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Methodology of the Farming Systems Project
in Central America

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METHODOLOGY OF THE FARMING SYSTEMS PROJECT IN CENTRAL AMERICA

Introduction

Small farms in Central America combine very often several production activities, such as annual and perennial crops, livestock and processing activities, which interact because of the joint use of inputs and sometimes compete for limited resources. The farming systems methodology stresses the importance of the description and analysis of farms as a starting point to design and conduct research and development projects. To ensure that research is directed to the constraints of agricultural production, (and later on new systems of production are developed, which are perceived by the farmers as contributing to their goals) it is necessary to identify the bio-technical and socio-economic problems faced by the target group. The project aims therefore, to study the interdependencies and interrelationships among farm enterprises and between these enterprises and the farm environment, and not only cropping systems or individual crops.

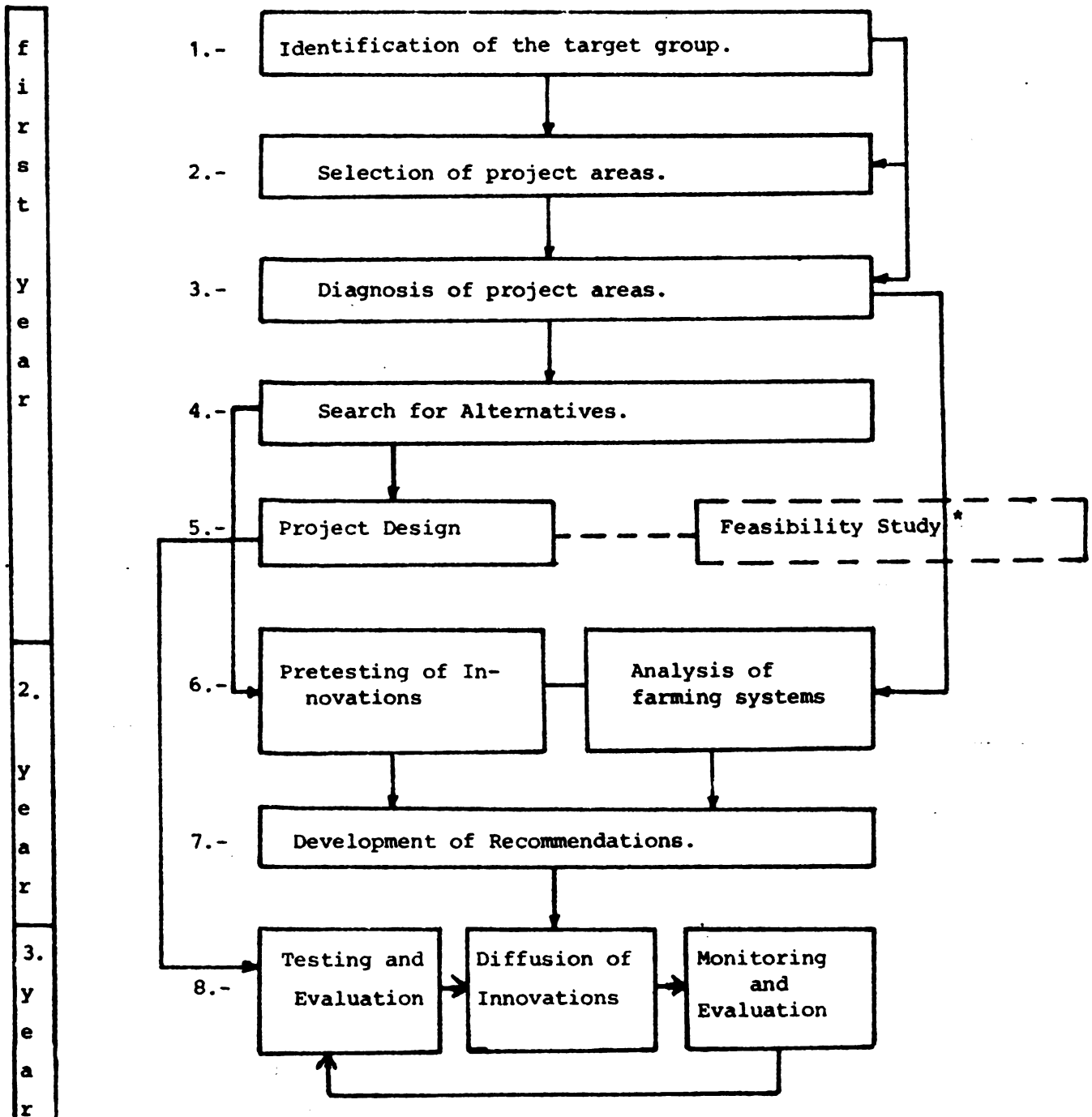
The analysis of existing farming systems will be combined with exploratory experiments. The testing of new technology has to be undertaken where we expect it to be used: on the farm. In this way, farmers can participate in the planning and conduct of experiments and the wealth of knowledge of farmers and research workers will be combined. Furthermore, we hope to increase the probability that technology will be fitted to the physical and socio-economic limitations.

