AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: _____

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: PANAMA

3. PROJECT NUMBER: 525-0227

4. BUREAU/OFFICE: LATIN AMERICA/CARIBBEAN — 05

5. PROJECT TITLE (maximum 40 characters): AGRICULTURAL TECHNOLOGY TRANSFER

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 31 YY 89

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 82 B. Quarter 4 C. Final FY 89

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 83 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	1,165	725	1,890	4,070	3,430	7,500
(Grant)	(784)	(-)	(784)	(1,500)	(-)	(1,500)
(Loan)	(381)	(725)	(1,106)	(2,570)	(3,430)	(6,000)
Other U.S. 1.						
Other U.S. 2.						
Host Country	-	608	608	-	6,340	6,340
Other Donor(s)						
TOTALS	1,165	1,333	2,498	4,070	9,770	13,840

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) FN	100	70	70	-	-	1,500	6,000	1,500	6,000
(2)									
(3)									
(4)									
TOTALS				-	-	1,500	6,000	1,500	6,000

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 080, 020, 090

11. SECONDARY PURPOSE CODE: 120

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BF	DEL					
B. Amount	4700	2800					

13. PROJECT PURPOSE (maximum 480 characters)

The project is the first phase of a planned national agricultural technology transfer program in Panama, whose purpose is to establish an operational technology transfer system in the Province of Chiriqui.

14. SCHEDULED EVALUATIONS
Interim MM 10 YY 84 MM 06 YY 86 Final MM 06 YY 89

15. SOURCE/ORIGIN OF GOODS AND SERVICES
☐ 000 ☒ 941 ☐ Local ☐ Other (Specify) _____

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY
Signature: Robin L. Gomez
Title: Director, USAID/Panama
Date Signed: MM 09 DD 03 YY 82

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MM DD YY

AID 1330-4 (8-79)

AGRICULTURAL TECHNOLOGY TRANSFER

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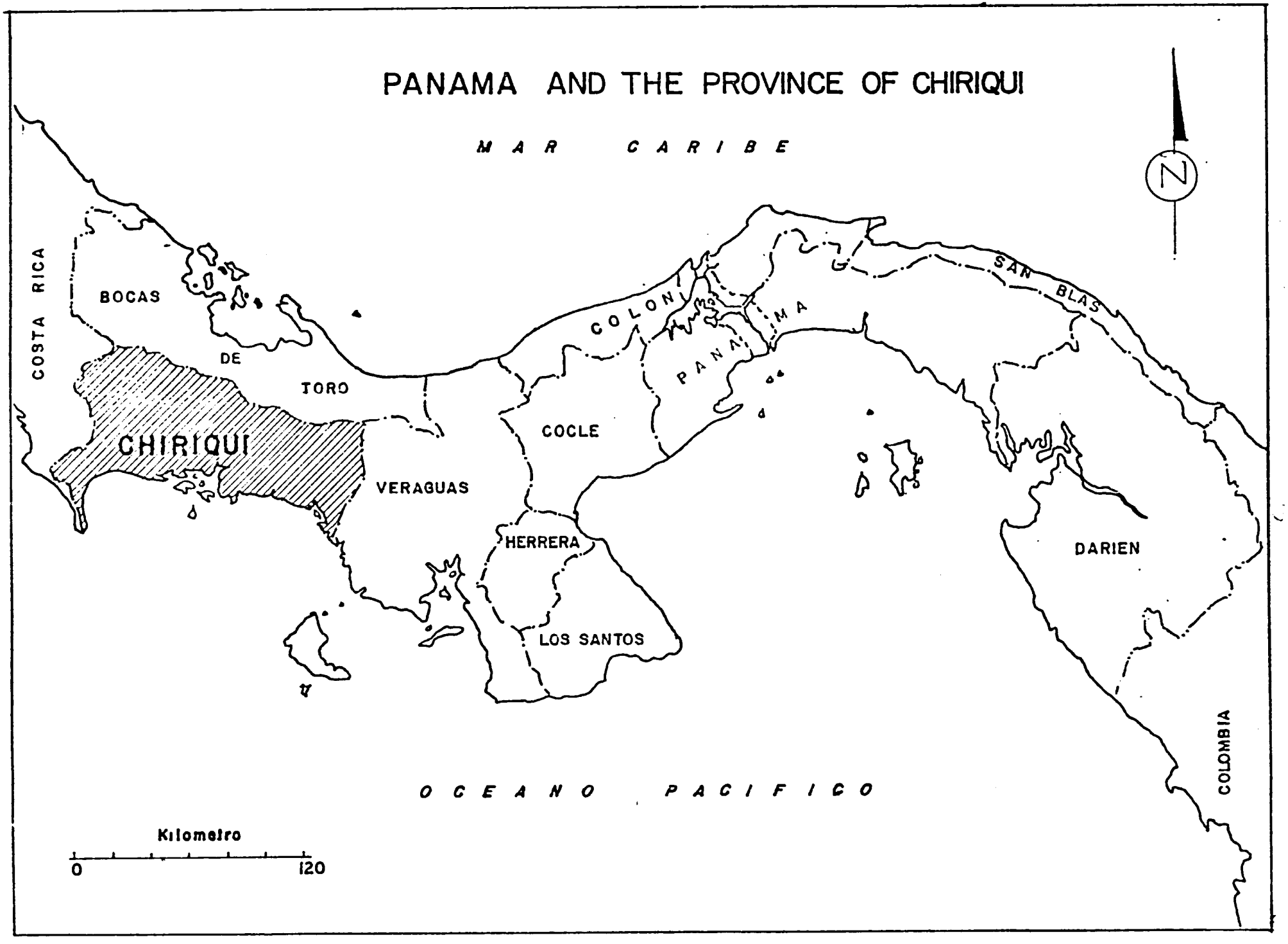
ACRONYMS/SPANISH TERMS

AGR	:	AID Office of Agriculture
AID	:	United States Agency for International Development
AID OT/IT	:	AID Office of Training/International Training
AID/DG	:	AID/Development Grant
AID/DL	:	AID/Development Loan
AID/W	:	USAID/Washington
ATT	:	Agricultural Technology Transfer
BDA	:	Banco de Desarrollo Agropecuario
BNP	:	Banco Nacional de Panamá
CAL	:	Comité Agropecuario Local
CAN	:	Comité Agropecuario Nacional
CAR	:	Comité Agropecuario Regional
CARTT	:	Comité Agropecuario Regional para Tranferencia Tecnológica
CATIE	:	Centro Agronómico Tropical de Investigación y Enseñanza
CCA	:	Comité de Asesoría Agropecuaria
CDSS	:	Country Development Strategy Statement
CIAT	:	Centro Internacional de Agricultura Tropical
CIMMYT	:	Centro Internacional de Mejora de Maíz y Trigo
COAGRO	:	Federación de Cooperativas Agropecuarias
CP	:	Condition Precedent
CRA	:	Comisión de Reforma Agraria
DTT	:	Technology Tranfer Directorate
ENDEMA	:	Empresa Nacional de Maquinaria
GOP	:	Government of Panama
ICTA	:	Institute of Agricultural Science and Technology
IDB	:	Interamerican Development Bank
IDIAP	:	Instituto de Investigación Agropecuaria
IDIAP/CYMMYT	:	Technology transfer method located in Caisán, Chiriquí
IE&C	:	Information, Education and Communication
IFE	:	Instituto de Fomento Económico
IICA	:	Instituto Interamericano de Cooperación para la Agricultura
IMA	:	Instituto de Mercadeo Agropecuario
INA	:	Instituto Nacional de Agricultura
IRD	:	Integrated Rural Development
ISA	:	Instituto de Seguro Agropecuario
MIDA	:	Ministerio de Desarrollo Agropecuario
MIPPE	:	Ministerio de Planificación y Política Económica
MOREPRA	:	Módulo Regional de Producción Agropecuaria
MS	:	Master of Science
NXP	:	Non-Expendable Property
ODR	:	AID Office of Development Programs
ODR	:	AID Office of Development Resources
OPG	:	Operational Program Grant
PACD	:	Project Activities Completion Date
PANAJURU	:	Patronato Nacional de la Juventud Rural
PFI	:	Programa de Fortalecimiento Institucional
RCO	:	Regional Contracting Officer
ROCAP	:	AID Regional Office for Central America and Panama
SESM	:	Senior Executive Staff Member
SONA	:	Extension model used in "IRD-Soná" Project
SPA	:	Sector Público Agropecuario
TAHAL	:	TAHAL Consulting Engineers, Ltd., Tel Aviv, Israel


PANAMA AND THE PROVINCE OF CHIRIQUI
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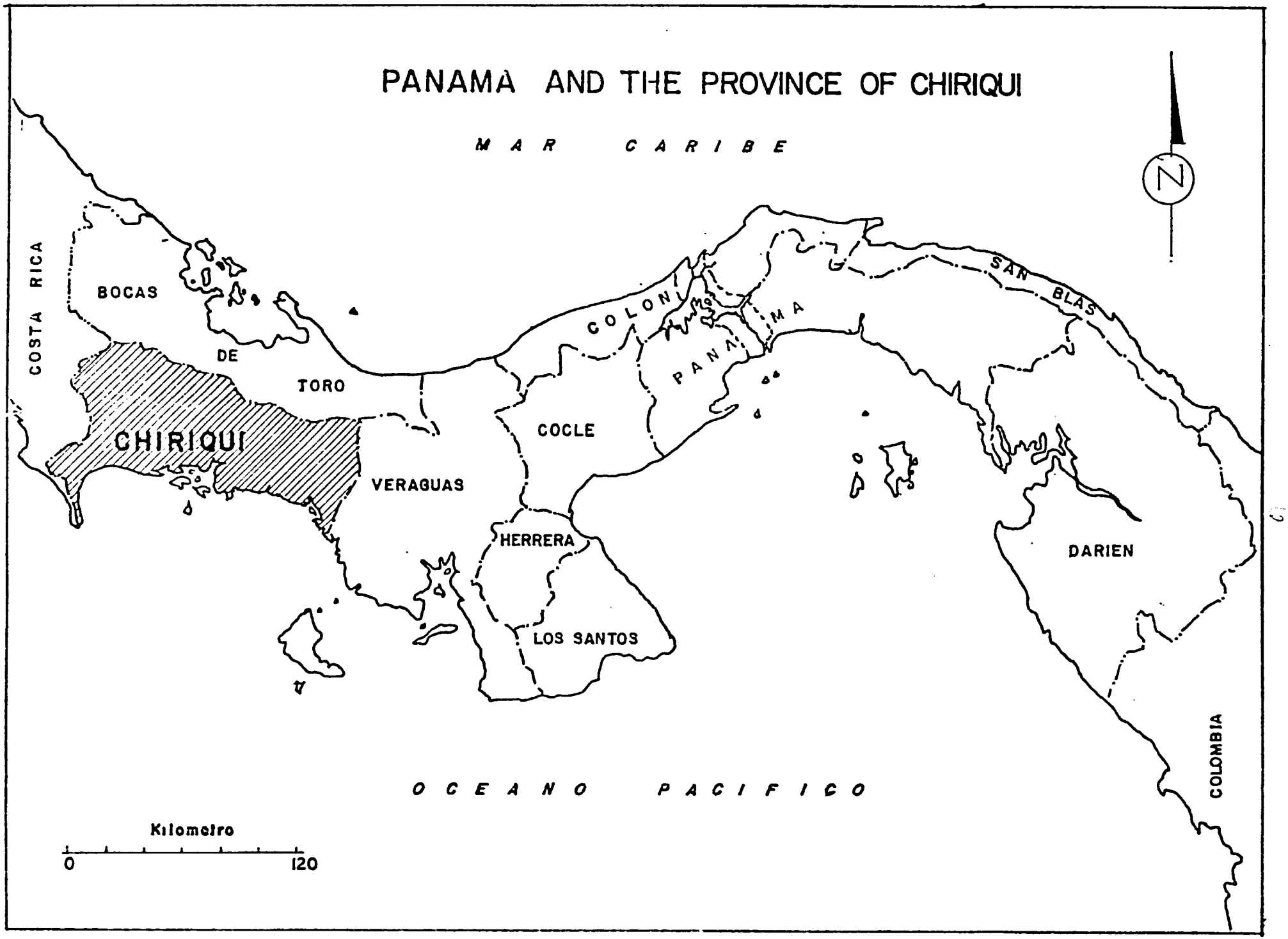
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PART I. - SUMMARY AND RECOMMENDATIONS

A. Recommendations

The USAID/Panama recommends authorization of a loan of six million dollars and a grant of one million five hundred thousand dollars to the Government of Panama (GOP) to establish a technology transfer system in the province of Chiriquí. Both the Loan and Grant will be fully funded in FY 1982. Loan terms include a 10-year grace period, 10-year repayment schedule, and an interest rate of 2% during the grace period and 3% thereafter on the outstanding disbursed balance. The project is to be fully disbursed within 81 months from the date the conditions precedent to first disbursement have been satisfied.

The Borrower will be the Government of Panama. Project coordination will be carried out by the Ministry of Agricultural Development (MIDA) and project activities implemented by personnel from MIDA Region 1 (Chiriquí) and the Panamanian Institute for Applied Agricultural Research (IDIAP). Signatories for the GOP will be the Ministers of Finance and Treasury, Planning and Economic Policy, and Agricultural Development.

B. Project Summary

This project is the first phase of a planned three part program to establish a national agricultural technology transfer system in Panama and is aimed at providing small and medium farm operators in Chiriquí Province with a continuous flow of adapted agricultural technologies and improved practices. Later phases will expand the geographic coverage and create the necessary institutional infrastructure for a national system.

Panamanian agriculture remains underdeveloped, with some of the lowest levels of technology and most inappropriate farm practices in Central America. This condition reflects, in large measure, the failure of the institutions within the sector to develop and provide agricultural producers with a systematic flow of relevant information and technical support on new technologies, farm practices, and crop and marketing information which can significantly improve yields and raise farm income.

While several GOP agencies in Chiriquí Province conduct limited farmer outreach programs, there is neither an organization nor an interinstitutional coordinating mechanism concerned primarily with and having (1) the capability to deliver agricultural technological information and (2) coordinate this transfer of technology with other farm services to small and medium producers. Specifically, the Ministry of Agricultural Development (MIDA) through its Region 1 Office lacks the area-specific technologies, the trained personnel, the communications packages, the logistical support system, and the coordinative mechanisms necessary for an effective technology transfer system.

The sector goal is to increase Panama's food production and employment opportunities while conserving the natural resource base. The project purpose is to establish an operational agricultural technology transfer

system in the Province of Chiriquí capable of delivering new technologies to 80% of small/medium producers on a yearly basis by 1989 with an adoption rate of 60%. The Project will finance training, technical assistance, construction, equipment and materials and public/private sector coordination with AID loan and grant funds and GOP counterpart funds, where appropriate, in six component areas: (1) Human Resources Development; (2) Infrastructure Expansion and Remodeling; (3) Logistical Support; (4) Information, Education and Communication; (5) Institutional Coordination; and (6) Evaluation/Phase 2 Design.

Total project funding is $13,840,000, of which $7,500,000 are AID funds ($6,000,000 Loan and $1,500,000 Grant) and $6,340,000 GOP counterpart.

C. Financial Summary

It is expected that AID loan and grant and GOP counterpart funds will be allocated as follows:

Summary Financial Plan
(US $000)

	AID/DL	AID/DG	GOP	TOTAL
1. Human Resource Development	2,383	1,450	606	4,439
2. Infrastructure	1,175	-	26	1,201
3. Info.,Educ. & Communication	167	25	757	949
4. Logistical Support	1,798	-	667	2,465
5. Institutional Coordination	258	25	-	283
6. Evaluations/Phase 2 Design	219	-	-	219
7. Operational Salaries	-	-	4,284	4,284
Totals	6,000	1,500	6,340	13,840

The following is a summary of estimated costs for implementing the planned activities based upon a seven-year project:

Summary Project Costs
(US $000)

ELEMENTS	USAID DL	USAID DG	GOP	TOTAL
Training (176 persons/2,498 p/m)	2,377	1,415	-	3,792
Technical Assistance (45 p/m)	280	85	-	365
Infrastructure (11 buildings)	1,175	-	26	1,201
Equipment/Materials (incl. vehicles)	2,168	-	667	2,835
All Project Related Salaries	-	-	5,647	5,647
Project Total	6,000	1,500	6,340	13,840

D. Summary Problem Statement

Historically, Panama has done little to develop a body of adapted technical knowledge leading to improved agricultural productivity. Even when a skeletal extension system existed, its usefulness was limited by lack of productive new technologies. Recently, this condition has begun to change. With the creation of IDIAP in 1975 , an accummulation of area-specific technical information is beginning to be developed and will accelerate in the next few years.1/ Information already available has not been widely disseminated to producers, moreover, because of an inadequate technology transfer system characterized by the following:

1) lack of a systematic approach toward providing improved area-specific technologies to private producers, particularly small and medium size farm operators;

2) lack of trained technology transfer field agents, subject matter specialists and supervisory personnel;

3) Lack of information, education and communication materials adapted to local physical and socio-economic conditions.

4) lack of an organized logistic system to support field personnel in reaching the producer;

5) lack of systematic geographic coverage; and

6) insufficient coordination between public agricultural institutions at all levels.

E. Project Rationale

In order to systematically attack stagnant conditions in Panama's agricultural sector, the country needs to establish an effective transfer mechanism capable of providing a steady flow of appropriate technical information and assistance to the producers. This project emerges from the basic premises that: (1) there is an available and growing stock of information on improved varieties, better culturally acceptable practices and modern husbandry techniques that could be successfully applied by Panamanian farmers; (2) this information is not being communicated on a coordinated and systematic basis to the small and medium producer; and (3) by making this information available to producers, significant increases in agricultural productivity and efficiency can be realized.

1/ Throughout this paper reference will be made to "improved technologies" or "technology packages" resulting from the research efforts of IDIAP and other institutions. These technologies encompass the full range of improved farming practices and crop innovations developed for farm use.

As the first phase of a nationwide technology transfer system, this project will concentrate on the region with the highest potential for immediate growth in agricultural production and where multiplier effects can be induced most rapidly. The later second phase will extend the mechanism to additional provinces as well as create the national line and staff entities for administering and coordinating a national system. Candidate provinces for Phase 2 are Coclé, Herrera, Los Santos, and Veraguas. These regions have future growth potential, but lack some ingredients for quick increase in agricultural production, e.g. productive new technologies and necessary infrastructure. Provinces with low growth potential owing to poor natural endowment and other constraining factors will be included in Phase 3. Phases 2 and 3 could be consolidated under one project, depending on the interests of the GOP, positive results gained from the first phase, the state of the Panamanian economy, and the fiscal solvency of the public sector.

Chiriquí Province was selected by the GOP as the area focus of this project because of its preeminent position as the country's most productive agricultural region. Moreover, in addition to being Panama's "breadbasket" (see Table 1 in Annex II.A), Chiriquí retains other positive factors in favor of its selection:

1) Chiriquí farmers have shown themselves to be receptive to adoption of new technologies as evidenced in the ongoing, AID-financed Agricultural Technology Development and Watershed Management projects.

2) Feasible new agricultural technologies are currently being developed and validated by IDIAP under a wide range of agro-climatic conditions for all priority commodities in the province.

3) All agri-support institutions including credit, marketing, and agricultural supplies are present in the province.

4) Chiriquí has an extensive and rapidly improving rural access road network (in part financed by AID Loan 525-T-048).

5) A technology transfer model designed for Chiriquí must be capable of operating under the broad range of climatic and agronomic conditions, thus enhancing its replicability to other regions.

F. Project Issues

Eight major issues were identified during the design process of the project. These are described below (not in rank order) along with the design and negotiation efforts to ameliorate or mitigate their negative effects on the project. Further details appear in the Detailed Project Description and Project Implementation Arrangements sections.

1. Project Approach: Regional vs. National Focus

A key design issue to be faced was whether the project was to be a regional or a nationwide effort in technology transfer. Conflicting signals were received from government officials who encouraged the development of this project and at the same time supported other technology transfer model pilot projects elsewhere. Questions were raised about the economic feasibility of a similar program in provinces other than Chiriquí. The design team response was to design a phased, from-the-ground-up program which would lead to the development of an integrated national technology transfer system, and that, at the same time, would create an operational and economically viable system in Chiriquí capable of standing alone should the government delay or decide against expansion to other regions.

2. Relationship of Extension to Research

Numerous experts in agricultural development have pointed out the need to link technology transfer and research, especially at the local level. Thus a continuing concern of the Project Design Team was the relationship of the planned technology transfer mechanism to Panama's on-going agriculture research efforts. While current circumstances precluded combining both efforts organizationally or administratively within the same institution, considerable emphasis was placed on how this could be accomplished operationally, particularly at the farm/farmer level, to meet project purposes.

As a result, the project has been designed with important cross-operational roles for MIDA and IDIAP. IDIAP specialists will be charged with training the MIDA senior technology transfer agents, who in turn will train their local agency assistants. IDIAP, through its Technology Transfer Directorate, will be responsible for developing all technology transfer materials, e.g. pamphlets, posters, radio programs, and videotape presentations which will be used by MIDA local agency personnel. Many of these will be developed at the Information, Education and Communication (IE&C) Center located in IDIAP's David regional office. This center will also contain an agricultural research and technology transfer library and conference room, further contributing to contacts between IDIAP and MIDA personnel. It is estimated that IDIAP's crop and livestock specialists will spend roughly 60% of their time supporting local technology transfer personnel through (1) demonstration plots/farms and (2) specific technical backstopping.

To formalize the integration of research and technology transfer under the project, a condition precedent is included that, prior to its receiving project funds, IDIAP will (1) sign an agreement with MIDA outlining the IDIAP role and resources committed in support of technology transfer in Chiriquí and (2) name a Project Coordinator who will be responsible for coordinating IDIAP technology transfer activities with MIDA and the SPA.

3. GOP Financial Commitment

An important and on-going concern is the financial capacity of the GOP to undertake the loan and provide the estimated $6.34 million counterpart contribution required, taking into account Panama's debt-service burden (estimated at 25%) and other anticipated financial commitments both within and outside the agriculture sector.

Much of the counterpart proposed for this project is in salaries of personnel already on the MIDA payroll. In the past, even in the worst of times, the government has shown that it is unwilling to make cuts in employemt. Capital investments and operational expenses such as travel, fuel and per diem are where cuts have and do take place. The project has been designed to require minimal new budgetary outlays, but those planned, e.g. gasoline and per diem, are critical and cannot be postponed or reduced without serious detriment to the project.

The Mission has noted a recent trend for the GOP to place more importance on the agricultural sector, particularly in the Province of Chiriquí. For example, the 1982 MIDA operational budget for Chiriquí showed an increase in funds for gasoline to $215,000 from the $39,000 allotted the previous year. The ATT project will require a minimum of $60,000 per year in gasoline (after the 1st year). The Mission is currently presenting this and other financial requirements to the government. It is essentially a question of political will as to whether the GOP will make the required commitment among other competing interests to this project. Recent events and pronouncements of high officials would appear to point favorably in this direction.

Because of the critical importance of gasoline in the operation of a technology transfer system and the large number of vehicles to be purchased, a condition precedent will require that the GOP provide evidence of budgetary support in this area before the bulk of the vehicles are purchased in year 2 of the project (vehicles for project coordination, logistic support and field surveys would be permitted during the first year).

