<td>2.146</td>
<td>2.173</td>
<td>2.192</td>
<td>1.907</td>
<td>1.891</td>
<td>1.872</td>
</tr>
<tr>
<td>20. Total debt service (installments of term loans, deferred payments and interest on term loans and deferred payments falling due in the year)</td>
<td>0.987</td>
<td>0.944</td>
<td>0.902</td>
<td>0.860</td>
<td>0.818</td>
<td>0.774</td>
<td>0.732</td>
<td>0.690</td>
</tr>
<tr>
<td>21. Debt service coverage (19+20)</td>
<td>1.280</td>
<td>2.388</td>
<td>2.379</td>
<td>2.527</td>
<td>2.680</td>
<td>2.463</td>
<td>2.583</td>
<td>2.713</td>
</tr>
<tr>
<td>22. Percentage of operating profit before interest (on term loans and deferred payments falling due in the year)</td>
<td>19.9%</td>
<td>19.9%</td>
<td>19.3%</td>
<td>19.0%</td>
<td>18.4%</td>
<td>18.6%</td>
<td>18.1%</td>
<td>17.6%</td>
</tr>
<tr>
<td>23. Percentage of profit after tax to equity capital</td>
<td>4.6%</td>
<td>41.4%</td>
<td>43.2%</td>
<td>48.5%</td>
<td>49.5%</td>
<td>55.4%</td>
<td>61.0%</td>
<td>68.3%</td>
</tr>
<tr>
<td>24. Net capital employed to sales ratio</td>
<td>0.61</td>
<td>1.87</td>
<td>2.04</td>
<td>2.24</td>
<td>2.48</td>
<td>2.79</td>
<td>3.19</td>
<td>3.72</td>
</tr>
</tbody>
</table>
The board of directors included John D’Souza, a well-known advocate and legal advisor; S.D.N. Wadiyar, an established industrialist and son of the late Maharaja of Mysore; and K.B.R. Urs, also a renowned industrialist of Karnataka. Basu had done well to include these distinguished members of the community; they were well known in financial circles and their presence on the board of directors gave greater credibility to the project's success potential. Furthermore, the project proposal provided for the proper staffing of the technical, commercial, and administrative functions and the promoters were committed to the same. Finally, with the involvement of MMSA to provide project management and technical support, it was felt that the project would get the administrative and managerial inputs necessary to ensure its success.

4. Social-political acceptance. Both socially and politically, the proposed project had tremendous acceptance. The proposed location in Nanjangud, a backward area, increased the social acceptance of the project, as the proposed plant would help bring prosperity to the area by generating employment, giving economic value to agricultural wastes, and increasing buying power in the area via the employees of the proposed paper plant. Politically, the Karnataka government fully supported the project, as the ruling party was committed to bring about an uplifting of the weaker sections of society in the rural areas by promoting and helping to establish relevant industrial projects there. Local politicians were therefore fully supportive of the project; both locally and nationally, the project would have continued political support.

5. Environmental factors. Paper plants normally generate effluents that can disturb the environment unless they are properly treated. Detailed discussions on effluent treatment were held with Anil Lal and other paper experts. An effluent treatment was planned that would make available an irrigant that could be used to augment agricultural production in the fields and farms. Since the effluent treatment process had been integrated into the project, the environmental acceptability of the paper plant was assured.

6. Commercial and financial considerations. Kraft paper, like other varieties, was in short supply in India. Therefore, the production of approximately 3,000 metric tons per year of kraft paper by the proposed paper project was commercially salable without any constraints in demand. A summary of projected profitability and cash flows (see Table 4.6) showed that the percentage of operating profit before tax to net sales would be around 19 percent, and the net operating profit after taxation to equity capital would be over 30 percent. An overall study of the projections established that the project was financially viable.

Based on this appraisal, the chairman of IDBI, having satisfied himself of the 10-tons-per-day kraft paper project's overall ac-
Cooking with caustic soda is done to remove all fats, grease and noncellulosic matter so that a cellulosic pulp is obtained.

2. Beating of the rag/jute line pulp is done to get the desired amount of freeness of the pulp solution.

3. Rosin and alum are added to give a water-resistant quality to the paper.

4. The flow box regulates the consistency of the pulp slurry at .5%.

5. The Fourdrinier machine wire helps form a wet web of paper.

6. The suction press sucks out the water from the web.

7. The MG cylinder dries the paper through the steam passing inside it and gives the paper a machine glaze by its finely finished outer surface.

8. Finishing covers winding, slitting, cutting to size, inspection, and packing for storage and dispatch.

9. Effluent collected from the various stages is treated separately to be used as an irrigant.
ceptability and viability, agreed to give IDBI's approval to the consortium of banks. The banks, on receiving this approval for refinancing the project, then formally committed themselves to financial assistance in September 1976; IFCI and other financial institutions similarly agreed to underwrite the public issue. With the financial approvals for Kabini Papers Ltd. finally obtained, Basu and the project team from MMSA got down to the detailed design of the project.

Design

Anil Lal of MMSA was given the responsibility of completing the design task for Kabini Papers. Lal, who had been involved in developing the indigenous technology for manufacturing paper based on agricultural wastes, had a good background in paper machine and equipment development as well as in project management. To finish the design task, he reviewed and finalized process parameters and material balances; preliminary work on equipment requirements and specifications had already been done during the detailed project report stage. Equipment specifications were also reviewed and completed in readiness for implementing the project. The projected process of manufacture is shown in the production outline flowchart in figure 4.2. Based on process parameters, material balances, and equipment speci-
fications, the architectural and structural blueprints for construction work were made ready through the civil engineering department of MMSA. The site area of 15 acres would have a built-up area of 2,960 square meters, with the cost of buildings estimated at Rs1.016 million.

All activities for completing the project were reviewed and an activity schedule chart (see figure 4.3) was drawn up. This chart would serve as a basis for project phasing and follow-up during a period spanning 78 weeks – the project cycle completion time after financial disbursements began.

The initial activities included preliminary staff recruitment and reviews of plant layout and process. Thereafter, time was allocated for preparing municipal drawings and obtaining approval for them, completing plant and equipment specifications, and preparing design and drawings of equipment and detailed drawings of plant buildings. The next set of activities was ordering equipment and finalizing raw material requirements. Tenders for the building work were then scheduled for preparation, issue, and completion. Site development, construction, and erection activities would then follow. Final staffing, procurement of raw materials, development of production and other systems, and trial runs and commissioning were the final set of activities scheduled between the 68th and 78th weeks of the total project period.
Having completed the design of the project, the next step taken by Basu and MMSA was to pursue the matter with the policymaking body of Kabini Papers Ltd., KSIIDC, and the consortium of banks, to select and approve the project for beginning financial disbursements. The total cost of the project had increased marginally to Rs1.125 million and was consequently at the top of the agenda.

The board of directors of Kabini Papers Ltd. as well as KSIIDC, which had been committed to the project right from the start, fully endorsed the project and authorized Basu and MMSA to take up the matter with the consortium of banks to begin financial disbursements. The consortium of banks had already assessed the financial viability of the 10-metric-tons-per-day kraft paper project and had approved it in principle, subject to IDBI refinancing. Now that IDBI had agreed to refinance the project, it remained for the consortium of banks to select the Kabini Papers Ltd. project for financial disbursements in relation to other projects and alternatives for deployment of their funds.

