A MECHANIZED CORN PROJECT IN COSTA RICA: A CASE ANALYSIS

Thesis for the Degree of M. S.
MICHIGAN STATE UNIVERSITY
THOMAS M. DICKEY
1974

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ABSTRACT

A MECHANIZED CORN PROJECT IN COSTA RICA:
A CASE ANALYSIS

By

Thomas M. Dickey

In the fall of 1971, the Ministry of Agriculture of Costa Rica, in coordination with two other governmental agencies, initiated a small development project for the introduction of mechanization and modern inputs into the cultivation of corn by small farmers near the town of La Fortuna. The development efforts of many countries involve many projects of this size. Such small projects rarely receive much evaluation or analysis even though they constitute a large portion of a government's effort when aggregated. The objective of this study was to present an evaluation framework for use by development institutions which have large numbers of small projects and to use the framework in the evaluation of the La Fortuna project. The evaluation framework concentrates on the effects of a project that generally are not listed as project objectives. The project objectives are usually considered if some evaluation is made. The Side-Effect Evaluation Framework may be used either rigorously (in a written form) or loosely (just by thinking through it; either way, the agency official gains

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an understanding of the meaning of each side-effect. The framework involves answering the following questions.

1. Identify and Describe the side-effect.

2. Determine the Incidence of the effect.

3. For each person or group listed in Step 2, estimate the potential duration of the effect.

4. For each person or group listed in Step 2, judge whether it is a bad or a good effect and also judge how good or how bad it is (a) taken by itself and (b) taken in conjunction with the other effects of the project.

5. Determine what aspects of the project, in conjunction with the social and economic context of the society, could have caused the effect.

6. (For purposes of evaluating the agency planning ability) Was this effect anticipated or was it a surprise to the agency?

The primary data sources were the small farmer survey which was conducted for the MSU-AID research project and conversations with agency officials in Costa Rica. Secondary data sources included studies performed by the Costa Rica Ministry of Agriculture and by the IICA-AID research team.

The evaluation of the La Fortuna Project produced the following observations:

1. The project did not achieve the listed objectives of increases in per manzana yields or in terms of the area to be planted under the project.

2. The farmers accepted the recommendations of the project as was required, but in the case of fertilizer and herbicide use they reverted to the original low levels of usage, once they left the project. In the case of machinery usage, they reverted from mechanical planting to hand planting, retaining mechanized plowing and disking. The latter effect was probably due to the land clearing operations of the project which made mechanization possible.

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3. No conclusions could be drawn considering changes in labor usage. Although the overall average manzana labor requirements did show a significant decline, the negative correlation between unit labor requirements and area planted to corn by farmer produced a large variance in the individual farmer's average labor requirements per unit of area.

4. A few special opportunities for individuals resulted from the project, although little resentment by the other farmers was perceived through the interviews.

5. The data suggest that the farmers in the project now have a significantly lower level of confidence in the institutions involved in the project. Based on this result and on the impressions received from the interviews, a relationship is suggested between past institutional performance and current levels of farmer confidence in the institution. The importance of this relationship results from the role of a farmer's confidence in an institution in his decision to adopt the innovations recommended to him by the institution.

6. Possible factors in the results of the La Fortuna project are listed, although direct causes can not be established. These include (a) low operating standards and poor planning, (b) the project monitoring and evaluation systems of the institutions, (c) the personalities involved, (d) the weather and (e) the input supply system.

Although the simple documentation of a project's successes and failures does not answer the questions of how the failures can be avoided and how the successes can be enlarged, it hopefully narrows the range of aspects through which to search. This is the essence of the Side-Effect Evaluation Framework which is presented.

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Thomas M. Dickey

A THESIS

Submitted to
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A special note of appreciation is due the author's wife, Elizabeth de Leon Dickey. In addition to her patience, understanding and reinforcement during all phases of the work, she accompanied the author, occasionally through ankle-deep

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mud or four hour horseback trips to the houses of the farmers in Costa Rica. Her presence permitted us to better know and appreciate the farmers and produced a more relaxed atmosphere in which to hold the interviews.

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CHAPTER I

INTRODUCTION

Introduction to the Research and the Data Sources

In the fall of 1971, the Ministry of Agriculture of Costa Rica, in coordination with two other agencies, initiated a project for the introduction of mechanization and modern inputs into the cultivation of corn by small farmers near the town of La Fortuna. It was a small project in economic development--only 48 farmers participated. The analysis presented here is based primarily on field research performed by this author for the Michigan State University, Department of Agricultural Economics, Agricultural Management Research and Training Project which was performed under contract with the U.S. Agency for International Development (U.S.A.I.D.).

This paper sets forth a framework for the analysis or evaluation of small agricultural development projects--the size of project that is the mainstay of efforts to develop the small farm sector. Although some aspects of the project are explored in greater detail and some theoretical considerations are included, the major portion of this evaluation can serve as an example of the type of evaluation that development planners and administrators can and should, but are generally not, performing. In general, it attempts to

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show what may be done with limited sources of information (or limited time to investigate a project). The M.S.U. field research questionnaire was not designed with this evaluation as its major objective. However, these data and data from other sources do provide a basis for an evaluation of the project that goes beyond the type of evaluation that one would expect to find done by the agencies involved.

Much of the literature concerning economic development deals with questions of investment decisions, means of financing development, problems of national economic planning and problems in the administration of development. Most of the literature deals with these problems on the national or international level, although a project as small as the La Fortuna project receives an occasional reference. Although agricultural development efforts by a country must be considered first on such a national level, the programs and projects, at least those aimed at the small farmers, must be disaggregated and evaluated, both ex-ante and ex-post, on a project level if the successful execution of the projects is to be expected. The centrally located top officials of government agencies and Agricultural Program Officers of foreign development agencies do not currently, in the opinion of this author, perform or receive the type of project analysis needed for the intelligent administration of agricultural development. The effective development of small farm agriculture (which implies a concern for distribution

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of wealth in addition to overall national development) requires a deeper understanding of the complex economic and social problems involved. Sociologists have provided insights into the culture of small farm agriculture, but unless these aspects are integrated into analyses of specific projects, these high level officials cannot be expected to gain that deeper understanding. In addition to these cultural aspects, the officials need to have a realistic understanding of the operating procedures and capacities of the change agencies and how these procedures interact with the social and economic aspects of planned or directed social and economic change. It is with this perception of current agricultural development efforts in mind that this case analysis is presented.

The Data Sources

The Michigan State University Project

The purpose of the Agricultural Management Research and Training Project was to formulate a methodology to determine where and what kind of "bottlenecks" are occurring in the management and administration of public institutions serving the agricultural sectors of the Less Developed Countries (LDC's) and then to suggest ways by which these bottlenecks might be overcome. The research was carried out by a multi-disciplinary team and the institutions were studied through several different approaches. One of these approaches was the Small Farm Survey which was designed to

evaluate the impact that the institutions were having and to measure the knowledgeability of the farmers about the projects, the participation they had in the planning of the projects and the communication flows between the farmers and the institutions. The information gained through these surveys was then compared with the information produced by the other approaches. In this manner, the operations of the institutions could be traced from the top levels to the field agent level.

The two projects studied, were selected upon the recommendation of agency officials and were the La Fortuna Project and a corn and rice project in the Cartagena area of the Nicoya peninsula. This author personally administered the interviews during the period September to November, 1972. In La Fortuna, 25 participants and 10 nonparticipants were interviewed, while in Cartagena 35 participants and 10 nonparticipants were interviewed.

The Ministry of Agriculture Data

The Department of Agricultural Economics and Statistics of the Directorate of Planning and Coordination of the Ministry has performed a series of production costs and returns studies which will be referred to as the "MAGPIE" studies.[1] These studies obtain data from farmers and

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[1]MAGPIE stands for "Ministerio de Agricultura, Programa de Investigaciones Economicas," a computer program written by U.S. Peace Corps Volunteers serving in the Ministry.

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classify the data according to type of expense (materials, works or other; with works further classified as being human labor, animal power or mechanized power) and the disposition of the yields (prices, product destination, e.g., sale, home consumption, seed or animal feed). The La Fortuna MAGPIE study included 28 of the 48 farmers that participated in the project, although these were not selected in a random fashion. The data gathered are fed into a computer program that computes averages and totals and performs some two-variable regressions. The mimeograph reports basically present the data averages with only little additional analysis included.

A similar study was done on a nonmechanized corn project in San Jorge de Arenal, also located in the San Carlos region. Data from this study are compared with the La Fortuna data in Chapter IV, "Labor Use Changes."

The Interamerican Institute of Agricultural Sciences (IICA) Data

A study similar to the M.S.U. research was being done by IICA to measure the quantity and quality of services received by the farmers. This study was a component of IICA's larger research which attempts to "study the conditions under which it is possible to improve the management of the agricultural programs in order to optimize resources and objectives."[2]

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[2]Instituto Interamericano de Ciencias Agrícolas de la O.E.A., "Programa de Gestión, IICA-AID, Proyecto III," Fase I, mimeo, 1972, San José, Costa Rica, p. 1.

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IICA interviewed a broader range of small farmers throughout the country, and among these were 13 small farmers from the La Fortuna area. Since these names were selected randomly from a list provided by the Ministry of Agriculture, they were, in all probability, all participants in the La Fortuna Project. Although the IICA data are similar to the M.S.U. data in a few respects, they provide more information on farmers' perceptions concerning reception of services and their uses of the services.

Background of the Cost Rica Agricultural Development Program

In August of 1970, the U.S. Agency for International Development (AID) signed a loan agreement with the Government of Costa Rica for $20,000,000 to help finance a four-year Agricultural Development Program (ADP). The Government of Costa Rica committed itself to provide an additional $16,885,000 for a total program of $36,885,000. The program consists of seven individual projects, which were considered to be sufficiently interrelated to be termed a sector program, although it was noted that the program does not constitute a "complete" sector program. The seven projects were: 1) Agricultural Services, 2) Agricultural Education, 3) Credit, 4) Cooperatives, 5) Marketing, 6) Land Tenure, and 7) Community Organization and Municipal Development.

As a condition precedent to the disbursement of the loan, the Government of Costa Rica was required to establish a

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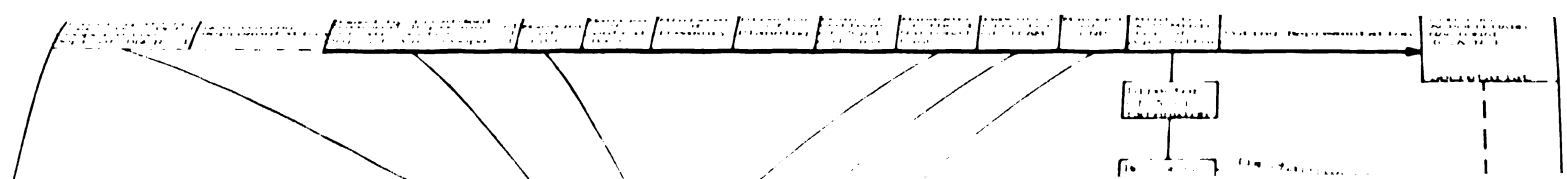
National Coordinating Council and provide it with the necessary authority, resources and administrative branch (Secretariat) for it to perform the coordinating role assigned to it. To this end, the Consejo Agropecuario Nacional (C.A.N.) (National Agricultural Council) was established in September of 1970. C.A.N. is composed of representatives of the private and public sectors and is presided over by the Minister of Agriculture. (See Figure 1) In March of 1971, the C.A.N. authorized the creation of Regional Agricultural Committees (CANcitos). Each committee is composed of regional delegates from the agricultural institutions and some of the farmers from the region. Supportive services for the CANcitos are provided by the Regional Center of the Ministry of Agriculture. The C.A.N. and the CANcitos are to make policy, approve and assign priorities to individual projects and leave the details up to the implementing institutions and the Project Coordinator.

The working form of this arrangement for coordination is based on individual projects. For each project in a zone, as established by the CANcito, a Project Coordinator is named and this person is to facilitate the coordination of the implementing institutions in the project.

The actual operation of this arrangement at the regional level has been greatly influenced by the structure of the institutions involved. Of the major institutions, only the Ministry of Agriculture (MAG) is structured with a regional



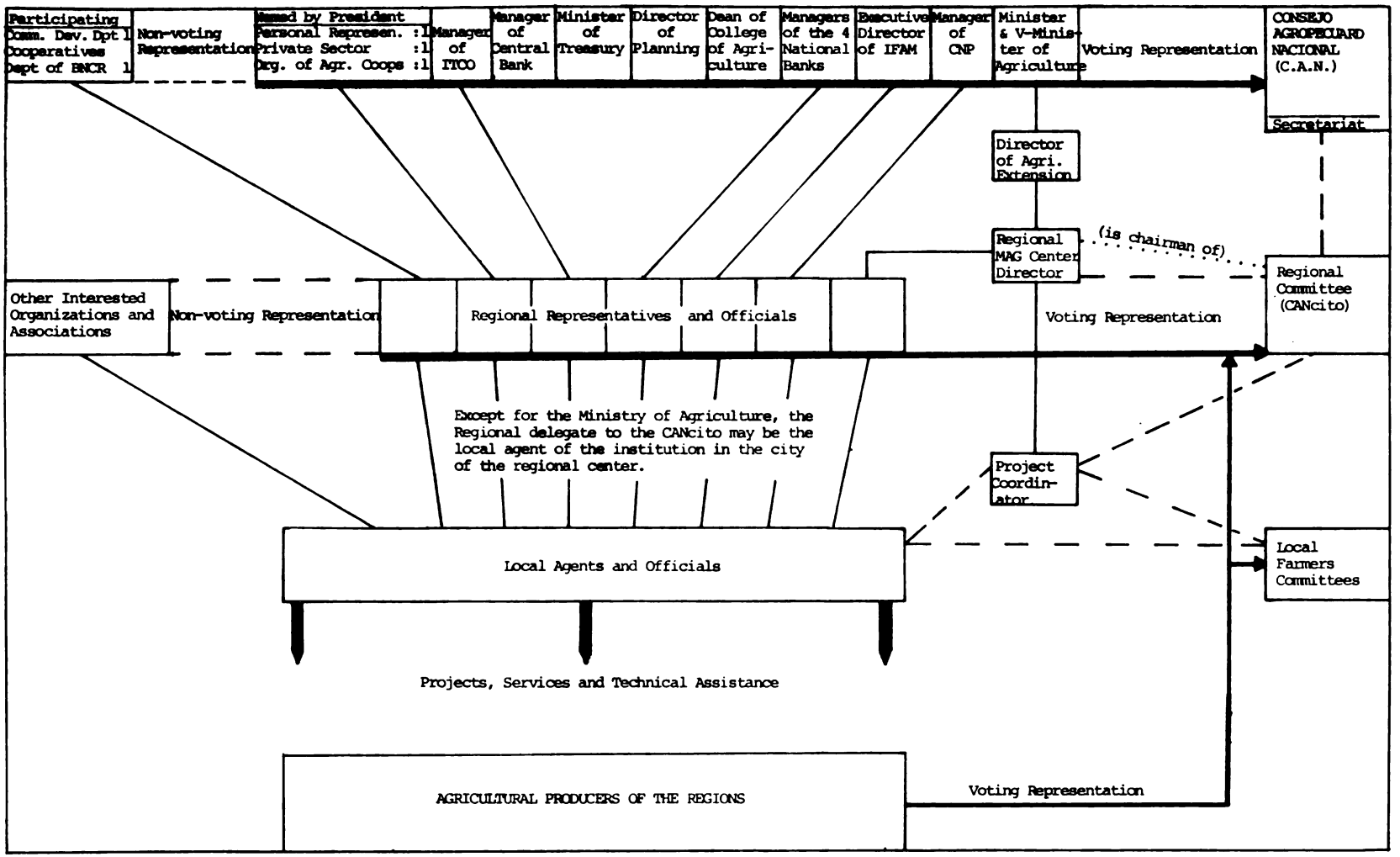


Figure 1. Schematic Representation of National and Regional Coordination Arrangement, Costa Rica.