4. Project Personnel

The project design team has presented the specific system requirements for all the field level and support staff positions. Review of MIDA personnel resources in the region and elsewhere demonstrates that the numbers and types of personnel necessary are available. The issue is whether the GOP will transfer the personnel from national programs, e.g, Producción Agrícola or Programa de Café, and from other regions required for the Chiriquí technology transfer system. The transfer of personnel is often nothing more than a paper transfer of persons already at the same site. Here it will be more problematical because of MIDA's centralized regional nature. Of the current 331 MIDA Region 1 employees, for example, 209 or 63% are located in David.

Once again it is a question of political and administrative will as to whether the GOP is willing to make MIDA Region 1 the decentralized field-level operation it should be and that is required for success of an agricultural technology transfer system. However, when feasible, field agencies will be located to minimize travel distances from David for those who, although located in the field, wish to continue to live in the provincial capital. The assignment and location of personnel at local offices will be made a condition precedent prior to purchase of the field vehicles.

5. Institutional Coordination

As the project was being designed, it became evident that its execution could be hindered by a lack of coordinative mechanisms at all levels in support of said system. In response, the Project Design Team decided on the inclusion of a Institutional Coordination component (described in section F.5) that includes the following:

a) At the local level, establishment of 10 Local Committees for Transfer of Technology (CAL) comprised of MIDA personnel, farmer-leaders and representatives of agro-support agencies to provide feedback and interchange of information between the public and private sectors on the provision of agricultural technologies and other farm services;

b) At the regional level, inter-institutional coordinative responsibility will be vested in the existing Regional Agricultural Committee (CAR), and the to-be-created Regional Committee for Transfer of Agricultural Technology (CARTT), a sub-committee of the CAR, comprised of representatives of agricultural support agencies and small and medium farmers from throughout the region; and

c) At the national level, delegation of authority for project monitoring and coordination to a ranking official from the Minister of Agriculture's executive staff, who will insure proper coordination with the National Agricultural Committee (CAN) and Agricultural Advisory Committee (CCA).

6. Procurement of Goods and Services

The Government of Panama's rather poor procurement performance in other AID projects was seen as an issue affecting the timely provision of project inputs, particularly in a project with significant procurement of commodities and construction services. In response, technical assistance will be provided to strengthen the MIDA Region 1 Office of Administration in logistics procurement and managment (see Section F.4). Also, during initial stages of implementation AID/Panama will give contracting and procurement assistance and advice to MIDA and IDIAP through the Regional Contracting Officer (RCO) and the Office of Development Resources (ODR). Informal workshops will be utilized to explain AID procurement procedures using the Mission Procurement Guide.

7. External Training

The Project contemplates sending 32 individuals for long-term training in various technical disciplines. Previous experience with GOP participant training, whereby returnees have been transferred to other directorates, even other ministries, thus negating potential Project benefits, was seen as a potential problem. The GOP requires that participants, who have undergone external training, work for the government for a time period equal to that of the training received. The Project Review Committee, however, considered it essential that a covenant be included in the Project Agreement in which the GOP would agree "to make all reasonable efforts to assure that personnel trained under the project will continue to serve in positions related to technology transfer."

8. Project Implementation

How project activities would be organized, coordinated and administered was a concern of the project design team, the more so given MIDA Region 1's lack of experience in implementing and administering a technology transfer system. The Ministry made it very clear that any system chosen should be an integral part of the regular Region 1 administrative system. The design team agreed with this guidance and determined that no formal restructuring, other than a formal decision by the Regional Director under his current authorities on the location and activities of personnel and channels of command, would be necessary at the local office level. However, at the regional level, additional responsibilities and duties would need be assumed by the existing MIDA administrative structure.

For this reason, the design team has called for Project and Deputy Project Coordinators to be added to the regional office staff. Because of their important roles, appointment of these persons will be made an initial condition precedent for disbursement. An additional condition precedent will require establishment of logistical, management and accounting procedures and controls for the Region 1 Office of Administration for which technical assistance will be provided.

Because of the decentralized nature of technology transfer, it was considered premature to set up a formal administrative structure at the national level until the Phase 2. However, the presence of a senior executive staff member to the Minister, who would providing oversight, coordination and support at the national level was considered equally as important as the new staff required at the regional level and will thus be included in the same initial C.P. Duties of various project personnel are outlined in the Section 5.B, Project Management and Coordination.

G. Summary Findings

The Project Review Committee has reviewed all aspects of the proposed Agricultural Technology Transfer project and finds that it is financially, socially, economically and technically sound, and consistent with the development objectives of the GOP and those objectives set forth in USAID/Panama's CDSS. It has further found that MIDA and IDIAP are institutionally capable of administering the project in the coordinated fashion discussed in the Project Paper.

H. Project Development Team

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PART II. BACKGROUND

A. Overview of the Agricultural Sector in Panama.

Agricultural production comprises 14% of gross national product, provides employment for nearly one-third of the labor force, and accounts for 45% of the value of merchandise exports of the Republic of Panama. The agricultural sector provides the basic raw materials for many of the important industries of the Republic, and many of the nation's trade and commercial operations depend on marketing and processing farm products. Food production is one of Panama's most important economic activities, and makes use of natural resources that would otherwise be unexploited.

The net value of crop and livestock production in Panama in 1980 was estimated at $194.2 million. This value output is produced on 153,670 farms. Most farmers are small and medium operators, although a small group of large owners holds a high percentage of the total land in agriculture. In 1970, 52% of the farmers held land under 5 hectares, with the total of these holdings amounting to 4.3% of the land area. Forty percent of the farmers operated farms between 5 and 50 hectares, and held 38.4% of the land. At the other extreme, 8% of the farmers with holdings over 50 hectares held 57.3% of the area.

The amount of fertile, flat land suitable for mechanized agriculture or intensive cattle husbandry is very limited in Panama. There is extremely little Class I land, and Class II land comprises less than 3% of the total surface area of the country. The hilly topography of many lands with the better soils severely limits the selection of viable cropping systems. Quality of land partially accounts for historical settlement patterns, land use, indigenous cropping systems, and low productivity of land and labor.

The most important crops in Panama are sugarcane, bananas, rice, corn, plantains, cassava, yams, beans, tomatoes, potatoes, and sorghum. Around one-third of sugarcane is produced on state-owned farms, and much of that grown on private farms is by large producers. Bananas are produced primarily for export, chiefly by large plantation owners. Rice, corn, beans and cowpeas are produced predominantly by small and medium farmers. Coffee is grown on large plantations, although several thousand small farmers play an important role in total production.

During the first half of the 1960s, the agricultural sector grew at an annual rate of 6.7%. While all farm sectors grew during this period, an increase in production of bananas for export was the main source of growth. During the second five-year period, the rate of growth of agriculture slowed to 4.0%. The growth rate of the farm sector averaged only 2.6% per annum from 1970 to 1975; and 1.1% from 1975 to 1980. Production of rice and corn trended upwards in response to favorable prices during the

1970-1975 period, but then declined in spite of continued upward trends in price. Output of beans and cowpeas was stable, although prices of both crops were increased more than twofold during the 1970-1980 period. Production of coffee rose 15% from 1971 to 1980, in response to favorable world prices and as output from new intensive plantings was placed in market channels. Output of sugarcane increased 133% from 1971 to 1977 owing to state involvement in production, establishment of new mills, and favorable prices during a few years. Production of sugarcane began to decline in 1978, when world prices fell and government farms began to incur heavy losses. Livestock production, which increased 5.1%, was the primary source for sectoral growth during this period. Overall crop production, which accounts for three-fourths of the value output of agriculture, declined 0.1% from 1975 to 1980. Downtrends in agricultural production have decreased employment opportunities in rural areas, reduced per-capita availability of food, placed upward pressures on food prices, increased food imports, and lowered exports of farm products.

Causes for the decline in agricultural sector production between 1970 and 1980 are varied and complex. Price controls were placed on some of the basic foods, while prices of material inputs were allowed to rise. MIDA technical assistance efforts were diverted from the private producers to Government sponsored and supported communities (asentamientos) which have failed to contribute significantly to total farm output. Uncertainties about government policies discouraged private investment in the agricultural sector. Labor unrest, adverse weather conditions, and other problems caused a reduction in exports of bananas. Quality of land resources began to degrade owing to the growing scarcity of readily assessible new land, and declining fertility of previously-cropped land due to continuous heavy use and neglect of soil conservation measures. Migratory susbsistence farming has compounded soil problems by destroying the forest and causing erosion in many areas. Over recent decades the quality of agricultural land in Panama has been further affected by the substantial increase in pasture/cattle raising and a decline in crop land.

Yields of basic staples, including rice, corn, and beans are lower in Panama than in other countries of Central America (rice yields in Honduras excepted). One reason for low yields is the critical lack of technical information on what, how, and when to plant. To address the problem of low technology in agriculture, the Government of Panama, in 1975, organized the Institute for Applied Agricultural Research (IDIAP). In 1979, AID provided $7 million to IDIAP for organizational strengthening and an expanded program of on-farm, area-oriented research, especially in Chiriquí and Veraguas Provinces. However, the evolving information on alternative technologies and improved practices appropiate to specific geographic areas does not effectively reach small and medium farmers owing to absense of a technology transfer system. MIDA has been carrying out some of the functions needed to transfer technology, but with its principal focus on state supported agrarian settlements (asentamientos).

Despite sluggish growth of the farm sector during the 1970-1980 decade, agriculture still produces 90% of local consumption needs.[1] Agriculture has further contributed to a positive balance of international trade on the basis of exports of sugar, bananas, coffee, and cocoa. Agricultural imports account for only 7% of total imports. Fruits and vegetables (23%), cereal products (12%), fats and oils (14%), milk products (12%), and meat products (12%), are the principle food imports.

B. History of Extension Services in Panama

Agricultural extension education activities geared to reaching farmers and ranchers have been conducted in Panama over the years in varying degrees of scope, content and intensity. These activities began as far back as 1928 when the first major effort was made to train "agricultural agents". Agricultural clubs and schools were sponsored in 1930 and model farms established in 1931. With U.S. assistance, agricultural development offices, cattle breeding stations, and experimental and demonstration plots were set up during World War II in an effort to increase domestic food production. In 1948, the Agricultural Development Service was formally created by the Ministry of Agriculture with guidance from the University of Arkansas. The purpose of the Agricultural Development Service was to provide technical assistance and support to farmers through demonstration activities, diffusion of new methods, and visits to farms. Little research was conducted to support extension activities, and farm credit was not tied to farming practices. In addition to Divisa in Veraguas, local offices were established in the provinces of Chiriquí, Herrera, and Los Santos. Emphasis was placed on control of livestock diseases and technical assistance. During this period U.S. extension specialists helped to introduce agricultural methods that could be adapted to Panamanian conditions.

The Agricultural Development Service operated out of the National Institute of Agriculture (INA) up to the end of 1952, when, by law, it was placed under the Ministry of Agriculture. Efforts of the Ministry were then focused on agrarian reform, farm credit, marketing of agricultural commodities, research, and extension education. The latter identified extension work as a primary responsibility of the Ministry. Offices were organized at the national, regional, and local levels. Extension education was carried out through local offices located in 35 towns and hamlets, including an office in the territory of San Blas. In-service training was given to extension workers, who were required to prepare annual work plans, and to report on work accomplished at the end of each month. Extension agents were located in the areas where they worked. Activities involved the farmer, housewife, and rural youth.

1/ Preliminary indications suggest that overall agriculture sector output for 1982 may be far below levels anticipated, thus reducing the percentage available for local consumption and raising both imports and prices for many agricultural commodities correspondingly.

In addition to the Agricultural Development Service, institutions such as the Commission of Agrarian Reform (CRA), the Institute of Agricultaral Development (IFA), and the Institute of Economic Development (IFE) also provided technical assistance to farmers as part of activities involving credit, development of farmer organizations, and land settlement. The Service was disbanded in 1971-72 by the Revolutionary Government as it did not fit into the new Government's strategy for the rural sector. The Ministry of Agricultural Development (MIDA), which was founded in early 1973, has been carrying out some of the functions of an extension service through its Regional Directorates. However, as mentioned earlier, MIDA has directed most of its attention and resources since the mid-1970s to the asentamientos.

Over the years, several other GOP institutions have become involved in technology transfer in a limited and uncoordinated manner, including IDIAP, and the Agricultural Development Bank (BDA). Near the end of 1979, IDIAP reoriented its research to an area focused production systems methodology with emphasis on the generation of appropriate technologies for small and medium producers through applied research conducted on farms in key geographic areas. IDIAP also has developed a limited capability to disseminate validated technologies to farms in the areas where research is being conducted. Despite these efforts, however, there is little linkage or coordination among the extension activities of IDIAP, BDA and MIDA's Regional Directorates, each of which provides agricultural services independent of the other, according to its own perception of farmer needs and its own institutional requirements.

C. Current GOP Agricultural Priorities

Policies and priorities of the GOP are designed to accelerate agricultural growth in order to make the fullest possible use of the nation's natural resources, while conserving the resource base, to enhance the growth of gross internal product, to increase the supply of food, whether for domestic comsuption or for export, to provide employment for an expanding labor force, to provide raw materials for industries based on agricultural inputs, to improve external trade accounts through substitution of imports, and to improve opportunities for the population of rural areas.

Policies are executed through a variety of public agricultural support activities. These support activities include agricultural research (IDIAP), farm credit (BDA, BNP), marketing of farm commodities (IMA), crop and livestock insurance (ISA), land preparation and cultivation (ENDEMA), and supply of inputs (COAGRO).

MIDA has responsibility for providing farmers various economic incentives through the provision of market information, improved seeds, helping farmers develop new skills through transfer of technology, furnishing technical assistance to the asentamientos, setting grades and

standards for various crops, establishing market regulations for basic grains, developing and protecting Panama's natural resources, controlling land redistribution, directing agrarian reform, and assisting in land titling.

Commodity programs by MIDA are concentrated on the following development goals by priority crop and livestock enterprises:

-- Increase production of corn, red kidney beans, cowpeas, onions, fruits, coconut, oil palm, soybeans, pork, milk and forest products in order to reduce imports of these crops and supply consumption needs through exploitation of internal resources.

-- Intensify and foment the production of beef, shrimp, coffee, cocoa, sugarcane, banana, plaintain, cassava, and yam in order to exploit and diversify internal markets.

-- Increase the production of fish, poultry meat, pork, and eggs to improve the nutrition of the population.

-- To ensure the domestic supply of rice, industrial tomatoes, potatoes, sugar, sorghum, fish, corn, and soybeans.

The policy of the current three-year program of MIDA stresses the importance of transfer of technology to small farmers as a means of achieving the goals of the above commodity development program.

D. Overview of Agriculture in Chiriquí Province

In 1980, the Province of Chiriquí contained a population of 286,418 persons, or roughly 16% of that of the Republic of Panama. Chiriquí Province has 865,404 hectares of surface area, of which 472,000 hectares or 55% are used for agriculture. Cultivated and pasture areas in the Province extend over four distinct agro-ecological zones ranging from sea level to over 3,000 meters in altitude. Of the 20,634 farms in the province, 55.5% hold fewer than 5 hectares, 23.4% have from 5 to 19 hectares, 21.2% have from 20 to 50 hectares, and 8.6% hold more than 50 hectares. Small and medium farms under 50 hectares have holdings amounting to 31.3% of the area, while farms over 50 hectares account for 68.7% of the land in farms.

Farms in Chiriquí Province account for around 60% of all agricultural commodities produced for domestic consumption in Panama. The Province produces nearly all of the kidney beans, potatoes, carrots, cabbage, and lettuce, as well as a significant portion of the onions, tomatoes, peppers and other high-input vegetables grown in Panama. The Province has 27.8% of the total area in rice in Panama, but accounts for 45.9% of total production. Chiriquí farmers produce 55.8% of the coffee, 40.5% of the sorghum, 38.1% of the beans, 78.8% of the tobacco, 44.5% of the bananas, 33.5% of the milk, and 22.4% of the beef meat produced in Panama.

One-third of the Class II land in Panama is located in the Province of Chiriquí. However, much land in the Province is very fertile, and has potential to support or sustain intensive production of high yielding annual crops such as vegetables, as well as permanent crops with high returns such as coffee. Conservation measures, however, are needed even on gentle slopes. Traditional farming dominates in the province at present. Small and medium farmers use few modern inputs to produce crops such as corn, beans, and rice, and little is done to improve native pastures.

E. Chiriquí: Small-Medium Farmer Profile

The majority of farmers in Chiriquí Province occupy farms that are very small, utilize rudimentary production methods, use little or no credit, lack formal title to the land they cultivate, grow subsistence crops, and produce too little cash income to provide anything but a modest standard of living for most farm families. Housing and health conditions are poor. The illiteracy rate is around 50% on target farms according to a recent survey.

At the time of the 1971 Census of Agriculture, fewer than one-half of the farms in Chiriquí Province received income from off-farm sales of crops or livestock. Of farms with off-farm sales, 42.6% reported that most crop and livestock products produced on the farms were used for home consumption. Still, 42% of farmers had no source of livelihood other than subsistence products or cash income from their own holdings. The annual volume of production in 1971 from a farm under 5 hectares allowed an average cash income of approximately $233 per farm in 1980 prices.

Prevailing small farm technology is one reason for low cash income. Recent survey data show that a common cropping pattern on small and medium farms at lower elevations in Chiriquí Province is rice and corn in the first crop, followed by rice, corn and cowpeas in the second crop. Beans, yuca and yam may also be planted for family consumption. Livestock on these farms consist of three or four dual purpose criollo cows, a few hogs, and a small number of chickens. Most of the labor is provided by the farm family. Little modern equipment is used; most farming operations are accomplished with hand tools. A study of agronomic practices used on the central and eastern areas of Chiriquí showed that slash and burn technology is used to prepare land for planting of corn, rice and beans on over 90% of farms. In areas such as Renacimiento, land is disked on about 20% of farms and slash and burn methods are used on 80%. Less than 5% of small farmers utilize soil conservation practices, only 25% apply some type of fertilizer, and most do not use improved seed. Corn, beans, and rice are planted with a chuzo or pointed stick. Hand harvesting methods predominate

Farms in the interior upland areas of Chiriquí differ significantly from those at lower altitudes. Soils at the higher elevations are fairly fertile, although the land is rolling or steep. Rice, corn, and beans are

grown for home use on most small farms. Coffee is an important cash crop at higher elevations. Caturra is the predominant variety. Some modern practices are used in coffee culture. Over two-thirds of small coffee farmers apply fertilizers and use chemical fungicides. However, manual weeding practices are used on over 85% of farms. New coffee technology developed in Costa Rica is being adopted by many farms near the Costa Rican border. Production systems for corn, rice and beans are very similar to those used on small farms at lower altitudes. Modern inputs are used on small farms in the Bugaba area for production of vegetable crops such as potatoes, tomatoes, onions, and carrots.

Yields of crops on small and medium farms are low, and may be increased significantly through the use of currently available modern farm inputs and practices. A study of farms growing corn in Chiriquí showed that yields may be increased from 26 to 52 cwt. per hectare by use of better seed preparation, improved planting methods, application of fertilizers, and chemical control of weeds and insect pests. Unit costs decreased from $7.20 per cwt. of corn on farms using traditional technology to $6.[illegible] on farms using modern methods. In the same study, farmers using modern planting and growing technology for cowpeas obtained yields of 25 cwt. per hectare; yields on farms using traditional methods were 9 cwt. per heactare. Unit costs were $14.22 per cwt. on the farms using traditional technology, and $9.16 on those utilizing improved production practices. Rice farms using manual soil preparation methods, manual planting and weeding methods, with no use of fertilizer or other farm chemicals, obtained yields of 48 cwt. per hectare, while farms using modern tillage and growing methods obtained yields of 83 cwt. per hectare. Unit costs were lower on the farms using improved technology.

Survey data show that fewer than one-fourth of small and medium farms in Chiriqui receive any type of technical assistance. Approximately 80% of farmers receiving technical assistance obtained information about crops and 20% received information about livestock. Of farmers receiving technical assistance, 53.1% obtained information from MIDA, 24.5% from BDA, 12.2% from BNP and 10.2% from private institutions.

Information developed through adaptive research by IDIAP is expected to provide opportunities for increased productivities on small and medium farms in Chiriquí. On-farm multi-locational testing as carried out by IDIAP should enhance confidence that experimental results may be successfully duplicated by farmers. Farmers, however, need technical assistance to put in practice the new technologies that are available. There is thus need to launch activities that will accelerate the broad scale diffusion of improved production technologies and crop varieties among small and medium farmers in Chiriquí.

F. New Sources of Agricultural Technologies

The primary institutional responsibility for development of agricultural technology in Panama lies with the IDIAP, which in 1975 was established by law to conduct research designed to generate technological innovations appropriate for small farmers. The research strategy utilized by IDIAP is focused on three types of production systems: (1) cropping systems; (2) mixed dairy/beef production systems; and (3) mixed cropping/livestock systems. The research methodology focuses on development of technologies that are economically and technically viable at the farm level, and on development of farm management practices which can best utilize these technologies. The methodology employs a farming systems approach. A key element of the methodology is that small farmers are directly involved in most aspects of the research process. Research is conducted on small farms in the actual environment that farmers operate. On-farm research involves not only testing technologies generated by IDIAP, but those developed in other regional and world agricultural research centers such as CATIE, CIAT, CIP, CIMMYT, and ICTA. CATIE, through ROCAP, is a source of technical assistance and testable technological packages developed for small farm production systems.

Cropping systems research conducted by IDIAP emphasizes efficient management of production resources for existing crops combined with plant adaptation research and pest control where appropriate. Specific types of modifications include planting techniques, planting dates, plant density and land preparation, weed and pest control methods, improved seed, new crops, use of organic fertilizers, soil conservation, harvesting methods, and on-farm storage.

The mixed beef/dairy production systems research is designed to solve production constraints of the small and medium producers who produce a large portion of the nation's milk and beef supply. Research is concentrated on pastures, animal health, controlled breeding, herd management, supplemental feeding, and improved milking arrangements.

The major research effort of IDIAP is concentrated in eight priority geographic areas of Panama. These areas are located in the provinces of Chiriquí, Veraguas, and Los Santos. In each geographic area, several commodities have been targeted as priority. These commodities represent the most important products produced by small farmers in the area. Four of the eight priority areas are located in Chiriquí. Priority commodities by geographic area in Chiriquí are:

a) Renacimiento District -- corn, beans, cattle.
b) Barú District -- rice, corn, sorghum, beans, cattle.
c) Bugaba District -- potatoes, tomatoes, onions and other vegetables.
d) Gualaca District -- cattle, corn, rice.

Limited agricultural research activities are carried out by other public agricultural agencies in Panama. The Faculty of Agronomy, located at David in Chiriquí Province, is engaged in a small research program designed to develop high potential technology suitable for small and medium farm production systems. The Faculty of Agronomy also is involved in an AID sponsored program which uses students in their fourth and fifth years to promote new crop and livestock technologies among a limited number of small and medium farmers in five communities in Chiriquí.

Research conducted by IDIAP helps develop new technologies and tests their feasibility among a relatively small number of farmers. The final step in the research-extension process is widespread dissemination of the validated technologies. There is need to develop within IDIAP/MIDA an institutional responsibility and capability to diffuse newly developed technologies to as many small and medium farmers as practical.

PART III - DETAILED PROJECT DESCRIPTION

A. Sector Goal:

To increase Panama's food production and employment opportunities in the agricultural sector while conserving the natural resource base.

B. Project Purpose:

To establish an operational agricultural technology transfer system in the Province of Chiriquí.