Selection and Approval

The banks used the following criteria in selecting one project from a variety of viable project proposals:

- Whether the project fit into the priority sector of the Indian economy and was in line with the government's industrial policy.
- Whether it was technically feasible in relation to the process equipment and expertise it intended to use.
- Whether the entrepreneurs and the company promoted by them would be able to organize and manage the project properly.
- Whether the market demand, cost of production, and overall viability of the project were favorable indicators of its continuing success.
- Whether the project was established in a backward area to help the development of rural regions and reduce the congestion in major cities.
- Whether the project would generate employment and contribute socially and economically to the well-being of society in general.
- Whether the project was based on technology and expertise that was indigenously available or on foreign expertise; and, if the latter, whether such expertise could be duplicated after a period of time by local resources and manpower.
- Whether the project used an efficient raw material system, preferably based on renewable resources and recycling of waste.
- Whether the effluent, if any, would be either properly neutralized to avoid environment hazards or converted to a usable commodity.

The kraft paper project of Kabini Papers Ltd., which had top priority, had been judged technically feasible by KSIIDC and IDBI.
KSIIDC, who had already selected it as a priority project, became its copromoter. The entrepreneur A. Basu, who had a background of professional management in business, could certainly provide the management and organization capability for the project, especially with the help of a consulting organization like MMSA. Market demand, cost of production, and financial viability had been established and indicated the project's strengths. The project was to be located in a backward area and would contribute to increased employment and the well-being of the community. It was based on indigenously developed technology to use agricultural and industrial waste materials. The utilization of various types of straws and industrial wastes like cotton rags and waste jute gave it an inexpensive and efficient raw material system with ample availability. The effluent was to be treated in such a way that it could be converted into an irrigant that would be useful in the agricultural fields bordering on the paper plant.

The consortium of banks consequently determined that Kabini Papers Ltd. could be given a priority claim for financial disbursement. Loan agreements were drawn up between the banks and Kabini Papers Ltd. and duly signed. According to these agreements, the term loan disbursements would start only after the promoter's equity was first put in by the promoters. Formal approval from KSIIDC as well as its contribution of Rs5 million toward the promoter's equity was thus received after Basu and his group of entrepreneurs had contributed their respective equity amounts in October 1976.

Now, having secured the financial arrangements for Kabini Papers Ltd., Basu wanted MMSA to begin work on the physical implementation of the project.

Activation

Whenever MMSA received a turnkey assignment, various personnel were grouped in different work cells under the project manager. These cells were the basis of allocating responsibilities to every worker. Once the turnkey phase was completed, the cells would be disbanded, to be reconstituted when required in line with the requirements of the next new project. The personnel constituting these project work cells were mostly full-time employees of MMSA. When outside expertise or additional technical manpower had to be brought in, however, MMSA utilized the services of such persons on an assignment-to-assignment basis.

Accordingly, MMSA established a project task force to be fully responsible for the turnkey assignment of Kabini Papers Ltd. The project manager was Anil Lal, who was to work in coordination with Basu and various government and financial organizations. Details of the project organization made up of full-time MMSA employees under the project manager are given in figure 4.4.

The policy committee was composed of A. Basu and KSIIDC, and MMSA personnel. Anil Lal, the project manager, was assisted by a
process engineering cell, an equipment design cell, and a project coordination cell. Responsibilities were allocated to each individual in these cells. Since this was a turnkey assignment, the entire responsibility for executing the project and bringing it to the production stage belonged to Anil Lal. A. Basu, who had been designated managing director of Kabini Papers Ltd., was responsible for all legal matters and follow-up with financial institutions for the progressive disbursement of the term loan.

Procurement procedures and schedules were reviewed. Since the paper machine and other equipment were fully designed by MMSA, it was decided that the equipment design cell would provide continuing support to the suppliers for component, subassembly, and assembly drawings, supported by bills of materials. The liaison and procurement assistant under the project coordinator would follow through on all orders for the speedy implementation of the project.

While reviewing the equipment to be ordered, problems were anticipated in certain cases. For example, the process engineering cell pointed out that the "decker washer," which was supposed to be bought from any of the standard equipment suppliers might not work satisfactorily, as the standard equipment available was not considered sturdy enough. The process engineering cell felt that instead of buying the standard decker washer, they should have one especially designed to the process parameters of Kabini Papers and manufactured to these specifications. The project manager had to decide whether the decker washer should be designed and made to specifications or bought from standard equipment suppliers conforming to generalized usage. The cost differential between the two alternatives was not great, but designing the "decker washer" and getting it made to specifications would mean
additional design effort and time. The project manager believed that it was important to ensure that the equipment used in the papermaking process not be compromised for the sake of expediency, as failure or inefficiency in any of the process equipment would affect the overall production considerably. He therefore decided to have the decker washer specially designed and manufactured, even though this meant additional work for the equipment design cell and the project coordinator. The new design of the decker washer was accordingly begun and was completed in about four weeks.

The equipment design cell was having problems with the detailed specifications of the machine-glazing cylinder. This was a key piece of equipment in the papermaking process, its function being to dry the wet paper sheet and impart a glaze on one side. It would weigh about 6 metric tons, and have a diameter of 10 feet and a width of 84 inches. The machine-glazing cylinder is a high-finish precision iron casting that is normally imported, and a major cost item. After considerable effort, Anin Lal conceived an alternate design, a fabricated steel cylinder with a special coating on the surface to give a fine finish to kraft paper. This piece of equipment would be considerably cheaper than the cast machine-glazing cylinder. The problem was that the newly designed cylinder's outer casing had to be supported to impart strength, which could be done in a number of alternative ways. The criteria for the design of the support rib structure were cost and ease of manufacture. The equipment design cell wanted to make sure that the right selection was made from among the different possibilities. To make a decision, the project manager invited potential fabricators of the new machine-glazing cylinder to take part in technical discussions. Then, taking into account their practical suggestions and difficulties while keeping the cost parameters in view, he selected a final design. The interaction between fabricators of the equipment and the equipment design cell at this stage ensured that the designs could be implemented in a practical manner.

PHASE 3: OPERATION, CONTROL, AND HANDOVER

With the project organization fully staffed and the initial problems of the process engineering and equipment designs settled, Anil Lal began the formal implementation of the project.

Implementation

Based on the final specifications made in the equipment design cell, inquiries were floated to different vendors inviting their quotations covering price, delivery schedule, and payment terms. Wherever required, the vendors were called back for clarifications and price negotiations. Thereafter, comparative statements of the bids received were compiled and reviewed by Anil Lal together with A. Basu, and vendors were selected. Orders were then directly placed by Kabini Papers Ltd., with a copy to the project coordinator for follow-up.
A key task was the manufacture of the paper machine. This job was assigned to a manufacturing company in Maharashtra, Messers Spraymetal Pvt. Ltd. It was decided that the machine-glazing cylinder should be manufactured in India, and this order was likewise given to Spraymetal Pvt. Ltd., who would also be making the other components of the paper machine, namely, the Fourdrinier, suction press, and winder. The entire plant was designed to allow for flexibility in the use of different types of agricultural wastes. To follow up implementation, a simplified precedence network chart (figure 4.5) was used instead of critical path method (CPM) or program review and evaluation techniques (PERT) charts.

Following the implementation procedure diagramed in the precedence network chart, the ordering, procurement, erection, and commissioning of the various items of plant and machinery were the vital activities. These tasks would take a minimum of 78 weeks to complete; the delivery time for the paper machine components would be about 60 weeks. In addition to the ordering of all equipment and other necessary goods, tender papers for civil works or building construction were made and a tender notice was published. The tender documents were bought by interested contractors, who submitted them with the stipulated earnest money, by the specified date and time. The civil works construction was divided into two categories: first and foremost the plant buildings themselves, and second, the administrative block.

The jobs were awarded based on a competitive scrutiny of the tenders received in each category. Contracts were issued directly by Kabini Paper Ltd., with follow-up to be done by the project coordinator. The third major job to be awarded was the electrical contract, and the same procedure was followed in this case as well. Tender papers were prepared by MMSA, and a tender notice was published in the press. MMSA compared the tenders submitted by the various contractors and made recommendations to Kabini Papers Ltd., who finally awarded the job.