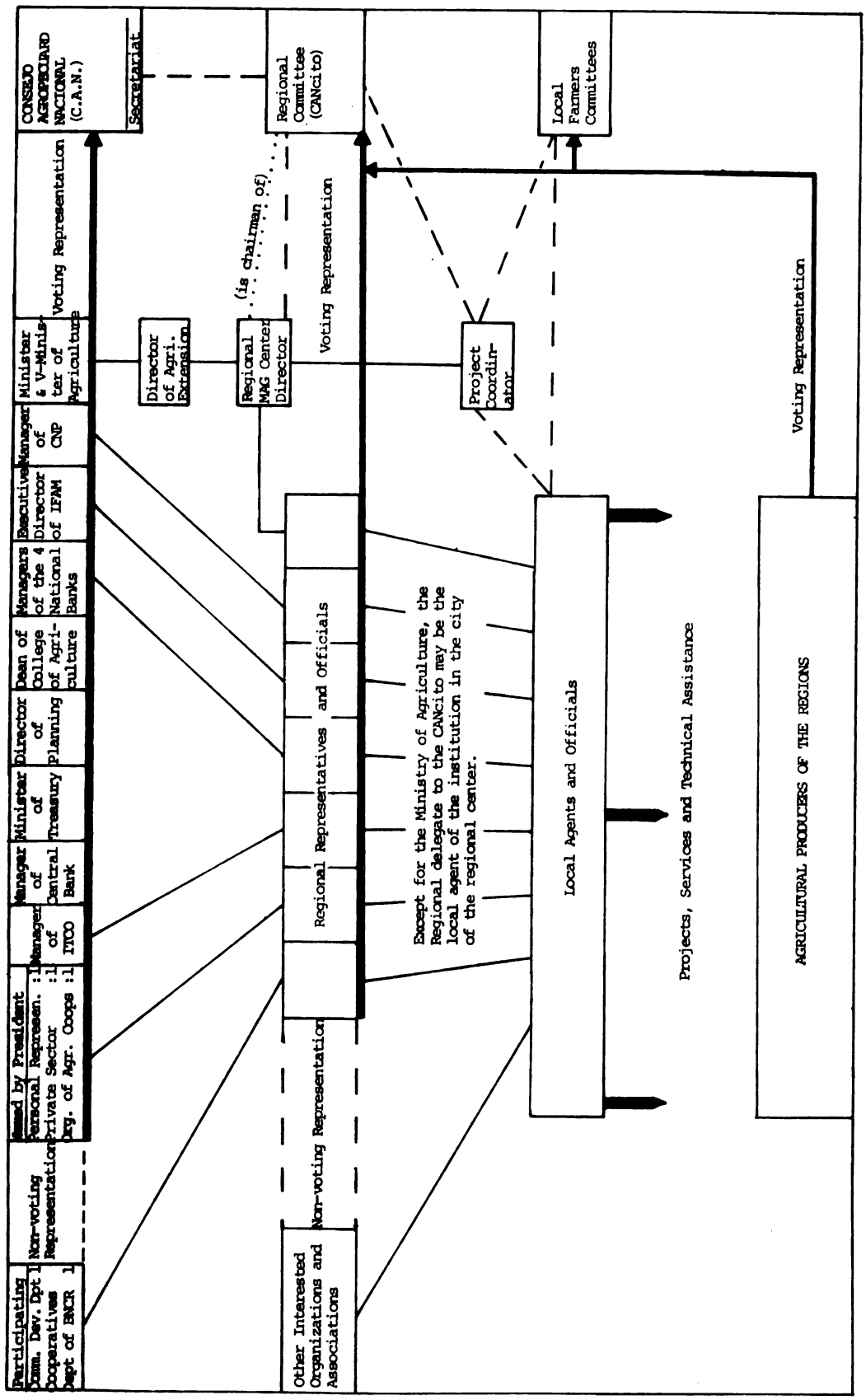


Figure 1. Schematic Representation of National and Regional Coordination Arrangement, Costa Rica.

level. The Consejo National de Produccion (CNP) (a semi-autonomous marketing agency with various additional functions) has only national and local offices. The four nationalized banks have similar structures, with the branch offices reporting directly to the national office. Although the CNP and the banks generally have local offices in the same towns as the regional offices of MAG, they often have additional offices within the same region. Thus, the local officials in the town of the regional office of MAG often become the representatives of these institutions on the CANcitos even though the sphere of interest and influence of these offices do not coincide with the other offices that may exist in the same region. For example, if the office of a bank in the town of the regional office indicates support for a given project, and the bank office in the town of the project refuses to participate, the project may be doomed to failure.

Since it is the MAG Regional Office that formulates project proposals and not generally the CNP or the banks, the CANcitos become essentially a formalized meeting in which to present the project proposals to the other institutions and to gain a promise of cooperation and assistance. Since the CNP and the banks have limited authority at the regional level, they are not necessarily capable of providing the requested cooperation even though their representative may be in favor of the project and may have given his approval to the project in the CANcito meeting.

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The La Fortuna Mechanized Corn Project is one of the projects that came about through this system of coordination. The idea for the project apparently came from the Regional Office of the MAG and was, also apparently, approved by the CANcito. MAG and CNP were responsible for the project implementation and the financing was arranged through the Banco Anglocostarricense (BAC) even though the BAC did not have a branch office in the region. The BAC opened an office to be staffed by agronomists to receive applications and payments, but the loans were funneled through the branch office in Alajuela (ninety minute drive by car).

The La Fortuna Project Plan

The description of the project plan contained in this section is taken from the document produced by the Regional Center for San Carlos-Sarapiqui of the Ministry of Agriculture, entitled "Corn Mechanization Project in La Fortuna, San Carlos, Second Half of 1971,"[3] hereinafter referred to as the Project Plan Document.

The Goals and Objectives

The general goals of the project are:

1. Increase the production of corn with a view of contributing toward the fulfillment of the national

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[3]Ministry of Agriculture, Proyecto do Mecanizacion de Maiz en La Fortuna, San Carlos, Segundo Semestre de 1971. (Mimeo) September 22, 1971.

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2. elevate the incomes of the small farmer and thus the level of living of his family.

These goals are quantified by the following objectives:

1. Cultivate an area of 600 manzanas (1,044 acres) for the second crop of 1971 with a total production of 36,000 quintales (36,000 cwt.) (An average of 60 qq./mz. or 61.58 bushels per acre.)
2. Increase the yields from 20 qq./mz. to 60 qq./mz. (24.63 bu/acre to 61.58 bu/acre.)
3. Involve 69 small farmers whose average (total) farm size is 20 to 30 manzanas (34.8 to 52.2 acres).
4. Establish an organization of farmers in the area.
5. Introduce mechanization into the area, possibly even mechanized harvesting.

The document stated that

> ". . .the success of the project will be based on (the two conditions of) the receptivity of the farmer to the technological changes in the crop and the services that the institutions involved should provide in a coordinated and opportune manner."[4]

The Project Area

The project was carried out in an area approximately nine kilometers square in which are located the settlements

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[4]MAG, op. cit., p. iv.

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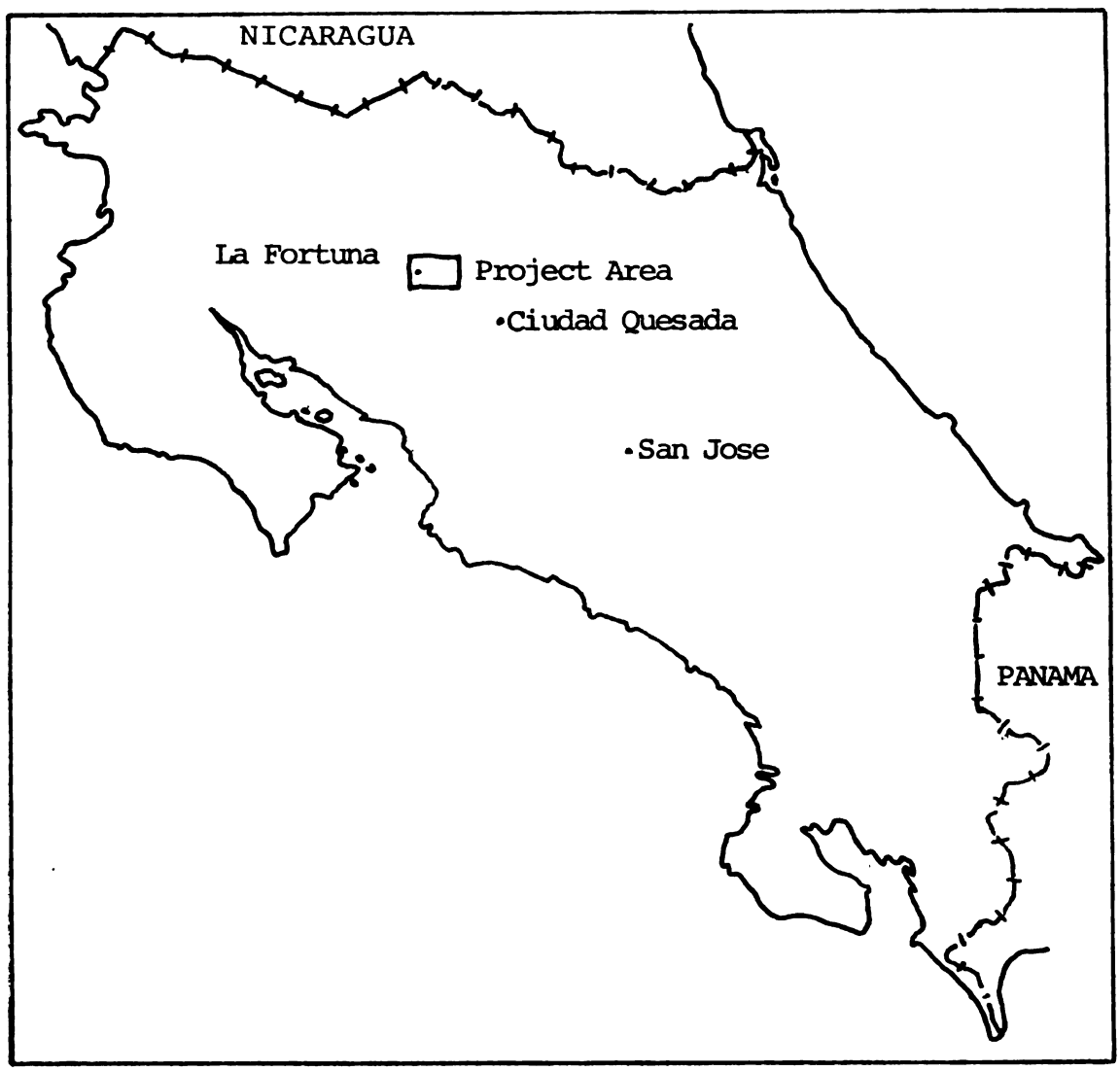
of Los Angeles, San Jorge, El Tanque, San Isidro and San Josecito. (See Figures 2,3, and 4) the all-weather road from Ciudad Quesada to La Fortuna passes through Los Angeles and El Tanque and extremely poor roads go from Los Angeles into San Isidro and from El Tanque into San Jorge and San Josecito. Bus transportation from Ciudad Quesada to La Fortuna does not leave the all-weather road so that persons living in from the road must either walk, ride a horse or hitch a ride with an occasional truck or tractor. For those living in San Josecito, that means 8 kilometers (5 miles). The trip from San Jose to Ciudad Quesada requires two hours by private car (slightly longer by express bus) and from Ciudad Quesada to El Tanque requires another two hours by jeep. From El Tanque to San Josecito requires 45 minutes by jeep. Electricity is not available in the project area except for the few individuals that have gasoline-powered generators. Mail and telegraph service is available at Los Angeles (also serves San Isidro), El Tanque (also serves San Jorge) and Boca de Arenal (serves San Josecito and is about 7 kilometers away).

The project area is at an altitude of 75 to 100 meters (246-328 feet) above sea level (not at 300 meters as the project plan document states). The land is reported to be firm and without stones and is relatively flat except for gullies of varying size, thus making feasible the use of machinery. Rainfall occurs throughout the year, diminishing



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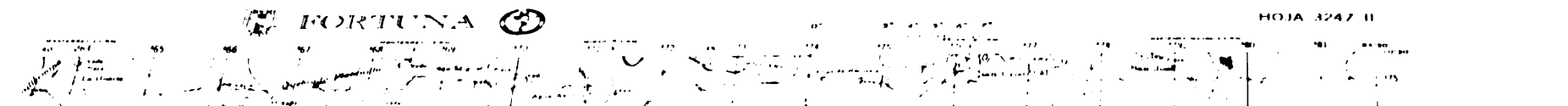
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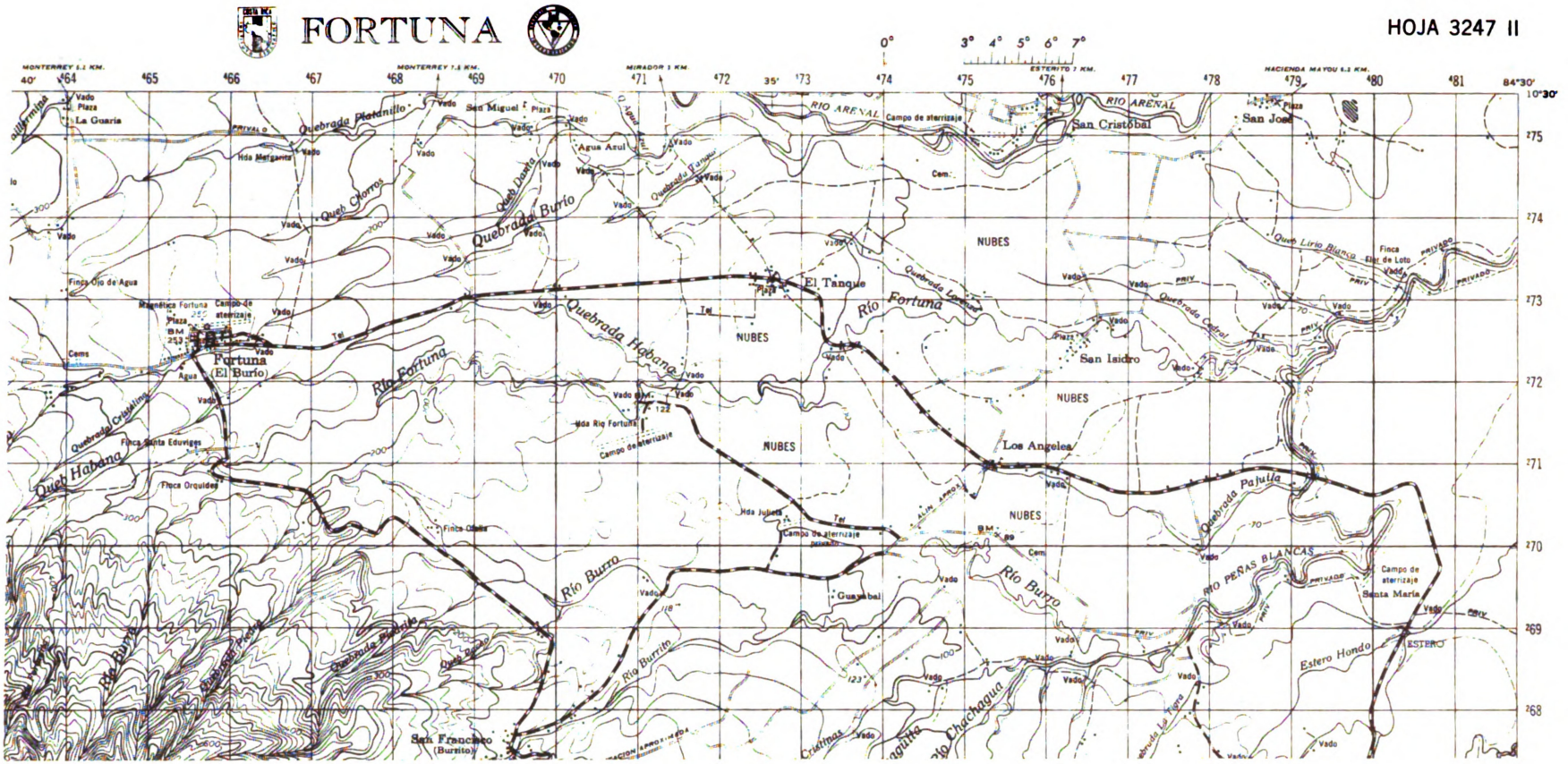