C. End of Project Status:

1. Establishment of a technology transfer system capable of disseminating new agricultural technology on a sustained direct or in-direct basis to 80% of the small and medium farmers in Chiriquí Province. Improved production practices will be used on 60% of the land of the farmers contacted.

2. The value of target agricultural commodities in Chiriquí Province will increase by $9.7 million, or about one-third above their value at the beginning of the program. Subsistence and monetary incomes of small and medium farm families will be increased accordingly.

3. An institutional structure will exist in MIDA/IDIAP capable of providing all required logistic support for a technology transfer system, including personnel management and training, infrastructure development and maintenance, vehicle procurement and preventive maintenance, and acquisition of other required goods and services, and budgeting, accounting and financial management.

4. Institutional mechanisms will exist to assure coordination among public agricultural agencies involved in improving food production, to support a continuous dialogue and feedback process with private producers, and to ensure availability of public sector resources in support of the technology transfer system.

5. Lastly, this project will provide the building blocks upon which a national system of technology transfer may be constructed. A vanguard staff of subject matter specialists and program directors will be trained capable of adapting and implementing the Chiriquí model for transfer of technology to other regions, continuous feedback will be available from the on-going experience from Region 1 (including new technologies developed, adapted and tested by IDIAP), and an evaluation/design process for Phase 2 will be financed with Project Loan funds.

D. Project Strategy:

1. Area-focused: concentration of activities in one compact region with Panama's highest agricultural potential with the aim of achieving a manageable project with a significant impact.

2. Commodity-focused: priority commodities have been selected which correspond to MIDA priorities, are targeted for research by IDIAP, and are the most important crops now produced on most small and medium size farms in Chiriquí.

3. Integration of Research-Extension Activities: critical horizontal linkages (both operational, programmatic and coordinative) will be forged between IDIAP and MIDA at the national, regional, and, most importantly field levels.

4. Targeted Institutional Focus: a narrow institutional focus on the major horizontal and vertical linkages necessary for creating and supporting a viable technology transfer system in Chiriquí. The Project is not an institution-wide reform project for MIDA, either at the national or regional level--such reform is the objective of another active MIDA endeavor: Programa de Fortalecimiento Institucional (PFI). Institutional development activities of this project will be based on the requirements of the technology transfer system from the field upward (as described in the Methodology section below) and as such will be primarily focused on (1) strengthening both the technical and adminstrative support functions within MIDA Region 1 as they apply to technology transfer and (2) creating the mechanisms necessary at higher levels (e.g. MIDA national directorates, MIPPE, and the Presidencia) to provide budgetary and policy support for sustaining technology transfer.

5. Support for IDIAP: To encourage development of appropriate new technologies through multi-locational on-farm research, avoid a fall back to the traditional division of effort between research and extension, and ensure effective and continual communication of new technology between research and extension workers, the Project will attempt to strengthen the IDIAP's Technology Transfer Directorate and use this directorate as the primary research-extension interface.

6. Complementary Farm Services: Although specific project activities with other farmer support institutions such as the BDA, ISA, ENASEM, IMA are not contemplated, coordination with the SPA (Sector Público Agropecuario) is essential. This function will be carried out at the national level by the Comité Agropecuario Nacional (CAN) and through yearly seminars and workshops sponsored by the existing, but little used Consejo Consultivo Agropecuario (CCA); at the regional level through the Comité Agropecuario Regional (CAR) and its proposed Comité Agropecuario Regional Para Transferencia de Técnologia (CARTT) sub-committee; and at the field level by MIDA/Region 1 agents who will channel these other farm services to the producers. These activities are described in detail in the Section E.5, Institutional Coordination.

E. Project Methodology:

1. Background:

The success of any technology transfer project is based on an extension methodology capable of quickly diffusing new technology which meets the specific local needs of large numbers of small and medium farmers currently using rudimentary crop and livestock production practices. Planning an efficient technology transfer system must begin from the ground up, starting with farmers and learning about their environment, resources, methods of production, problems, opportunities and aspirations, and how they react to change. Because the farm household both produces and consumes, values of the marketplace and farm household become mixed. Special efforts must be made to influence traditional attitudes, values, perceptions, and skills to facilitate the transition to new technology. At the same time, the small/medium farmer, with his knowledge and practical experience in crop and livestock production, provides an invaluable source of feedback regarding both the effectiveness of the transfer mechanism and the utility of the technologies being extended. Direct and continuous contact between the technology researcher, transfer agent and the farmer is thus critical to the success of a responsive technology development and transfer system.

2. Basic Elements:

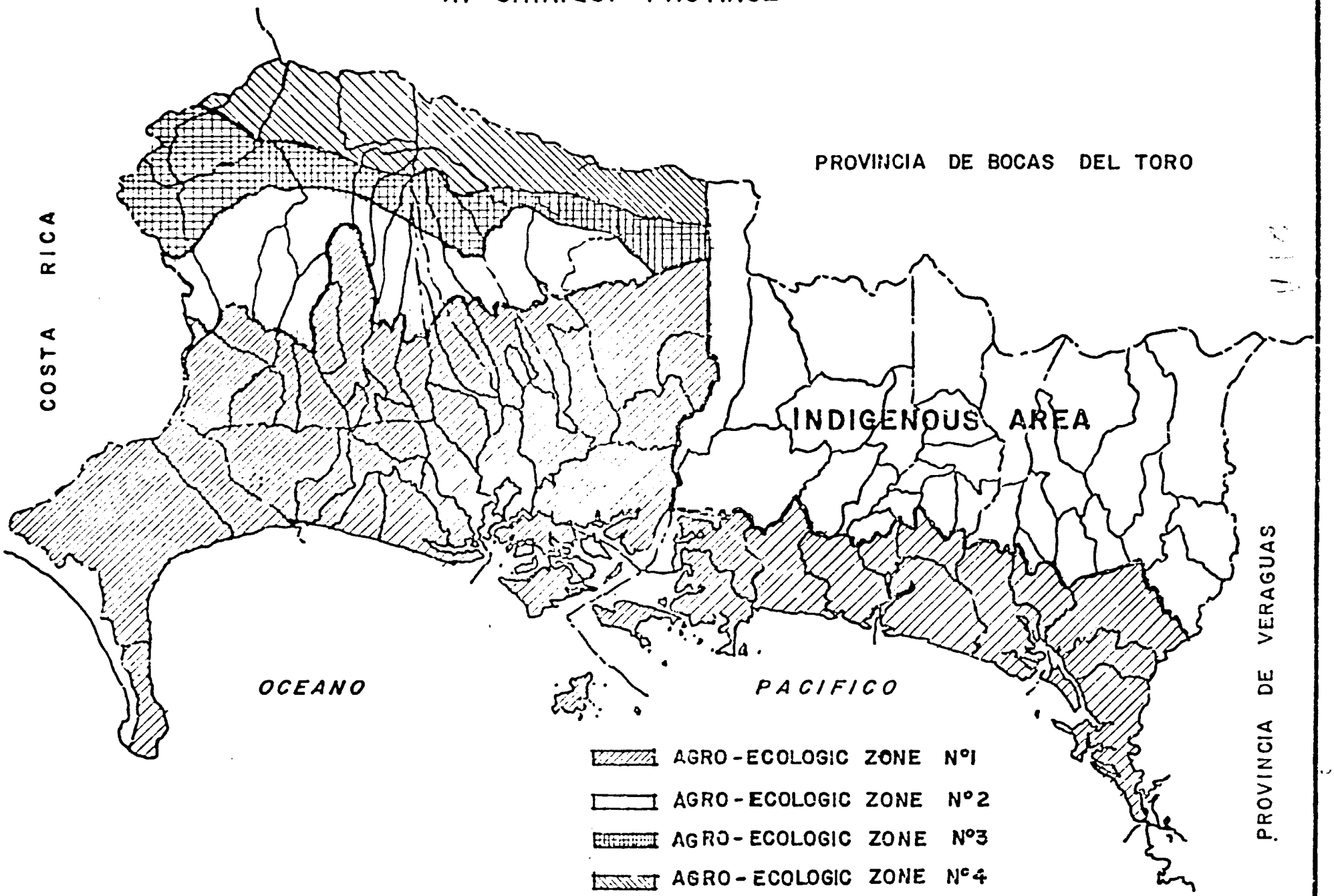
The methodology of this project combines the tested and favorable characteristics of the TAHAL, SONA, IDIAP/CIMMYT (see technical memos in Annex II.B), and classical extension models, and borrows from experiences in Costa Rica, Puerto Rico, and elsewhere. The classical model provides for establishment of local agencies, continuous training of field personnel, and the use of demonstration plots, farmer group meetings, field days and farmer tours, and mass media communication and education methods. Concepts such as the use of frequent and periodic direct on-farm visits, coordination with farmer support services, and delineation of micro-areas to be covered by individual field agents are borrowed from other technology transfer systems. Innovative features such as intensive training of farmers by stages have been developed for the Chiriquí model.

3. Description of Target Area:

The target area for this project is the Chiriquí Province, which has been identified as the area with the greatest potential for agricultural development through transfer of technology in Panama. The area has been divided into four agro-ecological zones, based on criteria such as climate, topography and agronomic features, and farming systems. The four agro-ecological zones are portrayed in Map 3-1; a description of each zone follows:

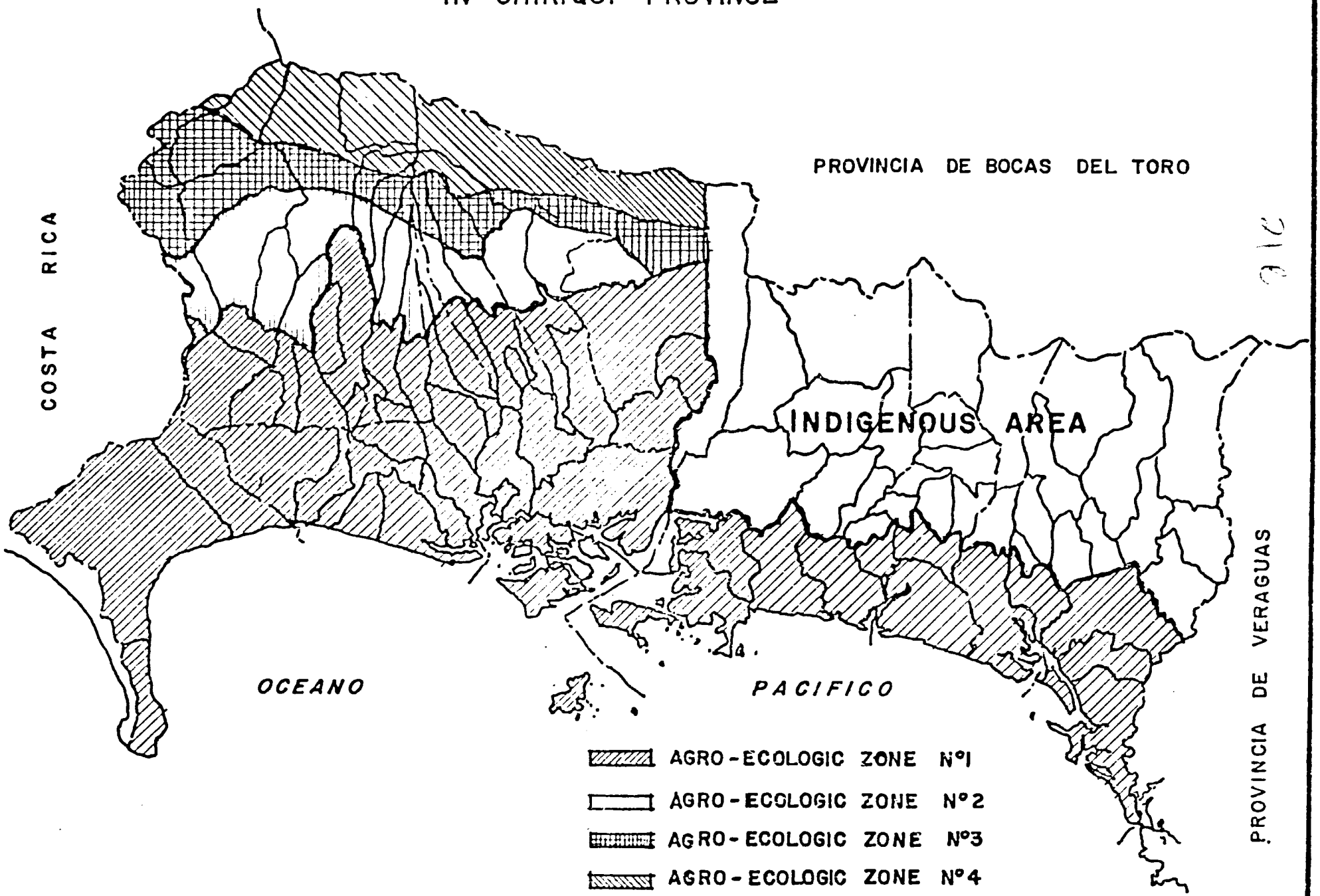
MAP 3-1

DELINEATION OF AGRO-ECOLOGICAL ZONES IN CHIRIQUI PROVINCE



MAP 3-1

DELINEATION OF AGRO-ECOLOGICAL ZONES IN CHIRIQUI PROVINCE



a. Agro-Ecological Zone No.1 Orientation: David

Physical Profile: Zone 1 is the largest of the four identified areas. It is located along the Pacific Coast and contains those areas under 400 meters above sea level. It is an area of flat plains and gentle slopes. Soils are of medium or low fertility and the surface is very rocky. The climate is tropical savanna with temperatures averaging over 24° C.

Agricultural Profile: 68.4% of the total area devoted to agriculture in the province is located in Zone 1. The zone contained 14,830 farms, or 71.9% of all farms in the province according to the 1970 Census of Agriculture. Of total farms, 52.6% were under 5 ha., 37.4% from 5-50 ha. and 10.0% were over 50 ha. The average farm size was 21.7 ha.

b. Agro-Ecological Zone No. 2 Orientation: San Andrés

Physical Profile: Zone 2 ranges in elevation from 400-800 meters. The topography has medium to steep slopes. Soils are of medium fertility and the surface is stony. The climate is wet with moderate temperatures ranging from 18 to 24 degrees C.

Agricultural Profile: Of the total area devoted to agriculture in the province, 13.8% is located in Zone 2. The zone contained 2,618 farms, or 12.7% of all farms in the province according to the 1970 Census of Agriculture. Of total farms, 44.6% were under 5 ha., 43.5% were from 5-50 ha. and 11.8% were over 50 ha. The average farm size was 24.8 ha.

c. Agro-Ecological Zone No. 3 Orientation: Río Sereno

Physical Profile: Zone 3 is located between 800-1,000 meters. The topography has steep to very steep slopes. The soils are fertile but erosion is a serious problem. The climate is dry and temperate with temperatures ranging from 15 to 18 degrees C.

Agricultural Profile: Zone 3 covers 6.8% of the area dedicated to agriculture in Chiriquí and represented 5.3% of the total producers in 1970. Of the 1,088 farms, 29.1% were under 5 ha., 51.6% were from 5-50 ha. and 19.3% were over 50 ha. The average farm size was 29.5 ha.

d. Agro-Ecological Zone No. 4 Orientation: Paso Ancho

Physical Profile: The highest lands of the Province of Chiriquí are located in Zone 4 with altitudes over 1,000 meters. The soils are very fertile, but severe erosion problems exist on steep slopes where potatoes, onions and other vegetables are grown. Its climate is wet with cool temperatures ranging from 8 to 18 degrees C.

Agricultural Profile: Zone 4 covers 11% of the area dedicated to agriculture in Chiriquí and represented 10.1% of farmers in 1970. Of the 2,077 farms, 56.1% were under 5 ha., 39.6% were from 5-50 ha. and 4.3% were over 50 ha. The average farm size was 25.1 ha.

4. Description of Target Group

The target group for this project includes more than 22,000 small and medium farms in Chiriqui Province. Of these, 12,832 are designated contact farmers, who will receive direct visits by technology transfer personnel. Contact farmers are those with potential for producing a dependable and continuous household food supply, as well as surplus commodities for sale. Non-contact farms will be reached by other methods, including agency visits, farmer group meetings, field days and mass media. The following tabulation shows that 37% of the contact farms have less than 5 hectares and that 69% have less than 20 ha.:

Contact Farm Size (ha.)	Number of Farms	Percent of Total
Less than 5	4,710	36.7
5-19	4,187	32.6
20-49	2,265	17.6
Over 49	1,670	13.1
Total	12,832	100.0

5. Priority commodities

As shown below, priority commodities have been selected for each of the four delineated agro-ecological zones within Chiriquí Province. As mentioned previously, these commodities and livestock enterprises are priorities of both MIDA and IDIAP and are the most important cash and subsistence crops now produced on small and medium farms in Chiriquí. Furthermore, these commodities comprise the basic food crops of Panama's rural and urban population.

Zone	Orientation	Crops	Livestock
1	David	1. Rice 2. Corn 3. Cowpeas	1. Cattle, d/p
2	San Andrés	1. Corn 2. Red kidney Beans 3. Rice 4. Cowpeas 5. Coffee	1. Cattle, d/p 2. Swine
3	Río Serreno	1. Coffee 2. Red kidney beans 3. Corn	1. Dairy 2. Swine
4	Paso Ancho	1. Coffee 2. Corn 3. Potatoes 4. Tomato 5. Red kidney beans 6. Onions 7. Other vegetables	1. Dairy 2. Swine

6. Area-Focused Model:

As described above, agro-ecological characteristics were used to divide Chiriquí Province into four major zones. Each zone has been further stratified into sub-areas based on the number and density of farmers, dominant crop and livestock enterprises, and physical features such as size, farm densities, and access. Each sub-area is further subdivided into micro-zones consisting of the number of farmers that can be directly and indirectly attended by individual field agent.

Analysis of environmental conditions, rural road networks, and farming systems was undertaken to determine the location of local technology transfer agencies in each agro-ecological zone, and in establishing the boundaries of influence of each agency. The analysis indicated that the 10 local agencies were required, located as follows: Progreso, Gualaca, Alanje, and San Juan in Ecological Zone 1; San Andrés, Concepción, and Potrerillos in Zone 2; Río Sereno in Zone 3; and Volcán and Boquete in Zone 4. The location of local agencies and their respective areas of influence are shown on Map 3-2.

Each local office will be staffed with from 2 to 4 senior technology transfer agents, each of whom will instruct and supervise from 3 to 5 assistants, who will disseminate technology directly to farmers. Within a given micro-area one third of all farmers will receive direct visits during the first two years of the project, or until improved production practices are adopted. During this time other farmers will be reached through other extension methods. Upon completion of the first stage, another one third of farmers in the micro-area will be visited for a two year period. The remaining third will be visited during the final stage. A minimum of 27 senior technology transfer agents and 109 assistant agents is required.

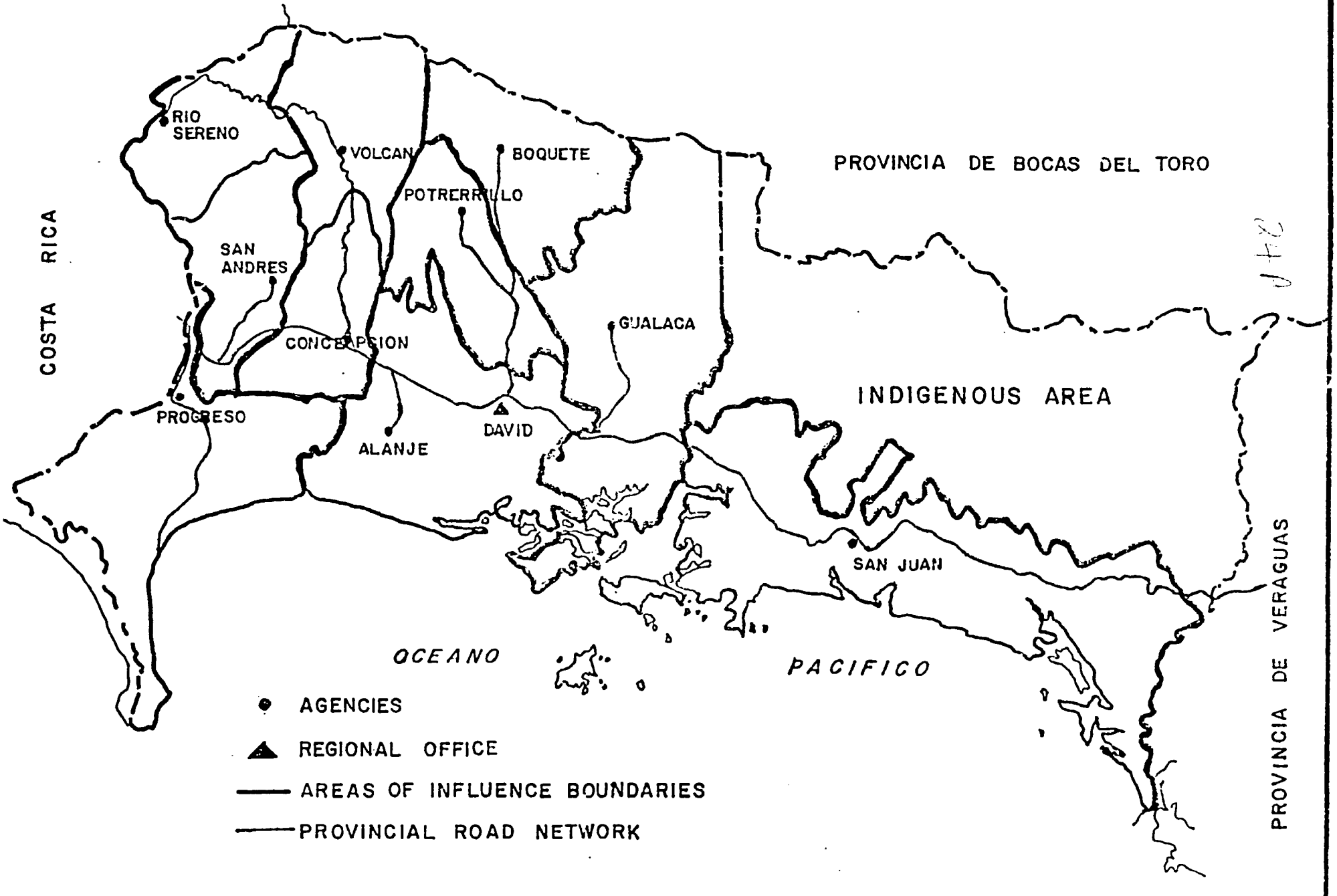
Each technology transfer assistant will work directly with approximately 40 contact farmers during each of the three stages of the project, the specific number depending on the size of farm, current level of technology and other factors. Over the life of the project, therefore, an individual assistant will directly transfer technology to around 120 farmers. A senior extension agent, with the help of 4 assistants may, in this way, reach 480 farmers. Variations of the above system are possible.

The one third of farmers receiving direct visits during each stage will be organized in groups of 6 to 8 members. A demonstration plot will be established on the farm of one group member. IDIAP will participate in the demonstration plot program by providing expertise and material inputs.