It was also felt that it would be desirable to begin selecting personnel for Kabini Papers Ltd. As a first step, a company secretary and a chief technical executive were hired using professional selection criteria. The post for company secretary was advertised, applications were screened, selected candidates were interviewed, and final selection was made by a committee composed of the board of directors of Kabini Papers Ltd. Qualifications, experience, and ability to do the job were judged in a detailed verbal interview. After his references were checked, the selected candidate was appointed. For the post of chief technical officer no advertisement was felt necessary, because a candidate had been identified who had the technical qualifications and the managerial abilities to do the job. A committee composed of the board of directors and Anil Lal, representing MMSA, conducted a formal interview, after which they appointed S. Ray the chief technical executive. Right from the start, Ray worked with the consultants to become thoroughly familiar with the plant and to be able to take over from the consultants when the plant was commissioned. He was to have
Fig. 4.5. Precedence Network
no direct responsibility for project implementation; that clearly belonged to MMSA. On behalf of Kabini, however, he was to coordinate with MMSA on all technical matters. It now remained to ensure proper supervision and control of project activities once they had been initiated.

Supervision and Control

Because of their push to promote paper projects based on indigenous technology, MMSA was simultaneously erecting a 5-metric-tons-per-day plant manufacturing high-density electrical insulation paper, and Anil Lal was also project manager for this project. MMSA was also involved in promoting other paper projects, for which they were making a number of feasibility studies and detailed project reports covering the manufacturing, writing, and printing of paper based on agricultural wastes. Meanwhile, Kabini Papers Ltd., through National and Grindlays Bank, went in for a public issue in mid-1977, which was fully underwritten. Public subscription reached 60 percent at a time when, due to national emergency, most issues in India were grossly undersubscribed. Because of the underwriting commitments, the remaining 40 percent of the shares was taken by underwriters, and therefore the equity was fully subscribed. Progress of each project activity was carefully monitored. This was based on the activity schedule (see figure 4.3), which listed the project activities and the scheduled period of each activity in relation to the overall project cycle time of 78 weeks. Based on the activity schedule, the precedence network (figure 4.5) showed the delays and overlaps anticipated between the commencement and completion of various activities. The project coordinator, assisted by the project monitoring assistant and the liaison and procurement assistant, followed up on the precedence network activities to see whether they were being kept within the time schedule as much as possible. This was done by comparing actual performance every week with the projected schedule for each activity in the network. Any delays were brought to the attention of the project manager, who took priority action to investigate the cause of the delay and arrive at an expeditious solution.

The project was progressing satisfactorily at this time. The construction of plant buildings and administrative block was completed within the time period allotted. Overall progress was fine until the activity "receipt of equipment and inspection," scheduled to occur between the 60th to 72nd weeks (see figure 4.3, set no. 25), when a major problem appeared.

The problem. Toward the 64th week, the paper machinery supplies filled all items of the paper machine order close to the scheduled delivery date, with the exception of the innovatively designed machine-glazing (MG) cylinder. Anil Lal visited the vendor repeatedly to hasten the work on this component, which was likely to exceed the scheduled date. Toward the time of delivery, which was scheduled to be December
1977, it was discovered that part of the work done in manufacturing the cylinder was faulty and not as per MMSA's specifications and drawings. The coating on the MG cylinder to give it a smoother finish after grinding had started to peel off from some parts of its large outer surface. The supplier of the coating, the well-known multinational company Larsen and Toubro Limited, was brought in to help solve the problem. Technical discussions among MMSA, the vendor of the equipment, and the supplier of the coating produced a solution, but it meant an anticipated delay of four to six weeks in supplying a satisfactorily coated MG cylinder.

Meanwhile, the requirements set down by the consortium of banks for the progressive release of the term loan were being observed, and regular progress reports on receipt of machinery and civil construction work were being made to get release of funds. By this time, a major portion of the term loan had been taken by Kabini Papers Ltd. Interest charges on the loan were mounting with each day the project was delayed. Furthermore, in their anxiety to keep the project cost at as low a level as possible, MMSA had planned for the barest possible equipment for the pulp preparation and blending stage. On further review, it was found that elephant grass, which was very conveniently available in the Nanjangud area, could be used along with rice straw. Rice straw would be available at approximately Rs 200 per metric ton, whereas elephant grass would be available at Rs 150 per metric ton. It would therefore be advantageous to replace at least 50 percent of the rice straw with elephant grass. In order to have this desired flexibility of raw materials, it was felt necessary to add certain balancing equipment in the pulping section. The cost of the additional balancing equipment and the cost of the four-to-six-month delay would increase the project cost by about Rs 3 million. The increase in the price of paper by Rs 300 per metric ton and using elephant grass in place of some of the rice straw would still keep the profits of the project fairly attractive, despite the increase in project cost. What this now meant was going again to the consortium of banks for an increase in the term loan.

The solution. A. Basu, along with KSIIDC, who had become copromoters, submitted the request to the consortium of banks for increasing the term loan to absorb the escalation in project cost. After a critical review of the viability of the project in the changed circumstances, the consortium of banks agreed, subject to the promoters' bringing in proportionately more equity. After considerable personal effort, Basu was able to meet the requirement of bringing in additional promoters' equity of RS 50 million.

Completion and Handover

With the problem of the additional financing requirements solved, the emphasis was to complete the project by the earliest possible date. As
most of the plant and machinery other than the machine-glazing cylinder were on their way to the plant, a construction team was formed consisting of one engineer from the equipment supplier, one engineer from the consultants' side, and the crew of an experienced paper-plant equipment erection contractor who had been chosen by the consultants from among a few such contractors of known reputation. The erection of the plant and machinery, a crucial activity, was carried out satisfactorily, since the supplier, consultants, and erection crew could work closely together on the site to take care of any clarifications required and problems on the spot. The various problems in the manufacture of the machine-glazing cylinder, however, caused a total delay of about seven months. When a cylinder conforming to the specifications and with an acceptable coating was received around August 1978, it was duly installed.

Personnel at the shift-engineer and operator levels were recruited to man the project. By mid-1978 the entire plant was ready except for the cylinder. The stock preparation lines of rice straw, elephant grass, and jute and cotton rags were successfully commissioned. Other workers, as per the organization chart of Kabini Papers Ltd. (figure 4.6), were progressively introduced.

Advertisements were released for the posts of supervisors and above; for skilled and unskilled workers, the local employment exchange was contacted. Preference was given to applicants with a paper industry background, a selection procedure which resulted in a nucleus
of paper-industry-trained personnel. On-the-job training for supervisors and skilled workers was arranged by MMSA, with the net result that Kabini Papers acquired a working staff that was a mix of technicians with paper industry experience and workers trained on the job. When trial runs were conducted, kraft paper of good quality and strength, conforming to Indian standard specifications, was successfully produced.

The treatment of effluents was carefully organized. In this case, the effluent consisted mostly of organic matter dissolved from the agricultural residues, sodium salts of organic matter, free sodium hydroxide, and the like. This material was treated with acid to bring the pH level to normal. The organic matter was further reduced to the extent required and calcium- and magnesium-based materials (gypsum, lime, and so on) were added to balance the cation ratio within desired levels. Because of its organic content, this treated effluent could work as an irrigant and nutrient to augment agricultural production in neighboring areas.

