ENVIRONMENTAL AND TECHNICAL ANALYSIS FOR THE CHAPARE RURAL DEVELOPMENT PROJECT

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

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I would like to thank each member of the team who prepared the technical reports whose conclusions and recommendations are summarized in the following pages. The interactions, both professional and social were stimulating as well as fun.

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INTRODUCTION

The environmental/technical analysis undertaken in this project is unique from other project analysis since that it not only evaluated the potential and limitations of the tropical ecosystems, but it also presents solutions that consider the technical, environmental, economic as well as social factors that characterize the Chapare. Furthermore, this exercise provides another viewpoint and expands ideas in progressing from the Project Identification Document (PID) to developing the Project Paper (PP).

The purpose of the Chapare Rural Development Project is to maximize the sustained productivity of the Chapare and increase farmer incomes through effective management of the natural resources. Improving the efficiency of the agricultural, forestry, livestock and fisheries production systems is probably the most practical approach to take at this time. Only after a few years of adaptive farm research and experimentation will it be obvious what new land management techniques or production systems will be successful under Chapare conditions. Likewise the experience gained in managing the natural resources here can be transferred to other similar tropical areas.

An important link with the production activities is the marketing and agro-industrialization of products already grown in the Chapare. Also the support activities provided research and extension, pest management, agricultural credit and farmer organizations all play an important role in the development of this area.

The following summary of conclusions and recommendations is based on various technical reports prepared by specialists and Bolivian counterparts

during January-February, 1983 (Tables 1 and 2). Needless to say these brief summaries are only a fraction of the total amount of material presented in the technical reports. Individual reports should be consulted in order to capture the detail presented and to understand the linkages with other sectorial activities so that the design and implementation of the project is integrated as well as realistic.

The statistics and calculations presented in the individual reports have been based on an analysis of the available documents and interviews with people who are concerned with the Chapare. It would be desirable to incorporate any new ideas or refine calculations presented in the analysis as new information becomes available.

Table 1

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SUMMARY CONCLUSIONS AND RECOMMENDATIONS

Fish Resources

1. Fisheries development cannot be handled under the present institutional framework; therefore, a department of fisheries should be established as soon as possible.

2. There is a lack of trained fisheries personnel in Bolivia, in particular with respect to management. Training schemes are outlined. Technical assistance to work with the development corporations (e.g. CORDECO) is recommended to assist in the development of a larger market for fish.

3. To assist in market development of different species, it is essential that a study of the spoilage characteristics of Bolivian fish be undertaken.

4. Research and monitoring of the fish stocks receives virtually no funding at present. Project funds should be provided for the monitoring of catch, composition, catch per unit effort by gear and age composition analysis through the Universidad Mayor de San Simón. Short-term technical assistance is required in the setting up of a data management system using a small computer.

5. There is no basis at present for a closed season (veda) and it should be suspended. If future fishing intensity became much higher than planned in these recommendations, a closed season may be advisable, but not during the period which is presently being used.

6. A survey of market conditions indicates that considerably more fish

could be sold without depressing prices. Meat is about twice the price of fish, the latter varying between $us.40. - 60. per kg. Despite the increased wealth of many inhabitants due to the coca boom, there still exist shortages in animal protein in most of the Chapare. Markets in La Paz and Cochabamba could be most efficiently supplied by an expanded fishery at Puerto Villarroel.

7. The proposed expansion of the fishery based at Puerto Villarroel to increase the yield by an additional 577 tons. per year would produce a total yield of only 25 percent of the estimated fish resource.

8. Funding for the Proposed Amazon project outlined by Walters et al (1982) is strongly recommended. It proposes Puerto Villarroel as one of the five centers for investment. The cost to finance the ice factory and electricity and water supply at Puerto Villarroel and cold storage facilities at La Paz and Cochabamba is estimated at $us.576,000. Technical assistance in marketing and preservation management would be provided by the British fisheries mission in Bolivia.

9. The key to a successful fishery in the Rio Ichilo is the maintenance of the natural hydrological regime and water quality. The continuing success of even the present fishery is dependent of there being no deforestation in the upland watershed and in the reparian zones further downstream. Of particular concern is the proposed road connecting Chimoré with Yapacaní. Extensionists should educate farmers in the correct use of pesticides. The navy should cease using large explosives to clear the main channel in the Rio Ichilo.

10. New fishing gear should not be of the specifications used at present which are designed for large fish species. Gillnets should be of 12 - 15 cm. stretched mesh to catch sábalo and other migrating species.