Senior technology transfer agents will, in addition to supervision of assistants, coordinate demonstration plot activities with IDIAP, organize and assist in training sessions, provide technical advice to

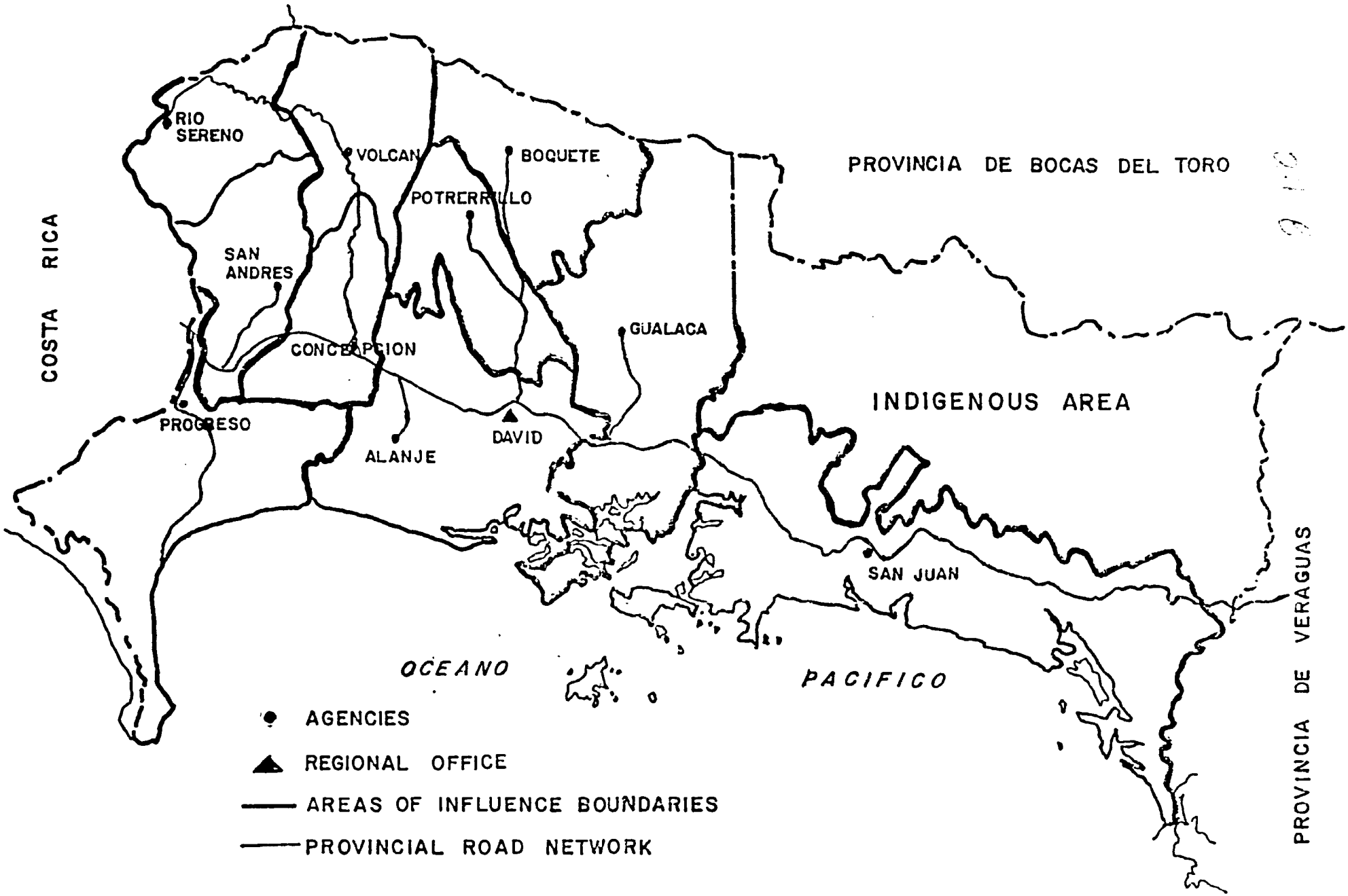
MAP 3-2

LOCATION OF LOCAL TECHNOLOGY TRANSFER AGENCIES AND CORRESPONDING AREAS OF INFLUENCE



MAP 3-2

LOCATION OF LOCAL TECHNOLOGY TRANSFER AGENCIES AND CORRESPONDING AREAS OF INFLUENCE



assistants with technical problems in the field or indicate the appropriate source for backstopping in IDIAP, meet with farmers at group meetings, and deal with other technology transfer matters.

The Technology Transfer Directorate (DTT) of IDIAP will have the major responsibility for packaging field-tested technologies and passing this knowledge to MIDA field agents and IDIAP specialists. The TDD will also be responsible for preparation of technology transfer materials, e.g. bulletins, leaflets, posters, radio and TV programs.

IDIAP and MIDA subject matter specialists with expertise in fields such as as plant protection, soils, irrigation, animal husbandry, horticulture, and farm equipment will furnish technical support for the technology transfer program. These specialists will conduct training programs for senior agents and will assist in establishment of demonstration plots, and provide specialized technical support to senior agents and assistant agents. A total of 24 subject matter specialists is required to furnish technical support for the program.

F. Project Activities and Outputs

1. Human Resources Development.

Implementation of the Chiriquí-focused technology transfer model described above requires a staff of 160 professional and sub-professional personnel: 109 assistant technology transfer agents, with professional preparation at the bachillerato, técnico or vocational level; 27 senior agents with college degrees in agricultural sciences (e.g. Ingeniero Agrónomo), and 24 extension specialists with college degrees (Ingeniero Agrónomo) and specialized training in subject matter areas. A limited number of personnel from Phase 2 candidate regions will also be trained in extension education and methodology and will comprise a vanguard upon which the program may be expanded. Human resource development activities are contemplated in the following areas:

a. Pre-Program Training

Technical assistance will be contracted to provide four weeks of intensive training to all 160 technology transfer personnel to familiarize them with program goals, adult education methods, philosophy of technology transfer, group organization techniques, project methodology, problem indentification and diagnosis, work organization and planning, and coordination of farmer support services. A total of $120,000 is budgeted for this purpose during the first year of the project. In subsequent years this training will be offered annually to an estimated 25 replacement personnel.

A total of $324,000 ($314,000 DL; $10,000 DG)) has been budgeted for Pre-Program Training.

b. Technical Training

Following pre-program training, four weeks of instruction will be offered to field staff in the technical aspects of agricultural production. Thereafter, assistant technology transfer agents will receive approximately 2 days training per month, or 4 weeks training each year, in the production, management, and marketing aspects of priority crops and livestock enterprises. This training will be given at frequent intervals, timed to meet the informational needs of farmers during different crop cycles. This training will be given by senior field staff with assistance from IDIAP, the Faculty of Agronomy, and other institutions.

A total of $603,000 ($578,000 DL; $25,000 DG) is allocated to technical training.

c. Training of Trainers

To provide the continuing technical training described above, senior technology transfer agents will receive specialized technical training from IDIAP subject matter specialists. Topics will include soil preparation and management, soil fertility and fertilizer practices, crop protection, irrigation and drainage, handling and marketing of agricultural crops, pasture and rangeland management, dairy and beef cattle production and management, farm management, and use and handling of agricultural chemicals.

A total of $118,000 in GOP counterpart funds has been allocated for this purpose.

d. Short-Term Training

Short-term training of 3 to 6 months duration will be offered to approximately 10 specialists per year from the Chiriqui Region, with more intense program levels in the early years of the project. This training will be offered to senior technology transfer agents and subject matter specialists and will be provided by IDIAP's Technology Transfer Directorate, the Faculty of Agronomy of the University of Panama, and visiting extension specialists. This program will be augmented through orientation training at other international institutions and universities. In addition, the Directors and Sub-directors of Phase 2 candidate regions will receive short-term training in extension organization, planning, and administration.

A total of $1,242,000 ($1,027,000 DL; $215,000 DG) has been budgeted for short-term training.

e. Long-term Training

Training at the MS level is contemplated for the 24 subject matter specialists from the Chiriqui Region. Areas of concentration include crop protection, animal husbandry, horticulture, soil conservation and management, fertilizers, farm management, extension education and communications, agronomy and other specialized fields. In addition, MS training will be provided for 8 specialists from the Phase 2 candidate regions.

Estimated costs of the MS program are $1,664,000 ($464,000 DL; $1,200,000 DG).

2. Infrastructure Expansion and Remodeling

Offices for local MIDA field personnel are currently located in Zone 1 at Progreso, David, and San Juan; in Zone 3 at Río Sereno; and at Volcán and Boquete in Zone 4. There is no local agency in Zone 2. With the exception of the Río Sereno office, facilities are small and overcrowded.

Planned infrastructure activities are as follows: the facilities at Progreso, San Juan, and Boquete will be enlarged and refurbished; the building at Río Sereno will be remodeled and refurbished; the agency at David will be relocated in new facilities to be constructed at Gualaca. New facilities will be constructed at Alanje in Zone 1, at San Andrés, Concepción and Potrerillos in Zone 2, and at Volcán in Zone 4. An IE&C center will be constructed at IDIAP's office in David.

$1,175,000 (DL) will be used for construction and/or expanding, remodeling and refurbishing existing facilities.

3. Information, Education and Communication

The IE&C center will form part of the Technology Transfer Directorate of IDIAP and will be located with IDIAP's regional office in David (although some of the major capital equipment, e.g. printing presses, will be located with complementary equipment in the Panama regional office).

The IE&C Center will produce and distribute printed material such as technical publications, bulletins, and leaflets. The Center will also prepare "comunicados" for television and radio news programs and educational radio and television programs. This unit will produce didactic photographs, films and slides, graphic arts. The Center will give technical assistance and training to technology transfer personnel in all of the above. Technical assistance will be provided to organize this unit and to train its personnel.

A total of $192,000 ($167,000 DL; $25,000 DG) is budgeted for equipment, materials and technical assistance for the IE&C Center.

4. Logistic Support

Critical to the success of any technology transfer activity is its logistical support system. The purpose of this component is not only to provide support to field personnel, but also to insure the continued operation of said system. Thus, before purchasing the commodities described below (with the exception of a few vehicles), technical assistance will be contracted to strenthen the Region 1 Office of Administration in the areas of logistical support systems and controls, financial management and general administration. A total of $41,000 has been budgeted for this purpose.

a. Vehicles

MIDA's fleet is currently located at the regional office in David and at the five local offices at Progreso, San Juan, Río Sereno, Volcán and Boquete. Field personnel operating out of the local office at David have access to the MIDA regional fleet. Of the 14 vehicles assigned to local offices, 6 vehicles are rated in good, 2 in average and 6 in poor condition

Low mobility has been identified as a major constraint to current MIDA efforts to transfer technology to small and medium farmers. Funds will therefore be invested to provide a fleet of 16 4-wheel drive vehicles for the 27 senior agents, a fleet of 32 4-wheel drive vehicles and 96 motorcycles for the assistant technology transfer agents (109) and a fleet of 10 four-wheel drive vehicles for the 24 subject matter specialists. Vehicles will also be provided for the Project and Deputy Project Coordinators. The current fleet of vehicles will be replaced over the life of the project.

Total cost for vehicles, including maintenance for the first three years of the project, is estimated at $1,140,000 (DL).

b. Equipment and Materials

The facilities to be constructed at Gualaca, Alanje, Concepción, San Andrés, and Potrerillos, and those to be remodeled and refurbished at other locations, will be provided with appropiate office equipment such as desks, typewriters, files, waiting and conference room, furniture, and air conditioning or ceiling fans.

The local field offices and the Chiriquí Regional Office will be equipped with training and visual aid materials, including film and slide projectors, photographic equipment, video-cassette systems, radio-cassette recording equipment. IDIAP's Technology Transfer Directorate will be provided with off-set printers, duplicating machines, movie-making equipment, video cameras and

editing paraphanalia and other equipment and materials required to produce pamphlets, audio-visual presentations and other technology dissemination materials. Farm inputs and agricultural equipment will be purchased for the demonstration farm program. In addition, equipment will be purchased to establish a vehicle repair and maintenance shop in the fourth year of the project.

A total of $617,000 (DL) has been provided for the purchase of these items.

5. Institutional Coordination

An effective technology transfer program also requires close coordination among members of the SPA at the local, regional, and national levels. In addition, active participation of the private sectors is needed. For these reasons, the Project contemplates utilizing or creating the following coordinative mechanisms.

a. Local Level.

The project contemplates the establishment of 10 Local Agricultural Committees (CAL) comprised of local farmers, local MIDA personnel and sub-area IDIAP specialists and researchers. These committees would be the local counterparts of CAR and CAN (described subsequently) and would promote feedback and interchange between the private and public sectors. Meetings could be held at local agencies during slack agricultural periods with the farmers being given small honoraria or víaticos for their participation. Several months of short-term technical assistance will be required to set up the mechanism and train CAL members in team building and other participatory methods.

b. Regional level.

Coordination between the SPA and the private sector at the regional level is also important to project success, and would be carried out through the existing Comité Agropecuario Regional (CAR), which has a legal mandate to "servir de mecanismo de encuentro y díalogo entre el Gobierno y los productores del país". However while the CAR does have an important coordinative function, a smaller, technology focused sub-group will be established within the CAR made up of small and medium farmers and representatives of MIDA, IDIAP, BDA, ENASEM, ENDEMA, ISA, COAGRO, and IMA. This group will be named the Comité Agropecuario Regional para Transferencia de Tecnología (CARTT) Technical assistance will be required to tailor the CAR or set up the CARTT to meet the requirements of the technology transfer system. Other costs would be honoria/víaticos for participating farmers and for a minimal amount of equipment/ materials and secretarial support.

c. National Level

To defend the interests of the technology transfer system in matters of national policies and budgeting. Principal roles for the Comité Agropequario National (CAN) and the Comité Agropequario (CCA) are perceived. The former is made up of national and regional directors and meets whenever necessary with the Minister of Agriculture to discuss sectoral issues, including the preparation of the annual budget. The CCA will be reinforced in order to sponsor annual encuentros or conferences for personnel from different technology transfer systems, e.g. SONA, MOREPRA, IDIAP/CIMMYT, to discuss and evaluate dissemination methodologies, their strengths and weaknesses, and other matters dealing with adoption of new technologies by small and medium farmers.

Responsibility for project monitoring at the national level, for serving as the project spokesman in allocation of counterpart budgetary resources, and for overseeing expansion of the program to other areas under Phase 2 will be vested in a high-ranking member of the Minister of Agriculture's executive staff. Requirements for a national office, its structure and responsibilities, and concomitant stafffing needs will be one of the primary tasks under Phase 2 project design.

$283,000 ($258,000 DL; $25,000 DG) is budgeted for this component.

G. Project Inputs

Project inputs financed by AID are shown by component in Table 3-1.

H. USAID Assistance Strategy

1. Relationship to the CDSS

This project is consistent with the objectives of USAID/Panama's FY 1984 CDSS and is a key component of the Mission's agricultural sector strategy. The goal of the Mission's agricultural program is to assist Panama to increase food production and raise incomes in the agricultural sector while conserving the natural resource base.

To help Panama reach the above goal, the CDSS states that the Mission will focus on (1) strengthening the capacity of the GOP to analyze and formulate policies that promote greater productivity and job creation; (2) improving the Government's capacity to develop new production and processing technologies and disseminate them widely to both public and private sector users; (3) strengthening public and private agricultural marketing, processing and transportation services; and (4) strengthening both the Government and private sector's capacity to protect and conserve the natural resource base of the country. Mission activities will concentrate on institutions, systems and programs in each area, leaving significant resource transfer activities such as credit, land tenancy, and infrastructure to other donors.

Tabel 3-1

Project Inputs

Component/Input	Quantity	AID/DL	AID/DG	Total
		($000)		
A. Human Resources Development		2,383	1,450	3,833
1. Pre-Program Training	310 p/m	314	-	314
2. Technical Training	1,120 p/m	572	-	572
3. Short-Term TA	5 p/m	6	35	41
4. Short-Term Training	300 p/m	1,027	215	1,242
5. Long-Term Training	768 p/m	464	1,200	1,664
B. Infrastructure	11 buildings	1,175	-	1,175
C. Info., Educ. & Communication		167	25	192
1. Short-Term Tech. Assistance	5 p/m	17	25	42
2. Equipment and Materials	various	150	-	150
D. Logistical Support		1,798	-	1,798
1. Short-Term Technical Assistance	5 p/m	41	-	41
2. Vehicles	156	1,140	-	1,140
3. Equipment & Materials	various	617	-	617
E. Institutional Coordination		258	25	283
1. Short Term Technical Assistance	5 p/m	17	25	42
2. Conferences/Workshops	7	175	-	175
3. Contingencies		66	-	66
F. Evaluation		219	-	219
1. In-house	4	20	-	20
2. Special Evaluation/ Phase 2 Design	15 p/m	123	-	123
3. End of Project	10 p/m	76	-	76
TOTAL		6,000	1,500	7,500

2. Relationship to Current Mission Programs

This project is a key component of the Mission's agricultural strategy with its emphasis on increasing Panama's basic food production. Direct linkages will be developed with two other AID-financed projects:

Agricultural Technology Development (No. 525-0180) which is focused on institutional development and the generation and dissemination of field-adapted production technologies in eight priority geographic areas.

PANAJURU OPG (No. 525-572) which will support activities of the Chiriquí branch of the Patronato Nacional de la Juventud Rural, Panama's version of the Future Farmers of America (with whom an interchange program is planned). This OPG is scheduled to be signed in the last quarter of FY 82.

The Agricultural Technology Project also complements or is a logical follow-on to the Mission's on-going projects in:

Education for Rural Development (No. 525-0219) which will upgrade the capacity of the University of Panama's School of Agriculture to provide training for students in extension techniques.

Rural Access Roads (No. 525-0192) which is opening isolated rural farm areas through the construction of farm-to-market roads.

Grains and Perishables Marketing (No. 525-0178) which focuses on the construction of silos and regional buying points to improve the public marketing of basic grains.

Integrated Rural Development (No. 525-0186) which has as one of its major components a pilot farm services program in the impoverished District of Soná.

In addition, the planned FY 1983 Agricultural Cooperative Marketing Project (525-0222) will attempt to improve the marketing system for small and medium size cooperative farmers in select areas of the country.

3. Other Donors

The IDB had originally expressed an interest in financing technology transfer activities as a part of a proposed $50 million Agricultural Sector Loan. Recent conversations between the Mission, AID/W and IDB officials have made it clear that IDB will leave the transfer of technology field to AID. Also, the GOP is presently testing several extension delivery methodologies with assistance from the government of Israel, and has received assistance from CATIE in the development of the extension delivery system for the AID-funded "Integrated Rural Development - Soná" Project. These other programs will be discussed at project-financed conferences and will be evaluated during Phase 2 design.

PART IV. - PROJECT ANALYSIS

A. Economic Feasibility

The project's economic analysis examined the direct output and income impacts arising from the adoption of new technologies and managerial practices by Chiriqui's small and medium size farmers.

Project economic feasibility was analyzed at the aggregate project level and the farm level. The former examined overall project feasibility while the latter provided insight into projected on-farm income and output impacts. An internal rate of return was calculated at the aggregate project level; changes in net farm returns were determined at the micro level. In addition, estimates of per farm project costs were calculated for the sixth year of project operation.

The analysis deliberately assumed conservative crop yield increases and livestock extraction rate changes -- levels that many better producers are already achieving or exceeding and which should be surpassed by a substantial margin by the majority of the beneficiary group as a result of the project. In addition the area under cultivation was assumed to be constant -- a condition that is not likely to hold as farmers become more efficient and have time to increase hectarage under cultivation. Beneficiary adoption rates of new technologies were based on the technology transfer system and methodology detailed in Annex II.B.

Project benefits were measured as the value of additional crop and livestock production by target beneficiaries. Project costs were the sum of AID and GOP operational and capital costs over the life of the project.

With the very conservative change assumptions utilized in the analysis, the project would still produce an internal rate of return (IRR) slightly greater than 15%. If less conservative assumtions were used and if the increased economic benefits flowing from increased food availability, reduced import dependency, and expanded agricultural exports were quantified, the mission estimates that the IRR would be well above 20%.

Results of the representative farm(s) analysis supported those of the aggregate project analysis. Projected increases in net income levels of the four representative farms examined ranged from 84% for a subsistence unit in Zone 1 to 245% for a 15 hectare general farm in Zone 2. Average net income increase for all four representative farms was 170%.

Based on the above analysis and conclusions, the mission considers the project both economically and financially possible.

B. Financial Feasibility

1. Introduction

As the activities proposed for financing under the project are not in themselves revenue producing, the financial analysis will not attempt to justify the project's financial soundness in the traditional sense. This section covers the basis for the development of the Project budget, the allocation of costs between the AID Loan and GOP Counterpart, the projected expenditures by year during the life of the Project and the recurring costs to the GOP of the Project.

2. Budget Analysis

The total estimated cost of the project is $13.84 million ($6.0 million A.I.D. Loan, $1.5 million A.I.D. Grant and $6.34 million, GOP counterpart budgetary support). The loan and grant will be fully funded in fiscal year 1982 subject to availability of funds. The overall project financial plan is presented in Table 4-1 and shows, by component, the AID loan and grant-funded and GOP counterpart costs.

Most of the GOP budgetary support for the project consists of in-kind contribution, principally salaries of personnel already on the goverment payroll. Minimal budgetary increases will have to be undertaken in the following areas: (1) Personnel (promotions, reassignments and increased salaries of employees returning with Master's degrees); (2) Logistics Support (primarily fuel and maintenance expenses for years four to seven; and land purchases for local agencies. Those increases applicable to the first year of the project have already been submitted by Region 1 for inclusion in the FY 1983 MIDA budget.

Annex II.C presents the detailed budgets for loan, grant and GOP counterpart funded activities. The figures therein show the estimated costs within each project component and how these costs were developed.

3. Allocation of Costs and Projected Expenditures by Year

The Loan will finance 43% of the project's cost, the Grant 11% and GOP counterpart 46%. The major loan funded activities are: Human Resource Development, $2,383,000 (40%); Infrastructure, $1,175,000 (20%); Information, Education and Communication, $167,000 (3%); Logistical Support, $1,798,000 (30%), and Institutional Coordination, $258,000 (4%). The remaining $219,000 (3%) will pay for equipment and materials, conferences, per diem expenses and periodic evaluations. Grant funds will finance training and technical assistance under the Human Resources Development component, $1,450, 000 (97%), with the balance ($50,000) for technical assistance in the IE&C and Institutional Coordination components. GOP counterpart costs will be: personnel, $5,647,000 (89%); and logistical support (including vehicles, fuel, maintenance, and land), $691,000 (11%). Projected disbursements by component by year over a seven-year period are shown in Table 4-2.