Figure 3. Project Area

o = Participant Interviewed

c = Non-Participant Interviewed

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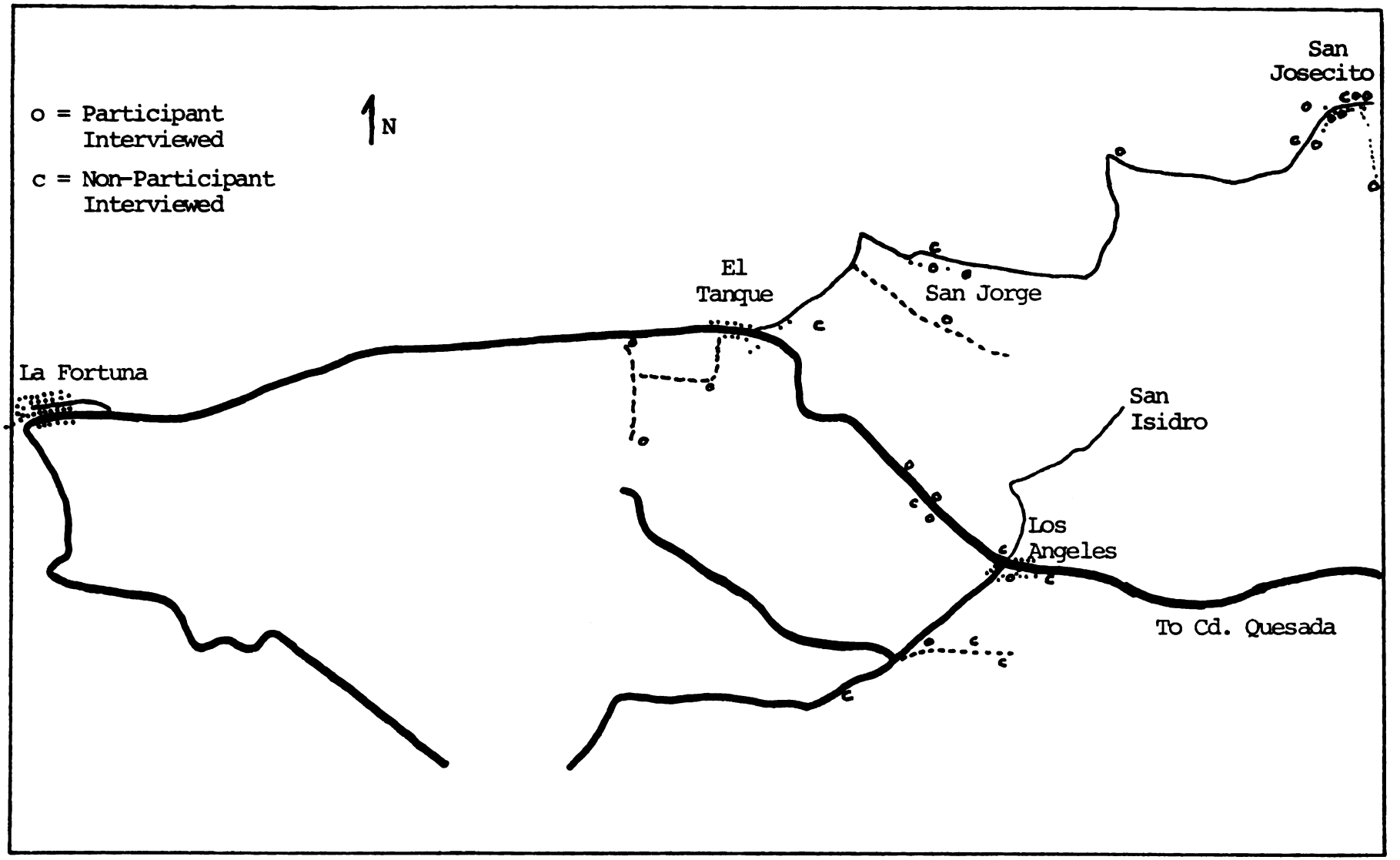

Figure 4. Distribution of interviews.

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during the months of February through April. Precipitation has been estimated at 3,000 to 3,500 mm. per year (118" to 137" per year) with 212 days of rain. The average temperature is 26°C (78.8°F). The soils are aluvial with a loam texture, deep, dark brown in color, and with a pH of 6.2 to 6.6. The subsoil is very permeable with excellent drainage.

The population of the project area was reported to be composed of small farms ranging from 10 to 50 manzanas (17-87 acres), generally raising cattle, corn and other crops such as plantains, bananas and yucca. The existence of large cattle ranches and banana operations was not mentioned in the project plan document. The current cultivation methods for corn were described as being "antiquated" but adapted to the conditions of uncleared lands. Fertilizers, herbicides and insecticides are not generally used. These factors, as suggested by the document, result in yields of 20 qq/mz (20.53 bu/acre). Trials performed by the Regional Office technicians have shown that one local nonhybrid variety is superior when used with applications of nitrogen and phosphorus.

CHAPTER II

FRAMEWORK OF ANALYSIS

The Questions

An ex-post project analysis should determine the extent to which the project achieved the objectives for which it was executed. In addition to answering that basic question, the analysis should also attempt to determine what else the project did and how it all happened. Before restating these questions, certain terms require definition so as to avoid confusion.

A goal is a desired state of affairs described by words and it represents a subjective value. An objective represents a measurable condition that can be considered as progress towards the achievement of the stated goals. An objective must be expressed in terms of a quantifiable target measure and may also be expressed with words. More than one objective may be required to adequately describe progress towards a goal. The outputs of the project are the changes in the target measures that are due to the execution of the project and the changes in the social, physical and economic conditions due to the execution of the project. The inputs to the project are those activities or physical objects which, through interaction with the "task environment" (other conditions of the state of affairs), influence the outputs of the project.

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In Chapter III,

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Depending on the definition or delineation of the system (project) under consideration, physical objects and activities are consequently defined as being either inputs or outputs. For example, the activities of the local extension agents are inputs into the project "system" but they are simultaneously outputs of the Extension Service "system."

The questions to be answered in an analysis may now be restated in a more specific form:

1. Are the stated goals appropriately represented in the form of quantifiable objectives?
2. Do the selected target measures properly correspond to the intent of the statement of objectives?
3. Did the project result in the achievement of the objectives, as quantified by the target measures?
4. What other changes in the state of affairs and the task environment resulted from the execution of the project?
5. Did the variables considered as inputs: a) include all those that did influence the result and b) exclude those that had no influence on the results (even though they may be correlated with the results)?
6. How did the interaction among the input variables and the task environment produce the outputs?

The first three of these questions will be considered in Chapter III, "The Goals and the Objectives." Chapter IV, "Other Project Impacts" reports some of the other changes

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that occurred in the state of affairs and the task environment (question 4). Questions 5 and 6 are difficult to consider completely, especially with limited information, but an attempt is made in Chapter V, "Factors in the Project Results."

Notes on Project Analysis

The manner in which an analysis is organized and written has an important effect on the way the readers of the analysis are likely to interpret it. First, an analysis that does not ask all of the relevant questions, as suggested above, is directly misleading. If the reader is not asked to evaluate seriously the relationship between objectives and goals or to verify that the target measures are valid measures of the objectives, a project that results in achievement of the desired target measures may be continued or even expanded in spite of the fact that it had little or no effect on the goals themselves. Secondly, an analysis that does explicitly evaluate all of the pertinent questions, but emphasizes some and considers the others in one small paragraph may mislead an unsuspecting or uncautious reader. A similar result occurs when some of the pertinent questions are lightly touched upon in the body of the report, but are not mentioned in the summary (especially when it is known that many decision makers will read only the summary). It is in this spirit of being explicit that the present analysis is written.

Some of the questions cannot be answered with the data presently available. Detailed agronomic studies would be

required to show conclusively that the recommended fertilizers and insecticides would have produced the projected corn yields under the conditions of the project area. Properly operated control plots could have indicated what the effect of the drought had on the corn yields. It may have been impossible to measure the effect on yields of the delays in planting caused by the delays in tree clearance and plowing operations. These shortcomings in data will be pointed out in the rest of the paper.

In spite of the missing data, it does seem worth the effort to utilize the data and other information that is available for three reasons. First, if complete information were to be required for all analyses, there would be few analyses ever completed. Secondly, an evaluation of the La Fortuna project is unlikely to be carried out otherwise. Thirdly, it provides an opportunity to raise and illustrate additional aspects of a project of this type which the development planners and project implementers may not have considered in the past nor are likely to consider in the future. These last two reasons are poignantly illustrated by the normal operating procedures of the Regional Center in Ciudad Quesada. A new project arises periodically, gets added to the hopper of ongoing projects, and the old projects quietly fall to the side and get forgotten. Projects seem to have a short life and like "old soldiers", they fade away--a death would require a burial (evaluation).

CHAPTER III

THE GOALS AND THE OBJECTIVES

The Goals

The goals given in the project document were:

1. supplying, in part, the national needs for corn, and
2. increasing the farmers' incomes, and thus their levels of living.

Although it was not explicitly stated in the project document, the tone of the document and the information on the distribution of areas planted to corn in Costa Rica implied that the first goal was really that of increasing the part of national needs that the San Carlos region provides. The second goal, if restated in accordance with the terminology noted in the Framework of Analysis, would be: "increasing the farmers' levels of living." The reference to increasing farmers' incomes is more properly an objective. Since goals are statements of values held, they cannot be "wrong." The analyst can only accept them. Individuals can, however, state their beliefs as to their appropriateness or state that, in their opinion, the goals should have been different.

The Objectives

The objectives and target measures of this project were stated in a manner that could better be described as being

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projections. The implicit objective was the (increased) production of corn and its disposition; to be achieved through increased mechanization, extension and improved marketing facilities. The statement of the objectives implied that 600 manzanas would, in fact, be planted and that 36,000 quintales would, in fact, be harvested under the project. By stating the objectives in this manner, the Ministry of Agriculture runs the risk of fooling itself and the country as a whole. The fact that little formal or serious analysis or evaluation occurs is the reason that they are able to do it, but the danger is that the government may be led to continue to spend its resources and perhaps even borrowed resources for projects of little value. This might seem to be a question of little importance, but had the objectives been stated as objectives and not as projections, at least the question of evaluation of results would be asked by more persons.

Perhaps a more subtle reason for more explicitly dealing in objectives instead of projections is the effect that it would have on the personnel of the institutions involved. If the individuals involved see the numbers as targets they might be more likely to strive to achieve them. For example, each agent is expected to make a certain number of farm visits each week or month. He normally sees this number as a target and realizes that an explicit comparison of his efforts is likely to be made against such

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a target number. However, if the number of manzanas to be planted in the project is not considered as a target, he will realize that an explicit comparison of his results with the projected number is less likely to be made.

The objectives (projections) for 1971, as stated in the project document were:

1. The cultivation of 600 manzanas of corn.
2. The increase of corn yields from 24 quintales to 60 quintales per manzana.
3. (By combining the first two) The production of 1.83 percent of the estimated corn needs of the country.[5]
4. Increase the incomes of the small farmers (implied).
5. Involve 69 small farmers.
6. Establish an organization of small farmers in the zone.
7. Introduce mechanization into the zone.

The Relation Between the Goals and the Objective

The third objective does represent the goal of increasing the part of the national needs for corn that is supplied by the San Carlos region.

The goal of increasing the farmers' levels of living through the achievement of the objectives is likely as long as several conditions hold. If 600 manzanas are brought into cultivation of corn that were either previously unused

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[5]Project plan document cited Econometrica, Ltda., "Granos Basicos en Centioameuca," San Jose, c.r., 1970, (mimeo) as the source of the estimated national need of 1,962,240 quintales.

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or taken out of a use that produced less net income than would be obtained in corn (whether the yields increased or not), then the farmers' incomes would be increased. If increasing the yields, whether on land previously used or not, resulted in an increase of receipts greater than an increase in costs, then the farmers' incomes would be increased. If the establishment of a farmers organization in the area assists the farmers in learning the proper utilization of the package of new technology, losses due to the misuse of the new technologies may be prevented. And, if the introduction of mechanization increases productivity and thus receipts to a greater extent than it increases costs (if at all), then farmers incomes would be increased. If, as may well be the case, the introduction of mechanization results in fewer opportunities for hired laborers, then these laborers may not be able, at some point in time, to begin or to expand a farming operation of their own. This effect is a matter which concerns the distribution of benefits as between small farmers and is not necessarily in conflict with the goals. However, if a decrease in the supply of labor were to be a later consequence, then the larger farmers may be induced into increasing their use of mechanization, thus diminishing even further the opportunities for hired labor. In this case, the question of distribution of project benefits is between small farmers and the larger farmers and is in conflict with

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the second goal; although a determination of the effect of the project itself would probably show only a slight effect.

The objective of involving 69 small farmers is by definition congruent with the goals of the project, as long as the other conditions hold and as long as no larger farmers are included in the project. If some larger farmers are served by the project, the goal of increasing the incomes of the small farmers may be achieved to a lesser extent--to the extent that the serving of larger farmers decreases the number of small farmers that can be served and/or the effectiveness of service to the small farmers.