11. Lack of published material from outside Bolivia and other tropical countries is a major impediment to fish research and development. A library should be established to identify and copy material of relevance to river flood plain fisheries and fish ecology.

12. Ice should be sold at a fixed price per unit weight. If higher prices are charged for smaller quantities this will discourage small entrepeneurs from buying and selling fish to local inhabitants within the Chapare. The viability of the project depends on most of the fish being sold in the cities, but there is room for profitable enterprises which will also increase the supply of animal protein in rural areas.

Interdisciplinary Integrated Pest Management

1. Apply Interdisciplinary Integrated Pest Management (IIPM) methods to improve production, quantity, quality and longevity of plants and animals in the Chapare. Integrate IIPM work with programs of agricultural crops and livestock production and with those of climatology and fisheries. Train farm families and Bolivian professionals to gather data for this work.

2. Since the first step in solving problems with insects is identifying the pests and beneficial insects, establish small reference collections in pilot areas established by the development team and improve the classical collection at San Benito. Same for weeds and diseases.

3. Assist GOB agencies obtain the material and human resources needed to improve the implementation for the pesticide regulations. Supervise the selection and use of pesticides according the EPA Regulations and train pesticide users in safety methods.

4. Help develop nonchemical pest control strategies (such as use of resistent varieties, cultural controls, time of planting, flowering, grazing, etc...biological control, burning), planting of polycultures as individual strategies or in combination with chemical controls as a last resort.

5. Train Bolivians of various levels of experience to participate in this integrated project. In most instances it will be better to provide technical assistance and training in Bolivia where the special conditions of the Chapare can be appreciated. When needed a limited number of Bolivian technitians should take advantage of pest management short courses in the U.S.A.

6. Obtain funds immediately to initiate some highly visible, attractive, simple projects that can involve a lot of people in the Chapare and show them something is going on while the main projects develop e.g. beekeeping.

Livestock and Pasture

1. All technical data including climatic and rainfall suggest that the Chapare is not the most suited area for livestock production.

2. Currently an estimated 10,000 - 12,000 head of beef and dairy cattle exist in the area. Poor pasture management, an excessively wet climate, and lack of experience with locally produced feeds are

negative factors that make expansion of livestock in the Chapare controversial.

3. In order to disprove or confirm these negative factors a phased approach with pilot modules is proposed on small, well-managed scale. Data collected will be used as criteria for either expanding or discontinuing one or any combination of the livestock activities.

4. The purpose of this modular approach that will include poultry, swine, dual-purpose dairy, steer fattening and a water buffalo cow-calf operation is to determine:

   a) cost and time required for the establishment of pasture and the level of management needed for maximum utilization.

   b) the best location for each activity based on the land use capability map

   c) the technology and animal nutrition of both concentrates and locally grown crops best adapted to the conditions of the Chapare.

   d) the feasibility of expanding any one or all if these livestock activities

   e) which of these activities has the potential to expand into commercial-scale or industrial production and which ones should be eliminated or raised only for family use.

Forestry Production

1. Since the Chapare is naturally vegetated with forests, agroforestry and management of second growth forest are ecologically suitable land uses. There is every likelihood that timber production as a component of agroforestry will soon arise spontaneously in the Chapare.

2. The proposal for agroforestry and second growth forest management relies entirely on technology which already exists in the Chapare. Farmers prepare nurseries to establish coca and citrus plants as they would for forestry, tembe, or other fruit tree species.

3. Forestry research and extension should be oriented toward the small farmer with most research performed on private farms. The objectives of this program should be to provide farmers with practical, accurate information on what trees to plant, where, how to care for them, and how to integrate forest trees into the existing agricultural production system.

4. Immediate forest research needs which apply to both agroforestry and management of second growth stands include selection of best trees for forest production, seed collection, nursery management, planting techniques, and silviculture.

5. The agricultural marketing component of the project should also consider the marketing activities of forest products.

6. Farmers should be encouraged to sell merchantable forest products, especially logs of good size and quality, rather than allowing them to be wasted when forests are cleared.

7. Market promotion is urgently needed for rubber which is going unharvested in the Chapare.

8. The market for balsa should be promoted. The possibility of using Chapare wood for charcoal for the Oruro smelting industry should be explored. Expanding lumber, furniture, flooring wood markets in

Cochabamba, Oruro and Potosí should be promoted.