MMSA's supervision of production and technical activities continued concurrently with the involvement of S. Ray, the chief technical executive, and his team of technical personnel. After successful trial runs, MMSA's supervision was gradually phased out and Ray took over the day-to-day technical responsibilities as the plant manager of the completed 10-metric-tons-per-day kraft paper project at Nanjangud. By this time, Ray and the plant organization under him (see figure 4.6) had been fully trained by MMSA experts. During the process of handover,
MMSA had also given operating manuals for the pulping and paper-making sections of the plant to Kabini Papers Ltd. In addition to Ray's services, Kabini's managing director Basu was given a company-secretary-cum-finance-manager and a sales and purchase manager. Thus, Basu got a fully operational organization and was able to run both the paper plant and the affairs of the company successfully.

**PHASE 4: EVALUATION AND REFINEMENT**

MMSA had a customary manner of evaluating the various aspects of a turnkey project. This was done soon after the Kabini Papers project was handed over. The evaluation was done in cooperation with the promoters of the project so that any needed follow-up actions could also be determined, to make the plant operate as efficiently as possible.

**Evaluation and Follow-Up**

The evaluation done by MMSA in conjunction with Kabini Papers Ltd. showed that the project had been successfully established. The capacity tests had shown that the plant could indeed make 10 metric tons per day of high-quality kraft paper; indigenous technology had been successfully used to promote a development-oriented project. A major breakthrough had been achieved by Anil Lal of MMSA in designing and introducing a machine-glazing cylinder that could be manufactured locally, at a considerable savings over the conventional cast-iron version.

The plant started producing an average of 6 metric tons of paper per day. This figure, based on the actual production achieved during early 1979 by Kabini Papers Ltd., was in line with the budgeted initial production, which was projected at 60 percent of the capacity during the first year of production — that is, 6 metric tons per day in the financial projections and projected profitability statements (table 4.6). In subsequent years, production was budgeted at 3,000 metric tons per year — a goal which, based on the plant's reaching 60 percent capacity soon after starting, was not expected to be a problem. Sales of kraft paper were carried out as projected, since the quality was good and it was a seller's market. Sales realization at Rs5,500 per metric ton was as per estimates and budget and was likely to climb to a higher rate in the future.

The actual number of persons employed as operators and chemists (skilled workers) and as helpers (unskilled workers) also went according to projections. There was, however, a shortfall in actual employment in the administration, accounts, and purchase departments. This was because it had been felt that the initial workload of these departments could be handled by reduced staff, which could then be increased to the required level when production reached 3,000 metric tons per year. Hence, the actual employment was around 160, as compared to a projected 169 (see figure 4.6).
Savings in the cost of raw materials were realized by using equal proportions of elephant grass (Rs150 per metric ton) and rice straw (Rs200 per metric ton) rather than rice straws alone. Certain chemicals, however, such as rosin, had gone up in price. When detailed calculations were performed, it was found that the savings generated by the use of the cheaper elephant grass were offset by the increased price of rosin, which was in short supply. Overall profitability was therefore not affected, as there was no significant change in the cost of other inputs or in sales. In July 1979, by which time Kabini Papers Ltd. was producing an average of 6 metric tons of quality kraft paper per day, the first full year of production had not been completed. But it was obvious from the comparison of planned and actual costs of production that there were no significant variances in the production and profitability estimates.

The impact of the project in various areas was evaluated as follows:

1. Political. The project helped to contribute to the government's policy implementation in promoting employment-oriented, agrobased small- to medium-scale industries in backward areas using indigenous resources as much as possible. The doubts of some administrative and financial organizations about the viability of small-to medium-scale paper units were successfully overcome and the project was accepted both politically and financially.

2. Social. The Nanjangud area had benefited from the project because it provided a source of income to the farmers – it created a demand for agricultural waste that previously had no market. In addition, the Kabini project improved employment in the area by providing both direct and indirect employment opportunities. The influx of professional, technical, and financial executives helped to improve the social environment, and the income potential and earnings of the local people improved, thereby helping to raise their standard of living. The project was fully accepted by the local Nanjangud society as one that would help to improve their economic lot.

3. Cultural. Because of the influx of about 170 well-paid employees of the paper plant, most of whom stayed locally, the cultural environment of Nanjangud was given a boost. With increased recreation demands, local cultural institutions became more active. The plant also helped activate a local club that served as a meeting place for an assortment of people, thereby increasing communication and cultural interchange among the residents of Nanjangud.

4. Environmental. The impact of the paper plant on the natural environment was favorable. Before, rice straw had been used partly as cattle feed, while most of it was burned or thrown away, and the burning or throwing away of the excess rice straw added to pollution and litter in the area. With a new local market for rice straw, which was the major agricultural waste of the area, the environment benefited.
Moreover, the effluent was not pumped out directly, which would have polluted the neighboring areas or the nearby local river. Instead, it was treated so that it could serve as an irrigant. A number of local farmers welcomed the treated effluent of the paper plant for use in their fields as an irrigant.

KSIIDC and the consortium of banks also evaluated the project upon its completion. The project cost had escalated, mainly due to the delay in the financial approvals and the further delay caused by the vendor failure to supply the vital machine-glazing cylinder on time. Nevertheless, the project's viability had not been impaired, both because of its own inherent strengths and because of the increase in the market price of paper. KSIIDC was so impressed with the developmental benefits provided by such a paper project based on agricultural wastes that they initiated two similar projects in the state of Karnataka.

In evaluating this project, it would be useful to review the development of the organization and the plant in the context of the entire management organization. MMSA clearly had the responsibility for project management and implementation, whereas Kabini Papers Ltd. had to provide the entrepreneurial inputs. MMSA also was responsible to help develop Kabini Papers Ltd. as an organization capable of running the project. Both organizations therefore worked together, but the obligations of each were different. It is significant that the leadership qualities of A. Basu and the technical competence of Anil Lal saw the project through during its early serious problems of obtaining approval from the Industrial Development Bank of India. Once the financial approvals were in hand, the project organization was formalized under Anil Lal.

The development of the organization of Kabini Papers Ltd., it should be noted, began with the professional selection of a company secretary and a chief technical executive. The chief technical executive coordinated all technical matters with the consultants' project organization, whereas the company secretary looked after all company law, financial and loan agreements, and accounting matters. Around the time the plant and equipment were being erected and installed, the supervisors and operators were recruited in readiness for the trial production. These workers were trained by the process engineering cell under the consultants' project manager. During the erection period, the sales staff were also recruited to do the market survey and to establish distribution channels in readiness for marketing the kraft paper when production began. Thanks to Basu's managerial and administrative skill, a fully effective management team emerged and took over competently from the MMSA project team upon project completion (see figure 4.6).

Plant development was based on MMSA's project report; minor additions to the plant, such as a few extra pumps, were introduced on the spot. The erection team, made up of the equipment supplier's engineer, the crew from the erection contractor, and an engineer from the consultants, did an excellent and well-coordinated job of constructing the plant. Without such a team approach, construction could not have proceeded so smoothly. The machine-glazing cylinder proved the
only major problem, resulting in the considerable delay of seven months. But its eventual manufacture was a technical breakthrough that would benefit future plant construction. The development of an acceptable eutectic coating for the cylinder by an internationally known firm was another highlight in the plant's development, as was the innovative approach to effluent disposal.

Leadership, technical competence, and good team spirit were the principal factors in the successful development of both the organization and the plant in the context of the entire management organization. But even though the Kabini project had been successfully launched, MMSA and Basu identified certain aspects that would need follow-up to ensure continuing success. The first item on the agenda was to establish a reliable system of raw material procurement. In the initial stages of the project, the enthusiasm of local farmers to supply waste rice straw was to be expected. But whether this enthusiasm would continue was not certain. Individual farmers did not have the resources to transport waste rice straw regularly to the factory. Dependable supplies could only be assured if Kabini Papers Ltd. organized a reliable system of raw material collection. They had initiated such a system by granting separate contracts for raw material collection. Through this arrangement the contractor could use primarily the local means of conveyance, namely bullock carts, to collect rice straw and elephant grass from the sources of supply. Despite the adequate raw material storage arrangements made in the paper plant, this was clearly an important area.