Table 4-1

PROJECT FINANCIAL PLAN

($000's)

Component/Activity	AID/DL	AID/DG	GOP	Total
A. Human Resources Development	2,383	1,450	606	4,439
1. Pre-Program	314	10	87	411
2. Technical Traininig	578	25	47	650
3. Training of Trainers	-	-	118	118
4. Short Term Training	1,027	215	151	1,393
5. Long Term Training	464	1,200	203	1,867
B. Infrastructure	1,175	-	26	1,201
1. Local Agencies	1,000	-	26	1,026
2. David IE&C Center	175	-	-	175
C. Info., Educ. & Communication	167	25	757	949
1. Development of Materials	57		378	435
2. Development of Training Courses	110	25	379	514
D. Logistical Support	1,798	-	667	2,465
1. Logistical Support Systems	41	-	-	41
2. Vehicles	1,140	-	-	1,140
3. Equipment & Materials	617	-	667	1,284
E. Institutional Coordination	258	25	-	283
1. Local Coordination	41	15	-	56
2. Regional Coordination	21	5	-	26
3. National Coordination	196	5		201
F. Evaluation/Phase 2 Design	219	-	-	219
G. Operational Salaries	-	-	4,284	4,284
TOTALS	6,000	1,500	6,340	13,840

Table 4-2

PROJECTED EXPENDITURES BY YEAR
($000's)

	Component	AID Year No.1	GOP Year No.1	AID Year No.2	GOP Year No.2
A.	Human Resource Development	752	112	956	138
B.	Infrastructure	600	26	575	-
C.	Info., Educ. & Communication	51	48	66	73
D.	Logistical Support	372	7	1,067	60
E.	Institutional Coordination	54	-	54	-
F.	Evaluation/Phase 2 Design	-	-	123	-
G.	Operational Salaries	-	417	-	612
	TOTALS	1,829	610	2,841	883

	Component	Year No. 3		Year No. 4	
A.	Human Resource Development	833	94	531	83
B.	Infrastructure	-	-	-	-
C.	Info., Educ.,& Communication	15	78	15	104
D.	Logistical Support	40	60	124	135
E.	Institutional Coordination	35	-	35	-
F.	Evaluation/Phase 2 Design	5	-	5	-
G.	Operational Salaries	-	651	-	651
	TOTALS	928	883	710	973

	Component	Year No.5		Year No.6	
A.	Human Resource Development	323	67	219	56
B.	Infrastructure	-	-	-	-
C.	Info.,Educ., & Communication	15	144	15	155
D.	Logistical Support	70	135	85	135
E.	Institutional Coordination	35	-	35	-
F.	Evaluation/Phase 2 Design	5	-	5	-
G.	Operational Salaries	-	651	-	651
	TOTALS	448	997	359	997

	Component	Year No. 7		TOTAL		GRAND TOTAL
A.	Human Resource Development	219	56	3,833	606	4,439
B.	Infrastructure	-	-	1,175	26	1,201
C.	Info., Educ., & Communication	15	155	192	757	949
D.	Logistical Support	40	135	1,798	667	2,465
E.	Institutional Coordination	35		283	-	283
F.	Evaluation/Phase 2 Design	76	-	219	-	219
G.	Operational Personnel	-	651	-	4,284	4,284
	TOTALS	385	997	7,500	6,340	13,840

4. Recurring Costs

Recurring costs for the project will involve both continued operating and new, non-expendable property expenses. Annual recurring operating expenses are estimated to be $997,000, or essentially the same amount as the yearly counterpart costs incurred during the last three years of the project. NXP costs involve the continuous overhaul required for the fleet of vehicles. While not all vehicles (estimated cost = $869,000) will require replacement in any single year, it is anticipated that a rather heavy turnover will occur in the first few years after the PACD, when the majority of the vehicles will be between 6-8 years old. However, with careful logistics planning and good maintenance, MIDA should be able to achieve a turnover rate of no more than 25% in any one year, with an eventual rate below 20%. Yearly recurring costs for the project are estimated at $1,171,000 ($997,000 operating + $174,000 for vehicles). This figure would amount to less than 6% of the total 1981 MIDA budget of $22.4 million ($19.1 million operational and $3.3 million investment). Inasmuch as a substantial proportion of these costs would be incurred in absence of the project, recurring costs are not judged excessive.

5. Conclusion

Based on the financial analysis summarized above, the project is considered to be financially feasible with respect to planned disbursements, counterpart funding and recurring project costs.

C. Social Soundness Analysis

Farmers are the purpose and the foundation upon which any technology transfer system must be constructed. Programs must therefore be planned from the ground up, and be farmer-based in order to ensure that interventions in traditional crop and livestock production systems are practical, beneficial, and within the resources of the target group.

Farmers with limited resources often do not adopt new technologies because (1) their conditions are substantially different from those where the technologies were developed, (2) they do not have the resources to purchase the required inputs, (3) the technologies do not apply to the crops being grown or the livestock raised on their farms, or (4) they do not know about the new technologies.

The Social Soundness Analysis undertaken for this project showed that Chiriqui farmers have been receptive to new technology in the past when viable agro-alternatives were known to exist, and if they led to higher incomes. The study showed that small and medium farmers who worked on large banana holdings, for example, adopted the techniques used on the plantation. Small farmers who came into contact with modern vegetable farming also adopted high output methods. Further, the study showed that Chiriqui farmers are becoming increasingly market-oriented as cash income needs grow. Recently, farmers in the Caísan area of Chiriquí rapidly adopted no-tillage methods for corn after it had been demonstrated that

yields were not affected, and that the new technology reduced labor and dependence on ENDEMA, the GOP agricultural machinery agency. Coffee farmers in the Río Sereno area of Chiriquí are adopting modern technology imported from Costa Rica. However, for most farmers, there is no private or public institution to which they can turn for reliable technological information.

The major means of making new technologies known to small and medium farmers in this project is through direct contact on a regular basis. Reconnaisance surveys will be made by area technology transfer agents so that small farmers and their environments are better understood, and to identify opportunities for improvement of farming systems through dissemination of technological knowledge. Demonstration plots located in strategic places will help overcome beliefs that new technologies do not apply in target areas. Local Technology Transfer Committees (CALs) are a mechanism for receiving direct and continuous feedback from small and medium producers for MIDA and IDIAP personnel and other members of the SPA in the province. In addition, they support the diffusion of project activities and therefore the provision of benefits to a wider audience.

Social Soundness Analysis concludes that the proposed project design is compatible with and supportive of the socio-cultural environment, actively encourages beneficiary participation and is aimed at promoting an equitable distribution of benefits throughout the province.

D. Technical Feasibility

1. Feasibility of the Technology Transfer System

The Chiriquí model for transfer of technology comprises a hybrid of extension models already being used on a limited scale to diffuse new technologies to small and medium farmers in Panama. The Training and Visitation method is being used in Soná; the MOREPRA model in Ocú; the IDIAP/CIMMYT methodology in Caisán; and the classical model in local agencies throughout Panama. The Chiriquí model simply marshals the favorable features of other models, and adapts these to the specific agro-ecological circumstances and farming systems of Chiriquí.

The model is based on direct and frequent contact with farmers, continuous training of technology transfer agents to provide the technical knowledge needed to deal with problems in the field, and in developing a thorough understanding of the farming systems used by small and medium farmers. Technology transfer workers will be backed by a strong research program, a cadre of subject matter specialists, and by access to technical information concerning priority commodities in the area. The model provides for professional upgrading of project personnel, and establishes various coordinative mechanisms with the agricultural support agencies and the private sector. Conditions for success are judged to be favorable.

2. Human Resources Availability

The primary source of human resources for this project will be the existing MIDA staff of approximately 5,000 professional and sub-professional employees. Some of the professional personnel at MIDA were members of the Extension Service prior to its disbandment in 1972, and thus have backgrounds in dissemin tion methods. A large number of MIDA personnel have training in agriculture at the technical or vocational school level. A smaller group is comprised of university-trained agronomists and veterinarians, who may be trained as specialists and senior transfer technology agents.

Careful selection, training, and motivation of technology transfer personnel is considered key to the success of this project. In addition to criteria such as preparation and experience, personnel will be chosen to minimize the social distance between the technology transfer agent and the target population. Opportunities for professional growth will increase the capability of project personnel to perform effectively at all levels of the project.

3. Infrastructure

There exist in Chiriquí Province a number of construction firms capable of refurbishing existing local MIDA offices and constructing all new edifices contemplated in the project. Materials and equipment needed for construction and refurbishing of buildings are readily available in Panama. Local labor will be used in all construction. Contracts for construction will be awarded through competitive bidding, of which the GOP has had ample recent experience under the AID funded Rural Health Delivery Systems (Loan 045), Education Sector Loan II (Loan 043), and the Agricultural Technology Development Project (Loan 050). Maintenance of physical facilities is not considered a problem.

4. Logistic support

Key to success of this project will be regular visits by technology transfer agents to contact farmers. Mobility for project personnel will be provided by a fleet of motorcycles and four-wheel drive vehicles. Careful consideration was given to existing and prospective rural road networks and topographical features in selecting the mix of vehicles that will be provided to local agencies. At least 3 four-wheel drive vehicles, and 7 motorcycles will be available in each local agency for use by technology transfer personnel.

Vehicle maintenance is a problem for MIDA Region 1 as it lacks shop equipment and experienced mechanics. For this reason, vehicle maintenance and repair for the first three years of the project will be by warranty protection and private sector service contracts (at which

time MIDA mechanics will receive on-the-job training). Strengthening of MIDA Region 1 capability to maintain the fleet after three years is provided for in the project. Maintenance of communication and other equipment is not considered a problem.

5. Replicability

Although project activities will be area-focused in Chiriquí, expansion of a similar technology transfer mechanism to other provinces (most likely candidates being Coclé, Herrera, Los Santos and Veraguas) is anticipated. Toward this end, the project provides for training two specialists in extension education and methodology as vanguard for the establishment of technology transfer systems in other areas. In addition, the Directors and Sub-Directors of other MIDA Regional Directorates will receive specialized training in the organizational and management aspects of extension systems.

Experience gained in establishing a technology transfer system in Chiriquí should minimize problems in extending the system to other regions or to a national level. It is expected that the program will be expanded to other geographic areas of Panama in 1986 during Phase 2.

Expansion into other regions may require relocation of MIDA staff and additional investments in buildings, vehicles, and equipment. Additional information, education, and education centers would likely be established in central locations such as Divisa and Panama City in conjunction with IDIAP facilities to be established at these sites. Expansion of the program to other areas will also coincide with IDIAP's short and long range plan for generating new technologies in other geographic regions.

6. Adequacy of Agricultural Markets

Priority GOP objectives for the agricultural sector are to satisfy internal demand for food products at reasonable prices, and to obtain a higher degree of auto-sufficiency in food production. Chiriquí province is estimated to produce 60% of the domestic food supply in Panama. Production in the province is expected to increase 41% as a result of adoption of improved technology. The overall impact on domestic food supplies is thus 24%, or approximately 4% annually. It is expected that this increase in aggregate food supply can be absorbed without difficulty.

Projections based on historical data indicate that the demand for many products will increase more rapidly than domestic supply. These projections show growing deficits in corn, beans, onions, yuca, beef, pork, poultry meat, edible oils, and cereals. The long-term outlook

for rice is uncertain, although rice is now in excess supply (this may be a result of alleged contraband rice coming from Costa Rica following currency devaluation). Coffee and sugar exports are heavily subsidized due to prevailing low world prices.

The Government Marketing Agency (IMA) provides storage facilities for grain, and purchases commodities that are surplus to private handlers. Rice, corn, and sorghum are the predominant grains produced in the target province. IMA purchases 20% of the rice, 33% of the corn, and 50% of the beans that move off the farm. Surplus storage capacity for rice exists in Chiriqui, even during the harvest season when most output is placed on the market (this includes the capacity of silos currently being constructed in David under the AID-financed Agricultural Marketing Project). Elevator capacity for corn and beans is now being expanded by IMA.

Perishable commodities produced in Chiriqui consist of tomatoes (principally industrial), onions, potatoes, and other vegetables. Marketing channels for these commodities are simple; most are consumed fresh without processing. Post-harvest losses are heavy due to lack of cold storage facilities and poor handling. Lack of grading and classification, and improper handling exclude important markets such as military installations.

Beef is marketed through well established and efficient channels. Abattoir capacity in Chiriqui is being utilized at only 50%; increased output can be placed in market channels without difficulty. Milk processing facilities are being used at near-capacity. However, projected increases in milk production owing to technology transfer are not great. Large increases in production of poultry products are not anticipated.

Pricing actions by the GOP encompass most agricultural products. When historical support prices for corn and rice are compared with the area planted, a high correlation is evident. Further, acreage expansion has been twice as high by small and medium operators as for large farmers. Such small farm response indicates that target farmers can make a contribution to increased output when there is a market demand (someone to sell to) and a market system (someone to sell through).

7. Credit Availability

Use of new production technology often involves expenditures by farmers on improved seeds, pesticides, fertilizers, and equipment and implements to apply new inputs. Such expenditures must be financed either by borrowing or from savings for the period between the time

that inputs are first purchased until the crop is marketed. Because of the poverty of many small and medium operators, it is argued that extending production credit to farmers can be an important accelerator of technology transfer. While there may be some validity in this argument, there is little empirical basis for the belief that small and medium farmers do not have savings which could be used for marginally increasing their productive capacity.

Survey data from Chiriqui Province indicate that 70% of the farmers interviewed did not use credit and, of these, only 18% answered the question regarding reasons for non-use of credit.1/ Studies have shown that lack of credit availability is not a primary reason why farmers do now borrow money to purchase improved seeds or fertilizers. The real reason frequently is (1) that the farmer is not convinced that the new input would be technically efficient, or (2) that he feels that the increased product to be had from the use of the new input would not be worth the cost plus the added labor in using it, or (3) that the increased output promised by the use of the new inputs is not large enough to justify the risk of trying out a new method.2/

Surveys have shown that the Agricultural Development Bank (BDA) is an important source of credit to small and medium farmers in the target province.3/ In FY 1980-81, farmers in Chiriqui Province borrowed $16.5 million from BDA, or 35% of all outstanding loans of BDA in that year (Annex II.H). Considering the importance of Chiriqui Province agricultural production in Panama, a substantial portion of production credit is financed out of farmer savings, or by other sources. Nonetheless, BDA has increased its credit portfolio substantially; total outstanding loans rose from $6.6 million in 1970 to $40.0 million in 1981. Further increases in credit availability are planned by BDA.

Availability of production credit is not assessed as a principal constraint to adoption of improved agricultural technology by small and medium farmers in Chiriqui. Hence, a credit component is not included in the project. Instead, technology transfer personnel will work closely with BDA agents in the field and through the CALs to make farmers aware of credit availability for use in exploitng the new technology.

1/ MIDA-IICA Perfil del Area de Renacimiento.

2/ See Credit and Technology Transfer, Annex 2-H, and A. T. Mosher, "Getting Agriculture Moving--Essentials for Developing and Modernization," Frederick A. Praeger Publishers, 1966.

3/ MIDA-IICA Perfil del Area de Renacimiento.

E. Administrative Feasibility

The basic thrust of project design has been to (1) minimize institutional changes; (2) take advantage of those strengths that exist; and (3) reinforce those parts of entities whose weaknesses could cause serious delay or damage to project implementation. Thus, MIDA will continue to operate with only minor institutional changes at the local, regional and national levels. At the local level, project-induced changes would include the reassignment of personnel from other programs to technology transfer, and placing senior technology transfer agents under the responsibility of the newly-created Project Coordinator position. At the regional level, the MIDA Region 1 Administration Office will be strengthened through technical assistance and training in new administrative, financial management, and inventory control systems. The office will be further strengthened by the appointment of a Deputy Project Coordinator, who will have primary responsibility for all project logistic systems. These activities will have direct positive effects on the Short-term Training and Logistic Support components.

Long-term training and infrastructure expansion and remodeling are not considered problems for either MIDA or IDIAP in that activities required will be essentially monitoring only as AID OT/IT and the Panama Mission will support the former and the private construction firms will construct/remodel the local agencies and the IE&C center (a MIDA architect is currently preparing the plans and specifications for these buildings; preliminary plans are shown in Annex 2.E).

Information, Education and Communication (IE&C) is an area in which MIDA has not demonstrated technical or managerial strengths. For this reason, the project will take advantage of the IDIAP's current operational programs in this area and will further strengthen the capability of IDIAP'S technology transfer unit to undertake expanded IE&C activities.

National level activities are focused on using the Comité Consultivo Agropecuario (CCA) as a national forum for technology transfer through meetings and annual conferences or encuentros, none of which involve activities beyond current capabilities (e.g. IDIAP sponsored an agricultural technology conference for 300 participants in August of 1982). Creation of a national technology transfer institutional structure at the national level is a critical, yet separate issue to be covered in the evaluation/design of Phase 2.

Administrative analysis has shown that the activities contemplated under the project are feasible within the current and planned administrative and managerial capacities of MIDA and IDIAP. This is further supported by the highly favorable response given to the project by the Region 1 Director and local agency employees, who perceive the project as an opportunity to receive new skills and technical/logistic support in the performance of their jobs.

PART V. - PROJECT IMPLEMENTATION ARRANGEMENTS

A. Implementation Plan

The anticipated sequence of major implementation events by quarter for the Agricultural Technology Transfer Project is shown in Table 5-1.

B. Project Management and Coordination

Successful implementation of the project requires technical expertise, close management at all levels in MIDA, and coordination at the policy and operational levels within the SPA as well as with various private sector entities. To meet these requirements, a project technical-management core will be located in the MIDA Regional 1 Office in David. This core will consist of a Project Coordinator responsible for agricultural technology transfer at the regional level and reporting directly to the MIDA Regional Director, a Deputy Project Coordinator in charge of project logistical support, and an office secretary. At the national level, project monitoring and prospective expansion to a national technology transfer program will be coordinated by a senior member of the Ministry of Agriculture's executive staff. Project management and coordination roles are summarized below:

1. Minister of Agriculture

The Minister of Agriculture will provide general policy guidance to the senior member of his executive staff, the Director of MIDA Region 1, the Director General of IDIAP, and other heads of the SPA as regards the content of activities and the roles of the various entities and their personnel. Once these guidelines are set, it is anticipated that in addition to his regular participation as chair of the Comité Agropecuario Nacional (CAN) and the Comité Consultivo Agropecuario (CCA), the Minister's involvement will be required only when new project policy issues arise.

2. MIDA Senior Executive Staff Member(SESM)

This person will be the Ministers' designee in overseeing the Project. While not involved in the day-to-day minutiae of project implementation, the SESM will bear the responsibility for national level coordination of the project, presentation of counterpart funding requirements to the Minister in conjunction with the MIDA Region 1 Director and the head of IDIAP, and coordination of evaluation and analytical and design components for the expansion of the technology transfer program under Phase 2.

Table 5-1: Agricultural Technology Transfer Project Implementation Plan

	FY82 Quarter	FY83 Quarter	FY84 Quarter	FY85 Quarter	FY86 Quarter	FY87 Quarter	FY88 Quarter	FY89 Quarter
A. Project Monitoring								
1. Loan Agreement Signed	. . . 4							
2. Conditions Precedent								
a. Initial Disbursement		1 . . .						
b. Additional Conditions		. 2 . .						
c. Logistics Support			. 2 . .					
3. Quarterly Project Reviews		1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
4. Project Evaluations				. . . 4	. . . 4	. . . 4	. . . 4	. . . 4
5. Evaluation/Phase II Design			. . 3 4	. . 3 .	. . . 3 .	. . 3 .	. . 3 .	. . 3 .
6. PACD								. . . 4
B. Pre-Implementation Activities								
1. Contracting TA for Pre-Induction & Tech. Training		. 2 3 .						
2. Construction Contracting		1 2 . .						
3. Logistics Support TA Contracting		1 2 . .						
4. Contracting for IE&C TA		. 2 . .						
5. Reassignment of Personnel		. 2 3 .						
6. Contracting for Project Evaluation/Phase II Design		. . 3 4						
7. Contracting Inst. Coord. TA			. . 3 .					
C. Project Activities								
1. Human Resources Development								
a. Pre-induction Training		. . . 4						
b. Technical Training			1 . . .					
c. Training of Trainers		. . 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
d. Short Courses		. . 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
f. Masters Programs		1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 .		
2. Infrastructure Expansion								
a. Local Offices		. 2 3 4	1 2 . .					
b. David Information Center		. . 3 4	1 2 3 .					
3. Info., Educ. & Coms.								
a. Development of Materials		. 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
b. Development of Training Courses		. . 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
4. Logistical Support								
a. Logistical Support Systems		. . 3 4	1 2 . .					
c. Purchase of Vehicles		. . 3 .	. . 3 .					
d. Purchase of Equipment & Materials		. . . 4	1 2 3 4	1 2 . .				
5. Institutional Coordination								
a. Local Committees (CAL)				. 2 . 4	. 2 . 4	. 2 . 4	. 2 . 4	. 2 . 4
b. Regional Committees (CAR/CANRT)			. . . 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
c. National Committees (CAN/CCA)				1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
d. Technology Transfer Conferences				. 2 . .	. 2 . .	. 2 . .	. 2 . .	. 2 . .

3. MIDA Director/Region 1

The MIDA Region 1 Director will have the primary responsibility for the implementation of the project and for coordinating its activities within the region. He will have the overall responsibility for decisions regarding project personnel, construction of infrastructure and provision of necessary logistical support and technical assistance. The Regional Director will also be responsible for the development of the yearly counterpart budgets in consultation with the SESM for presentation to the Minister in support of the ATT project. He will continue as chairman of the Comité Agropecuario Regional (CAR) and will also preside over the proposed technology transfer sub-group, CARTT.

4. MIDA Project Coordinator

The MIDA project coordinator will report directly to the Regional Director and will be responsible for the day-to-day administration of the project, planning and monitoring the major implementation actions of the project, e.g., the contracting of technical assistance, yearly implementation plans, training plans, evaluations, and for bringing those issues requiring higher attention to the Regional Director.

The Project Coordinator will be a critical element in the implementation of the Project. This person will be responsible for the technical execution of all Project activities, supervision of technical-assistance personnel and for the quality/quantity of the technical outputs. Such an individual should have a technical background in agricultural technology transfer, possess public management skills and have proven experience in the implementation and evaluation of complex agricultural development projects. Specifically, he/she will be charged with the (1) developing/finalizing scopes of work for all technical assistance provided under the Project, (2) scheduling technical assistance as regards the most efficient timing of inputs and their proper sequence of execution, (3) over-seeing all technical-assistance inputs and outputs, (4) facilitating the work of technical assistance consultants within and between the region's various field units, (5) coordination of training, infrastructure and logistic support plans, and (6) suggesting remedial actions and/or additional inputs for those activities suffering implementation difficulties. Short courses training technology transfer administration will be provided for this individual during the first year of the project.

5. Deputy Project Coordinator

A Deputy Project Coordinator with specific responsibility for project logistics will be located in the David Regional Office. This person, working in conjunction with Office of Administration staff, will be charged with supporting the local offices and the information center with personnel, vehicles, vehicle maintenance, fuel, office

equipment and supplies. In addition, the deputy will also work with the technical assistance consultants provided to strengthen the logistic, financial management and control systems of the Office of Administration. This person will work under the direction of the Project Coordinator and will actively participate in all facets of project in addition to the above responsibilities.

6. IDIAP Coordinator

IDIAP will name a coordinator to be charged with coordinating the day-to-day activities between MIDA and IDIAP's Technology Transfer Directorate. As with the Project Coordinator, the IDIAP coordinator will be responsible for facilitating and coordinating the work of the consultants within IDIAP and for coordinating those activities with other members of the SPA.

7. Consultants

Consultants providing technical assistance will be responsible to the Regional Director and work under the daily supervision of the Project Coordinator. Their specific counterparts will be the technical personnel from the local offices, the regional logistics office, IDIAP's Technology Transfer Directorate coordinator or the Project Coordinator as required. Any problems or difficulties with consultants that cannot be resolved by the Project Coordinator, in consultation with the technical personnel, will be raised to the level of the MIDA Region 1 Director.

8. AID Project Officer

The AID Project Officer will work closely with the MIDA Senior Executive Staff Member, the MIDA Regional Director, the Project and Deputy Project Coordinators, the IDIAP Coordinator, and technical assistance consultants. The Project Officer will be responsible for helping MIDA and IDIAP develop Annual Financial Plans, for the development and approval of Quarterly Work Plans, and for reviewing and approving scopes of work, terms of reference and specifications for the procurement of technical services and equipment. The ATT is a field project and will require active field monitoring of all project components, especially during the intitial stages of project implementation.