9. The agroindustry component of the project should be expanded to attract forest products processing plants into the Chapare except where there are real advantages to locating them elsewhere. Forest products processing plants that appear to be appropriate to the Chapare are flooring and furniture factories, wood preservation plants for posts, poles, railroad ties, and mine timbers, small-scale industrial charcoal kilns, and rubber laminating plants.

10. Forest production and industrialization should be included in the credit component as well as agricultural production and agroindustrialization. Such credit should include a payback system with a long grace period since there are many years between forest establishment and harvest.

11. Training in forestry is needed for professionals and technitians as well as farmers, loggers, agronomists and extension agents working with forest production activities, especially agroforestry. Professional foresters as well as forestry technians need to be hired by the GOB institution that will administrate and implement the Chapare project.

12. Training should consist primarily of on-the-job training for technicians, farmers, and people in the forest industry. On-the-job training should be augmented by short courses in the field and at Bolivian universities or overseas as the needs are identified. Forestry training and technical assistance should concentrate on the practical needs of the project such as training in agroforestry systems, silviculture of selected species, nursery practices and forest extension.

Natural Resource Protection

1. As a condition to financing development in the Chapare, the GOB should be required to permanently halt construction of the road into Isiboro-Secure National Park. The GOB should be required to take serious measures to prevent further invasion of the park and require squatters to leave. No land titles nor timber concessions should be granted within the park.

2. An inventory of the natural resources of Isiboro-Secure National should be initiated as well as developing a park management plan.

3. Efforts should be made to coordinate with CDF improved forest regulations in the Chapare. Forest concessions should be granted on the basis of approved management plans which are checked in the field by CDF foresters. No concessions should be granted on lands designated as protection forest and those lands should be patrolled to insure that no timber is cut from them. Management plans should be encouraged for timber harvest on private lands with CDF foresters responsible to see that plans are complied with.

Climate and Fluvial Morphology

1. Seven existing climatological stations should be upgraded to support planned agricultural modules and a microcomputer should be used to for data storage, retrieval, and analysis. This program will require one technician, one microcomputer, miscellaneous meterological equipment, and access to a vehicle. Five year cost, including technical assistance, is estimated at $.60,000.

2. Approximately $.800,000 will be required for extending the main spans

on four failed bridges in the Chapare. This project should be contemplated as part of the caminos vecinales II project. Financing for the 5th damaged bridge has already been obtained.

3. The upper watershed (above 500 m. MSL) should be protected against any type of development due to the high erosion hazard. There is little erosion hazard on the flat alluvial lands in the Chapare area.

4. The rivers in the Chapare flood, erode their banks, and change course from time to time as a result of natural geologic/hydrologic processes. Development to date has probably had little effect on these processes. It is not feasible to control these processes. Rather, development should be avoided in areas known to have historically been subject to flooding and erosion. Maintenance of riverbank vegetation will help retard the rate of river erosion and meander.

5. Agricultural development is not forseen to have an impact on river navigability.

6. A rural electrification project for the Chapare has been prepared by Empresa Nacional de Electricidad for financing by BID.

7. Large scale drainage projects should not be contemplated in the Chapare area. However, small on-farm drainage ditches may improve crop production in some areas. Small on-farm systems of contour dikes could be constructed in many aereas for paddy rice production. Field trials would be required to determine economic feasibility.

8. Reliable public water supplies do not exist in the Chapare. A separate rural sanitation project is being developed by USAID to provide public water supply.

Farmer Organizations

Conclusions

1. The success of a farmer organization depends on and is justified by the success of its individual members as farmers. When the situation of the farm economy is as precarious as it is in the Chapare, emphasis must be placed on strengthening the farmers' income, even if the institution must operate at a loss during some period of time. This subsidy must be focused on the organization and not the members, and its activities must have a solid prospect of becoming profitable. Otherwise the institution ultimately will fail, and the benefits to members will cease.

2. There is no example of a farmer organization succeeding in the Chapare. If a new organization is needed and requested by the farmers, then this institution has to be of a size and nature better able to offer services and benefit the farmer. This new institution should not be seen as a threat to the local cooperatives, associations, and other groups. On the other hand, if the new institution is perceived as working for the local groups and fortifying them, the Chapare farmers would be more receptive to it. The active syndicate network in the area, with its "centrals" and federations, is an example people understand although the objectives are different from a farmer organization.

3. Rather than an institution trying to cover the whole Chapare from the outset, organizational efforts should concentrate on a few areas which have more interest and experience in farmer organizations and have an appropriate agricultural base.