The second important area needing follow-up was effluent treatment. Effluent treated by the process designed by MMSA had been found acceptable as an irrigant, but it was believed that a better treatment for a more useful irrigant and nutrient was possible without increasing the cost of treatment. MMSA had developed the effluent treatment in cooperation with the University of Agricultural Sciences, Bangalore, in the state of Karnataka. Although a suitable treatment had been evolved, further modifications and improvements were being done in conjunction with the University of Agricultural Sciences.

Refinement of Policy and Planning

Based on the experience gained in completing the Kabini project, MMSA reviewed its policy toward management of turnkey projects. The considerable delay in getting the machine-glazing cylinder from the supplier showed that steps would have to be taken to avoid such situations in the future. It was agreed that a policy of spreading out orders for fabricated equipment would have to be adopted, to fit the context of the country's developing industrial environment. This was necessary because delivery schedules from vendors were usually affected by raw material shortages, occasional power disruptions, working capital constraints, and the like. It was therefore imperative not to order most of the fabricated items from one vendor, however competitive and capable the vendor might appear to be. Also, vendor
follow-up would need to be done more effectively right from the start. When planning the project team's workload, an allowance for this spreading out of orders would have to be made in the future.

MMSA also decided to promote and pursue the construction of further small- to medium-size paper projects using agricultural wastes to manufacture kraft paper, writing paper, and other specialty papers.

The government agency KSIIDC also refined its policy toward small- to medium-size paper projects. Based on the successful experience of Kabini Papers Ltd., it helped promote a project for manufacturing 8 metric tons of kraft paper a day in the Nanjangud district and a project for manufacturing 20 metric tons per day in another backward area of the state of Karnataka. With their apprehensions about small paper projects dispelled, KSIIDC planners were able to clarify and reinforce a policy of promoting such projects.

**CONCLUSION**

Thus the Kabini Papers Ltd. project was successful in achieving its objective of promoting an attractive development-oriented industrial venture in a backward rural area of India utilizing agricultural raw material wastes.

**NOTES**

(1) Ministry of Industrial Development, Government of India, New Delhi.

(2) Indian Planning Commission, New Delhi.

(3) "Public sector" in India implies governmental or quasi-government investment, whereas "private sector" signifies private investment. "Joint sector" means investment by both public and private sectors, with day-to-day management by private-sector entrepreneurs but policy and control exercised by a board of directors that includes public-sector nominees.


(5) Prominent among these are the J.K. Research Institute, Orissa; Padamjee Papers Mills, Poona; and MMSA, New Delhi, in the private sector and Institute of Paper Technology, Saharanpur; Regional Research Lab, Jorhat; and Hand Made Paper Institute, Poona.

(6) Indian Planning Commission, New Delhi.
The research necessary to carefully document each of the case histories in this book as well as the cases in the three energy books in this series(1) clearly demonstrates the significance of this mechanism of learning from the past as a basis for providing managers and policy officials with lessons for the future. Indeed, the use of case histories by senior scholars and practitioners since 1978(2) shows their usefulness for 1) management education and training programs, 2) guidelines for policymakers, and 3) analyses of development projects concerned with interrelated global problems of unemployment, inadequate food supplies, unreliable energy sources, and the need to make more effective use of locally available natural resources.

International assistance policies today place increasing emphasis on social equity, spatial and social redistribution of income, and increases in the productivity of the poorest groups in developing nations. The trend is away from simple economic growth financed by industrial and capital infrastructure projects, toward multipurpose, multisectoral integrated projects in social sectors such as rural development, population planning, agriculture, and education that promote growth-with-equity. Yet most studies show that the new strategies and policies are extremely complex and that both the assistance agencies and the developing countries are having serious problems implementing them.

The three cases in this book are vivid illustrations of the fact that policy, planning, and management issues in implementing development projects create problems that cut across national boundaries. Sound project planning must link project objectives with national and regional (subnational) development objectives, which in turn should be linked with the policy goals they support. These points will be covered in the discussions and analyses of each case. Of particular interest will be the last task in the IPPMC — refinement of policy and planning.

The epilogue examines developments in the SEAFDEC and Kabini projects since the case studies were finished. In addition, it briefly
summarizes the outstanding features of several case histories concerned with energy for rural development, especially the multiple purposes of these projects.

THE CASE HISTORY RECORD

The three countries from which the case histories are drawn — the Philippines, the United States (state of Hawaii), and India — approach their development problems through different government structures and therefore use different policymaking procedures. The strategies each country adopts to cope with a multiplicity of problems, such as shortages in food supplies, shortages in manufactured products, and unemployment, have in common the fact that they are being determined to a large degree by decisions at the highest level of government. In the Philippines, with its martial law administration, direction was received from the central government, under whose auspices strategies, policies, priorities, and plans were developed. In Hawaii, relief for economically depressed areas emanated from the governor's office and state legislature with input from the private sector. In India, major policy statements and decisions are made by the prime minister, working in concert with the parliament and various central ministries. It is a centralized government system with a federation of states. Each state has a governor, a chief minister, and a legislative body, and is responsible for local input to assist implementation of development projects. Thus, each of these countries uses a decision-making apparatus with subsequent implementation that operates in a different way to cope with the problems of economic and social growth.

Each case will now be discussed and analyzed with respect to policy and research issues in the IPPMC framework.

Philippines: Freshwater Fisheries Station

The freshwater fisheries station of the SEAFDEC Aquaculture Department of the Philippines is an example of a food project that has a clear need and rationale. The importance of fish protein in the diets of people in Southeast Asia, the decline in natural fish stocks, and the high capital costs involved in marine fishing all lend support to the argument that "aquaculture, or the application of farming techniques to the breeding and rearing of fish and other aquatic organisms directly or indirectly useful to humankind, remains a highly promising option." The case itself thoroughly details the development of one major aquaculture project and offers a variety of insights and information on the planning, administration, and management problems inherent in such a complex regional endeavor. However, some issues emerge as especially significant, and in fact the case study raises more questions than it answers.

One major issue that is not pursued as such in the case history but is clearly important for further research has to do with initial efforts to
organize the administrative structure of SEAFDEC, taking into account the needs and goals of each of the member countries (Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam). While the case focuses primarily on the development of the Aquaculture Department of SEAFDEC, the larger organization appears to represent a potential model of regional cooperation. Although the war in Indochina and subsequent events have altered some of SEAFDEC's internal relationships, the notion of regional cooperation to solve regional developmental and resource needs remains an intriguing concept.

The aquaculture project itself raises a variety of issues relevant for project managers and policymakers involved in similar food projects. The initial project design, for example, outlined a very ambitious five-year research and development program from the planning and construction stages, to the development of pilot projects, topographic, hydrographic, and road surveys, construction of laboratories, housing units, and offices, and the eventual development of substations throughout the Philippines. The question of project scale and funding arises here, and as the case study demonstrates, these plans were clearly out of line with available resources. The revised five-year program was more realistic in terms of scale; in addition, it raised questions of how to develop closer links with other ongoing projects of the Philippine government's Aquaculture Department. The new program also recognized the need to articulate the research program of the station with research being conducted at such universities as Central Luzon State University, the University of the Philippines College of Fisheries, the University of the Philippines at Los Banos, and the Bureau of Fisheries and Aquatic Resources. This effort to avoid duplication of research and development is an area that must be of concern to policymakers involved in similar projects. It remains a major problem for development projects in many nations.