The Achievement of the Objectives

Supplying an Increasing Part of the National Needs

The project plan document accepted the projections of national needs of corn made by Econometrica, Ltda.,[6] as shown in Table 1, along with the projections of area and yield for the project.

It should be noted that the data that follow refer to corn produced under the auspices of the project and do not indicate that this production, or any increase thereof, is due to the project.

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[6]Econometrica, Ltda., Granos Basicos en Centroamerica (San José, Costa Rica; mimeo, 1970), p. 140.

Table 1.

Year	Area Under Proje	
	--Mz	
1971	60	
1972	1,00	
1973	1,60	

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Table 1. Projected Area and Yields for La Fortuna Project and Projected National Needs for Corn.

Year	Area Under Project[a]	Yields Per Mz.[a]	Project Total Production	Projected National Needs	Project As Percent of Needs
	--Mzs---	--------Quintales----------			-----%-----
1971	600	660	36,000	1,962,240	1.83
1972	1,000	60	60,000	2,047,360	2.93
1973	1,600	80	128,000	2,136,960	5.99

[a]No explanation is given for projecting 1,000 mzs in 1972 and 1,600 mzs at 80 qq/mz in 1973. No indication is given as to whether or not these figures include two crops per year. Since the project was to begin with the second crop of 1971, the 1971 figures can only be for one crop in that year.

Estimates of Corn Yields

For both the MSU and the MAGPIE studies, averages can be computed by two methods. Method 1 computes the average yield for the total number of manzanas:

$$\text{Method 1:} \quad \frac{\text{Total Production Reported}}{\text{Total Manzanas Reported}}$$

Method 2 computes the average of reported farm yields:

$$\text{Method 2:} \quad \frac{\text{Sum of } \frac{\text{Farm Production}}{\text{Farm Mzs in Corn}}}{\text{Number of Farms}}$$

The IICA study does not indicate the method used for computing average yields and thus it will be assumed that they computed the yield of the average farmer (Method 2) since their use of the data is for making comparisons between farmers by location. The estimates of average yield by method and by

source of data are given in Table 2. Since the estimation of total production under the project is the current objective, the sample average yield (Method 1) will be utilized here.

Table 2. Average Yields Estimated in La Fortuna

Study	Method 1 Sample Average Yield	Method 2 Yield of Average Farmer[a]
MSU	17.25 qq./mz.	20.68 qq./mz.
MAGPIE	16.84 qq./mz.	21.35 qq./mz.
IICA	No Data	23.3 qq./mz.

[a]The fact that Method 2 results in higher average yields is due to the fact that, in general, the larger size of the corn plot, the smaller the yield per manzana, in the case of this project.

Estimates of Area Planted

The Regional Center in Ciudad Quesada provided to this author a list of project participants and the number of manzanas that each participant was cultivating under the project. That list contains 48 names with a total of 381.5 manzanas. However, by comparing the areas reported by each farmer to the MSU and the MAGPIE studies with the area that the MAG list indicated for that farmer, the 381.5 mz. total can be adjusted downward. This variation may be due to the farmers' decision to plant an amount that is different from the amount he signed up to plant or to the abandonment of

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Table 3.

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areas in which the corn did not develop properly. By taking the high estimate of 381.5 mzs. and the low estimate of 350.2 mzs. along with the high estimate of 17.25 quintales per manzana and the low estimate of 16.84 quintales per manzana, a range of figures for total production is estimated. The highest estimate of total production is 6,581 quintales and is equivalent to 0.336 percent of the projected national need and the lowest estimate of 5,897 quintales is 0.301 percent of the projected national need. Based on these estimates, it can now be stated that the project did not meet its stated objective (projection) of 1.83 percent of national needs for 1971.[7] Neither the objective of 600 manzanas nor the objective of raising yields to 60 quintales per manzana were achieved.

Table 3. Adjusted Estimates of Area Planted

Study	No. of Farmers	Reported in Survey	Areas Listed for Farmers in Surveys	Reported as Percent of Listed	Adjusted Estimate of Total Area
MAGPIE	28	212.5 mzs.	218.0 mzs.	97.5	372.0 mzs.
MSU	20	201.0 mzs.	219.0 mzs.	91.8	350.2 mzs.

[7]Table 1 is incorrect since the corn produced under the project in the last half of 1971 would not be harvested until early 1972, and therefore could not have been available to meet 1971 needs. Since the basis on which the La Fortuna projections were made is not known, this error is just noted and not corrected. However, a correction of the project plan document would only make the project appear in a worse light.

Table 4.

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Table 4. Estimates of Total Production

Yield Estimates	Area Estimates	
	High (381.5 mzs.)	Low (350.2 mzs.)
High (17.25)	6,581 qq.	6,041 qq.
Low (16.84)	6,424 qq.	5,897 qq.

The data available were insufficient to give any indication of what the areas planted or the yields would have been without the project. One might suspect, however, that areas planted to corn may have increased slightly due to the operations in clearing land of trees and stumps, but it is also quite possible that these newly cleared lands might now be planted to some other crop that would yield the farmer higher incomes.

Increasing the Incomes of Small Farmers

The data available are insufficient to give any conclusive proof that farmers' incomes were increased or decreased as a result of the project. However, the data do suggest that the farmers' incomes may well have been diminished by the project, at least in the short run. The MAGPIE study of 28 of the 48 participants, although not a random sample, indicated that each manzana, on the average, produced a loss of ¢ 320.01 ($37.21) on a cash plus noncash basis.[8] Of that amount, cash losses were ¢185.75 ($21.60)

[8]Noncash items include family labor, imputed rent, corn retained for farm or family use, etc. Cash items include all of the "out of pocket" costs and the corn sold to a second party.

and noncash losses per manzana were ¢ 134.26 ($15.61). On a per participant basis, total cash plus noncash losses averaged ¢ 2,428.64 ($282.40). Average cash losses per farmer were ¢ 1,409.69 ($163.92) and average noncash losses per farmer were ¢ 1,018.95 ($118.95).

Only three of the 28 farmers reported a profit on a cash plus noncash basis, while only 12 of the 28 reported a profit on a cash-only basis.

Continuing Farmer Participation

Although a lack of continuing farmer participation in the organized project is not a completely reliable measure because the farmers may continue to cultivate increased areas of corn or use improved methods in their cultivation, the lack of continuing farmer participation would indicate a dissatisfaction with the results of using the improved methods under the auspices of the project. For La Fortuna the evidence is fairly clear. Of the 48 farmers in the first crop season of the project, only 11 participated in the second season's project, no additional farmers entered the project at this time, and a Ministry employee reported that these 11 had indicated their intentions of not continuing in the project.

CHAPTER IV

OTHER PROJECT IMPACTS

Evaluation of Side Effects

The previous chapter considered the extent to which the objectives of the project were or were not achieved. Such an evaluation is incomplete by itself. By their very nature, economic and social development projects have "side-effects" or "impacts" which do not get listed among the objectives. The fact that complex interrelationships exist within a society means that a process of adjustment occurs when some aspect or aspects of society undergo a change. Arensberg and Niehoff state that,

> "Every cultural system is a functional whole. . . Customs are interwoven so that an economic or technical practice is related to religious beliefs, social structure, and general values of the functioning system. A change may disrupt a related practice and if the disruption is enough, it. . .the change. . .might be rejected."[9]

The people promoting specific changes are too often blinded by narrow preoccupation with the tasks at hand to be aware of these related effects and of their importance. It is

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[9]Arensberg, Conrad M. and Arthur H. Niehoff, Introducing Social Change, 2nd Edition, (Chicago: Aldine-Atherton) 1971, p. 134.

logical that the better is one's ability to predict all of the impacts of a change, the better will be one's ability to guide the societal state of affairs toward one's goal; the fewer will be the wrong turns due to unexpected interactions. The potential importance of such "side-effects" or interactions should not be underestimated; they can affect both current and future efforts of planned change.

Economists have written large amounts of literature about project side-effects or impacts, especially as they relate to decisions concerning public programs and projects. Much of this literature is on Benefit-Cost Analysis and deals with the problems of measuring these side-effects once they have been identified. The concepts of consumers' surplus and producers' surplus are prominent among the methods of measurement.[10] However, when it comes to small development projects, attempts at measuring the side-effects will be of questionable value and accuracy. Also, the application of the measuring techniques will generally be beyond the abilities of the field level or regional officials

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[10]See, for example, McKean, Roland M., Efficiency in Government Through Systems Analysis, (New York: John Wiley and Sons) 1958, Mishan, E. J., Cost-Benefit Analysis: An Introduction, (New York: Praeger) 1971, and also by Mishan, Economics for Social Decisions: Elements of Cost-Benefit Analysis, (New York: Praeger) 1973, and Bromley, Daniel W., A. Alan Schmid and William B. Lord, Public Water Resource Project Planning and Evaluation: Impacts, Incidence and Institutions, (Madision, Wis.: Center for Resource Policy Studies and Programs, School of Natural Resources, College of Agriculture and Life Sciences, the University of Wisconsin) 1971.

and would require inordinate amounts of the officials' time given the relative size and number of the small projects. Although the use of the measurement concepts is not recommended, the program administrators could improve their planning, implementation and evaluative tasks through the understanding of the concepts of externalities and implicit pricing.

Externalities

In a broad sense, any project effect may be seen as a product or good--including changes in societal relationships and economic or social practices. Although not normally traded, such changes in cultural practices may be considered by some as an imposed "cost" and by others as a "benefit." If an effect occurs for which compensation by a market process (whether monetary or otherwise) is <u>not</u> made, it is termed an "externality." An effect is not an externality if it is completely internal to the decision-making unit (firm or individual). If an effect is not internal but compensation is made with the other decision-making units, the effect is said to have been "internalized." The classification of an effect as being an externality or not is thus clearly dependent upon the division that exists among the decision-making units. In the case of the La Fortuna project, most of the effects would be externalities since the MAG, CNP, BAC and each farmer are individual decision-making units and since few effects were traded in a market

process. As Schmid points out, the classification of an effect as an externality does not describe the character of the effect, rather it describes the existence of a market for that effect in which trading could occur.[11]

Implicit Pricing

The underlying concern is to in some way be able to take into account in the decision-making process the many and varied effects that an action or a project produces. The "internalized" effects are by definition already accounted for through internal or market processes. It is the external effects which provide the difficulties. Although the cultural side-effects and many of the economic side-effects of development projects are neither traded nor given prices in a market process, relative prices of the various side-effects are implicitly established by the decision to carry out the project in a certain way. The choice of a project or the choice among alternative methods of implementation is based, at least in part, on the expected effects of each alternative and the trade-offs that must therefore be made. The choice itself therefore established some set of implicit prices that satisfies the values on which the choice was made. These are not money prices. Rather they are in terms of the

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[11]Schmid, A. Alan, "Non-Market Values and Efficiency of Public Investments in Water Resources," American Economic Review, May 1967, p. 162.

other project effects or products that constituted the alternatives. Although the determination of these prices in terms of a monetary unit is not being suggested here, it is important that this concept be understood by the development administrators.

A major concern of this thesis is improving the decision-making processes of the development agencies through an improved ability of the decision-making units to, first, be aware of the many effects or products of their decisions, and second, to be more consistent in their establishment of implicit prices of these "goods" from project to project. Improved consistency of pricing does not have any intrinsic value or importance--it acquires importance because it is a measure of the adherence to the values of the decision-making units by these units. Assuming that the values of the government agencies are the bases upon which their decisions are made, and assuming further that those values do not undergo large and significant changes between every project decision, then the relative prices of project effects should not vary significantly between projects due to the decisions of the agency, unless their value systems also change. Assuming that the agency official desires to adhere to his values or those of his agency in a consistent manner, then a framework for the description of side-effects that aids the official in evaluating the meaning of the side-effects should be useful to him.

Keeping in mind that the agency official cannot spend large amounts of time documenting small-project side-effects or determining precise cause-effect relationships, the analytical framework must be kept simple, but descriptive. The framework proposed here is a series of steps which may be followed by the official either rigorously--in a written form--or loosely--by just thinking through it in his mind. Either way, if the agency official gains an understanding of the meaning of each side-effect as it interacts with the other aspects of society, he should be better able to adhere to his value system when he makes decisions in the future.

A Side-Effect Evaluation Framework

1. Identify and Describe the side-effect.
2. Determine the Incidence of the effect. Who does it affect?
3. For each person or group listed in Step 2, estimate the potential duration of the effect. Is it a short run or a long run effect?
4. For each person or group listed in Step 2, judge whether it is a good or a bad effect and also judge how good or bad it is a) taken by itself, and b) taken in conjunction with the other effects.
5. Determine what aspect of the project, in conjunction with the social and economic context of the society, could have caused the effect.
6. (For the purpose of evaluating the agency planning ability) was this effect anticipated or was it a surprise to the agency?

Several examples of side-effects are discussed in the following sections and in Chapter V. Except for the section on Special Opportunities, the analysis presented goes beyond the framework presented above, since there are more data available.

Technology Adoption and Reversion

The La Fortuna Project promoted the use of a "package" of newer technologies which included the use of mechanization, fertilizers, insecticides and herbicides. The use of these technologies was required in the sense that the farmers could not continue to participate in the project if they did not comply with the recommendations made by the MAG personnel. This section presents the data that show the levels of technology that the farmers were using before, during and after the project. The side-effect under consideration is the net adoption of these technologies by the farmers.

Use of Mechanization in Land Preparation and Planting

Most of the land cultivated under the project had not been cleared completely and therefore was previously unsuitable for tractor plowing, disking and planting. As a part of the project, the CNP provided a land clearing service to the participants at a cost of ₡200 ($23.26) per manzana. Financing for this service was arranged separately from the corn expenses loans, but with the same bank. The term of this loan was four years, with repayment at the rate of ₡25 per crop (two crops per year).

The plowing, disking and planting operations were to be contracted locally by each farmer. Payment was to be made with the proceeds of the short-term corn crop loan.

Five basic combinations of methods of land preparation and planting were found in the La Fortuna area. These methods

are ranked as follows, in ascending order of labor intensity:

1. Broadcast seeding followed by hand weeding by machete. (Voleo)
2. Hand weeding followed by planting with a metal-tipped stick. (Espeque)
3. Oxen plowing followed by planting with a metal-tipped stick.
4. Tractor plowing and disking followed by hand planting.
5. Tractor plowing, disking and planting (which includes the first of two or three applications of fertilizer).

The methods normally used prior to the project were the first two since the others are not feasible in uncleared lands.

Of the 48 participants in the first project (1971 second crop) (designated 1971-2) a random sample of 20 farmers were interviewed. An attempt was made to find out what methods each had used for at least three crop seasons, i.e., the crop preceeding the project (1971-1), the project (1971-2) and the crop following the project (1972-1). It was not possible to obtain such information on all three crops for all 20 farmers due to: 1) the farmer may not have planted in each crop season, 2) he could not remember the specifics of one or more of the crop seasons, or 3) the circumstances of the interview led to a decision to not pursue completely all questions in order to obtain more accurate or more detailed responses to other questions. Therefore, in measuring the adoption of increased mechanization between crops 1971-1 and 1971-2 only 10 of the 20 responses were usable. In

measuring the reversion to lower levels of technology between crops 1971-2 and 1972-1 only 12 of 15 responses were usable. In measuring net adoption between crops 1971-1 and 1972-1 only 5 of 15 responses were usable. The last two categories were limited to 15 farmers because five of the 20 (#16-20) had continued in the project for the 1972-1 crop. Table 5 indicates the changes in use of mechanization.