C. Training

The various diagnostic studies pointed out training needs for technical and operational-level personnel in four areas: (1) pre-program training, (2) initial technical training, (3) in-service training and (4) long-term training. More detailed information on specific training needs and the planned program can be found in Annex II.B.

In order to meet the initial training needs and assure the efficient and timely execution of project activities, a pre-induction training course will be held to introduce regional personnel to the concept of technology transfer, explain the project and its activities and outline their roles in the project. This will be followed in close sequence by a one month technical course on how to prepare farm diagnostics and on the specifics of various technical assistance packages to be transferred. Both of these courses will be held in Chiriquí and will be presented in training packages specifically adopted to the circumstances and socio-cultural characteristics of the region.

These courses will be followed by regular in-service training sessions during which (1) IDIAP specialists will train the senior technology transfer agents and (2) the senior agents will pass new technological packages and other farm service skills to their assistants. In-service training will not require outside inputs, e.g. technical assistance, except for the most exceptional technical circumstances. Also, during project implemtation, subject matter specialists will be sent to various short courses in Latin America and the U.S. to upgrade their technical skills and knowledge. These course will be arranged by the Project Coordinator in consultation with the AID Project and Training Officers.

Also receiving training will be the members of the local and regional technology transfer committees (CALs, CAN and CARTT) who will receive short courses in "team building", how to work with and improve their functioning in groups, specifically how to elicit feedback from the private sector members, how to plan and organize meetings and set agendas, and how to coordinate activities with other members of the SPA. This type of training is available from local Panamanian firms and because of the need for socio-cultural sensitivity to the circumstances in Chiriquí will likely be solicited from within Panama.

D. Procurement of Goods and Services

1. Overview

AID guidelines suggest that the Borrower under an AID loan be charged with the procurement of goods and services unless there are mitigating circumstances. In the case instant, it is felt that the complexity of the Project and a realistic assessment of the GOP's procurement performance in other AID projects suggests a transitional mechanism. Such a mechanism will not only satisfy the procurement needs of the Project itself, but also strengthen the Government of Panama in this area, specifically as it relates to AID procurement regulations and procedures. Thus, during the first few months of the project, AID will play a key supporting role in Project procurement. Specifically, AID will give advice and guidance on (1) the contracting of the technical assistance for the pre-program workshops, initial technical training and logistical technical assistance and (2) the procurement of any necessary goods and services required for the

initial operation of the Project Coordinator's office and related coordination functions. If necessary, the Regional Contracting Officer will purchase any vehicles required during the first year of implementation.

Once the actions described above have been completed, it is expected that AID's active procurement/contracting support role will end. With the planned technical assistance in logistical systems and controls, financial management, and general administration, MIDA's Regional Office of Administration and IDIAP will assume responsibility for the procurement of goods and services financed under the Project with the full-time support of the Deputy Project Coordinator. The deputy will be charged with the development of several informal workshops for local and regional office personnel in consultation with the RCO, ODR and the Project Coordinator in order to develop detailed procurement plans for technical assistance and other project goods and services. He/she will also support each project activity in drafting scopes of work, terms of reference, specifications, and other required documentation.

2. Waiver for Motorcycles

Off-road motorcycles are the most effective and economical means of transport for field agents in the performance of their farm visits in many areas of Chiriquuí. The Project Design Team analysed agent transportation needs, weather conditions and road networks and decided that 96 motorcycles of approximatlely 175 cc. size (estimated cost $200,000) would be required under the project. Lightweight motorcycles of this type (under 250 cc.) are not manufactured in the U.S. There are, however, several brands of Japanese manufactured motorcyles sold in Panama with adequate maintenance facilities which meet field agent needs. A waiver will be included in the Project Authorization (see Annex I.D) for the purchase of off-road motorcycles from Geographic Code 935; all four-wheel drive vehicles will be of Geographic Code 000 source and origin.

E. Project Evaluation

Annual progress evaluations will be held in 1984 through 1988 with an in-dept impact evaluation scheduled for the end-of-project in June 1989. The evaluation in 1984 will be a joint evaluation-design process to review the project and decide on the feasibility of its expansion to other priority regions. Given the other technology transfer models being tested, AID and the GOP will have to assess their success to some degree (the technology transfer conferences to be sponsored yearly by the CCA should help in this regard) before deciding to move foward with a national program. If the decision is positive, the consultant team will have two key design tasks: (1) whether it is feasible to combine Phases 2 and 3 into one project and (2) the development of a national institutional mechanism to coordinate and administer a nationwide technology transfer system.

Regular progress evaluations will:

1. Examine the Project's design to determine if it conforms to current reality;

2. Examine the timely provision and quality of inputs by AID and the GOP;

3. Compare and analyze actual progress toward achievement of planned outputs and purpose; and

4. Identify and analyze implementation problems, their causes and effects.

5. Assess the strengths and weaknesses of other technology transfer models and consider which positive attributes might be worthwhile incorporating in Chiriquí.

Using the results of each evaluation, the combined MIDA, IDIAP and AID evaluation team will hold a workshop to prepare an action document that contains major findings and recommended corrective actions. This report will be submitted to the Minister of Agriculture's senior executive staff designee, the Region 1 Director, the Director General of IDIAP, and AID. The MIDA and IDIAP Project Coordinators will be responsible for ensuring that the recommended actions are carried out within the time period specified in the evaluation report.

The final End-of-Project evaluation will be prepared by an outside group of consultants. This evaluation will cover the topics mentioned above and also determine whether the project has achieved its end-of-project status, determine the project's positive and negative impacts, catalogue what lessons have been learned, and specify if these lessons apply to the other phases of the technology transfer program if under implementation, to other Mission sectoral projects or to activities in other countries. Copies of this report should be delivered to the Minister of Agriculture, the Director General of IDIAP and AID within 30 days of the Project PACD.

F. Conditions, Covenants and Negotiating Status

The project has been thoroughly discussed with members of the public and private sectors at the regional and local levels and has been formally presented to the Vice-Minister of Agriculture and the new Minister of Planning and Economic Development. Reaction has been favorable and there appear to be no major impediments to negotiating and signing the Project Loan and Grant Agreement in FY 1982. However, while the GOP has agreed verbally to providing the personnel and logistic support required for the project, the mechanics have not been presented yet to AID. For this reason, in addition to the standard conditions, we are recommending the following:

1. Conditions Precedent to First Disbursement (Loan and Grant)

Prior to any disbursement, or the issuance of commitment documents under the Project Agreement to finance any Project activity, the GOP shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

(a) evidence that the Ministry of Agriculture has appointed a senior executive staff member to monitor the coordination of the Project at the national level;

(b) evidence that a Project Coordinator and a Deputy Coordinator for the Project have been appointed for the MIDA Regional Office in David;

(c) a long term training plan which specifies the number of personnel to be trained, the subject areas to be studied and the designated positions to be filled upon completion of studies.

(d) an agreement between the Ministry of Agricultural Development ("MIDA") and the Panamanian Institute for Applied Agricultural Research ("IDIAP") which details IDIAP's responsibilities and the resources to be committed under the Project;

(e) evidence that IDIAP has appointed a Project Coordinator for its activities under the Project.

2. Conditions Precedent to Disbursement (Loan and Grant)

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance any Project activity except for long-term training, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(a) a financial plan which details Loan, Grant and GOP counterpart funds budgeted for all activities to be carried out over the first year of the Project;

(b) a quarterly work plan, to be submitted each quarter during the first year of the Project, which details each Project Activity to be carried out during such quarter and a budget which details the proposed AID funds for each such activity.

3. Condition Precedent to Disbursement for the Logistics Support Component (Loan)

Prior to any disbursement or the issuance of any commitment documents under the Loan to finance any Project logistic support activities, except for technical assistance for the MIDA Region 1 Office of

Administration and except for the procurement of such vehicles as USAID/Panama may approve, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(a) evidence that an adequate logistics control and management system to support the local field agencies has been established;

(b) evidence that the necessary personnel for the field offices have been reassigned, recruited and placed at such offices, and that such personnel have completed pre-program and initial technical training under the Project;

4. Recurring Condition Precedent to Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance any Project activity, each Project year after the first Project year, except for long-term training, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(a) a financial plan which details Loan, Grant and GOP counterpart funds budgeted for all activities to be carried out over such Project year;

(b) a quarterly work plan, to be submitted each quarter during such year, which details each Project activity to be carried out in such quarter and a budget which details the proposed AID funds expenditures for each such activity.

(c) evidence that it will provide budgetary support of no less than the equivalent of $60,000 to cover the expenses of fuel for vehicles procured under the Project.

5. Covenants

The GOP shall covenant that, unless AID otherwise agrees in writing, it will:

(a) provide budgetary support over the life of the Project of not less than the equivalent of Six Million Three Hundred Forty Thousand United States Dollars ($6,340,000) for Project activities and to provide budgetary support for on-going activities after the life of the Project;

(b) make reasonable efforts to retain personnel trained under the Project in positions related to agricultural technology transfer.

Annex I: STANDARD ATTACHMENTS

AGRICULTURAL TECHNOLOGY TRANSFER
PROJECT DESIGN SUMMARY: LOGICAL FRAMEWORK MATRIX

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
A. Sector Goal			
To increase Panama's food production and increase employment opportunities in agriculture while conserving the natural resource base	Yearly increases in food production of at least 4% after the fourth year.	Census & national statistics	1. Lower prices do not offset gains in agricultural sector's productivity.
B. Project Purpose			
To establish an operational agricultural technology transfer system in the Province of Chiriquí.	A system in place capable of delivering new technologies to 60% of small/medium producers in Chiriquí on a yearly basis by 1985, with an adoption rate of 60%.	Annual Project Reviews Project evaluations AID Project Files GOP statistics	1. New technologies are made available throughout the life of the Project by IDIAP, UP, Int'l Agricultural Research Centers and others.
1.1 Delivery of Technologies		MIDA records and files.	
1.1.1 By Technicians		AID Project files.	2. C.P.s relating to field services met on a timely basis.

Type: Direct	1983	1984	1985	1986	1987	1988	1989	Totals
Demonstrations	-	200	450	450	450	450	450	2,450
Farm Visits	8,550	25,662	51,324	51,324	51,324	51,324	51,324	290,832
Field Days	-	110	110	110	110	110	110	660
Farmer Meetings	220	220	220	220	220	220	220	1,540

1.1.2 By Specialists

Type: Direct	1983	1984	1985	1986	1987	1988	1989	Totals
Seminar/Wrkshps	16	16	18	24	40	48	48	210
Field Visits	100	120	120	144	240	240	240	1,204
Field Days	-	8	10	12	24	24	24	102
Farmer Meetings	-	16	18	24	40	48	48	194

Type: Indirect	1983	1984	1985	1986	1987	1988	1989	Totals
Pamphlets	-	8	10	12	24	24	24	102
Radio	100	120	120	200	240	240	240	1,260
Newspapers	10	20	50	50	50	50	50	280
Other media	12	12	12	12	12	12	12	84

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
C. Project Outputs			
1.0 Human Resources Development A staff of trained technology transfer technicians and administrators of sufficent size to extend new technologies to small/medium farmers throughout Chiriqui Province.	1.1 Trained Personnel	1. MIDA records and files. 2. AID Project files. 3. Field Inspections. 4. Project Evaluations	1. Persons trained under the project begin work on a timely basis, are located where needed and work in the subject areas in which they were trained.

1.1.1 Pre-Program Training (1 month)

Position	83	84	85	86	87	88	89	Total
Ing. Agron.	27	-	-	-	-	-	-	27
Assistants	109	25	25	25	25	25	25	259
Specialists	24	-	-	-	-	-	-	24
Support Staff	12	-	-	-	-	-	-	12
Yearly Totals	172	25	25	25	25	25	25	322

1.1.2 Initial Technical Training

Position	83	84	85	86	87	88	89	Total
Ing. Agron.	27	-	-	-	-	-	-	27
Assistants	109	-	-	-	-	-	-	109
Specialists	24	-	-	-	-	-	-	24
Yearly Totals	160	0	0	0	0	0	0	160

1.1.3 In-Service Training

Position	83	84	85	86	87	88	89	Total
Specialists								
Ing. Agron.	27	27	27	27	27	27	27	189
Assistants	109	109	109	109	109	109	109	763
Yearly Totals	136	136	136	136	136	136	136	952

1.1.4 Short Courses (3-6 months)

Position	83	84	85	86	87	88	89	Total
Specialists	8	7	5	4	3	3	3	33
Ing. Agron.	10	8	9	3	4	4	4	42
Yearly Totals	18	15	14	7	7	7	7	75

1.1.5 Long-term Training

Position	83	84	85	86	87	88	89	Total
Specialists	8	8	8	-	-	-	-	24
Ing. Agron.	8	-	-	-	-	-	-	8
Yearly Totals	16	8	8	-	-	-	-	32

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
2.0 Infrastructure Adequate structures located in strategic locations to carry out project activities in Chiriquí Province.	2.1 Infrastructure Upgrading Activity — 83 / 84 / Total 1. Local Agencies a. Remodeling — 2 / - / 2 b. Expansion — 2 / 1 / 3 c. Construction — 2 / 3 / 5 Total — 6 / 4 / 10 2. IE&C Center a. Construction — - / 1 / 1	1. MIDA records and files. 2. Quarterly Work Plans. 3. AID Engineering Inspection reports and site visits. 4. BID documents and Construction Contracts.	1. Acces to isolated sites remains open for construction equipment, materials and workers.
3.0 Information, Education & Communication A regional agricultural IE&C center capable of reproducing and delivering on a timely basis adapted technology transfer research results and other useful information developed by IDIAP, MIDA, Faculty of Agronomy, or adapted from other sources outside of Panama.	3.1 An IE&C Center located in David capable of producing technology transfer materials in the following quantities: 3.1.1 I,E&C Ouputs	1. Annual Project Review 2. I, E & C files 3. Local agencies' records	1. IDIAP, VP and International Agricultural Research Centers will provide constant flow of technological changes of applicability in Chiriquí. 2. Extension agents and assistants will hold regularly scheduled farm visits, field days, farmer meetings and cultivate demonstration plots giving validity to improved practices and methods transferable to other areas.
4.1 Logistical Support A logistical support system capable of supporting all technology transfer activities in Chiriquí.	4.1.1	1. Review of Deputy Project Coordinators and USAId Project Manager Records. 2. MIDA/IDIAP reimbursement requests.	1. It is assumed that MIDA personnel will be reassigned to or recruited for the project as needed, that counterpart funding is forthcoming for equipment and materials, and that GOP's procurement performance is improved by technical assistance.

New Materials	83	84	85	86	87	88	89	Totals
a. Handouts	10	24	28	36	100	100	100	398
b. Pamphlets	-	20	50	60	100	100	100	430
c. Technical notes	-	24	25	60	100	100	100	409
d. News releases	15	40	100	100	100	100	100	555
e. Circular letters	10	26	50	50	50	50	50	286
f. Planting guide	-	12	10	10	10	10	10	62
g. Tech-Packs	-	10	10	10	10	10	10	60
h. Video-Cassettes	-	6	6	6	10	10	10	48
i. Graphic designs	-	50	50	50	50	50	50	300
j. Slide-Tapes	-	12	12	12	12	12	12	66
k. Other	-	12	12	12	12	12	12	72

4.1.1	83	84	85	86	87	88	89
a. Personnel reassigned/ recruited	160	25	25	25	25	25	25
b. Vehicles purchased	13	138	-	-	2	3	-
c. Vehicles maintained 1/	-	-	-	151	153	156	156
d. Equipment and materials purchased	$	$	$	$	$	$	$
e. Construction contracts	6	5	-	-	-	-	-
f. New logistical management systems and controls	1	-	-	-	-	-	-

1/ During the first 3 years vehicles will be maintained through warantee and a private maintenance contract.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
5.0 Institutional Coordination Institutional mechanisms set up capable of generating private sector feedback and coordinating activities of MIDA Region 1 with IDIAP and other members of SPA.	5.1 Formal Memo of Understanding signed between MIDA and IDIAP by January 1, 1983.	1. Copies of agreements/memos.	
	5.2 Other agreements executed (BDA, ISA, Facultad de Agronomía, et al.) as required.	1. Copies of agreements/memos.	
	5.3 Comité Agropecuario Regional de Transferencia de Técnologia operational and coordinating project activities within the sector and with complementary activities of other Ministries.	1. Formal Enabling Documents 2. Committee Minutes.	
	5.4 Ten (10) Local Coordinating Committees established and providing continuous feeback to MIDA, IDIAP and other SPA repesentatives on the project and its implementation (CALs to meet at least 3 times a year)	1. Formal enabling documents. 2. Committee Minutes.	
	5.5 A minimum of 7 conferences sponsored by OCA have been held on the subject of technology transfer throughout the life of the project.	1. Conferenece proceedings and reports.	

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NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS										MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
D. Inputs			($000)								1. GOP Reimbursement Requests. 2. AID Controller reports. 3. AID Project Files.	1. Conditions Precedent are met as scheduled in the Pro Ag. 2. Technical Assistance Contracts let on a timely basis. 3. Inputs are available and in place on a timely basis. 4. Prices do not rise significantly beyond what has been allowed for contingencies. 5. GOP counterpart funds are available on a yearly basis as required by Project implementation plans. 6. GOP presents reimbursement requests on a continuous, timely basis in order to keep the rotating fund functioning properly.
1.0 Human Resources Development			1983	1984	1985	1986	1987	1988	1989	Totals		
1.1 Short Term Technical Assistance		5 p/m	41	-	-	-	-	-	-	41		
1.2 Training		2,498 p/m	752	915	833	531	323	219	219	3,792		
Total			-	-	-	-	-	-	-	3,833		
2.0 Infrastructure			1983	1984	1985	1986	1987	1988	1989	Totals		
2.1 Construction		11 buildings	600	575	-	-	-	-		1,175		
3.0 IFAC			1983	1984	1985	1986	1987	1988	1989	Totals		
3.1 Short Term Technical Assistance		5 p/m	21	21	-	-	-	-	-	42		
3.2 Equipment Materials		various	30	45	15	15	15	15	15	150		
Totals										192		
4.0 Logistical Support			1983	1984	1985	1986	1987	1988	1989	Totals		
4.1 Short Term Technical Assistance		5 p/m	-	41	-	-	-	-	-	41		
4.2 Vehicles		156	195	870	-	-	30	45		1,140		
4.3 Equipment Materials		various	167	141	20	104	20	20	20	502		
4.4 Field Equipment Materials		various	-	15	20	20	20	20	20	115		
Totals										1,798		
5.0 Institutional Coordination			1983	1984	1985	1986	1987	1988	1989	Totals		
5.1 Short Term Technical Assistance		5 p/m	21	21	-	-	-	-	-	42		
5.2 Conferences		7	25	25	25	25	25	25	25	175		
5.3 Visitors		various	8	8	10	10	10	10	10	66		
Totals										283		
6.0 Evaluations			1983	1984	1985	1986	1987	1988	1989	Totals		
6.1 Short Term Technical Assistance		25 p/m	-	123	-	-	-	-	70	219		

Total AID Loan Funded	$6,000
Total AID Grant Funded	1,500
Total GOP Counterpart	6,340
TOTAL PROJECT	13,840

CERTIFICATION PURSUANT TO SECTION 611(e)
OF THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Robin Gomez, the principal officer of the Agency for International Development in Panama, having taken into consideration among other factors, the maintenance and utilization of development projects in Panama previously financed or assisted by the United States, do hereby certify that, in my judgment, Panama has the technical capability and the physical, financial, and human resources to utilize and maintain effectively the proposed loan/grant of Seven Million Five Hundred Thousand United States dollars ($7,500,000) from the Government of the United States of America to the Government of Panama to establish an operational technology transfer system in the Province of Chiriquí.

This judgment is based on the facts presented in this Project Paper and the Mission's previous experience with the Ministry of Agricultural Development and the Panamanian Institute for Applied Agricultural Research, as well as loans to other Government of Panama agencies.

Robin Gomez
Director, USAID/Panama

9/1/82
Date:

5C(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, and criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBLITY

1. FAA Sec. 481. Has it been determined that the government of the recipient country has failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully? — No

2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government? — No

3.	FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?	No.
4.	FAA Sec. 532(c), 620(a), 620(f), 620D; FY 1982 Appropriation Act Secs. 512 and 513. Is recipient country a Communist country? Will assistance be provided to Angola, Cambodia, Cuba, Laos, Vietnam, Syria, Libya, Iraq, or South Yemen? Will assistance be provided to Afghanistan or Mozambique without a waiver?	No.
5.	ISDCA of 1981 Secs. 724, 727 and 730. For specific restrictions on assistance to Nicaragua, see Sec. 724 of the ISDCA of 1981. For specific restrictions on assistance to El Salvador, see Secs. 727 and 730 of the ISDCA of 1981.	Not applicable.
6.	FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property?	No.

7.	FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC?	No.
8.	FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? (b) If so, has any deduction required by the Fishermen's Protective Act been made?	No.
9.	FAA Sec. 620(q); FY 1982 Appropriation Act Sec. 517. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any AID loan to the country? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the appropriation bill appropriates funds?	No.
10.	FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country has spent on military equipment? (Reference may be made to the annual "Taking into	Yes.

Consideration" memo: "Yes, taken into account by the Administrator at time of approval of Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

11. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

No.

12. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? (Reference may be made to the Taking into Consideration memo.)

Panama is not in arrears in its payments of its U.N. obligations.

13. FAA Sec. 620A; FY 1982 Appropriation Act Sec. 520. Has the country aided or abetted, by granting sanctuary from prosecution to, any individual or group which has committed an act of international terrorism? Has the country aided or

No.

abetted, by granting sanctuary from prosecution to, any individual or group which has committed a war crime?

14. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA? — No.

15. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device, after August 3, 1977? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.) — No.

16. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Session of the General Assembly of the U.N. of Sept. 25 and 28, 1981, and failed — No.

to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the Taking into Consideration memo.)

17. ISDCA of 1981 Sec. 721. See special requirements for assistance to Haiti. — Not applicable.

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria.

a. FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy? — No.

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the country made such significant improvements in its human rights record that furnishing such assistance is in the national interest? — No.

b. ISDCA of 1981, Sec. 725(b). If ESF is to be furnished to Argentina, has the President certified that (1) the Govt. of Argentina has made significant progress in human rights; and (2) that the provision of such assistance is in the national interests of the U.S.?	Not applicable.
c. ISDCA of 1981, Sec. 726(b). If ESF assistance is to be furnished to Chile, has the President certified that (1) the Govt. of Chile has made significant progress in human rights; (2) it is in the national interest of the U.S.; and (3) the Govt. of Chile is not aiding international terrorism and has taken steps to bring to justice those indicted in connection with the murder of Orlando Letelier?	Not applicable.

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance Funds, B.2. applies to projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT? **Yes.**

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b).

   (a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that amount)?

   A congressional notification was sent to Congress and the 15 day waiting period expired on August 25, 1982.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,00, will there be

   Yes.

(a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

No further legislative action is required to carry out this Project.

4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? (See AID Handbook 3 for new guidelines.)

The Project will not include any water or water-related land resource construction.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?

This is not a capital assistance project.

6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	No.
7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	a) Will not increase international trade. b) Project will foster private initiative and competition by helping small farmers enter the marketing system. c) Project activities will be channeled through agricultural, credit and savings cooperatives whenever appropriate. d) Will promote the entry of small farmers into the marketing system. e) Project is specifically designed to improve the technical efficiency of small farmers. f) Not applicable.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	Private U.S. firms will be utilized to provide technical services.