Despite careful planning, revised program objectives, and coordination with other agencies and institutions, several additional management problems arose that illustrate the difficulties that are perhaps inherent in projects that are joint public-private enterprises. On-site research of the type described in the case creates management problems when the central offices are located some distance from the project. Division of authority problems were also present, due in part to personality disputes but also, it appears, to the lack of clear lines of authority. The lack of autonomy in budget matters as well as the centralized nature of materials and supplies disbursement created additional problems. The request for and subsequent approval of greater enterprise autonomy that followed provided some relief, but the problem might have been avoided earlier if the feasibility phase had included a more thorough analysis of the centralized nature of the administrative structure.

A final component of the project, and one that has great appeal for many Asian and Pacific nations, is the notion of an "ecological community." Development projects are often viewed with cynicism by
local inhabitants because of an unfortunate record of land displacement, lack of local participation in planning and management, and general unconcern for the needs and aspirations of people living in areas contiguous to the projects. Many of these problems plagued the SEAFDEC station as well, and it remains to be seen whether the vision of an integrated ecological community will ever be realized. The concept of developing a project that would utilize appropriate technologies, maximize the use of indigenous resources, increase the quality of life of local residents, minimize ecological damage, and involve local residents in the transfer of technology in a participatory manner is laudable. But as is noted in the case, it was not implemented. Although the proposed ecological community was not realized, the training component did achieve many of its objectives. This is another important feature of development projects and one that involved both local and international personnel. And it should be noted that although the ecological community was not realized, the attempt to realize it did inspire the Philippine government to support the concept on a nationwide basis through the BLISS program.\(^3\)

The SEAFDEC case, then, raises a number of questions relevant to project planners and policymakers. Questions of scale, management and administration, centralization and decentralization, research priorities, and local involvement all emerge. In addition, one of the outstanding features of this case was the ability of indigenous scientists and engineers to develop a new technology, including infrastructure, for prawn farming in a freshwater environment. In addition, appropriate technologies were developed and effectively implemented in the design and maintenance of fish pond and pen systems which increased fish production. It appears that the project planners have decided to focus future activities on extending research projects to other parts of the Philippines and developing a more effective training and staff development program. Regardless of the outcome of this particular project, the development model of an integrated research, development, training, and community aquaculture system remains an important challenge to policymakers and planners throughout Asia and the Pacific, and is an important aspect of efforts to provide solutions to the current food crisis.

United States: Hawaii Biogenics

This project was intended to create a self-sufficient agribeef industry in North Kohala by growing feed grains locally and using them in a feedlot operation that would fatten local ranchers' cattle for market. Eventually the project was to handle all aspects of a beef industry – slaughtering, processing, and marketing. To fully discuss the implications of the case, the project must be situated in its larger context. Hawaii Biogenics was the most ambitious project in an overall effort by the state of Hawaii to provide employment for the residents of North Kohala following the shutdown of the Kohala Sugar plantation. More
important, the project was the centerpiece of government efforts to revive North Kohala's agrarian economic base, which had been declining for over a decade. In this respect, North Kohala was typical of many rural communities in the state, which were slowly declining as the agricultural economy contracted. In a larger context, then, the project was a bellwether of the state's policy of sustaining the economic viability of rural communities throughout the state. Unfortunately, as the case history recounts in detail, the project in large measure failed to achieve its goals. At this juncture, it would be valuable to discuss the major policy issues that can be derived from the case.

First of all, the entire project approval, formulation, and identification was an example par excellence of the problems inherent in crisis management. The Kohala Sugar Company had announced it was shutting down its plantation, and laying off more than 500 workers. This would destroy Kohala. The state was thus challenged to respond promptly and successfully to the plight of one of its rural communities. A crash program was needed. To be sure, there was a guiding ideology of promoting agricultural development and a long history of ranching in Kohala. The state needed a program immediately that fit this format, that seemed superficially feasible, and that was dynamic and exciting. It was in this context that the Kohala Task Force was willing to accept the risk in the proposal of Hawaii Biogenics. One illustration of the State's willingness to accept high risk was the oversight in evaluating the integration between the feedlot and agricultural production. Project viability depended on the success of growing local corn and sorghum for the cattle. However, techniques for feed crop production in Hawaii were still experimental; up to that point all feed had been imported from the mainland. Thus the task force was willing to take the calculated risk that unproven agricultural methods would be successful. Sometimes crisis management and crash programs must be undertaken, but the costs are extremely high and must be assessed against the long- and short-term benefits, in the light of the high probability of failure.

Another policy issue involves the organizational and institutional arrangements that may constrain the development of a new food project. In this case, the livestock project first had to obtain cattle. Contracts had to be negotiated with local ranchers, who were skeptical of committing their cattle to a new feedlot that might fail. Not the least of their worries was the monopolistic position of the Hawaii Meat Company, the only other feedlot in the state. Hawaii Meat Company held access to all major meat markets in Hawaii and could make it difficult for ranchers who did not use Hawaii Meat facilities to sell their beef. Even if Hawaii Meat did not directly inhibit the new project, Biogenics still needed to arrange for credit, transportation, market contracts, slaughtering, and processing of the beef. Resolving these aspects required considerable amounts of expertise, money, and time. Given Biogenics' undercapitalization, crisis management approach, and lack of expertise in these areas, it is understandable that problems developed. At the same time, it is only fair to point out that Hawaii Biogenics did, at one point, overcome these organizational and institu-
tional barriers. For a brief period, the court receiver provided a strong competent management, obtained the confidence of local ranchers, and enabled the feedlot to actually show a profit. During this period, however, the larger organizational and institutional problems were not resolved. If the project was to expand and accomplish its goals, the problems of transportation, market access, credit, slaughtering, and processing would still have to be solved. Although this case deals only briefly with these issues, and deals only with one livestock project, the institutional and organizational constraints surely must affect other food development projects. These constraints must be dealt with if such projects are to succeed.

A final policy issue deals with the conflict between private and public goals illustrated in the project. On the one hand, Biogenics had private entrepreneurial goals of viability and profitability, which implied a cautious and conservative approach to developing the integrated feedlot. Expansion would occur only when justified by profit, and when techniques proved feasible. On the other hand, the state had three public goals. First was the goal of minimum employment generation, which was worked into the project and which forced project expansion irrespective of financial viability. Underlying this goal was the need for immediate results to save the Kohala community. The second goal was to promote integrated self-sufficiency in beef and grain production. Since the state had to import both feed crops and beef, the project might go a long way toward making Hawaii self-sufficient in beef production. Finally, a major public goal was to make Kohala a viable rural community based on diversified agriculture. This final goal fit in neatly with the state's overall desire for a more balanced economy, one that was not so heavily dependent on tourism and land speculation.

When the project was proposed, it seemed to satisfy all these goals, and at the same time it seemed likely to be profitable. Yet the broad public goals were never articulated or integrated into the project's implementation objectives. Conflicts naturally emerged. The project was forced to hire a number of employees before it could afford to and was thus held to commitments that it could not feasibly honor. Additionally, the high expectations of public officials based on the unstated public goals contrasted sharply with the actual achievements of Biogenics. This created tension between Biogenics management and state officials.

Certainly it is difficult to implement a project that has both public and private goals. But had all goals been explicitly set forth, some of the difficulties in implementing the project might have been foreseen. For example, it seems unlikely that profitability could be achieved along with immediate relief for Kohala residents. There had to be tradeoffs between the public welfare aspects of the project and its private goals of profit. At the same time, if the public goals of saving Kohala, promoting diversified agriculture, and attaining beef self-sufficiency had been articulated and explicitly stated, then it might have been possible to initiate Biogenics as a public project, to be transferred to private owners later. The public goals, after all, seemed
legitimate public functions and appeared to contribute to the general welfare of the state's population. In sum, it seems that some sort of public or quasi-public development corporation, with complete expertise and adequate funding, is necessary to fulfill the goals of such quasi-public projects.