4. At the present time, there is no public sector agency which is recognized as apolitical and has developed the capacity and experience to provide the initial direction and support for farmer organizations. Likewise, a new organization should not be identified as an outgrowth of the syndicate network, because of the strong political ties involved. However, the federations should be consulted in a way to show support. The element of trust and stability is a prerequisite to begin any organizational effort.

5. Primary emphasis should be placed on providing two types of services. The first would focus on relatively simple activities whose benefits would be tangible to participating groups. The second type of services would have the objective of training personnel to manage these activities at the local level.

6. After the initial period of finally establishing the institution and its basic services, additional activities would be offered if their financial feasibility were proven. However, at any time a participating group would be free to develop itself different services according to its needs and capacity.

Recommendations

1. The institutional structure proposed is a second-level cooperative which legally could have a membership comprised of various types of rural organizations: consumer cooperatives, credit unions, associations, and other associative forms. It would be classified as a secondary, multiservice cooperative with regional scope (tentatively called: Central Cooperativa de Servicios Regionales). It would be located in Chimoré and would concentrate on the areas of Lauca, Las Mariposas and Valle Ivirza.

2. The implementing institution would be the National Federation of Savings and Loan Cooperatives (FENACRE). This broad-based federation (with 200 member cooperatives) is recognized as being apolitical and having sound management. Services it provides to members include: financing, insurance, and technical assistance in management, promotion, education and auditing. The General Manager of FENACRE has expressed agreement with this proposal and indicated that FENACRE has been studying similar plans for working in the Chapare through its members there.

3. FENACRE would be charged with the promotional activites required to organize the Central and with establishing the services to participating groups. In its capacity as a financial institution, it would serve as fiduciary and disbursing agent for the funds required for the operation of this component in the Chapare Integrated Rural Development Project (IRD), subject to approval by USAID/B. This authority would extend under the IRD Project up to the time when the Central no longer required operational subsidies and would be self-sustaining. Until the Project termination date, FENACRE would retain an advisory capacity within the Central.

4. Initially the services offered through member groups would be rural savings and the provision of consumer goods and inputs. The Central would function as dispository for savings and as purchasing agent. Furthermore, it would provide assistance in management and a bookkeeping service to maintain proper financial documents for the groups, and facilitate adequate technical training for local personnel.

5. Services offered in the second phase of this Project would be expanded

to include a short-term loan capacity for agricultural production and other uses complementary to the governmental small farmer credit program (PCPA). If circumstances permitted, limited marketing and industrialization projects could be implemented.

6. Because of the importance both marketing and industrialization of agricultural products will have in the development of the Chapare, the capacity for investigating market potentials and realistic projects and disseminating this information should be created independently of the farmer organization component. Probably this would be attached to a governmental agency and could serve also as a method for informing the public of other matters, such as through a part-time local radio station.

Crop Ecology/Soils

1. The agricultural potential of the Chapare is limited due to the extremely wet climate and nutrient poor soils. It is recommended that agricultural research, extension, and training, and agricultural credit activities be aimed at improving the existing agroforestry production system to improve the family's standard of living as well as market any surplus crop production to regional and national markets.

2. The environmental and climate constraints of a large portion of the Chapare make successful pasture management difficult. Carrying capacity is low, forage quality is generally poor and pasture invasion of woody growth is problematic. Livestock ventures should be encouraged only in areas where conditions are drier and as indicated by the land use capability map. The family level of livestock production, especially pigs should be encouraged utilizing locally grown feeds.

3. The level of technology utilized in the Chapare will not radically change with the purposed development project. If market conditions as well as fruit quality improves and processing outlets are established, moderate levels of fertilizer and pesticide inputs may be feasible. Yields of specific crops (bananas, plantains, pineapple, tembe, papaya, rice, corn, etc.) can be increased with the addition of fertilizer and improved levels of farme management, but the profitability of coca and the current marketing situation do not justify those added costs under present conditions. Alternative methods of maintaining soil fertility with minimum use of fertilizers are readily utilized by the farmers. It is recommended that these methods be carefully observed by extentionists as well as researchers to see why they work and how they can be improved.