Table 5. Changes in Land Preparation and Planting Technology Levels

Adoption	1971-1 to 1971-2	(10 of 20 responses usable)
7 (70%)	changed from level 2 to level 5	
1 (10%)	changed from level 2 to level 4	
2 (20%)	changed from level 1 to level 5	
Reversion	1971-2 to 1972-1	(12 of 15 responses usable)
10 (83%)	reverted from level 5 to level 4	
1 (8%)	reverted from level 5 to level 3	
1 (8%)	remained at level 4	
Net Adoption	1971-1 to 1972-1	(5 of 15 responses usable)
3 (60%)	changed from level 2 to level 4	
2 (40%)	changed from level 1 to level 4	

These changes are perhaps more easily seen by glancing at Table 6 (page 40) which presents the raw data.

The effect of the project is striking; the farmers complied with the requirements of the project, but once free from these requirements they reverted to a lower level of technology which was about the level they previously used. Care should be taken at this point, however, to note that no information is available to indicate whether these farmers

will continue to use tractors for plowing and disking or not. What can be said, however, is that they apparently adjusted their farming operations as they saw fit once they were no longer participating.

Table 6. La Fortuna Land Preparation Technology Levels

Farmer	Crop Season		
	1971-1	1971-2	1972-1
1	2	5	4
2	-[a]	5	4
3	2	4	4
4	-	5	4
5	-	5	4
6	-	5	4
7	2	5	4
8	-	5	4
9	-	5	3
10	1	5	4
11	1	5	4
12	-	5	4
13	-	5	-
14	2	5	-
15	-	4	-
16	2	5	5[b]
17	2	5	5
18	2	5	5
19	-	-	5
20	2	5	5

[a] Dashes indicate no Response, Did not Remember or Did not Plant.

[b] #16-20 continued in project for crop season 1972-1.

From conversations with the farmers, it would seem that the use of tractors for cultivating corn was generally not previously possible due to the uncleared lands and the low supply of tractor services. Once these lands were cleared as a result of the project, several individuals purchased additional tractors and provided the service for which the demand had been created by the project.[12] After the project, the increased availability of tractor services remained and they voluntarily continued the use of them. Although there are several possible reasons for the discontinued use of mechanical planting, the most significant one is probably the poor performance experienced by the farmers during the project. It was reported that the planter was not planting all of the seeds (nor all of the fertilizer). Mechanized planting appeared to be economically competitive with the hand planting methods although there was a wide variability in the reported costs of the two methods.

The adoption of mechanized land preparation and planting does not appear to have been common in the area, although a few of the nonparticipants interviewed did adopt the use of mechanization. Ten nonparticipants were interviewed and of that number, one did not respond for the project crop season (1971-2). Of the remaining nine, one used level 5, one used level 4, four used level 2 and two used level 1. In the

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[12]See also Section D of this chapter, "Special Opportunities."

following crop season, the ones using level 4 and 5 reverted to level 2 and two of those using level 2 adopted level 4. The low adoption rate by the nonparticipants may be seen in Table 7.

Table 7. Land Preparation Technology Levels of Nonparticipants, La Fortuna

Farmer	Crop Season		
	1971-1	1971-2	1972-1
26	2	5	2
27	-[a]	1	-
28	-	4	2
29	1	2	4
30	-	-	2
31	-	2	2
32	-	2	2
33	-	2	4
34	-	1	1
35	-	3	3

[a]Dashes indicate No response, Did not remember, or Did not plant.

By comparing Table 6 with Table 7, it appears that the project had a definite effect on the use of mechanization by the participating farmers and that the increased use of mechanization was probably not due to other influences. Since four of the farmers tried the higher levels of mechanization, it may be that a "demonstration effect" also occurred.

Although the introduction of mechanization was listed as a minor goal of the project, it may be analyzed or

evaluated using the Side-Effect Evaluation Framework set forth in Section A of this Chapter. The effect is the increased use of mechanization by farmers. The participating farmers were the group primarily affected, although some of the nonparticipants also adopted the use of mechanization. The use of mechanized planters was of a short run duration although the use of mechanized plowing and disking may be a longer run phenomenon. No indication is available for the probable duration of the effect on the nonparticipants. The increased use of mechanization is probably a good effect, although it may have the consequence of decreased opportunities for hired labor in the longer run. The use of higher levels of mechanization was due to its promotion by the project organizers. Since this effect was promoted by the project organizers, it may be assumed that the effect was anticipated by them, although the reversion to an intermediate level of technology may not have been anticipated.

Fertilizer Use

A second effect of the La Fortuna project was the use of chemical fertilizers by the farmers. The general recommendation of the Ministry of Agriculture was the application of 5.5 quintales per manzana (316 lbs/acre). This included 3 quintales of 18-18-5-2 (N-P-K-Mg) at planting time and 2.5 quintales of 18-18-5-2 30 days later. The Ministry of Agriculture had the responsibility of supplying the farmers with the necessary inputs and instead

of supplying 18-18-5-2, they sent to the farmers five other formulas which were applied with a large variation in amounts and formulas applied on each application. This problem, when added to the difficulties that the farmers had in remembering the details of formulas that they applied make it difficult to use the data obtained. For these reasons, the data for each farmer were summarized to show the total amount in quintales per manzana that each farmer applied in each of the three crop seasons. This summary was then categorized on the following basis. If a total application of more than 5 quintales per manzana was applied it was designated a full application. If some fertilizer was applied, but an amount less than 5 quintales per manzana, it was designated as a partial application. If no fertilizer was applied the designation none is used. This constitutes the Adoption Measure. The Adoption Measure compares fertilizer use in 1971-2 with 1971-1.

A measure of reversion between crop seasons 1971-2 and 1972-1 uses the same terms but refers to the change in levels of fertilizer use. Thus, if a farmer applied a full amount in 1971-2 and only a partial amount in 1972-1, his measure of reversion is partial. The resulting combinations of the Adoption and the Reversion measures are then ranked on a scale of 1 to 6, where full adoption and no reversion is ranked number 6. Table 8 presents these six combinations and the number of farmers in each class.

Table 8. La Fortuna Fertilizer Adoption and Reversion

Rank	Acceptance	Reversion	8 of 15	12 of 20
6	Full	None	0 % (0)	17 % (2)
5	Full	Partial	13 % (1)	17 % (2)
4	Partial	None	13 % (1)	8 % (1)
3	Partial	Partial	13 % (1)	17 % (2)
2	Full	Full	25 % (2)	17 % (2)
1	Partial	Full	38 % (3)	25 % (3)

The column headed "8 of 15" refers to the eight usable responses given by the 15 participants which did not participate in the 1972-1 crop season. Of the 20, only 12 usable responses exist since some of the farmers did not plant or did not respond to the questions. The raw data, in quintales per manzana, are given in Table 9

Table 8 and 9 show that the farmers did not comply with the fertilizer requirements as fully as they did with the mechanization requirements. Of the 12 that responded for 1971-2, only six applied more than five quintales per manzana. Of the eight responding farmers that dropped out of the project after 1971-2, only one continued to fertilize at the same (partial) level and five of these eight reverted fully to zero levels of fertilization.

Conversations with the farmers indicated that they were familiar with inorganic fertilizers before the project and many of them used fertilizers on their other crops. A probable cause of the low rate of adoption may have been the

mix-up in the fertilizer deliveries by the Ministry of Agriculture--both in terms of types of fertilizers delivered and the delivery system failures.

Table 9. Fertilization Levels in La Fortuna (Quintales Per Manzana)

Farmer	Crop Season		
	1971-1	1971-2	1972-1
1	2	4	4
2	-[a]	-	1
3	0	5.3	0
4	-	-	0
5	-	8	0
6	-	4	0
7	0	4	3.2
8	0	-	0
9	-	4	0
10	0	4	0
11	0	5	4
12	-	-	3
13	-	-	-
14	0	4.5	-
15	-	1	-
16	0	5.5	5
17	0	6	6[b]
18	0	4.3	3.7
19	-	-	-
20	0	5.5	5.5

[a] Dashes indicate No response, Did not remember, or Did not plant.

[b] #16-20 continued in project for crop season 1972-1.

Using the Side-Effect Evaluation Framework, the effect of fertilizer use may be summarized as follows. The participating farmers were the ones affected. The high rates of reversion indicate that the effect was of short duration. The use of fertilizers is accepted as good but poorly applied fertilizers (in terms of types, amounts, and timing) and drought can render useless the expense involved. The use of fertilizers was promoted by the project organizers and therefore should have been anticipated, even though the reversion was probably not anticipated.

Herbicide Use

A third example of technology adoption and reversion in the La Fortuna project is the use of herbicides. The data obtained from the interviews were varied and incomplete. Since many of the farmers could not remember the details for the three crop seasons, the data were converted to a binary form. If the farmer indicated having used herbicides for a crop, it is shown in Table 10 as a "1"; if not, it is shown as a "0".

Table 10 shows that of the 20 random sample participants, only 11 gave responses for both 1971-1 and 1971-2. Of these 11, nine (82 percent) began using herbicides and two (18 percent) continued their use. In measuring reversion from 1971-2 to 1972-1, only 11 of the 15 respondents that left the project responded for both crop seasons. Of these 11, nine (82 percent) reverted fully, one (9 percent) continued using

herbicides and one (9 percent) had not used herbicides in either of the two crop seasons. This analysis is summarized in Table 11.

Table 10. La Fortuna Project Herbicide Use

Farmer	Crop Season		
	1971-1	1971-2	1972-1
1	0	1	1
2	0	-	0
3	0	1	0
4	0	-	0
5	-[a]	1	0
6	-	1	0
7	0	1	0
8	0	1	0
9	-	1	0
10	0	1	0
11	1	1	0
12	-	1	0
13	-	-	-
14	0	1	-
15	-	0	0
16	1	1	1[b]
17	0	1	1
18	0	1	1
19	-	-	-
20	0	1	1

[a]Dashes indicate No response, Did not remember or Did not plant.

[b]#16-20 continued in the project for crop season 1972-1.

Table 11. La Fortuna Herbicide Adoption and Reversion

Adoption	1971-1 to 1971-2 (11 of 20 usable)
9 (82%)	Adopted
2 (18%)	Already Used
Reversion	1971-2 to 1972-1 (11 of 15 usable)
9 (82%)	Reverted Fully
1 (9%)	Continued Using
1 (9%)	Never Adopted

As was the case with mechanization, the farmers complied with the requirements of the project, but deemed the practice of herbicide use to be not worth continuing when making their own decisions. Although the farmers probably knew about herbicides before the project, it is not known if they used them prior to the project. It may well be that difficulty in obtaining herbicides on their own is a determining factor in the farmers decisions to discontinue its use, especially in light of the reduced fertilizer use. This is because transport costs of herbicides by themselves would be prohibitive, whereas they would not add much to the costs of transporting the fertilizers. Another possible factor in the discontinued use of herbicides is the health hazard involved. This was dramatically demonstrated to the farmers of the area by the death of several of one participant's children when chemical poisons were unknowingly added to the tortillas by his wife.

Using the Side-Effect Evaluation Framework, the effect of herbicide use may be summarized as follows. The participating farmers were the ones affected. The high rate of

reversion indicates that the effect was of short duration. The use of herbicides is probably accepted as good, but less so than chemical fertilizers since weeding can be done by hand. Also, the improper application of herbicides may be useless and they do pose a serious hazard to health. The use of herbicides was promoted by the project organizers and therefore should have been anticipated by them, even though the reversion was probably not anticipated.

Labor Use Changes

The increasing concern about unemployment in less developed countries suggests that a development project such as this one should be evaluated also on the basis of its effect on labor usage.

The impact of this mechanized project can be considered in both the context of the farmer's corn crop and in the context of his total farming operations. First we shall consider the context of his corn crop. One would hypothesize that the increased use of machinery would diminish the use of labor on a per area basis for the cultivation of corn. If the farmer increased his corn crop area by a larger percentage than the percentage decrease in labor requirements per unit of area, then more employment opportunities would result. If not, his total labor requirements for corn would diminish.

In the context of a farmer's total operation, other factors must be considered. If the increased mechanization

in his corn crop allowed the farmer more time, he will benefit only if there exist other opportunities to which he could apply his labor and management efforts. If mechanization has reduced the total labor requirements of the farmers' corn crops, the employment opportunities for the hired laborers will also be reduced unless the farmers' new opportunities use more hired labor than the amount reduced. In order to determine the effect of labor usage, the entire realm of economic activity in the area must be analyzed. In the La Fortuna area, one would judge that alternative opportunities for labor usage would be or become available. The area is much like a frontier area with farms that are larger relative to other areas of Costa Rica such as in Cartagena where farm sizes are smaller due to many years of land division and where the production activities of the small farmers are of a more subsistence character. In La Fortuna the farms are more diversified; 14 of the 20 farmers in the sample had at least one additional farming activity and six of those had three or more additional farming activities. Twelve of 19 farmers responding (63 percent) reported having no off-farm income to the family, while seven did have outside sources. In Cartagena, only eight of 35 (23 percent) reported having no other family income. The average farm size in Cartagena (excluding one 280 mz farm) is 11.9 manzanas. In La Fortuna, the average farm size (excluding one 400 mz farm) is 31.0 manzanas--over 2.6 times larger. In La Fortuna

there appeared to be relatively fewer landless laborers. All of this information suggests a real difference in the relative supplies of land and labor between the two areas and a higher probability of new economic opportunities for farmers of La Fortuna and thus for hired laborers. Based on these observations, it may be reasoned that other opportunities for labor may exist in La Fortuna, while they are less likely to exist in Cartagena.

Several types of data are available concerning labor usage in the La Fortuna area. The Ministry of Agriculture "MAGPIE" studies in both La Fortuna and nearby San Jorge de Arenal provide data on labor usage. The San Jorge de Arenal project was a nonmechanized corn project. From the MAGPIE analyses on these two projects, we find that the average manzana received the following amounts of labor.

Table 12. Labor Used on Average Manzana of Corn, La Fortuna and San Jorge de Arenal

Location	Type of Project	Paid Man-hours	Nonpaid Man-hours	Total Man-hours
La Fortuna (212.5 mz.)	Mechanized	30.6	36.1	66.7
San Jorge de Arenal (41 mz.)	Non-Mechanized	59.2	34.6	83.8[a]

[a]The total does not equal the sum because not all of the manzanas received all of the labor activities. The nonpaid amounts represent the average for only those manzanas that had such activities.

Since the San Jorge de Arenal project included three farmers (18 mzs.) that plowed and disked with tractors, a calculation of man-hours per average manzana of the remaining 23 manzanas would result in a total of 96.0 man-hours. Thus, it appears that the seven nonmechanized farmers (herein termed San Jorge-7) used 43.9 percent more labor, while the inclusion of the 18 mechanized manzanas (the total; herein termed San Jorge-10) brings the increase in labor usage down to 25.6 percent.