The phased planning is based on a systematic collection of necessary information. It allows the participation of national institutions in project planning (phases 4,5 and 7) and it facilitates training of national technicians (phases 3, 6 and 8).

The implementation of the various phases needs sufficient flexibility because the methodology and project design has to be adapted to the specific environments. Or in other words "Good project designs seldom come off the shelf" (NORMAN, D., 1977).

Long-term objectives and broad outline of project phases:

The long-term objectives are to produce and diffuse production systems which could increase actual production and hence the general well-being of smallholders in Central America. To reach these goals the following sequential phases are planned:



* A feasibility study will not be conducted by the research team, but assistance could be given if required.

Methodology of project phases 1 to 7

In recognition of the complexity and interaction of the various components of farming systems, a multi-disciplinary approach is required to tackle the given problems.

For maximum impact of the project, a close collaboration of agronomists, pedologists, agr. economists, sociologists and specialists in other disciplines (according to the specific situation in the project areas), seems to be a prerequisite. This collaboration will be obtained by an agreed interaction of the project with other CATIE activities, mainly with the Small Farm Production Systems Project (ROCAP-Project).

Phase 1: Identification of the target group

The target group is already specified in the project agreement between CATIE and GTZ: small farmers with limited resources and a low level of technology. The choice of the target group is the first part in the planning of a project (Development for whom?), because the strategy has to be oriented towards the elimination of binding constraints which may prove detrimental to the diffusion of technical innovations. Elimination of constraints is regarded here in a broad sense: constraints of the innovations, farmers resources and abilities, and input supply.

The important question to answer now is: How do we define a small farmer and how can we find them?.

The definition of a small farmer according to the land he owns or cultivates, perhaps differentiated according to various farm enterprises, or according to the net sale of farm products seems to be a difficult and time consuming procedure. It is proposed to use the method: "look and decide".

This means that during the phases "Selection of project areas" and "Diagnosis of Project Areas" the research team will have sufficient time to identify smallholders with a low standard of living. The general impression of the types of houses, clothes, nutrition, capital, equipment

and technologies used is regarded as a sufficient and a quick way to locate areas with a concentration of small farms and later on to identify the various farms.

Phase 2: Selection of project areas

Selection of project areas is a critical phase in so far as the decision influences greatly the potential achievement of the project. If possible mayor agroclimatic zones should be chosen, so that the results have a chance of being applicable in other regions. However, due to the fact that adoption of innovations is not only a function of the fit of the technology to the ecological conditions but also to the socio-economic conditions, which seem to vary within similar agroclimatic zones, the probability of direct extrapolation of results is regarded as low. Hence more emphasis should be given to the number of possible adopters within the project areas.

For the selection of project areas the following criteria will be used:

1. Criteria to select regions within a country

- Population density
- Standard of living (general impression)
- Region and target group should have preference in the national development plan
- Distance to the nearest research station (CATIE) and project area

With these criteria feasible regions are drastically reduced and it's possible to continue with the selection of project areas with a more concentrated effort in fewer regions.

2. Criteria to select areas within selected regions

- Accessibility of areas
- Number of small farms
- Agricultural potential

- Soils
- Topography
- Climate
- Actual production (in Kg/Ha)
- Infrastructure
- Existence of diversified farming systems
- Possibility of cooperation with other institutions

Generally it is not possible, in the limited time available to quantify the values for all criteria. This is especially the case for the criterion "agricultural potential". With information on environmental factors and after visiting possible areas (and comparing them) the best estimate of the research team and of collaborating scientists should be sufficient.

The procedure of selecting project areas starts with the identification of possible areas. Published and unpublished data, and knowledge of the region by personnel from CATIE and national institutions enables identification of possible project areas. The research team has then the task to collect the necessary information. It seems useful to start the collection with basic information from the various countries, and proceed then to the possible project areas. Finally some indications on constraints from the national and farmers' points of views should be given. As a guideline, the following terms of reference are used for selection of project areas:

A.- Background information on the country (actual situation and outlook)

- 1.- Population and economic situation
- 2.- Agricultural sector
- 3.- Institutions
- 4.- Agricultural development strategy

B.- Project Region

- 1.- Locality
 - a) Geogr. localization
 - b) Distance to research center (CATIE)
 - c) Infrastructure (physical and social)
 - d) Research and project history