4. The human carrying capacity of the area has probably already reached its sustainable limit. As road construction continues to open up unsettled areas more colonists will be attracted, but can only expect to live at or below subsistence levels if land resources are not managed for sustained production. Rural populations may become more stable as more permanent crops or agroforestry systems become of harvestable age. On the other hand if the coca control program is successful, there may be a destabilization of rural populations as they seek new lands to plant. Since soils are poor the most practical land use is shifting cultivation where follow-rotation periods are used as a method of maintaining soil fertility.

5. The potential production area for coca in Bolivia is very large. A coca reduction program in the Chapare, if successful, will increase prices and make illegal production more attractive, both in the project area and elsewhere. No proposed substitute crop will give farmers

greater economic return than coca. The proposed agricultural development activities will improve quality and quantities of products harvested from permanent cropping systems but will not replace coca as the most valuable crop in the Chapare.

6. Evaluation of past colonization efforts show how unrealistic planning results in over exploitation of resources, poor return on investment, and undesirable environmental impacts on the region which are difficult to overcome. Selection of cropping, livestock and agroforestry systems needs to be based on land capability, cultural acceptability, labor availability, ecological constraints, profitability and a marketing and processing infrastructure. There is a wide selection of tree crops that will grow in the Chapare, but only those that are adapted and have market potential will be promoted. The best sustained agricultural production system is also the most ecologically sound management of the Chapare.

7. The settlement of the Andean slopes and the Amazonian lowlands is a consequence of minifundio and marginal productivity of sierra farmers and the realities of the rural-urban migration process. Since expansion of the agricultural frontier and population migration is of great importance in the corridor and in particular the Chapare and areas like it, it is recommended that the proposed project include a component on regional development strategy.

8. Research and extension agents should be offered training sessions and/or work seminars in cooperation with similar development projects in the humid tropics (i.e., Central Selva Natural Resource Project, Perú; Yurimaguas Experiment Station, Perú).

9. It is strongly recommended that pejebeye, te, and rubber be included in marketing and agro-industrialization feasibility studies to determine market and production potentials.

10. The Chapare Rural Development Project should be approached as a long-term venture in the efficient management of tropical lands rather than treated as a "crash program" with immediate positive results.

11. When proposing project components, think of yourself as a farmer in the Chapare. Ask yourself, would I adopt that change or take that kind of a risk. Farmers behave economically and are rational beings. Farmers may be illiterate, but not ignorant.

Research/Extension

1. Undertake a long-range project for agriculture research and extension program development for the Chapare area involving extensive revision of the present system.

2. Concentrate all development efforts for research and extension within one institution to achieve uniformity of purpose and method of operation.

3. Utilize IBTA as the delivery agency for the development project and operate within the present organizational structure with one exception. Coordination of the project will be better facilitated by creating an Extension Supervisor position with this individual stationed permanently in the Chapare area. This will permit coordination at the supervisory level between the research and extension components in the Chapare.

4. Establish a special project budget managed by IBTA Department of Cochabamba office for the Chapare Research and Extension Project. The

budget should specifically identify research funds and extension funds to be provided in amounts necessary for conducting an effective program. AID or its appointed representative should develop a method for periodic review and evaluation of disbursments with appropriate steps to discontinue funds if irregularities are not corrected.

5. Establish this development effort as a pilot project and provide the necessary funding to supplement salaries of IBTA professional employees as an incentive to remain with the Chapare project and also as compensation for additional duties. The base salary along with established salary supplements paid by IBTA should remain the responsibility of IBTA.

6. Develop job specific, minimum standards for employment, including educational background and experience desired, to be used in filling new or vacated positions within the Chapare project.

7. Involve the PRODES organization only in a consulting capacity at the Department level. Farmers now associate this organization with coca control programs and political activities. This image is viewed as detrimental to the overall success of a development program for research and extension.

8. Concentrate experiment station investigations on studies of total farm systems, crop associations, variety screening and new crop introductions. The selection of crops to include in these studies should be based on the land capability, marketing and agricultural study and recommendations contained in other components of this environmental assessment report.

9. Establish a system of on-farm adaptive research where experiments will be conducted under commercial farm conditions with cultural activities performed by the farmer. The diagnostic study should be utilized to select five farms per experiment station which are representative of the farm categories existing in the area of the station.

10. Divide the work time of each researcher so that his position responsibility includes 40% of time related to on-station research projects, 40% of time conducting adaptive farm research and 10% of the work time should be allocated to assisting extension agents with technical problems of individual farmers and with conducting educational group meetings for farmers.