The data may also be used to calculate what the average farmer used on his average manzana by performing the following calculation: $\frac{\text{Sum of total labor used/sum of manzanas}}{\text{Number of Farmers}}$.

In this manner, we find that the average La Fortuna farmer spent 110.63 man-hours on his average manzana; the San Jorge-7 farmer spent 97.55 man-hours; and the San Jorge-10 farmer spent 86.27 man-hours. Since the average farmer, in each case, spent more man-hours per manzana than the average manzana received, one would expect a negative correlation between the number of manzanas of corn that each farmer had with the average labor input to those manzanas. In La Fortuna, the correlation was $r = -.5015$; for the San Jorge-7 it was $7 = -.0660$; and for the San Jorge-10 it was $r = -.1051$.

The reason that the data do not provide any strong indication is the large variances that exist in the data. For example, a Student's-t, one-tailed, test of a zero difference between the means of the amount of labor the

average farmer applied per manzana in La Fortuna compared with the San Jorge-10 results in the acceptance of the null hypothesis that the mean amounts of labor used is equal at the 5 percent level. A 95 percent confidence interval on the difference between the means in (-16.71; 65.43), with the sample means of 110.63 (La Fortuna) and 86.27 (San Jorge-10) for a difference of 24.36 man-hours. The standard deviations of the sample means were s = 74.52 (La Fortuna) and s = 41.52 (San Jorge-10).

In summary, although the average manzana data suggest that mechanization did reduce labor requirements by up to 44 percent as might be expected, these data could not be properly disaggregated to perform statistical testing. On the other hand, the data for the average farmer's average manzana showed no significant difference in labor requirements per manzana, mainly due to the large variances that existed in the data. The negative correlation of medium strength between the manzana labor requirements and the number of manzanas planted to corn by each farm would suggest that the larger the area a farmer plants to corn, the less labor per unit of area he will require. This would tend to confirm the expectation that, for a single crop, the displacement of labor by mechanization has a greater impact on larger farms.

None of these data give any indication of the impact of mechanization in the broader context of total farm operations, as mentioned earlier. The MSU questionnaire contained

a very broad question on changes in the use of hired labor: "Did you use more hired labor (or less) in 1972 or in 1971?" The question was repeated for comparing 1971 with 1970. The resulting combinations of pairs of responses are given in Table 13.

Table 13. Changes in Use of Hired Labor

		Hired Labor Use in 1971 Compared with 1970					
		None in 71	Less in 71	Same in 71	More in 71	Total	Percent
Hired Labor Use in 1972 Compared with 1971	None in 72	4	-	1	-	5	25
	Less in 72	-	6	-	1	7	35
	Same in 72	-	1	1	1	3	15
	More in 72	-	2	1	2	5	25
	Total	4	9	3	4	20	
	%	20	45	15	20		100

For each of the questions on labor use changes, the question of why the change occurred was also asked. Of the six that used less in each of the two years, five listed mechanization as a reason for the change on at least one of the two questions. As can be seen in Table 13, 5 of the 20 used the same amount or more in both of the comparisons; three used less and then the same or more. Of the nine responses (out of 40 possible) that indicated more hired labor, the reasons given were: mechanization (2), a change in area

planted to corn (2), natural phenomena (2) and other reasons (3). No real conclusions can be drawn from these data concerning the context of the farmers' total operations.

Using the Side-Effect Evaluation Framework for the context of the farmers' corn crops, the data on average manzana labor usage suggests an effect of diminished labor usage. Judging from the data in Table 12, hired laborers were the ones affected. No judgement can be made concerning the potential duration of this effect. A decrease in the opportunities for hired labor may be judged as bad in itself, but the context of total economic activity in the area is the important consideration here. The decrease in labor requirements is a direct result of the introduction of mechanization and this effect may or may not have been anticipated by the project organizers since their main concern was probably with the farmers themselves and not the local laborers.

Opportunities for Individuals

A development project such as the La Fortuna project inherently creates opportunities for individual gain. That is its objective. A project may be designed so as to improve community welfare by providing a good, service or facility which may be used by any or all individuals in the community (a public good) or it may be designed so as to improve the community welfare by providing assistance or opportunities to individual members of the community who

will be able to benefit privately by such assistance. The belief that community welfare is enhanced by the provision of assistance to individuals for their own private benefit is evidenced by the operation of extension services with public monies.

Selection Policies

Since MAG is operated by the government with public monies, it is to be presumed that the service is to be made available to any or all individuals that desire to receive it. However, since there normally exist limited budgets and capacities of extension services, there also exists the possibility that some individuals or groups will be served while others may be systematically not served. That this possibility not only exists but often occurs is widely accepted. The systematic favoring of one group over another is not necessarily a result of an intentional policy of the institution--it may well be an unintentional result of the local agent's selection of participants or the regional director's choices of project to implement. These choices may have been based on the expected ease of project implementation, e.g., the farmers living close to the road are easier to visit and farmers that can obtain loans by themselves can more easily purchase the needed items for a project requiring purchased inputs.

The problem of planning and evaluating project participant selection patterns will not arise when a project

faces a condition of under-enrollment or lack of demand for participation. This appears to have occurred in the La Fortuna project. The projection of 69 or 70 participants was not met--only 48 participated. Thus, even though the farmers were to be selected by the Regional Director with assistance from the CNP, BAC, the La Fortuna MAG agent and a Committee of Farmers (the existence of which was neither apparent nor determined), the La Fortuna agent was probably soliciting farmers to participate.

When a project is under-enrolled, the project officials should attempt to determine the reasons for the under-enrollment for several reasons. First, it may be due to poor project design and thus a need to redesign the project may exist. Second, if certain types of projects are consistently under-enrolled, the institution officials should seriously consider eliminating that type of project from their future activities and replace them with projects that meet with popular demand; thereby permitting an improvement in the institution's capacity to serve within their budgetary limits.

Specific Indirect Opportunities

Whether the project required some selection policy to be used or whether the agents had to solicit participation, there may exist special opportunities which are not open to all participants. These special indirect opportunities may be such that once one individual, participant or not, has

taken advantage of them they will no longer be open to others. There is nothing inherently undesirable about these special opportunities; in fact, it may often be more desirable to allow one individual to take advantage of an opportunity to provide a service required by the project than to have the extension service provide it themselves. However, if the institution desires to attempt to control the project side-effects to the greatest degree possible, then the institution should do its best to foresee such opportunities so that they can anticipate these side-effects. Also, by searching for these types of side-effects in the project evaluations, the institution will be better able to control them in future projects.

An example of an indirect special opportunity created by the La Fortuna project was the purchase of an additional tractor by one of the relatively better-off participants. The increased demand for tractor services by the participants--both during the project and later due to the land clearing operations--made such a purchase profitable. That this man was benefitting from the project to an extent greater than the others was well known by the area farmers. However, in this case, there did not appear to be any resentment by the other farmers. If there had been resentment, the farmers' confidence in the institutions might have been diminished. (The potential consequences of reduced confidence are discussed in the next chapter.)

CHAPTER V

CONFIDENCE IN INSTITUTIONS

The Problem

An additional effect of the La Fortuna project, and one that requires a more detailed analysis, is the effect that this project had on the confidence that the farmers place in the institutions. A lack of confidence in the institution promoting planned or directed change is one of the most serious obstacles to planned economic development efforts and it is possibly the most unnoticed obstacle. When any development project relies on individuals accepting the recommendations of an institution, it is logical that those individuals must trust the agents of that institution if they are to be expected to accept those recommendations in the face of risk and uncertainty. This is especially true of small "risk-averting" subsistence farmers.

Everett Hagen suggests four difficulties in innovation in agriculture; the third of which is:

> "The peasant often has reason to distrust the persons who come to suggest changes to him. . . In many countries almost every peasant has had a lifetime of experiences with landowners, rent collectors, moneylenders, and government agents which justifies his suspicion that anything

> proposed by an elite person is not likely to be to the peasant's benefit."[13]

Thomas Fraser also suggests that what villagers perceive to be the "real" objective of the outsiders is a factor in their decisions.[14]

Arensberg and Niehoff point out that a change agent usually comes to a community as a person of high prestige or influence, but that he must remain "predictable" if he is to be a real positive force over time.[15] "Reliable" would perhaps be a more accurate term since it incorporates a quality-of-advice factor. Rogers provides an example of reliability that is lost when he describes a case where the use of hybrid seed was discontinued due to a "cultural incompatibility" (the corn made inferior tortillas). He noted that in this case, "As a result, the change agent's future promotion of other innovations was also damned."[16]

This leads to the following hypothesis, as stated in null form:

Hypothesis: The La Fortuna Project did not result in any significant reduction in farmer confidence in the institutions.

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[13]Hagen, Everett E., The Economics of Development. (Homewood, Illinois: Richard D. Irwin, Inc.) 1968, p. 72.

[14]Fraser, Thomas M. Jr., "Sociocultural Parameters in Directed Change," in Human Organization, Vol. 22, No. 1, Spring 1963, p. 104.

[15]Arensberg and Niehoff, op. cit., p. 107.

[16]Rogers, Everett M., with F. Floyd Shoemaker, Communication of Innovations, 2nd Edition (New York: The Free Press) 1971, p. 150.

The Evidence

The evidence that is available is insufficient to perform any conclusive testing of the hypothesis. Ideally, the evidence would have been based on a series of interviews with an improved instrument before, during and after the La Fortuna project. The fact that the research was performed after the project was completed is an obvious limitation. In spite of this serious weakness, the evidence that is available is instructive, even though it is not conclusive. The evidence consists of two types of information: a) the responses to a question concerning experiences and b) farmer participation.

Responses to the Questions

"Have you had (good, bad or regular) experiences with the institution?" Scale: 1-4.

La Fortuna Participants Versus Control Group

Participants Rating of MAG 2.737 (n = 19)

Control Group Rating of MAG 3.6 (n = 5)

A student's-t test of significance of the difference between the mean scores given the MAG showed no significant difference at the 10 percent level. This result is not surprising since a) the project was well known and the nonparticipants may have been influenced by their empathy with the participants and b) the small sample sizes. It might be noted, however, that at the 15 percent level, the test does show a significant difference between the mean score of ratings between the two groups.

La Fortuna Participants Versus Cartagena Participants

The Cartagena project was located in a different region of Costa Rica and was a project that was not as integrated as the La Fortuna Project. It did not include such a great emphasis on the use of mechanization and was basically a production credit type project. Although the Cartagena project also showed poor results, the participating farmers generally did not perceive the existence of a "project", nor did they generally associate the MAG and the CNP with the corn and rice cultivation which was financed by the Banco de Costa Rica (BCR). Based on this, it seems to be possible that the Cartagena responses would be similar to the responses that would have been given by the La Fortuna participants if they had been interviewed before the project.

Table 14 lists the mean score given to each institution and a mean composite score, for each project.

Table 14. Mean Scores on "Experience" Questions

Institution	La Fortuna	Cartagena	Difference
MAG	2.737 (n=19)	3.353 (n=17)	-.616
CNP	2.895 (n=19)	3.333 (n=15)	-.438
Bank	BAC 2.842 (n=19)	BCR 3.828 (n=29)	-.986
Composite	2.821 (n=19)	3.487 (n=31)	-.666

A student's-t test of significance of the difference between the means of the composite scores shows a significant difference at the 1 percent level with 48 degrees of freedom.

A similar test performed on the difference between the scores given MAG also shows a significant difference--this time at a 2.5 percent level with 34 degrees of freedom. These results suggest the rejection of the hypothesis but do not constitute conclusive evidence--they can only be instructive.

Farmer Participation

The under-enrollment of farmers in the project[17] and the comments of some of the nonparticipants might suggest a less than ideal level of confidence in the institutions. One farmer in particular reported that his refusal to participate was based on his judgement that the plowing should be done at a depth of four inches instead of the eight inch depth that the Regional Director of MAG was requiring of all participants.

An additional indication of a lack of confidence in the institutions was the fact that 37 of the 48 participants decided to not continue in the project after the first crop. The remaining 11 were all in the San Josecito sub-area and through conversations with these and other farmers it is apparent that their continuing participation was directly due to the leadership of the local school teacher and the well-to-do farmer that had benefitted from providing the tractor and truck services. These 11 also indicated that

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[17] See also Chapter IV, Section "Special Opportunities".

they would not continue after the second crop season. If one can assume rationality on the part of the farmers, then it would be reasonable to expect at least some of the farmers to continue if they felt that the losses were due to the drought and not due to the performance of the institutions and if they did not expect a drought to occur again during the next crop season.

Additional Insights on Farmer Confidence

Before presenting a model of farmer confidence that points out the importance of this aspect of development projects, some related insights from the MSU questionnaire results will be presented.

As would be expected, not all of the farmers reported identical experiences with the institutions. The following data suggest some of the other variables which seem to affect the responses given by the farmers.

1. There are consistently positive, though weak, correlations between the size of a respondent's farm (TOTALLAND) and his perceptions of experiences with the institutions.

Table 15. Coefficients of Correlation: Total Land and Experiences

TOTALLAND	versus	Experience - MAG	r = +.22
TOTALLAND	versus	Experience - CNP	r = +.12
TOTALLAND	versus	Experience - BAC	r = +.16
TOTALLAND	versus	Composite Experience	r = +.19

These relationships would weakly suggest that larger farmers generally perceived better experiences with the institutions.

2. There are consistently negative, though weak, correlations between the number of years a respondent has farmed (YRSFARM) and his perceptions of experiences with institutions.

Table 16. Coefficients of Correlation: Years Farming and Experiences

YRSFARM	versus	Experience - MAG	r = -.20
YRSFARM	versus	Experience - CNP	r = -.36
YRSFARM	versus	Experience - BAC	r = -.47
YRSFARM	versus	Composite Experience	r = -.38

These relationships would weakly suggest that those farmers that have more years of experience in farming generally perceived worse experiences with the institutions.

3. There are consistently positive correlations of medium strength between a respondent's composite measure of modernity (MODERNALL)[18] and his perception of experiences with the institutions.

[18]The composite measure of modernity (MODERNALL) is the sum of responses given by the farmer to eleven questions, each with a scale from 1 to 4 where 1 = traditional and 4 = modern. See Appendix B for a list of the eleven questions.

Table 17. Coefficients of Correlation: Modernity and Experiences

MODERNALL	versus	Experience - MAG	r = +.25
MODERNALL	versus	Experience - CNP	r = +.51
MODERNALL	versus	Experience - BAC	r = +.56
MODERNALL	versus	Composite Experience	r = +.49

These relationships would suggest that the farmers with the more "modern" outlook generally perceived better experiences with the institutions.

4. There are consistently positive, though weak, correlations between the number of conversations a farmer reported with agents of an institution (CONVERSE-) and his perception of experience with that institution and with the Composite Experience variable.

Table 18. Coefficients of Correlation: Conversations and Experiences

CONVERSE- MAG vs.	Experience- MAG r=+.32	Comp. Experience r=+.23
CONVERSE- CNP vs.	Experience- CNP r=+.34	Comp. Experience r=+.36
CONVERSE- BAC vs.	Experience- BAC r=+.31	Comp. Experience r=+.35

These relationships would weakly suggest that those farmers that had more contact with an institution's agents generally perceived better experiences with that institution and with all three institutions (the composite measure).