2.- Ecological Factors

- a) Topography
- b) Soils
- c) Climate

3.- Resources

- a) Human resources
- b) Agriculture
- c) Industry
- d) Administration and **Institutions**

C.- Constraints

1.- Constraints of the National Economy

- a) Production
- b) Infrastructure
- c) Balance of Payment
- d) Employment

2.- Tentative constraints at the farm level

- a) Agronomic constraints
- b) Input supply
- c) Marketing

Phase 3: Diagnosis of project areas

The objectives of this phase are:

- a) Collection of data on exogenous and endogenous factors influencing the yields of crops and grassland.
- b) Identification of evident constraints
 - farm level constraints
 - service constraints
 - marketing constraints
 - institutional constraints

The major emphasis will be on the description of the exogeneous factors, such as:

- a) Climate
 - Precipitation (distribution and probability)
 - Evapotranspiration
 - Humidity
 - Temperatures
- b) Soils
 - Texture
 - pH
 - Soil elements (especially deficiencies)
 - Toxic elements
- c) Topography
- d) Economic resources
 - Land (size, tenancy)
 - Labour
 - Capital
- e) Socio-economic environment
 - Markets (size, principal products)
 - Whole-sale and retail market systems
 - Storage facilities
 - Availability and prices of inputs
 - Availability and interest rates of credit
 - Service institutions
 - Cooperatives
 - Local customs

Data on the endogeneous or management factors like farm enterprises, cropping pattern, crop rotations, varieties, fertilization and weed and pest management are more difficult to collect and a broad description is all what can probably be achieved during this phase.

To collect the necessary information on environment and management, the following methods will be used:

- Analysis of existing literature
- Field visits of the research team and collaborating scientists (objective: identification of farm level constraints).

- Collection and analysis of soil samples
- Discussions with regional and local institutions and farmers organizations
- Conduct of baseline surveys

Baseline surveys

Baseline surveys^{2/} will provide the required information on farmers resources, farm enterprises, crops grown, use of improved technology, traction and information on the willingness of farmers to cooperate in the conduct of experiments and in the multi-visit survey.

Sampling method

The first step is to identify the geographical area within the project region. The factors which will mainly influence the decision are (a) the concentration of small farmers within the area, and (b) the accessibility of the area throughout the year.

This procedure is necessary for operational convenience but it is important to note that inferences can only be drawn on the population actually sampled. The next step requires a complete listing of farms in the area in order to draw a random sample. If such a list is not available, an alternative method is to interview each 4th or 5th farm along the streets, according to the number of farmers in the area and the sample size required.

Due to limited financial resources and time the sample size will be about 200 farmers. These farmers will later provide the sampling frame from which the respondents for the multi-visit survey will be chosen.

Phase 4: Search for Alternatives to Remove Bottlenecks

With the information of evident constraints at the various levels the research team, collaborating scientists and members of national institutions have the task to identify technological packages. These pa-

1/ quantity and quality

2/ one-visit surveys

ckages will be pretested on farmers fields (phase 6), hence it is important that only "known techniques" are included in this phase. In the early stage of collaborative work between the research team and the farmers it seems crucial to demonstrate that we can offer something to the farmers. The final decision on the type of experiments to conduct will be done after discussing them with the participating farmers.

Phase 5: Project Design

The diffusion of innovations needs to be organized and this especially under low resources farmers conditions. The preparation of a project is generally a long lasting procedure due to the fact that several organizations sometimes with different objectives are involved in this phase. Furthermore, financial and/or technical assistance is often required which presumes the preparation of a project proposal.

Hence, the project design and proposal have to be prepared as early as possible, although -at this moment- there is not sufficient information on farm level constraints and the technical packages are not yet pretested. The available time up to the diffusion stage is sufficient to collect the missing information. The task of the research team will be to assist the national institutions in the preparation of the project design (for phase 8).

The planning of the project is a continuous process and a lot of the information required will already have been collected during the previous phases. It will then have to be put in a systematic order:

1.- Constraints

(this information will be taken from phase 3).

2.- Objectives

The formulation of objectives results out of the analysis of the existing situation and the constraints at the various levels. It seems important that the objectives are clearly defined and separated for all participating groups:

- Farmers
- Institutions (execution, research)

- Ministry of agriculture
- Donors

The next task during this planning phase is the analysis of the various objectives whether they are (a) congruent, (b) complementary, (c) independent or (d) competitive. After structuring the objectives the planning continues with the identification of operational goals, means and the organization for the project execution.