India: Kabini Papers Ltd.

This case has many features that are relevant for policy formulation, project planning and management, and utilization of natural resources to stimulate rural development. The success of the initial mini-paper plant project is due to the combination of a viable industrial policy on the part of the Indian government and the ability of an indigenous consulting firm to develop and effectively implement appropriate technologies for both manufacturing paper from agricultural waste and treating the effluent to create an irrigant to augment agricultural production in the area. The consulting firm had extensive experience with research, management and "turnkey operations" — responsibility for a project from identification through completion, including handover to operations, and sufficient follow-up to ensure satisfactory production. Many turnkey projects by multinational firms gave rise to future problems because of lack of attention to maintenance needs, availability of raw materials and spare parts, manpower needs, and so forth. Increasing experience with turnkey projects by local or indigenous firms promises a higher rate of success.

In particular, the Kabini case demonstrates the benefits of integrated planning and management to ensure the success of a development project that capitalizes on the identification of opportunities to optimize raw material resources through the development and implementation of a new technology: one that results in the establishment of mini-paper plants in rural areas utilizing agricultural waste materials in place of the conventional but more expensive raw material, wood pulp. The problem is complicated when the development project seeks to satisfy a variety of basic needs in backward areas of developing countries, including creation of jobs and improvements in food production, in addition to the primary objective of meeting the demand for paper in the area.

The case illustrates the importance of managerial capability to put into effect and sustain viable policies, innovative social and technological plans and resource development programs. It is especially significant in light of India's official policy which discourages the importation of paper products through the imposition of heavy import duties. This policy in turn has created a paper shortfall, and for this reason the government has supported efforts by individual entrepreneurs to develop paper plants. Government support for small and medium-scale paper plants have resulted in widely dispersed enterprises throughout India, contributing not only paper products, but also facilitating employment especially in rural areas. For areas that have been
designated "backward," the government has offered positive incentives in the form of cash subsidies, income tax deductions, low interest rates, reduced electrical power rates, and interest-free sales tax loans. Small and medium industrial units, including paper plants, have thus been encouraged to locate their operations in these regions and have thus contributed to India's overall development plan.

The Kabini Papers, Ltd. project was successful in achieving its objective — promoting an attractive development-oriented industrial venture in a "backward area" of India utilizing agricultural raw material wastes. It was a breakthrough in using indigenously developed appropriate technology for the manufacture of paper. It conformed to the government's industrial policy objectives of employment generation, raw material resource development, and increasing standards of living in a developing economy. The project used an appropriate method of effluent treatment to help provide a desirable use for it as an irrigant in augmenting agricultural production in its own small way. Finally, a conceptually clear project management approach was used, thus helping the project to overcome serious problems to reach a successful conclusion.

The government agency Karnataka State Industrial Investment and Development Corporation (KSIIDC) also refined its policy toward small-to-medium size paper projects. The successful experience of Kabini Papers, Ltd. helped promote a project for manufacturing eight tons of Kraft paper a day in the Nanjangud district, and a project for manufacturing 20 tons per day in another "backward area" in the state of Karnataka. With their apprehensions about small paper projects dispelled, KSIIDC planners were able to clarify and reinforce a policy of action promoting such projects.

Provided such projects are properly conceived and implemented, the future of paper projects based on agricultural wastes looks good for developing countries with agrarian base, since utilization of agricultural waste provides an inexpensive raw material system. In the future, such plants could also be planned to include their own power generation from such agrarian resources as farm animal dung. Gas produced from this source is an inexpensive method of running generating sets to provide power. Plants of Kabini's size require only about 1,000 KW, which can be generated inexpensively from farm animal wastes; in India, generation of power from biogas produced from dung is already being used to run large farms. Thus the future may see paper plants based on agricultural wastes powered, as a public policy, by their own captive-biogas generating system.

POLICY AND RESEARCH ISSUES

The cases presented in this book as well as data from numerous other food projects raise a number of policy and research issues, some of which are overlapping between the cases and some of which are specific to a particular project. The lessons learned in these two areas can be
of use to food policymakers and planners in a variety of national settings. A summary of the policy and research issues from each case is shown in matrix form in table 5.1.

Policy Issues

With respect to broad policy areas, each of the cases has implications for under- and unemployment, a socioeconomic problem facing both developed and developing nations. The closure of the Kohala Sugar plantation in Hawaii, the depressed nature of coastal fishing communities in the Philippines, and the endemic problem of unemployment in India all presented the respective governments with the challenge of supporting innovative projects that would generate employment. Thus while the production of food or other commodities was of prime concern to project managers and policymakers, the cases demonstrate that production is not always the sole policy consideration. The multipurpose nature of food projects in particular is a policy area worthy of future study.

Another policy aspect that cuts across each of the projects is the notion of "self-sufficiency." This concept has been hotly debated by development specialists and policymakers for at least two decades. Some countries, such as China and Tanzania, have attempted to implement this notion on both a local and national scale, with varying degrees of success. It is worth noting that each of these countries, having pioneered the concept, has to different degrees abandoned it as the primary policy guideline for development projects. What is of note in each of the cases in this study is that they have all attempted to implement self-sufficiency in limited but significant ways.

The range of options for achieving some degree of self-sufficiency is rather broad, allowing policymakers latitude in deciding the exact configuration to be pursued. For example, the SEAFDEC case presents a picture of a project that outlined ambitious self-sufficiency goals and then had to retrench. The crisis nature of the Kohala project created obstacles in realizing the goal of beef self-sufficiency. It appears that policymakers and planners involved in the Kabini case were right on target. Self-sufficiency, then, is a development option that remains viable and presents policymakers with a complex set of variables to consider.

A third policy consideration that emerges in each of the cases, and is a feature of all development projects, is the nature of planning strategies. Clearly, policymakers must consider early on the relative advantages and disadvantages of participatory, integrated, and/or centralized planning. There are numerous implications for each in such areas as project effectiveness, acceptability by local inhabitants, articulation with other parallel development projects, and infrastructure needs that may be dependent on some degree of autonomy, as was the case with the SEAFDEC Fisheries Station. No one planning formula is always correct, and policymakers must take into account the many mixes of options that are possible.
Table 5.1. Food and Agricultural Waste Policy and Research Issues

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<th>Development Project</th>
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<th>Research Issues</th>
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<td>Kohala</td>
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<td>Institutional and organizational barriers</td>
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<td>Employment generation</td>
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<td>Beef self-sufficiency</td>
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<td>Diversified food supplier</td>
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<td>Planned economic development</td>
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The policy areas discussed above are "macro" in scope, and it is necessary to note that each of the cases contain specific policy issues that are likely to be present in other similar food projects. For example, the funding and financial issues raised in Kohala (undercapitalization, joint public-private linkages, and so forth), while they may have been specific to the nature of the crisis facing the region, are likely to be present in many projects generated under similar circumstances. The policy issue of raw material resource development highlighted in the Kabini case is another area that emerges in debates centered on the competing and conflicting areas of food production, raw materials, and employment. Likewise, the SEAFDEC case points to the complex policy issues that surround the need to articulate research and development programs on a nationwide basis.

While there are doubtless numerous additional policy issues that emerge from each of the cases, those discussed above seem to have been most central to policymakers actually involved in the three projects. The important point is that the experience gained by analyzing a development project must be translated into lessons for policymakers if projects in the future are to avoid problem areas as well as benefit from successful strategies.