5a. There are consistently positive and generally strong correlations between the score that a respondent gave

an institution and the scores that he gave the other institutions.

Table 19. Intercorrelations of Experiences with Institutions

	Experiences with		
	MAG	CNP	BAC
Experience- MAG	1.		
Experience- CNP	.80	1.	
Experience- BAC	.51	.71	1.

5b. Tests of significance on the difference between the mean scores given each institution with the mean score given each other institution[19] showed no significant differences at the 10 percent level.

These relationships would suggest that the farmer either a) perceived the institutions to be working together in the project (as they were supposed to) or b) confirm the suspicion that the farmers tended to confuse the institutions and agents and therefore tended to give all institutions similar scores.

In summary, these related relationships suggest that the more traditional farmers reported worse experiences and that, in general, farmers tended to give similar reports on experiences with all institutions. The other relationships are much weaker, but they would suggest that the smaller

[19]The three combinations for testing are MAG vs. BAC, MAG vs. CNP, and BAC vs. CNP.

farmers with more years of experience in farming and that had fewer contacts with the agents, reported worse experiences. These relationships may be only partial explanations of the reasons why farmers responses differed, but they do not explain or document an overall reduction in confidence. As partial explanations of why responses differed, they may be instructive for agency personnel in regard to their dealings with individual farmers.

A Model of Farmer Confidence

Although the hypothesis could not be properly tested, the available evidence leads to the preliminary conclusion that if the farmer perceives that the project has caused him harm, the level of confidence that he places in the institution will be reduced. This preliminary conclusion, however, describes only one side of the spectrum. What happens to farmer confidence when the farmer perceives neither harm nor help or when the farmer perceives significant help? Some impressions received by this author in the process of interviewing the farmers in both Cartagena and La Fortuna suggest what happens in the intermediate case--that of no significant help nor harm.

The questions concerning experiences with institutions produced responses from the Cartagena farmers that generally indicated that they tended to base their evaluation of their experiences with the institutions on their own fulfillment of responsibilities. For example, a typical response to the

question relating to the bank which financed the Cartagena project was, "Very good, I have always complied and paid on time." These reasons that were given and the tendency of the farmers to respond, "Yes, they are all good" indicates that the farmers may judge (or at least report to outsiders) the institutions not so much on the institutions' abilities or responsibilities to assist them or to fulfill the objectives that someone perceives the institution to have, but rather they report good experiences as long as the institution has not needed to pressure the farmer to achieve a required compliance.

The plausibility of this basis for farmers' judgements was not diminished by the responses given in La Fortuna. Since many of the farmers in La Fortuna had needed to request an extension of their loans and since the banks were refusing to give further extensions, many of the farmers were openly resentful of the bank and the other institutions.[20] Occasional

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[20]It was reported that Ministry of Agriculture officials had visited the corn plots shortly before harvest time and had estimated yields to be around 50 qq./mz. Farmers reported yields that averaged 16.837 qq./mz. to the MAG production costs study. (Total production of 28 farms, 212.5 mzs., was 3,577 qq. The average farm yields were thus 21.35 qq./mz. A regression of average farm yields per manzana 'y', with the number of manzanas of corn by farm 'x' resulted in $y = 24.517 - .417x$. The regression coefficient was -.417 and the correlation coefficient was -.415. A Student's-t test on the regression slope is significant at the 2 percent level.) A Student's-t test run on the average per farm yields provides a 95 percent confidence interval of $(18.366, \bar{y}, 24.334)$. This implies a 95 percent probability that the mean of the population lies within this interval. This would indicate that farmers were either telling the truth or lying in a consistent manner. The IICA study interviewed 43 farmers in

comments by the nonparticipants interviewed indicated a sympathy towards those participants then faced with financial difficulties.

These impressions involve two aspects. First, if a farmer does not perceive harm being incurred, he will give a "good" or "okay" rating to the institution. Second, if the institution imposes a requirement on the farmer, he will give a "good" rating if he is able to comply without having to restrict his normal way of farming or of life, or he will give a "bad" rating if he is unable to comply. The first aspect and the conclusion drawn from the evidence in this chapter is suggestive of a relationship between past institutional performance and current farmer confidence, which is curved downward from a point representing mediocre past performance and an "okay" level of confidence. Figure 5 is an example of the shape of such a relationship, which when extended upward (on the basis of logic) would have a symmetrical but inverted shape.[21,22] The complete relationship may

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the San Carlos area and found an average yield per manzana of 21.8 qq. For the sub-sample of the La Fortuna area, the average yield per manzana for corn was 23.3 qq. This would appear to be consistent with the above findings.

[21]The precise function for the example curve in Figure 5 is $y = \frac{(x-2)^3}{4} + 2$, where y is the farmers level of confidence and x is the measure of the institution's past performance. With this function, the midpoint is (2,2), Point A is (1.134,1.838) and Point B is (2.860,2.162). Both axes extend from 0 to 4. For both points A and B, dy/dx = 1.

For the middle range of past performance, between points A and B, the distance on the x-axis (performance) is (2.868-1.134) = 1.732. This represents 43.4 percent of the possible ratings (0 to 4) of performance. Between points A and B, a

now be posited as follows: 1) there is a large middle range of "mediocre" performance which produces a small middle range of an "okay" confidence level on the vertical scale and 2) that from the midpoint, slight and equal successive increases (decreases) in the quality of an institution'- performance will result in increases (decreases) in the farmers' level of confidence at an increasing (increasing) rate.

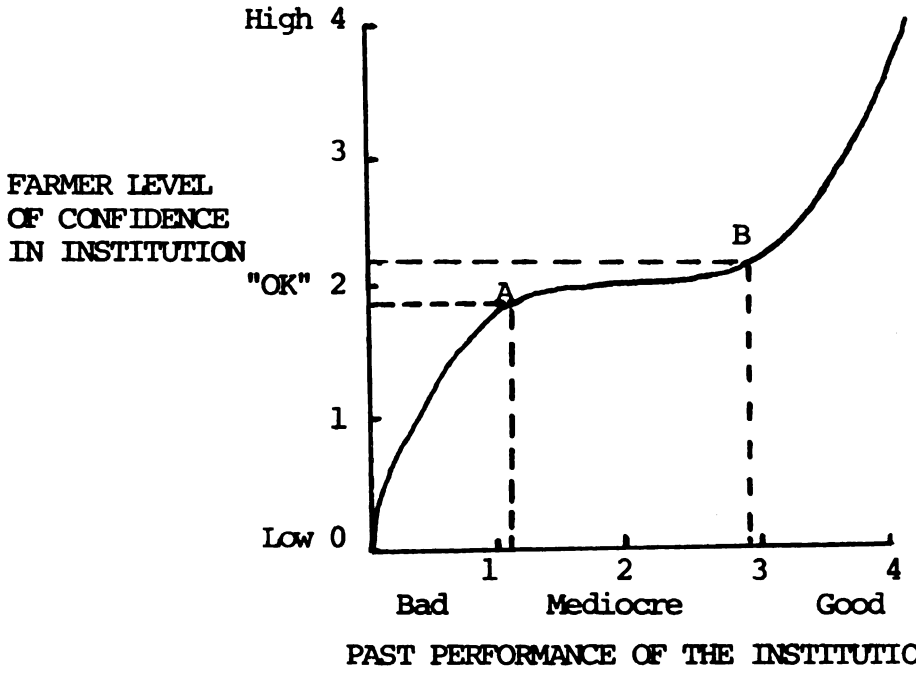

Figure 5. Suggested relationship between past performance of the institution and farmer confidence in the institution.

range of (2.162-1.838) = .324 (8.1 percent of 4) exists on the farmers' level of confidence axis. These figures are consistent with the assumption that a wide middle range of past performance will result in a rating of "okay" by the farmers.

[22]This relationship is much easier to conceive than to measure. Measurement problems of two types exist for both axes. First, the measures must be such that they may be used for interpersonal and interinstitutional comparisons. Secondly, there is a statistical problem in the approximation of any precise function since both variables are only indirectly observable.

If Point B is defined as having a slope of one, any improvement in institutional performance beyond this point will result in increasingly greater improvements in the farmers' level of confidence. Similarly for Point A, with slope of one, any worsening in performance will result in increasingly greater declines in the farmers' level of confidence. Point A can be interpreted as the point where, when moving to the left, the institution begins to inflict significant harm on the farmers. The experience in La Fortuna would suggest that the Ministry of Agriculture of Costa Rica, with respect to the La Fortuna area farmers, is located somewhere to the left of Point A on the curve.

The importance of this relationship is based on the assumption that the farmers' "willingness to adopt" a recommendation given by an institution is greatly affected by the level of confidence which they place in that institution. If a farmer's willingness to adopt is directly related to his level of confidence in a scalor function, then it becomes possible to substitute the variable "farmer's willingness to adopt" in place of the variable "farmer confidence in institution" on the vertical axis, as is shown in Figure 6.

From this author's experiences in Latin America, it is expected that most of the institutions serving the small farmer do so in a nominal manner and would be in the range between Points A and B of the two figures. That MAG had to

look for participants instead of selecting from among applicants is evidence of the nominal service normally provided by MAG. In other words, they are ineffective in either helping or hurting most small farmers. The conclusion that follows from this hypothesized relationship between institutional experiences and farmer willingness to innovate is that an institution such as the Ministry of Agriculture in Costa Rica will require a large improvement in effective ability to assist small farmers before any significant response is to be expected from the small farmer. For institutions with mediocre histories, the importance of avoiding failures and of improving performance is significant.

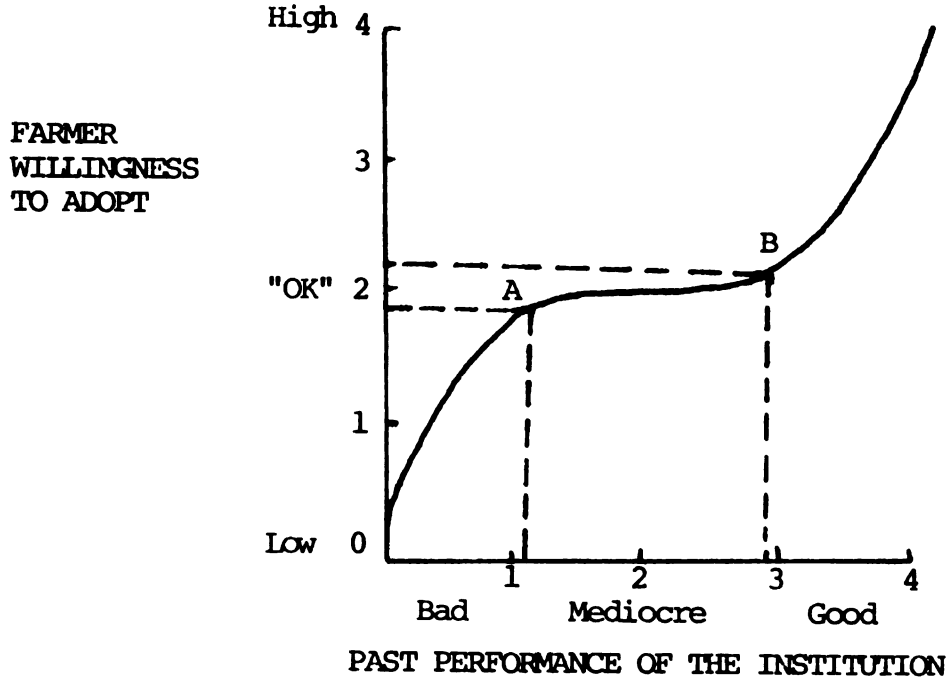

Figure 6. Suggested relationship between past performance of the institution and farmer willingness to adopt.

CHAPTER VI

FACTORS IN THE PROJECT RESULTS

In the chapter "Framework of Analysis", the last two of the six questions to be answered by an analysis deal with the determination of the cause and effect relationships of the project. This chapter will endeavor to point out certain conditions which would appear to have had an influence on the results of the project and the reasons for which it is felt that they may have influenced the results. Although the information concerning rainfall during the project is very indicative, it cannot show the specific cause-effect relationship or its magnitude. As also noted in the Framework of Analysis, the manner in which an analysis is written influences its interpretation; for this reason, the suggested factors that follow are not presented as definitive causes of the project outcome--only as possible factors. The order in which these possible factors are listed is completely arbitrary and does not indicate any ranking in terms of importance.

Low Operating Standards and/or Poor Planning

A number of conversations that this author had with people associated with the project indicate the possibility that the agents of the institutions were either 1) not

sufficiently trained to meet the unforeseen problems that might have arisen, 2) not sufficiently in contact with the project to meet the problems when they arose and/or 3) had not planned the project sufficiently well to be able to anticipate the problems that did arise. Several of the problems are listed here.

First, a number of the farmers complained about the fact that the poor organization of the mechanization services, both clearing by the CNP and the locally contracted tractor services, delayed planting as late as December and January. The normal planting times are October and November. The effect that these delays had on corn yields can not be determined with the information available, especially considering that the rainfall pattern was abnormal during this period.

Second, the pricing of tractor services of the CNP, and at least initially, for plowing and disking, was fixed on a per manzana basis and apparently administratively fixed. Given the wide variation that existed in the amount of time required to do each manzana, many of the farmers interviewed complained loudly about the overpricing that resulted.

Third, it was reported that the farmers were required, without having been previously informed, to supply the lunches of the CNP bulldozer operators and, on occasion, the farmers reported being held responsible for the supply and/or transportation of the fuels and lubricants required by the machinery.

Fourth, the CNP was to install a grain purchase and drying station in the project area, supposedly before the time of the first harvest. Some, but not all, of the farmers reported being unable to sell and/or have their grain dried at the station and thus had to transport their corn to Ciudad Quesada.

Fifth, there was criticism voiced by the farmers and also by a U.S. Peace Corps Volunteer located at the Regional Office, that the operation of the mechanical planter was extremely detrimental. Instead of planting in parallel rows, the tractor operator drove around the field from the outside to the inside and thus disturbed an area of planted corn when he drove out of the field. This pattern of planting would also make mechanical harvesting more difficult. As was previously mentioned, the planter was very poorly calibrated from the result that insufficient amounts of fertilizer and seed were applied.

The observed operating practice of the Ministry of Agriculture in Costa Rica is the promotion of project after project with many failures occurring. In conversations with the Regional Directors of the Ministry in two regions, the MSU researchers were encouraged to look at other projects and not to continue with the ones previously selected on the basis of Ministry recommendations. In the early stages of the MSU research, the Cartagena project was recommended by the Ministry. In the field work stage, the Regional Director in that region told us that: "Cartagena is the

project most behind in progress."[23] He then placed the blame on the people of Cartagena themselves by saying that you could not work with them and that there was no leadership there. In a separate conversation with this author and with the IICA researchers, he suggested that we look at the project in Sardinal.

In the San Carlos region, the Regional Director was described by one of his subordinates as having a new project every week, with each new project receiving his and the whole office's full attention until the next project idea surfaced. Althoughthis is probably an exaggeration, when this researcher talked with the Regional Director, he consistently steered the conversation to the newer projects, in spite of efforts to ask questions about the La Fortuna project.