9.	FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	The currency used in Panama is the U.S. Dollar, although it's denominated a "Balboa". Therefore, no U.S. owned local currency exists.
10.	FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No.
11.	FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes.
12.	FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	The agricultural technology system designed under the Project will increase agricultural production of commodities for domestic consumption.
13.	FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16? Does	Yes.

the project or program take into consideration the problem of the destruction of tropical forests?

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?

Not applicable.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and

a) The Project will assist small farmers through the development of a technology transfer system capable of disseminating appropriate agricultural technology on a sustained basis. Small farmer participation will be secured through the establishment of local and regional technology transfer committees comprised of private sector beneficiary farmers as well as public sector technical specialists. Small farmer participation will also be secured through applied research of small farmer problems and through field demonstrations, field days and training activities.
b) Assistance will be channeled through small farmers organizations such as agricultural cooperatives and credit and savings unions whenever appropriate.
c) Other private self-help organizations such as 4-H clubs will also receive technical assistance and support.
d) Regional cooperation will be encouraged through visits to research

otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

and educational facilities, and by sharing research results with other countries in the area.

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

Yes.

c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?

Yes. The Project is specifically designed to disseminate appropriate technologies to small farmers.

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activitiy with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

Yes. Panama's counterpart contribution exceeds 25% of the total costs of the Project.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"? (M.O. 1232.1 defined a capital project as "the construction, expansion, equipping or alteration of a physical facility or facilities financed by AID dollar assistance of not less than $100,000, including related advisory, managerial and training services, and not undertaken as part of a project of a predominantly technical assistance character."	No.
f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes.
g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage	The Project has been designed in close collaboration with Panamanian public and private institutions at the local and national level and attempts to address the needs of Panamanian small farmers.

institutional development; and supports civil education and training in skills required for effective participation in governmental processes esential to self-government.	It provides training and assistance to strengthen institutions and human resources in the public and private sectors.
2. Development Assistance Project Criteria (Loans Only)	
a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.	USAID review has concluded that the GOP has the capacity to repay the loan.
b FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	Assistance provided under the Project is not for any productive enterprise which will compete with U.S. enterprises.
c. ISDCA of 1981, Sec. 724 (c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)?	Not applicable.
3. Economic Support Fund Project Criteria	
a. FAA Sec. 531(a). Will this assistance promote economic or political	Not applicable.

stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities? — Not applicable.

c. FAA Sec. 534. Will ESF funds be used to finance the construction of the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives? — Not applicable.

d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? — Not applicable.

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes.
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes.
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	Panama does not discriminate against U.S. marine insurance companies.
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be	Not applicable.

financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)	
5. FAA Sec. 604(g). Will construction or engineering services be procured from firms of countries otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one or these areas?	Not applicable.
6. FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?	Not applicable.
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other	Yes.

Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	
8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes.
9. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?	Yes.
B. Construction	
1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services to be used?	Not applicable.
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Yes.

3. FAA Sec. 620(k). If for construction of productive enterprise, will agggregate value of assistance to be furnished by the U.S. not exceed $100 million (except for productive enterprises in Egypt that were described in the CP)?	Not applicable.
C. Other Restrictions	
1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	Yes.
2. FAA SEc. 301(d). If fund is established solely by U.S. contributions and administed by an internatioal organization, does Comptroller General have audit rights?	Not applicable.
3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries?	Yes.
4. Will arrangements preclude use of financing:	
a. FAA Sec. 104(f); FY 1982 Appropriation Act Sec. 525: (1) To pay for performance of abortions as a method of family	Yes.

planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? **Yes.**

c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? **Yes.**

d. FAA Sec. 662. For CIA activities? **Yes.**

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? **Yes.**

f. FY 1982 Appropriation Act, Sec. 503. To pay pensions, annuities, retirement pay, or **Yes.**

adjusted service compensation for military personnel?	
g. FY 1982 Appropriation Act, Sec. 505. To pay U.N. assessments, arrearages or dues?	Yes.
h. FY 1982 Appropriation Act, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending)?	Yes.
i. FY 1982 Appropriation Act, Sec. 510. To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?	Yes.
j. FY 1982 Appropriation Act, Sec. 511. Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?	No.
k. FY 1982 Appropriation Act, Sec. 515. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes.

DRAFT PROJECT AUTHORIZATION

Name of Country:	Panama
Name of Project:	Agricultural Technology Transfer
Number of Project:	525-0227
Loan Number:	525-T-053

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Agricultural Technology Transfer project for Panama involving planned obligations of not to exceed Six Million United States Dollars ($6,000,000) in loan funds ("Loan") and One Million Five Hundred Thousand United States Dollars ($1,500,000) in grant funds ("Grant") over a seven year period from date of authorization, subject to the availability of funds in accordance with the AID OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project ("Project") consists of support to the Government of Panama ("GOP") to establish an operational, agricultural technology transfer system in the Province of Chiriqui which will to provide appropriate technical information and support to small and medium producers.

3. The Project Agreement, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with AID regulations and Delegations of Authority, shall be subject to the following essential terms and major conditions, together with such other terms and conditions as AID may deem appropriate.

a. Interest Rate and Terms of Repayment

The GOP shall repay the Loan to AID in U.S. Dollars within twenty (20) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The GOP shall pay to AID in U.S. Dollars interest from the date of first disbursement of the Loan at the rate of (i) two percent (2%) per annum during the first ten (10) years, and (ii) three percent (3%) per annum thereafter, on the outstanding disbursed balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods and Services (Loan)

Goods and services, except for ocean shipping, financed by AID under the Loan shall have their source and origin in Panama or in countries included in AID Geographic Code 941, except as AID may otherwise agree in

writing. Ocean shipping financed by AID under the Loan shall be financed only on flag vessels of Panama or countries included in AID Geographic Code 941, except as AID may otherwise agree in writing.

c. Source and Origin of Goods and Services (Grant)

Goods and services, except for ocean shipping, financed by AID under the Grant shall have their source and origin in Panama or in the United States, except as AID may otherwise agree in writing. Ocean shipping financed by AID under the Grant shall be financed only on flag vessels of the United States, except as AID may otherwise agree in writing.

d. Conditions Precedent to First Disbursement (Loan and Grant)

Prior to any disbursement, or the issuance of commitment documents under the Project Agreement to finance any Project activity, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(1) evidence that the Ministry of Agriculture has appointed a senior executive staff member to monitor the coordination of the Project at the national level;

(2) evidence that a Project Coordinator and a Deputy Coordinator for the Project have been appointed for the MIDA Regional Office in David;

(3) a long term training plan which specifies the number of personnel to be trained, the subject areas to be studied and the designated positions to be filled upon completion of studies.

(4) an agreement between the Ministry of Agricultural Development ("MIDA") and the Panamanian Institute for Applied Agricultural Research ("IDIAP") which details IDIAP's responsibilities and the resources to be committed under the Project;

(5) evidence that IDIAP has appointed a Project Coordinator for its activities under the Project.

e. Conditions Precedent to Disbursement (Loan and Grant)

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance any Project activity except for long-term training, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(1) a financial plan which details Loan, Grant and GOP counterpart funds budgeted for all activities to be carried out over the first year of the Project;

(2) a quarterly work plan to be submitted each quarter during the first year of the Project which details each Project Activity to be carried out during such quarter and a budget which details the proposed AID funds for each such activity.

f. Condition Precedent to Disbursement for the Logistics Support Component (Loan)

Prior to any disbursement or the issuance of any commitment documents under the Loan to finance any Project logistic support activities, except for technical assistance for the MIDA Region 1 Office of Administration and except for the procurement of such vehicles as USAID/Panama may approve, the GOP shall, except as AID may otherwise agree in writing, furnish to AID, in form and substance satisfactory to AID:

(1) evidence that an adequate logistics control and management system to support the local field agencies has been established;

(2) evidence that the necessary personnel for the field offices have been reassigned, recruited and placed at such offices, and that such personnel have completed pre-program and initial technical training under the Project;

g. Recurring Conditions Precedent to Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement to finance any Project activity, each Project year after the first Project year, except for long-term training, the GOP shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

(1) a financial plan which details Loan, Grant and GOP counterpart funds budgeted for all activities to be carried out over such Project year;

(2) a quarterly work plan to be submitted each quarter during such year which details each Project activity to be carried out in such quarter and a budget which details the proposed AID funds for each such activity.

(3) evidence that it will provide budgetary support of no less than the equivalent of $60,000 to cover the expenses of fuel for vehicles procured under the Project.

h. Covenants

The GOP shall covenant that, unless AID otherwise agrees in writing, it will:

(1) provide budgetary support over the life of the Project of not less than the equivalent of Six Million Three Hundred Forty Thousand United States Dollars ($6,340,000) for Project activities and to provide budgetary support for on-going activities after the life of the Project;

(2) make reasonable efforts to retain personnel trained under the Project in positions related to agricultural technology transfer.

i. Waiver

The following waiver to AID regulations is hereby approved: AID source, origin and nationality requirements are hereby waived to allow procurement of up to 96 motorcycles, whose source, origin and nationality may be in any country included in AID Geographic Code 935. In doing so, I hereby certify that exclusion of procurement from Free World countries other than Panama and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the Foreign assistance program.

Assistant Administrator
Bureau for Latin America
and the Caribbean

Date

34

0227

RECIBIDO
JUN 1 1982
TEAM (6)

Annex I.E
Page 1 of 1

República de Panamá

Ministerio de Desarrollo Agropecuario

Despacho del Viceministro

Panamá, R. de P. 25 de mayo de 1982
DVM-238-82

ACTION
TO AGR
DUE 6/8/82
TAKEN
8/13/82

Señor
ROBIN GOMEZ
Director-Agencia
para el Desarrollo
Internacional-Panamá
E. S. D.

	ACT	INF
DIR		✓
DIR		
COUF		✓
ESD		
ADM	✓	
COR		✓
		✓
ADM		

Estimado Sr. Gómez:

A través de la presente queremos hacer llegar a usted, de manera formal, los acuerdos establecidos en reunión celebrada el día 11 del presente, con la participación de ambas Instituciones:

1. El MIDA reitera su interés en continuar con la elaboración del Proyecto de Transferencia de Tecnología, hasta su culminación en una solicitud de préstamo.

2. Se define como prioritario, el inicio de la ejecución del proyecto en la Provincia de Chiriquí, como área piloto.

3. De ser satisfactorio los resultados que se logren en esta provincia, el MIDA podrá adoptar este esquema para el resto del país, salvaguardando la idiosincracia de cada una de las provincias.

4. El método de transferencia a ser utilizado en la ejecución del proyecto, será definido por el MIDA con la asesoría de la AID, en la fase de formulación.

5. Los trámites para la formalización de la solicitud, se realizarán según las normas establecidas por el Ministerio de Planificación y Política Económica.

Esperando que la misma sirva de base para unas relaciones satisfactorias entre nuestras Instituciones, nos despedimos de Ud. atentamente,

Lic. JERRY WILSON NAVARRO
Viceministro

c.c. Sr. Ministro

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USAID/PANAMA
CORRESPONDENCE

PRODUCCION ES REVOLUCION

"Explota la tierra y no al hombre"

Initial Environmental Examination (IEE)

Project Location	:	Panama, C. A.
Project Title	:	Agricultural Technology Transfer
Funding	:	LOP Total : $12,500,000
	:	LOP (AID) : $ 7,400,000
	:	FY 82 (AID) : $ 2,200,000
Duration	:	Four Years (1982-1986)
IEE Prepared by	:	Frank Zadroga, Regional Environmental Management Specialist (REMS) ROCAP
Environmental Action Recommended	:	Negative Determination based upon conditions outlined under recommendations, Section I.B, 1-3.
Action	:	1. Copy to Robert Otto, LAC/DR, Chief Environmental Officer 2. Copy to ROCAP, REMS File

Concurrence:

Robin Gomez
Director
USAID/Panama

March 26, 1982
Date

I. Examination of the Nature, Scope and Magnitude of Environmental Impact/Effects

A. Project Description

The basic goal of the project is to increase Panama's agricultural production and raise incomes of small farmers and their families through a mechanism of improved technology access. The purpose of the project is to assist the GOP in the establishment of an agricultural technology transfer system.

The project will promote activities whereby MIDA will establish a national extension service to disseminate appropriate agricultural technology and practical information to meet the needs of small and medium sized farmers not presently being served.

The major project activities contemplated are grouped under one or more of the following elements:

1) organizational development, strengthening and restructuring;
2) human resource development;
3) infrastructure expansion and renewal; and
4) equipment and materials procurement.

In addition to promoting the development of a national extension organization, project activities will implement a technology transfer program in specific (not yet determined) geographic areas of concentration.

B. Identification and Evaluation of Impacts upon the Human Environment and Physical/Biological Systems

Of the proposed project elements, the infrastructure expansion and renewal (GOP $2.0 million) and the equipment and materials procurement (AID $2.8 million and GOP $0.9 million) are the only activities that give rise to direct environmental concerns. Probably the most significant environmental issue under this project is discussed in point 3 below.

1. Infrastructure Expansion and Renewal

It is important in the cases of expansion of the extension network into new and oftentimes more remote (or marginal) areas that the following issues be addressed:

a) The decision to provide extension services to new areas should be justifiable based upon sustainable agricultural or forestry productivity criteria. New extension facilities should normally not be developed in areas where resource degradation problems are likely to occur or are

occuring (i.e. in or around wildlands, national parks, protection watershed, etc.) Such infrastructure expansion would promote increased population and resource pressures leading to environmental degradation.

b) In the cases of significant building or infrastructural improvement (such as improved access), construction impacts should be assessed and steps taken to mitigate or eliminate negative effects. It would seem logical that RENARE, as the natural resources directorate of MIDA most responsible for natural resources and environmental concerns, should develop an environmental assessment/impact analysis capability to meet environmental evaluation needs. Technical assistance could be provided under this project to RENARE, as needed, to develop this important capability.

2. Equipment and Materials Procurement

a) For reasons of energy conservation and the problems that result from the high operational and maintenance costs of vehicles, boats and motors (plus present GOP austerity measures imposed on transportation) the Mission should take steps to reduce project vehicle procurement to what is absolutely necessary and increase the efficiency of existing MIDA transporation systems/arrangements. Some current GOP austerity measures (e.g. limitations on daily fuel consumption) drastically limit the efficiency and practicality of vehicular transport needed by extension agents. Such contraints should be eliminated while other energy conservation measures need to be imposed in order to be able to justify sizeable vehicle procurement.

b) It is assumed that no toxic or potentially contaminating products such as pesticides and other agrochemicals are to be procured through this project. If this were to be the case, special environmental dispensations would be required.

3) An Extension Capability in Environmental Protection and Natural Resources Management

The most important environmental issue raised by this PID concerns the need for the development of a permanent and sound national extension capability in the area of environmental protection and natural resources management. It is necessary that, as part of the institution building and human resource development elements, extensionists be trained and a central capability be developed in the following areas (in addition to soil conservation and water management topics already mentioned in the PID):

- agrochemical use and handling
- community water supply protection and development
- range management
- forestry and agroforestry techniques

It is critical that this basic part of the extensionist's information base be built into the project so that issues and technologies relating to such problems as improper agrochemical use, soil erosion, deforestration, watershed protection, fuelwood production, etc. be made available to the farmer.

II. Threshold Decision and Related Recommendations

It is recommended that a negative determination be provided if the issues raised in this IEE can be adequately addressed prior to or at the PP stage. If this occurs, no further environmental assessment will be necessary.

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TO AMEMBASSY PANAMA PRIORITY 3231
BT
UNCLAS STATE 110737

ACTION COPY

ACTION TAKEN_____

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Annex I.G
Page 1 of 2

AIDAC

E.O. 12065: N/A
TAGS:
SUBJECT:AGRICULTURAL TECHNOLOGY TRANSFER PID REVIEW
- -

SUBJECT PID WAS REVIEWED AND APPROVED BY THE DAEC ON APRIL 8, 1982, WITH THE FOLLOWING POINTS TO BE ADDRESSED DURING INTENSIVE REVIEW.

OFF	ACT	INF
DIR		✓
D/DIR		
CONT		
EX-O		
ADD	✓	
ODP		
ODR		
HUD		
HRD		
ENG		
RCO		
LMO		
AAG		
IIS		
EMB		
C&R		

1. GOP COMMITMENT - MIDA'S AGRICULTURAL STRATEGY IS TO ASSIST INDEPENDENT FARMERS; HOWEVER, IF THE GOP OVERALL ATTITUDE REMAINS ONE OF GIVING THE MOST ATTENTION AND RESOURCES TO THE ASENTAMIENTOS, THERE IS A RISK THAT FUNDING DURING AND AFTER THE PROJECT MAY NOT BE PROVIDED. THE PP SHOULD DEMONSTRATE THAT SUPPORT OF THIS MIDA POLICY INITIATIVE FOR INDEPENDENT FARMERS EXISTS IN THE MINISTRY OF FINANCE, THE PRESIDENCY, AND OTHER RELEVANT GOP OFFICES, AS WELL AS IDENTIFY AND CONFIRM FUNDING FOR THE RECURRENT PERSONNEL AND OTHER OPERATING COSTS CREATED BY THE PROJECT.

2. PROJECT DESIGN - ALTHOUGH THIS PROPOSAL RESPONDS TO A MIDA INITIATIVE, THE MISSION SHOULD CONSIDER OTHER INSTITUTIONAL ARRANGEMENTS,SUCH AS THE FORMATION OF A NEW AUTONOMOUS ENTITY OR AN EXPANSION OF THE EXTENSION CORE AT IDIAP. THE COORDINATION MECHANISMS TO BE USED WITH OTHER AGENCIES, IN TERMS OF JOINT ACTIONS (E.G. PERSONNEL) AS WELL AS TO AVOID DUPLICATION OF SERVICES, SHOULD BE SPELLED OUT. IN CONSIDERING TECHNOLOGY TRANSFER TECHNIQUES THE MISSION SHOULD LOOK AT A RANGE FROM PERSON TO PERSON CONSULTATIONS AND THE USE OF PARAPROFESSIONALS AND KEY FARMERS TO WHATEVER MODERN MASS MEDIA DEVICES MAY BE PRACTICAL, AND ATTEMPT TO DESIGN THE MOST COST-EFFECTIVE PACKAGE FEASIBLE. THIS COST ANALYSIS SHOULD TAKE INTO ACCOUNT RECURRENT AS WELL AS INITIAL PROJECT COSTS. THE PROJECT SHOULD ALSO SEEK WAYS TO ENHANCE THE IMPACT OF PRIVATE SECTOR EXTENSION ACTIVITIES, E.G. THE TECHNICAL ASSISTANCE OFTEN OFFERED BY FERTILIZER DISTRIBUTORS AS PART OF THEIR SALES EFFORTS, OR THE USE OF CROP ASSOCIATIONS AND SIMILAR GROUPS AS INFORMATION MEDIA; AND SHOULD ASSURE THAT THE PROJECT'S EXTENSION AUDIENCE IS PRIMARILY PRIVATE FARMERS AND GROUPS, RATHER THAN THE ASENTAMIENTOS. THE SEQUENCE OF ACTIVITIES (SUCH AS TRAINING, AGENT ASSIGNMENT, AND EXTENSION WORK) THROUGH OUT THE PROJECT PERIOD SHOULD BE LAID OUT, AND THE ANTICIPATED GEOGRAPHIC COVERAGE SHOULD BE DEFINED.

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C&R SECTION

3. THE PP SHOULD SET FORTH THE RELATIONSHIP BETWEEN APPLIED RESEARCH CONDUCTED BY IDIAP AND THE PROPOSED EX-

Annex II: PROJECT DEVELOPMENT

Table 1

PRODUCTION OF SELECTED COMMODITIES
TOTAL PANAMA AND CHIRIQUI, 1979-80

Item	Unit	National production	Chiriquí production	Percent Chiriquí
Crops				
Potato	cwt	260,500	260,500	100.0
Celery	cwt	5,900	5,900	100.0
Beets	cwt	3,100	3,100	100.0
Carrots	cwt	22,300	22,300	100.0
Head lettuce	cwt	40,400	40,200	99.6
Cabbage	cwt	31,100	30,600	98.5
Kidney Beans	cwt	11,208	10,087	90.0
Tobacco	cwt	30,800	24,178	78.5
Coffee	cwt	134,500	74,900	55.7
Onion	cwt	74,000	39,000	53.0
Salad tomato	cwt	672,500	346,300	51.5
Rice	cwt	3,539,000	1,624,600	45.9
Sorghum	cwt	522,861	211,760	40.5
Beans	cwt	81,900	31,200	38.1
Cowpea	cwt	81,900	26,000	31.8
Corn	cwt	1,395,900	205,200	14.7
Sugarcane	mt	2,631,130	28,890	12.5
Bell pepper	cwt	21,700	1,300	6.0
Watermelon	ea	376,600	1,900	3.9
Cucumber	cwt	12,600	200	1.6
Livestock products				
Milk	liter	74,619,216	24,997,400	33.5
Beef	mt	47,746	10,711	22.4

Source: MIDA and Comptroller General of Panama.

PRESTAMOS FORMALIZADOS POR PROVINCIA Y RUBRO
Julio 1980 - Julio 1981

RUBRO	Bocas del Toro	Coclé	Colón	Chiriquí	Darién	Herrera	Los Santos	Panamá	Veraguas	Total
Arroz	128,850	3,431,155		6,561,280	6,772	198,926	887,911	1,172,732	1,134,367	13,521,993
Maíz	21,042	52,168	5,870	152,914	214,758	285,385	1,569,456	262,401	45,606	2,609,600
Sorgo		239,260		448,631		723,309	527,726	55,870	18,946	2,013,742
Frijol		792		16,497			1,000	3,342		21,631
Poroto			1,217	222,672						223,889
Tomate Industrial		299,259		18,600		179,210	1,293,546	6,730	8,735	1,806,080
Hortaliza		21,610	21,054	218,356		69,755	36,935	115,398	2,184	485,292
Cebolla		289,961		205,437		218,268	12,281	3,280	3,381	732,608
Papa				1,209,556						1,209,556
Fruta		5,000		336,269		96,741	1,000	68,622	10,123	517,755
Melones de Exp.						17,036				17,036
Oleaginosa		31,582						14,660		46,242
Cacao	265,463	39,600	18,552							323,615
Caña				59,195		29,125				88,320
Café	2,500	178,914	53,760	2,688,506		11,532	42,483	19,053	102,300	3,099,048
Otros Cultivos	64,488	97,575	9,257	200,440	31,412	480,092	167,449	1,557,215	77,289	2,685,217
Sub-Total	482,343	4,686,876	109,710	12,338,353	252,942	2,309,379	4,539,787	3,279,303	1,402,931	29,401,624
Ganado Vacuno-Carne	515,313	1,251,542	701,202	3,507,339	58,735	535,217	2,828,304	1,735,114	3,354,210	14,486,976
Ganado Vacuno-Leche	5,000	41,500		352,652		83,458	295,534	68,920	113,461	960,525
Ganado Porcino	8,500	119,901	28,750	147,134		337,334	415,898	335,499	403,703	1,796,719
Avícola	69,775	44,685	9,818	58,708		148,070	38,762	56,387	247,973	674,178
Apícola		50,260		102,657			1,000	123,534	30,608	308,059
Otras Crías				39,200		1,000	2,500	33,128		75,828
Sub-Total	598,588	1,507,888	739,770	4,207,690	58,735	1,105,079	3,581,990	2,352,582	4,149,955	18,302,285
TOTAL AGROPECUARIO	1,080,931	6,194,764	849,480	16,546,043	311,677	3,414,458	8,121,785	5,631,885	5,552,886	47,703,909
Comercialización					108,279	30,000	82,630		22,390	243,299
Infraestructura y E.	1,500	25,522	12,802	128,096	14,156	82,790	15,820	72,870	43,000	396,556
TOTAL GENERAL	1,082,431	6,220,286	862,282	16,674,139	434,112	3,527,248	8,220,235	5,704,755	5,618,276	48,343,764

FUENTE: Gerencia Ejecutiva de Operaciones. Departamento de Estadística.