3.- Project Description (operational goals)

- Technical packages
- Institutional strengthening
- Input supply
- Constructions

4.- Project Execution

- Organization
- Identification of responsibility for various tasks:
- Testing and evaluation
- Extension service (diffusion)
- Monitoring and evaluation
- Seed production, input distribution
- Credit, marketing

Phase 6:

a) Pretesting of Innovations

Pretesting of technological packages during the first year of collaborative work with farmers has to be as simple as possible. It should include one or two packages for one ecological zone without a variation in the level of factors (e.g. fertilizer, insecticides). This facilitates farmers' participation in the execution of experiments and it is easy for them to compare the results with the traditional practices.

The package should have sufficient replications in one village (5-10 plots), in order to test the variability and hence the risks invol-

ved. This approach has also the possibility to identify yield influencing factors of the cropping pattern^{1/}. Farmers are generally good observers and an increase of yields on 1 or 2 plots (maybe even under favourable conditions) will not be sufficient to convince them.

The execution and supervision of experiments will be primarily the task of an agronomist (with backstopping from the research center) who is living in the project area and evaluates the work and progress at least once a week.

Evaluation of results has to be undertaken with the farmers and according to the farmers' objectives because they will decide the adoption rate. The next step consists of describing how good results in specific areas can be achieved or what factors have to be modified.

b) Analysis of Farming Systems

The analysis of actual farms explores the present farm organization, the utilization of resources and enables the identification of production constraints which prevent increasing land and labour productivities. The work has to start with identifying testable hypotheses which will be derived from the previous experience in the project area. Generally speaking, the analysis of farming systems implies the testing of two hypotheses: (a) there exists a high variation in performance and a reallocation of resources within the present farming systems can improve the welfare of farmers, and (b) technical innovations are able to increase production and income of farmers.

The collection of data has to be organized with the general and specific hypotheses in mind. The required data will be collected by the means of a survey during cultivation cycle(s) of one year. Due to the fact that farmers do not see immediate returns from the survey, this activity has to be conducted simultaneously with the on-farm experiments.

The respondents will be drawn from the group of farmers interviewed during the one-visit survey in phase 3. The sample size should

^{1/} For the identification of yield influencing factors soil samples will be taken from all plots, % slope will be measured and data on precipitation will be collected in each village.

-theoretically- depend on the variability of the various parameters. This knowledge seldom exists before conducting the survey. Hence the sample size is mainly influenced by experience from other surveys and the financial resources available. To improve the chances of statistically valid results, a stratification of the population according to important variables (farm size and farm enterprises) seems appropriate.

It is proposed to include 50-60 farmers in each project area, stratified into two groups. The classification variable will be identified after finishing the baseline survey.

The data to be collected from the farmers can be divided into three groups:

Situational data collection

- Farm labour (family labour + permanent hired labour)
- Farm land, field sizes and land tenure
- Crops and cropping pattern
- Farm equipment
- Draft animals
- Livestock
- Farm buildings
- Tools
- Financial liabilities
- Resource inventory (at the beginning and end of a year)
- Farmers' views on constraints

Weekly data collection

- Yield measurement of arable and tree crops
- Output of livestock
- Expenditure
- Labour input (fields, processing, off-farm activities)

Monthly data collection

- Market prices for farm products
- Off-farm income

The farm level survey will be complemented by a survey on the marketing sector in order to describe the existing market structure, costs

and returns of the participating groups and to analyse the constraints within the marketing sector.

The field work, data collection and analysis has to be accurately planned and organized. The supervision of the field work will be the task of agricultural economists who stay in the project areas. Their duty is to check the work of the enumerators (5 enumerators in each area), to discuss problems with farmers and hence to maintain cooperative relationships with them, to collect data by observation in order to facilitate later on the interpretation of results, and to feed back information about progress and problems to the project coordinator.

Planning and conducting the survey requires the following sequential steps:

- Developing precoded questionnaires
- Pretesting questionnaires
- Recruitment of enumerators
- Training of enumerators (office training + field training)
- Purchase of survey material
- Selection of farmers (random sample)
- Informing farmers on planned project activities and objectives
- Conduct and supervision of the survey
- Transfer of data for computer analysis
- Analysis of data

Phase 7: Development of Recommendations

After pretesting of innovations and analysis of existing farming systems the research team, collaborating scientists and members of national institutions have the task to develop recommendations on "known techniques" ready for diffusion and on innovations to be tested and evaluated. Furthermore, the constraints of the farming systems have to be discussed and ordered into three groups:

- Constraints which can be solved in a short period
- Constraints which can be solved in a medium period

- Constraints which can't be solved in the foreseeable future

These information is expected to assist CATIE in developing their research priorities for the conditions prevailing in the project areas.

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