This mode of operating may be possible due to the lack of any project evaluation and the methods used in reporting activities by the agents. If the agents report only the manner in which they spend their time and the number of contacts with farmers, and not the results of projects in which they were involved, the question of the effectiveness of their efforts is never raised.

Project Monitoring and Evaluation Systems

The evidence gathered by the MSU research indicated that the higher level and central office employees of the

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[23]"Cartagena es el proyecto mas atrasado que tenemos." Ing. Victor Quirós, September 28, 1972, in Liberia, Guanacaste, Costa Rica.

institutions knew relatively little about the project. Given the size of the project in relation to the overall operations of the institutions, this low level of knowledge is not too surprising. If the reports that were sent up the hierarchy were mainly concerned with the activities of the agents and the number of farmers contacted in a given month (as might be expected) and not a report on the progress of the project, then there is no way for the higher levels to know about the problems or success encountered. Reporting by agent and not by project, coupled with the apparent poor coordination between institutions is not very conducive to institutional improvement.

Personalities

As was indicated above, the Regional Director of the Extension Service tended to periodically change the emphasis among ongoing projects; his most recent idea tended to receive top priority and thus a larger share of the employees time, to the detriment of older projects.

Another aspect of his personality also permeated the character of the project (and possibly its under-enrollment). Being somewhat dictatorial, the recommendations of the project became requirements of the project and the farmers did not seem to appreciate this limitation on their management of their farms. This tenor of requirements probably also led to an inflexibility to adapt the loan amounts to the actual needs of each individual farmer.

Weather

Data included in the MAG production costs study report are the sources for Figures 7 and 8. Figure 7 shows the recorded rainfall for Ciudad Quesada and La Fortuna (the town) for the months of October, 1971, through March, 1972, in relation to the average rainfall by month as recorded for 11 years in Ciudad Quesada. Figure 8 shows the high and low record rainfalls for the 11 year period and the average. The two arrows indicate that the record lows for the months of November and December occurred in 1971 during the project planting period. No information is available on the magnitude of the impact on corn yields that this drought caused although one might assume that it was significant since the drought occurred in the critical period just after planting.

Input Supply

The President of the San Jorge sub-area Committee of Farmers reported that the MAG had had delivered the inputs for San Jorge to a room ("bodega") and that farmers from other sub-areas, in addition to those from San Jorge, had retrieved their supplies without any inventory control. He said that since farmers from other sub-areas had used part of the San Jorge supply, he had needed to bring supplies from rooms in other sub-areas to fill the needs of the San Jorge area farmers. This report indicates that two problems occurred. First, that there was no assurance that each farmer got the exact amounts of and the proper types of

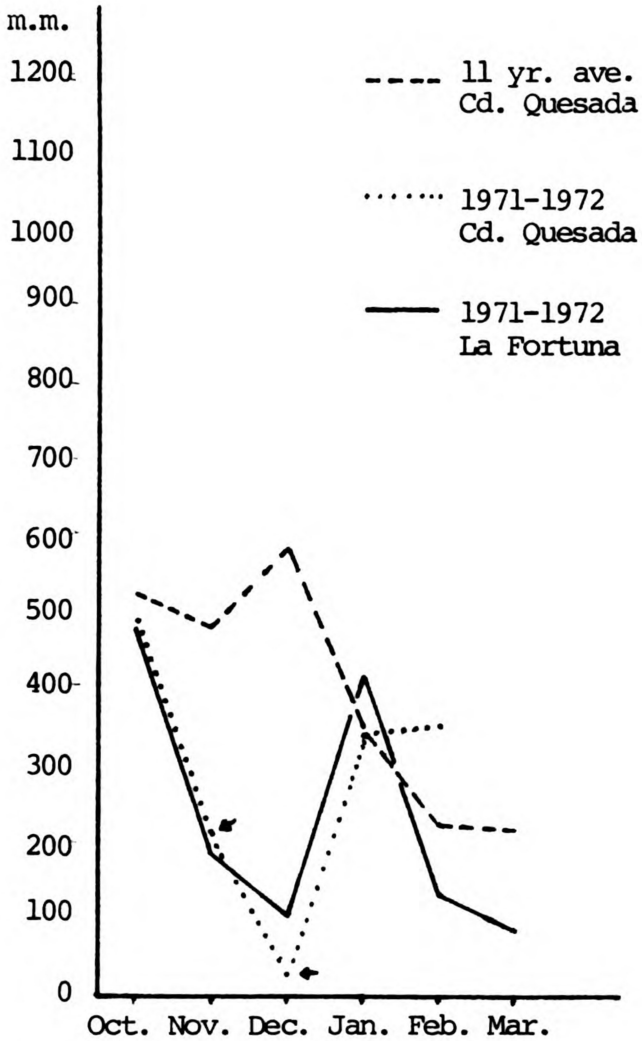

Figure 7. Recorded rainfall in La Fortuna and Ciudad Quesada, October 1971 to March, 1972

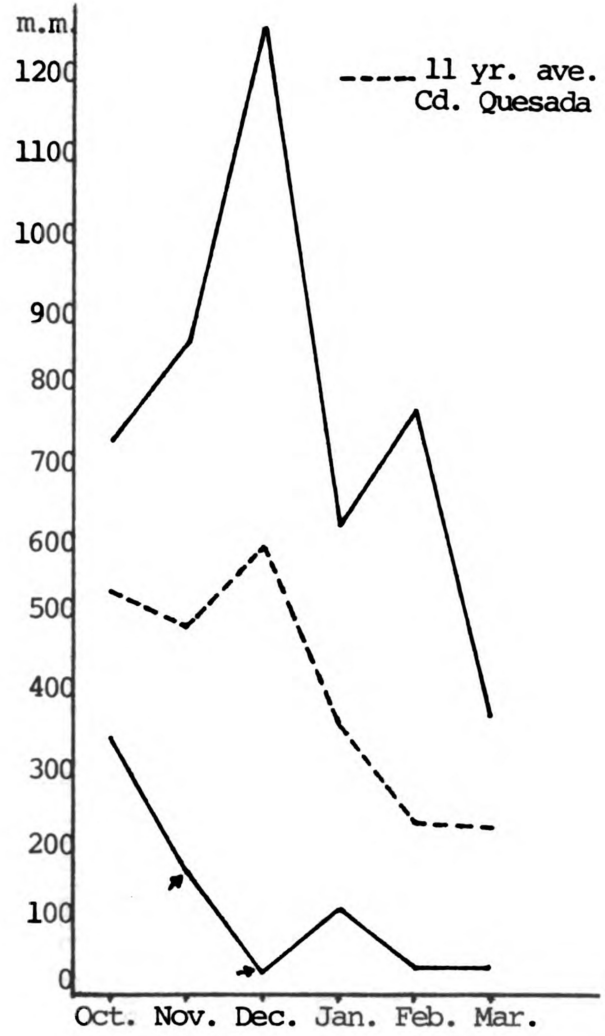

Figure 8. Recorded high and low rainfall by month in Ciudad Quesada, 1961-1972.

supplies needed. Second, the existence and accuracy of the records kept were questioned by some of the participants; one of whom complained that the bank had refused to show him their record of his withdrawals.

Implications

With the exception of the drought, all of the factors mentioned reflect the administration of the institutions or the management of the project. Although cause and effect relationships cannot be conclusively shown with the available information, the possibility that these management factors did have some effect on the outcome of the project is strongly suggested.

CHAPTER VII

CONCLUSIONS

> "The success of the project will be based on (the two conditions of) the receptivity of the farmer to the technological changes in the crop and the services that the institutions involved should provide in a coordinated and opportune manner." Project Plan Document, p.iv.

At first glance, and if based on the specific objectives or projections of the project, it is clear that the La Fortuna project was a failure. The area planted to corn under the auspices of the project fell short of the objective and it appears that the yields were improved little, if at all. Farmers' incomes were not generally increased; many reported losses. Of the original 48 farmers, none stayed in the project for more than two crop seasons.

Even though it is unlikely that any significant analysis of this failure will be done by the Ministry of Agriculture or by the other institutions, the project is no longer an activity which the agents and regional officials may list on their reports; they have other and newer projects to list.

In spite of this, the project did have an impact not soon to be forgotten by the farmers. Some aspects were good and some were bad. Although these impacts cannot be averaged or netted out to provide a single judgement, they can be listed and evaluated individually.

First, the available data suggest a definite increase in the use of mechanization after the project was over. Although it was impossible to indicate the real effect on labor utilization, the residual impact of mechanization may result in an increase in area under cultivation and the agricultural production in the area. The residual use of fertilizers and herbicides does not appear to be very large.

Second, and probably the most significant impact of the project, the available data suggest a reduction in the level of confidence which the farmers place in the institutions. Based mainly on the impressions of this author obtained from interviewing the farmers (rather than from any specific data) a model of the relationship between the institutions' past performances and the future willingness of the farmer to respond to the innovations promoted by the institution is suggested. It is noted that an institution such as the Ministry of Agriculture generally operates in an ineffective manner; incurring no perceptible harm on the small farmer nor significantly assisting him and having little, if any, impact on the farmers' adoption of innovations. The model suggests that if the institution could improve to the point where significant assistance is perceived by the farmer, the responsiveness of the farmers to innovations being promoted would increase more than proportionally. Similarly, if the institution became more effective, but through poor standards, procedures or recommendations,

incurred perceptible harm on the farmer, then the farmer's responsiveness to innovations being promoted would decrease to a greater extent than did the performance of the institution; possibly even to the point of not even listening to the suggestions of the institution. Based on the experience of this author in Costa Rica and in other countries, it appears that most of the institutions similar to the Ministry of Agriculture would require large advances in effectiveness in being of assistance to small farmers before any significant increase in the small farmers' adoption of innovations will occur as a result of their efforts. Conversely, a smaller decrease in institutional performance, involving perceptible harm, would probably result in large numbers of farmers refusing, on an a priori basis, to participate in similar projects.

Finally, since development projects inherently create special opportunities for individuals, the example of the La Fortuna Project indicates that project planners and evaluators should take note of and document such opportunities that arise. If a project is to benefit a certain target group, then such documentation of who benefits is required to properly evaluate the project.

The causes of the project results are extremely difficult to assess. However, it does appear that, in addition to the drought, the project planning, management and execution were deficient and thus were significant factors in the poor results.

The La Fortuna project appears to confirm the qualification which Hirschman applies to his principle of the "Hiding Hand." This principle holds that an underestimate of future problems which, if accurately forecast would have precluded the project's initiation, and an underestimate of one's creativity or ability to solve those problems may often lead to an improved, though often different, project result. Hirschman qualifies this principle by noting, among other things, that if the problems arise too early in the project's life, the creative problem solving effort may not be forthcoming. Since agricultural projects have a relatively short life (in comparision, say, to a hydroelectric dam), it is not likely that such creativity will occur.[24]

Although the simple documentation of a project's successes and failures does not answer the question of how the failures can be avoided and how the successes can be enlarged, it hopefully narrows the range of aspects through which to search. This is the essence of the Side-Effect Evaluation Framework which is presented.

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[24]Hirschman, Albert O., Development Projects Observed. (Brookings Institution; Washington, D.C.) 1967.

APPENDICES

APPENDIX A

TRAINING MATERIALS

Several ideas which have been given emphasis in this thesis may be recommended for use in a training course for project administrators and staff.

Clientele Confidence in Institutions

The relationship between institutional performance and farmer willingness to adopt which was presented in Chapter V may be expanded to a discussion of how an institution's current performance affects its ability to perform in the future. By presenting case studies, some of which are familiar to the course participants, the importance of this relationship may be shown. This discussion should perhaps follow a discussion of institutional policies and objectives and precede a discussion on the topic of project planning and implementation. If the course participants do not become aware of the objectives of their institutions so that they can better understand their personal motivations, the discussion of the importance of clientele confidence is not likely to be as effective as it might be. Similarly, a discussion of project implementation techniques will be more effective if the course participants are aware of the

importance of selecting implementation techniques which do not reduce the confidence of their clientele.

Side-Effect Identification

Although the discussion of side-effects presented in Chapter IV was set primarily in the context of project evaluation, the concepts of side-effect identification should be presented to the course participants in the contexts of project design, planning, implementation and evaluation. The importance of properly identifying the potential side-effects of a project lies in, first, improving the institution's ability to design projects which most accurately reflect the priorities among the institution's objectives. Secondly, the proper identification of actual and potential side-effects is important in order that an institution may improve its ability to plan and implement projects which will accomplish the goals of the projects with the least possible amount of interference from undesirable side-effects.

Evaluation of Small Projects

The general theme of this thesis has been that the honest evaluation of small projects is important as a means of institutional improvement--even if the evaluations are relatively simple and in general terms. The fact that an exhaustive evaluation of all small projects is too costly should not be an excuse for not performing any evaluations.

Project monitoring systems which ask only that the project's implementing agent account for his time and not the problems and successes encountered cannot constitute an evaluation of the agent nor of the projects he implements.

APPENDIX B

THE ELEVEN MODERNITY QUESTIONS

1. Do you consider your life to be ___ now than it was five years ago? 1 = Better, 2 = Worse, 3 = Same, 4 = Who knows, God knows, don't know.
2. Do you expect your life to be ___ five years from now? 1 = Better, 2 = Worse, 3 = Same 4 = Who knows, God knows, don't know.
3. To better one's situation, it is best to:

   1 = Just start working
   2 = Make plans first
   3 = Both 1 and 2
   4 = Doesn't know
   5 = Question not understood
   6 = Gave reason for neither

4. To better one's situation, it is more important to:

   1 = Work hard
   2 = Have luck
   3 = Both 1 and 2
   4 = Doesn't know
   5 = Question not understood
   6 = Gave reason for neither

Questions 5 through 11 are to be answered as follows:

1 = Agrees with statement

2 = Disagrees with statement

3 = Thinks it may be true

4 = Doesn't know

5 = Question not understood

5. Making plans only brings unhappiness, because the plans are hard to fulfill.
6. It doesn't make much difference if the people elect one or another candidate, for nothing will change.
7. With things the way they are today, an intelligent person ought to think only about the present, without worrying about what is going to happen tomorrow.
8. The son of a farmer does not have a very good chance of becoming a professional.
9. When looking for a job, a person ought to find a position in a place located near his parents, even if that means losing a good opportunity elsewhere.
10. In order to be happy, one must behave in ways that other people desire, even if one has to suppress his own ideas sometimes.
11. People in a big city are cold and impersonal; it is hard to make new friends.

Questions 5 through 11 were taken from Kahl, Joseph A., The Measurement of Modernism: A Study of Values in Brazil and Mexico. (Austin: The University of Texas Press for the Institute of Latin American Studies) 1966. pp. 30-33. See Table 1, questions 1, 2, 3, 9, 18, 21 and 43.

APPENDIX C

CONVERSION FACTORS

1 Manzana (Mz.) = 1.74 acres

1 Quintal (qq.) = 100 pounds

1 Bushel of Corn = 56 pounds

1 Kilometer (km.) = .62 miles

1 Meter (m.) = 1.094 yards

1 Millimeter (mm.) = .04 inches

1 Bushel per Acre = 1.026 quintales per manzana

1 pound per acre = 1.74 pounds per manzana

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