Research Issues

Each of the policy issues discussed above could also be viewed in a research framework. In other words, it would be possible and even desirable to design research projects around each of the policy issues raised. However, some additional important research areas emerge from the case studies.

The projects presented in this study raise three major research issues that are worthy of future study. Each case history described an array of institutional and organizational barriers to project completion. In Kohala political-economic issues revolved around credit needs, problems related to monopolistic control of the industry, and support-enterprise features such as slaughtering and processing. In SEAFDEC the sociological problems of community development emerged as a major organizational and institutional barrier to successful project completion, as did the political problems of project autonomy. Finally, in Kabini the institutional issue of defining "backward" areas, providing government support, and successfully integrating private and public planning suggests a research area of importance to many projects in the Third World, especially since planners in the Kabini study successfully solved the problem. Related to the research question of institutional and organizational barriers is the issue of management needs— a second area for further research. The management style exhibited in these cases represents three varying management models that could be researched in a comparative manner. Since management science is still imprecise, field and research studies designed around specific cases such as those presented in this study will further the development of
this area of inquiry. Finally, the broad area of rural development strategies remains a research field still in need of further refinement. After nearly three decades of numerous development studies there is no consensus on how successful rural development strategies are defined. The positive and negative rural development features that emerge in each of the cases here present researchers with several variables to be further refined, quantified, and measured.

In addition to these three "macro" research issues there are a variety of case-specific research issues that are worthy of further consideration. These include appropriate technology, the development of tropical feed, and the concept of an ecological community. "Appropriate technology" means using a technology that produces the desired results while fitting the specific environment. The Kabini paper plant, for example, had to use technology that was appropriate to the rural setting and that made use of locally available raw materials. Often, however, "appropriate" is interpreted to mean economical, which implies economies of scale and high productivity. This has frequently led to the adoption of technologies that are too large and too sophisticated for a given area. Certainly there are tradeoffs between economic profitability and appropriateness. But as is demonstrated by the Kabini case, a proper balance can be achieved. Considerably more research must be conducted on technologies that can strike this balance.

As the Kohala case demonstrates, the development of tropical feed is an important research area. Presently, tropical grains have proportionately less caloric value than grains grown in other areas. Yet tropical and semi-arid regions constitute a very large portion of potentially cultivable land. The productive value of tropical grains, along with the development of a meat industry, could be significantly enhanced if tropical agricultural research were increased.

Another important research area, illustrated in the SEAFDEC case, is the conceptualization and study of an ecological community. Such a community would, in concept, be ecologically sound and self-reliant, and would use appropriate technologies. It would function to provide all inhabitants with the basic needs: water, food, clothing, economic base, medical services, education-culture-technology, sports and recreation, shelter, mobility, and ecological balance. Considerable research must be focused on obtaining these goals. More important, however, the political, social, and institutional context must be examined. It is this context that will determine questions such as who will benefit most from the ecocommunity, who will govern the community and make its rules, whether the community will be autonomous, whether there will be equal opportunity, and what barriers there will be to achieving the community's goals.

Each of the cases raised other specific research areas. Hopefully, the brief discussion on these three has illustrated the numerous research topics that need to be addressed.
Concluding remarks are fitting to 1) briefly comment on development project areas that can provide food and create jobs for the rural poor, and 2) emphasize the significance of the IPPMC to ensure success of the projects. These comments reflect the lessons learned from the cases in this book and previous cases of energy projects for rural development.

Since the writing of the SEAFDEC case, the Ministry of Human Settlements in the Philippines has developed a number of small freshwater fishery projects as part of the rural BLISS program to build model communities or upgrade existing ones in rural settings. These projects are intended to provide a meaningful livelihood for poor people. A more recent development is the implementation of the Asian Development Bank (ADB) Laguna Lake Development Authority to produce milkfish and tilapia on a major scale. This large investment on the part of ADB is a direct result of the appropriate technologies and management system developed by the staff members of the pilot freshwater fisheries project.

The Kabini Papers Ltd. case provides a useful model for integrated rural development that reflects today’s international assistance policies for multisectoral integrated projects that benefit the rural poor. It demonstrates the importance of interrelating viable government policies with effective project planning and management. In addition, it dramatically emphasizes the significance of appropriate institutional linkages with academic and research organizations in the area to ensure the necessary technical expertise. Since the writing of the case, there have been new developments such as making plans to expand the capacity of the paper mill. Also, planning is underway to utilize both agricultural and animal waste materials to provide energy to run the mill. These plans will increase production of both paper and food, as well as create more jobs.

A clear example of another development project that has multiple purposes including food-related outputs is the case of the Yaocun hydroelectric project in the People’s Republic of China.(4) Originally designed to solve a severe water shortage in the drought-prone Linxian region of Henan Province, the extensive canal system described in the cited case study was retrofitted to accommodate several small hydroelectric stations, thus providing the surrounding rural population with much-needed electrical energy. The entire project, however, also solved an extensive irrigation problem by channeling reservoir-stored water to surrounding communes. In addition, energy generated by the hydroelectric stations provided power to run irrigation pumps, milling stations, and agriculture-related machinery. The integrated nature of this one development project illustrates the linkages that often occur between development projects in both food and energy.

Another example of an integrated rural development project is the case of the Fiji biogas project.(5) The Integrated Farming System (IFS) concept is based on effective planning and management of water and
food systems, and involves a complete recycling program. Using the sun as the only external energy source, the production of food, animal feed, and fertilizer is accomplished with minimal cost and without significant pollution.

The Philippine hydroelectric case(6) highlights the importance given the small hydro program for rural areas. In particular, the energy policy changes of the late 1970s encouraged the expansion of small hydro projects both to provide electrification and also to meet irrigation and flood control needs, and thus have greater impact in stimulating rural development. Indeed, rural development via electrification was viewed from the angle of employment generation. A rural electrification co-op provides employment directly through its internal operations and indirectly, as a catalyst, through provision of power to industry. As a matter of policy, co-ops offer jobs at attractive competitive wages to qualified permanent residents from within the coverage area. The co-op also provides employment opportunities through its impact on industry and trade.

A final and extremely important lesson that emerges from these cases and many other that have been documented elsewhere has to do with evaluation.(7) Evaluation approaches and guidelines have not been systematized, and much research on the subject is needed. Evaluation is in fact the means by which success or failure of a project is measured, and the only means by which useful information about the impact of a project can be disseminated to refine policy and planning. More than simply an after-the-event examination, evaluation should also be a continuous process during each phase of the integrated project cycle.

International assistance agencies continue to pour billions of dollars each year into more than a hundred developing countries to accelerate economic and social growth, and to eradicate absolute poverty. Yet, the plight of humankind continues to worsen. This is a clear indication that most evaluations of past projects by a variety of technical assistance agencies have not yet identified the major obstacles to alleviate the poverty that continues to plague much of the developing world.

One overall conclusion however, that has emerged from this series, and that has been discussed in every case history, is that a nation's most important and valuable resources are human resources. In this respect, all nations seeking equitable economic and social progress must fill the continuing need for skilled indigenous persons in all areas. As this series has demonstrated, one vital area is the training and education of highly qualified policymakers, planners and managers who can create viable development programs and implement them effectively. Most importantly, the series has clearly demonstrated the need for a project manager or project management team that can provide unified and efficient control over all the phases of the integrated project planning and management cycle. It further demonstrates the need for impact analyses of each project to provide lessons for improving the planning and management of future projects.

Most countries throughout the world are facing severe economic and social problems today because of high rates of inflation and unemployment. It is the hope of the general editors and the many contributing
authors from 6 countries, both developed and developing, that the basic
text and 5 case books have set the stage for a new kind of project
manager — one who can optimize human, financial and natural
resources.

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