11. Organize a Research Advisory Board for each experiment station. The Board should be made up of farm leaders, Federation representatives, agribusiness representatives and agricultural produce handlers and processors. Each board should be composed of 20-25 members with over 50% being farmers representative of the various farm categories. Institutional representatives can serve as resource persons and participate in meetings but not have a voice or vote on any decision made by the Board.

12. Utilize a team approach for conducting adaptive farm research involving an evaluation of the total farming system (i.e. crops, livestock, agroforestry). The team should be composed of appropriate research specialists to fit the farm category and the extension agent assigned to that territory.

13. Develop experimental designs for on-farm investigations utilizing three levels of technology - tradicional, low and medium. Maintain accurate

records of income and expenses to determine economic viability.

14. The operation of plant nurseries could continue as currently organized under the management of various institutions. There should, however, be an effort made to coordinate the sale price of plants so that uniformity of pricing exists for similar plants. When plant distributions occur, IBTA personnel should be notified so that post-planting assistance can be provide by specialists.

15. Assign an additional two extension agents to the Chapare area and create a new position for a Chapare Extension Program Supervisor.

16. Establish boundaries for work territories assigned to agents so that each territory will not include more than fifteen "sindicatos". Where memebership of a "sindicato" greatly exceeds 100 members the territory should be adjusted to include fewer "sindicatos".

17. The work time of an agent should be divided so as to devote 60% of time to the adaptive farm research cooperator program and the Demonstration Farm program, 20% of time assisting non-cooperator farmers and conducting group educational activities and 10% of time working in organizing the Community Council and training the leaders and members.

18. Organize a Community Agricultural Council to serve as an advisory group for each agent. The Council should include a representative of each "sindicato" within the agent's territory.

19. Agents should assist in preparing the diagnostic study of his territory and serve on at least one adaptive farm research team whether the farm is in their territory or not.

20. Agents should help prepare individual farm maps based on land capability classification and marketing and agroindustrialization requ... 3.

21. Each agent should recruit up to a maximum of ten agricultural leaders who are willing to cooperate as demonstrators by permitting demonstrations (not experimental trials) to be carried out on their farms. Based on the farm category the appropriate technological package will be utilized in conducting the demonstration.

22. In the third year of the project eight farmers from the demonstration cooperators and Demonstration Farm operators are to be selected or recruited by each agent to work as para - technicians. These farmers will become employees of IBTA under the supervision of the agents and will be responsible for establishing a demonstration program on ten farms each. If the success of the project and the extent of the development effort justifies doing so, another group of para - technicians could be trained and employeed during year five of the project.

23. Should infrastructure and operating conditions improve within the Chapare area additional territories could be involved in the extension program thus requiring increased numbers of agents to serve the new territories.

24. Construct a combination office/residence in each territory so that the agent can live within the territory and operate out of a local office. No construction will be necessary for the agent serving the Chipiriri area as facilities are available at the experiment station. A larger structure will be required at the La Jota station as the office will house both the agent and the supervisor. Both will also live at this location. One such structure is located at Villa Tunari and is ready for occupancy at this time.

Land Use Capability

1. Although the general location of specific types of production is known to PRODES experts, actual land use and its extension at a detailed level is unknown and unmapped. A detailed map and objectively-derived field data on area-by-area crop location and productivity, species, and variety grown, areas occupied, production systems employed should be prepared. In order to progress of the project, it will be desirable to repeat the actual land use mapping at least once every two or three years.

2. The improvement of agriculture, even on small farms in the ten to twenty hectare range, requires as a pre-condition, the preparation of a farm plan, including a map of future production subdivisions and cropping and rotation schedule. Such a plan should be based upon a detailed survey and map of the physical conditions present on the farm. This activity should be an integral part of the research and extension program.

3. Farm planning should proceed with a detailed study of soil fertility in production areas. An accurate and detailed soils map needs to be prepared for clean-tillage, permanet crop, and intensive forestry (A,P,C, F,) category areas shown on the land capability map. This mapping work should begin in the existing settled areas as indicated by the actual land use map and proceed to cover those areas designated for future settlement.

4. An estimated 200,000 hectares is producing and will probably continue to produce woody biomass under agro-forestry production systems throughout the immediate future: This large area and its forest cover represents an enormous and under-exploited raw-material base for the eventual supply to local industries. A forestry extension program and the creation

of a local industrial base for the elaboration of wood products are needed in order to efficiently utilize the forest resource.

5. Forestry extension should be conducted integrally with agricultural extension, as should its research aspects, if true agro-forestry production systems are to be developed.