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Annex II.A
Exhibit 1
Page 2 of 2

HISTORIA DEL SERVICIO DE EXTENSION AGRICOLA EN PANAMA

El Servicio de Extensión Agrícola ha atravesado por diversas etapas en función del nivel de desarrollo progresivo de las instituciones del Sector Público Agropecuario.

Analizando las décadas desde 1940 hasta 1981, podemos indicar las acciones de mayor importancia.

I. Década del 40:

Los servicios de asistencia técnica para el sector rural, brindados por el Gobierno, se inician con las oficinas de Fomento Agrícola institucionalizada en la década del 40, con el propósito de brindar asistencia y apoyo a las actividades agrícolas, las cuales fueron ubicadas en las cabeceras de las Provincias de Chiriquí, Veraguas, Herrera, Los Santos. Las mismas se circunscribieron a ejecutar sus actividades a través de las demostraciones de métodos y resultados de prácticas o técnicas nuevas, dar consejos técnicos y visitar las fincas de los productores.

Durante esta década la investigación agropecuaria no se había institucionalizado y se practicaba bajo el interés personal de los funcionarios en el Instituto Nacional de Agricultura (INA), centro educativo formal, fundado al inicio de la década.

El crédito se ofrecía a los pequeños y medianos productores, a través del Banco Agropecuario e Industrial, pero no estaba vinculado con la asistencia técnica del fomento, ni con el otorgamiento del patrimonio familiar.

Durante esta década la República de Panamá y los Estados Unidos firman acuerdos relacionados con:

-El control de enfermedades pecuarias

-y asistencia técnica en Agricultura

para los cuales los Estados Unidos envía tecnicos especializados con el propósito de ayudar a aumentar la producción de alimentos.

II. Década del 50 hasta 1970:

Durante los primeros años de la década del 50, los servicios públicos del Sector Agropecuario atendían:

- Mecanización agrícola
- Titulación de tierras
- Créditos
- Demostraciones de nuevas técnicas e insumo

No se realiza extensión o transferencia de tecnología.

El 26 de noviembre de 1952, mediante Ley 43, se establece la norma jurídica que reglamentó el servicio que el Gobierno brindó a la agricultura, atendiendo:

- Reforma Agraria
- Crédito al agricultor y ganadero
- Mercadeo de la producción
- Investigación Agrícola
- Divulgación Agrícola o extensión.

Surge en esta época la Extensión o Transferencia de Tecnología, con las siguientes características:

1. Se reconoce como función principal dentro del Ministerio.
2. Se perfecciona su organización a nivel nacional, regional y local. Este último llegó a contar con más de 35 Agencias de Extensión en todas las Provincias y la Intendencia de San Blas.
3. Fuerte respaldo presupuestario.
4 - Sistematización del trabajo.
   a) Selección y capacitación del personal.
   b) Programación (planes anuales y mensuales de trabajo).

c) Supervisión Nacional y Regional del trabajo.

d) Ubicación del trabajo con participación del productor.

e) Alcance familiar de trabajo con el agricultor, ama de casa y juventud.

Factores que limitan los logros del Servicio de Extensión:

1. Atendía a un productor carente de recursos básicos como: tierra y crédito.

2. No interino en cambios de la estructura de tenencia de la tierra y otras instituciones no la hicieron en forma efectiva.

3. Operó dentro de un modelo de desarrollo económico que no dió prioridad al sector agropecuario.

4. No existió un plan de Desarrollo Sectorial que permitiera la coordinación inter-institucional (investigación, crédito, extensión, comercialización, etc.) y su necesaria sincronización de políticas para el logro de objetivos comunes.

III. Década 1970 hasta 1981:

Durante los primeros años de la década del 70, conviven paralelamente el Servicio de Extensión Agrícola utilizado por el Ministerio de Agricultura y Ganadería, y el impulsado por la Comisión de Reforma Agraria (C.R.A.). En dichos años la extensión empieza a ser sistemáticamente cuestionada, ya que la práctica demostraba que la misma correspondía a estructuras productivas de países con condiciones distintas a las de Panamá.

Paralelas al MAG, operaban otras instituciones que brindaban servicios similares a la agricultura; tales instituciones eran: Reforma Agraria (C.R.A.) y el Instituto de Fomento Económico (I.F.E.).

El MAG realizaba asistencia técnica a través de extensión agrícola y atendió fundamentalmente a pequeños, medianos y grandes productores, incidía en algunos aspectos de mercadeo y crédito agrícola.

La Comisión de Reforma Agraria (C.R.A.), además de los aspectos de tierra, concentró sus esfuerzos en los campesinos precaristas organizados en empresa de autogestión productiva e incursionaba en el crédito a través del Convenio IFE-CRA.

El Instituto de Fomento Económico (IFE), por su parte, tenía a su cargo el crédito agrícola, daba asistencia técnica y realizaba además labores de mercadeo.

Como vemos, existía en algunos casos la dualidad de funciones y no existía unanimidad de criterios intitucionales en cuanto a los problemas y proyecciones del sector.

Estas fueron las causas que propiciaron un serio estudio del sector agropecuario, dando como resultado la creación del Ministerio de Desarrollo Agropecuario mediante Ley 12 del 25 de enero de 1973.

Durante este período se fortalece significativamente el mecanismo institucional público que sirve al sector agropecuario; se incrementan los recursos para promover el desarrollo del sector; se realizan cambios estructurales significativos en relación a la tenencia de la tierra y a los modelos empresariales para la producción.

Durante este período desaparece la función de Extensión Agrícola, reemplazada por acciones de Asistencia Técnica, brindada exclusivamente por el Ministerio para las organizaciones campesinas (Asentamientos, Juntas Agrarias de producción y mercadeo) beneficiarios de la Reforma Agraria y comunicación.

Frente a esta realidad el Ministerio de Desarrollo Agropecuario enfrenta ahora su interés a adoptar un sistema que integre a la generación y transferencia en un proceso único y que el mismo llegue al productor del agro.

EXTENSION METHODOLOGIES

1. Panama Experiences.

Panamanian agriculture remains underdeveloped, with some of the lowest levels of technology and farm practices in Central America. According to a 1975 report of the Banco Interamericano de Desarrollo,[1] 75% of the area devoted to permanent crops, and 22% of the land in semi-anual crops, was under low or traditional technology. With respect to the livestock sub-sector, 86% of the beef cattle and 55% of the dairy cattle were raised on farms using low technology. Most of the land under prevailing low technology is in the hands of the small and medium size farmers who receive little or no technical assistance.

The most important problems affecting the development of the agricultural sector are related to the use of low productivity technology, inadequate agricultural support services, price and other government policies, the scarcity of good agricultural land, and declining fertility of soils.

In Panama, as in many developing countries, some efforts have been made to transfer technology in the past, but results have been discouraging. The Panamanian extension service was discontinued in 1972, and most of the technical assistance received by the farmers since then has been provided by the Ministerio de Desarrollo Agropecuario (MIDA). MIDA, however, lacks the organizational structure, operational strategy, and the methodology and resources required for an appropriate technology transfer program. Other factors which have impeded efforts to provide technical assistance to farmers are the lack of an appropriate framework for generation of science and technology responsive to needs of farmers, shortage of skilled technical personnel to take improved technology to large numbers of farmers, and lack of coordination among the technical, administrative, and operational units of the public agricultural support agencies.

The strategy for the transfer of technology used by MIDA has been the creation of commodity production programs, which are administered as semi-autonomous projects at the regional level. These programs are based on diversifying production through policies established at the national level without considering their impact on farmers, and without providing the type of technical assistance needed by farmers to increase production of specific commodities.

Technical assistance by MIDA has been directed mostly to organized groups of farmers (asentamientos). The impact of this program on total production has has been very insignificant. One reason that the "asentamientos" program

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1/ Informe sobre el Sector Agropecuario de Panamá. Banco Interamericano de Desarrollo. Enero de 1982.

failed to meet national objectives is that farmers were not taught new technologies; rather, MIDA personnel became personally involved in the administration of the "asentamientos" according to government directives. Another shortcome of the program was the lack of an adequate research base.

2. Experience in other Countries.

Whyte, in his evaluation of research and extension systems throughout the world, states that most models have been created in the industrialized nations and were then introduced into the developing nations. 2/ One type, the European colonial model, was already introduced before World War II in theAfrican and Asian colonies. A second type was developed after 1945 through U.S. technical and financial assistance in Latin America and some Middle Eastern and Asian nations.

With the passing of the colonial era, the U.S. model of agricultural research and extension gained in popularity and influence. The Point IV program, designed to bring technological and financial assistance to agriculture in developing nations, brought with it the model of American "land grant" universities linked to an extension service taking the results of university-based research "out" to farmers. If the system worked as intended, it brought farmer's experience and problems "back" to the researchers at the university or experiment station.

As whyte pointed out, one of the factors underlying the failure of the U.S. model in other areas was that agricultural development planners focused mostly on one part of the model, rather than transplanting in developing countries all components, particularly the university and experiment station-based research programs, which are vital features of the U.S. model. 3/ However, the failure of the agricultural extension systems to produce expected benefits cannot be attributed to any single cause. Some of the factors involved are the following:

a) Limitation in research strategy

Less developed countries seriously underestimated the importance of undertaking research in the areas where results are to be applied. Planners initially assumed that research results obtained in the U.S. and other developed nations could be extrapolated to the developing nations. This assumption involved a great overestimation of the transferability of agricultural knowledge and materials. The problem is not simply that those countries are different from U.S., but that there can be enormous variability of conditions of soil, climate and water even within small

2/ Whyte, William F. Participating Approaches to Agricultural Research and Development. A State-of the-Art Paper. Cornell University, May, 1981.
3/ Whyte. Op. Cit.

areas of a country. Therefore, general recommendations for a country or a region are rarely valid for all farmers and may lead some or many of them to economic disaster. It is clear now that a model which consigns basic research to the industrialized countries and only application of that research knowledge to developing countries, can make little contribution to the welfare of the developing countries. There is within any developing country an obvious need at least for adaptive research in which, for example, plant scientists test plant varieties and other inputs developed abroad under varying conditions in their own countries.

b) Limitations in extension strategy

Common deficiencies in knowledge and ability on the part of extension agents are found in most developing countries where college education and even high school education has been confined largely to persons coming from urban families. Persons of such backgrounds employed as extension agents often had little or no actual farming experience, and, furthermore, their education had been largely a matter of book learning. Therefore, a young and unexperienced extension agent often had to deal with a middle-aged experienced farmer, who was likely to discover rather quickly that the agent was without practical experience and might not know what he was talking about. The agent, lacking confidence in his own farming ability, would be inclined to compensate for his insecurity by emphasizing the superior importance of book learning. Relationships built upon such a foundation could hardly lead to constructive outcomes.

Even when the extension agent has been able to combine some practical knowledge with formal learning, and has learned to relate well to peasant farmers, his effectiveness can be undermined by the scope of work or tasks, territory and population he is expected to cover. As reported by Whyte 4/, in Kenya, where monthly workloads of extension staff were analyzed in terms of set targets, attending all planned activities would require as much as 474% of an agent's time. In such situations, it becomes "rational" for the agents themselves to adopt strategies vis-a-vis farmers that protect their careers, giving precedence to reports over field work, or focusing field work on richer farmers that are more inclined to cooperate and who have holdings of sufficient size to make use of the preferred seeds and fertilizer, and thereby make the agent's performance look better.

The scope of an agent's responsibilities, i.e., the number of activities and the number of farmers assigned to him, often prevented him from undertaking the kind of follow-up on the results of his recommendations that would enable him to be a more effective change agent, or they would keep him from dealing with new problems which small farmers face and are

4/ Whyte. Op. Cit.

not part of a commercial system of production and marketing.

If an extension agent works closely with farmers throughout the agricultural cycle, he will have a good chance of learning the reasons why farmers often do not adopt new technologies and this knowledge should increase his effectiveness. However, such an intensive relationship cannot be developed and maintained if the agent is responsible for a large territory and a large number of farmers, as usually is the case. Hence, organizational strategies and extension methodologies are needed which will not only provide useful information but will channel it more effectively and economically to those who need to use it.

c) Other limitations

Another aspect found almost universally is a lack of integration among the various government agencies which have official responsibilities for serving the small farmers. It is rare indeed to find a country where there is an effective collaborative relationship between research and extension. It is often found that research people look down upon extension agents, considering them incompetent and poorly trained. On the other hand, extension agents are often inclined to think that research people are out of touch with the practical realities of farming and simply pursuing esoteric projects designed to enhance professional prestige.

Extension problems are often compounded by difficulties with agricultural credit and marketing. As various studies have shown, credit tends to go predominantly to the more affluent farmers. This bias cannot be explained in terms of credit risks, since studies indicate that the failure of repayment is higher among larger farmers, whose social position and political connections help them avoid penalties for defaulting on their obligations.

The cost of credit for small farmers is also likely to be a major problem. In order to protect low income farmers from the exhorbitant interest rates charged by money lenders, many governments have established special credit programs for small farmers. However, even if such programs provide money at lower nominal interest rates than private lenders, the de facto rates may still be so high as to discourage borrowers. Or the cost, in terms of time, to obtain necessary certificates and signatures may be substantial and detract from the value of the loan. It is not just a question of the availability or unavailability of credit or even of rates of interest so high that loans are not attractive to farmers, but of the problems involved in getting authorized credit to farmers in time for them to make an optimum use of that credit.

3. Sources of Agricultural Technology.

Prior to 1975, agricultural research was carried out independently, with little or no coordination, by the research departments of MIDA's National

Directorates of Crop and Livestock Production, and by the Faculty of Agronomy of the University of Panama. The Faculty of Agronomy research projects were methodologically more rigourosly carried out, but were limited to fewer geographic areas than MIDA's and were not always relevant to problems of the agricultural sector. Research results were not published on a regular basis. While the Faculty did have a cadre of PhD scientists, most of these had major teaching and/or administrative responsibilities and were able to dedicate only a limited amount of time to research activities.

By 1975 the Government of Panama (GOP) recognized the need for an integrated farmer-oriented agricultural research program which would generate significant increases in agricultural productivity. The Panamanian Agricultural Research Institute (IDIAP) was created in response to this need.

In 1978 the IDIAP adopted an area research approach and concentrated projects in three important agricultural regions, namely: Chiriquí, Veraguas and Azuero. Eight priority areas were selected within these three regions to concentrate inter-institutional efforts on the generation and dissemination of appropriate technology for small and medium farmer. Also, with financial assistance from AID and other institutions, IDIAP prepared in 1978 a long-range plan 5/ for generating and disseminating appropriate technology. This plan established more specific priorities in terms of the target group, geographic areas and commodities. In addition to establishing a long-range framework for agricultural research in Panama, it set forth IDIAP's plan of action during the next five years, described the production systems research and other activities which would take place during that period, and detailed the staff expansion, training and technical assistance needs required to complement the plan.

In addition to IDIAP, the Faculty of Agronomy, and MIDA, there are international research Institutions that may serve as a source of information and/or training capabilities for a technology transfer system. These are:

a) The Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), represents a fundamental source of technical expertise and information. CATIE can provide components for training, transfer and extrapolation of research results.

b) The Instituto Inter-Americano de Ciencias Agrícolas (IICA) has operated a regional office in Panama for some years and has a small number of technical experts which work with Panamanian agricultural agencies. Besides, IICA has sponsored, together with RUCAP, the Central American Agricultural Research and Information Systems Project (PIADIC) whose main objective is to assist in the development of a National Agricultural Information System. The

5/ Agricultural Technology Development, (AID Project No.525-0180), Annex III, Exhibit A.

PIDIAC plans to provide the Panamanian agricultural sector with better agricultural production statistics through an improved area sample frames, an improved marketing data base, and the provision of appropriate technical information from non-Panamanian information services.

c) The International Research for Development Center (IRDC), is providing assistance to IDIAP for a project involving the development and transfer of technology to help solve problems of small and medium ranchers involved in milk/beef production in Panama. Financial assistance for research and training is being provided.

d) The Tropical Agriculture Research Center (CIAT), the International Potato Center (CIP), and the International Center for Corn and Wheat Improvement (CIMMYT) can provide technical collaboration and training in the priority commodities. CIAT's assistance would focus on pastures, yuca, beans, and seed technology. CIP provides seeds and assistance for potato production. CIMMYT is cooperating in priority areas where corn and sorghum are being produced.

4. Extension Models.

Various technology delivery systems have been developed in accordance with the conditions and realities of the developing countries. Most of them are modifications of the classical U.S. extension model. A discussion of the main features, advantages and disadvantages of the most widely used models follows:

a) The Training and Visitation System (Sistema de Capacitación y Visitas)

This system, developed by Benor and Harrison 6/ for the World Bank, is mostly used in the developing countries. The system is largely based on the systematic capacitation of the extension agents and on systematic scheduled visits to farmers. It establishes definite work schedules and responsibilities for the agents as well as a clearly defined supervisory system at all levels. The number of farmers to be assisted by each agent is fixed at a manageable level, and a rigid visiting schedule is followed. Frequent training sessions (monthly or bi-weekly) are an integral part of the system.

An individual extension agent is responsible for providing technical assistance for a number of farmers that varies from 300 to 1,200 depending on various factors and conditions. Usually these farmers are organized in eight groups, each group composed of approximately the same number of farmers. One of the farmers in each group will be selected to serve as

6/ Benor, Daniel and Harrison, Q. James. Sistema de Capacitación y Visitas. Banco Mundial. Mayo de 1977

the linkage (enlace) between the agent and the other farmers. The extension agent will concentrate most of his efforts with the linkage farmers. It is expected that the linkage farmer will transmit the technical information received from the extension agent to other members of his group.

Other important components of the training and visitation system, are close coordination with a vigorous on-farm research program, proper coordination with other agricultural services, especially agricultural credit, continuous training of extension personnel, and use of other extension methods such as mass media communications, farmers meetings, and demonstration farms.

b) The TAHAL Model.

This model is based on the Training and Visitation system developed by Benor and Harrison. This system has been implemented in the Dominican Republic, Costa Rica, and other developing countries. It employs the training and visiting methodology, involving constant training of extension agents, and systematic scheduled visits to farmers. It is mostly a self contained model.

A description of the most important features of the Tahal Model, as established in Costa Rica, follows:

-- Farming regions are delineated into ecologically homogenous micro-areas, each containing approximately 400 farmers. These are organized in groups of 10 farmers. Of the target population in each micro-area, 40 farmer-leaders are selected as linkages or "enlaces". Eight fixed routes, each containing the farms of 5 linkages or "enlaces", are established in each micro-area.

-- The extension workers visit the "enlaces" on a bi-weekly basis. Those "enlaces" are expected to adopt the recommended technology, establish demonstration plots and serve as contacts from which the transferred technology will outreach to 9 peripheral farmers. The extension agents visit 5 "enlaces" per day, cover 4 set routes per week, and 8 routes every two weeks. A written message with detailed instructions concerning activities to be carried out over the next two weeks is left with the "enlace". One day is set aside every two weeks for training, and another day is separated so to allow agents to return to the field to visit farmers that were missed on the scheduled visit. With this scheme, one agent theoretically diffuses technology to 400 farmers.

-- The extension agents receive intensive and continuous bi-weekly training on problems presented by the "enlaces". A cadre of subject matter specialists is established to train and capacitate field

extension workers, serve as linkages with research, and to serve as technical support for the agents themselves.

c) The SONA Model.

This system is being established in the southern region of the Veraguas Province in Panama, as one component of an integrated rural development project. The model employs the training and visitation methodology and the systematic scheduled visits to farmers. It has many common features with the Tahal System.

Farming regions are delineated into ecologically homogenous micro-areas each containing about 126 farmers. These are organized in groups of 7 farmers. Of the target population in each micro-area, 18 farmer-leaders are selected as "coordinadores" or coordinators that serve as linkages between the rural development agent and the other farmers.

Six fixed routes, each containing the farms of 3 coordinators, are established in each micro-area. The rural development agents visit the coordinators on a bi-weekly basis. Coordinators are expected to adopt the recommended technology, establish demonstration plots, and serve as contacts from which the transferred technology will outreach to 6 peripheral farmers. The rural development agents visit 3 coordinators, plus one member of his group, per day, cover 3 set routes per week and 6 routes every two weeks. Peripheral farmers will therefore be visited once every 12 weeks. Of the bi-weekly program, one day is set aside for training of field agents and 3 days are set aside for coordination with credit and other agencies, and for other extension activities. With this scheme, one agent is supposed to reach 126 farmers on a direct basis.

The rural development agents receive intensive and continuous bi-weekly training on problems of farmer clientele. A technical committee composed of subject matter specialists and from MIDA and IDIAP is responsible for training the rural development agents. Other specialists serve as technical support for the field agents.

The Soná model provides a good structural organization and close supervision at all levels.

d) The MOREPRA Model (Módulo Regional de Producción Agropecuaria).

This model was designed by the Instituto Interamericano de Ciencias Agrícolas (IICA) to be implemented in the district of Ocú in Herrera Province in Panama. The intent of the model is to transfer technology to small and medium size farmers through a model farms program carried out in 6 "corregimientos". One extension agent will be in charge of each "corregimiento". Twenty farmers will be selected in the region where the model farms will be established. Four to six satellite farms for each

model farm will be included in the program. Technological packages with all pertinent agricultural practices with the more recent technology will be tested on the model farms. Model farms serve as demonstration plots where satellite farmers may observe the new technology which will be applied to their farms.

The strength of the program is the concentrated technical assistance to be provided to the farmers through a specialized group of professionals at the area and regional level. Another aspect is the proper coordination with other service agencies or intitutions through various coordination committees at all organizational levels.

e) The IDIAP Model.

The Agricultural Research Institute of Panama (IDIAP) has developed a technology transfer program that is closely associated with the on-farm applied research system.

IDIAP's strategy for research and technology development uses an area-focused production systems methodology. The steps followed in the research process are: (1) target area selection; (2) diagnostic studies to identify and rank problems; (3) analysis of constraints and development of a research plan, and; (4) the generation of appropriate technologies.

When a technology has been sufficiently developed and tested on experimental plots and on participating farmers' parcels, it is then subjected to a process of validation. At this stage a practice or practices are tested on 20 to 30 farms in each area. The validation process requires two years in the case of crops, and more in the case of animal-related activities. During the first year, the practice is introduced under close supervision and participating farmers are continually provided technical assistance. During the second year, activities of the participating farmers are closely monitored to determine to what extent the practice has actually been adopted. At this stage, special attention is given in order to study economic benefits and in assessing comparative efficiency in land and labor utilization.

Once research results have been validated on farmers fields by the researchers, the dissemination of the validated technologies will be carried out by technicians who serve in extension capacities in the research program. In addition, other professionals from different MIDA directorates, and from the Agricultural Development Bank (BDA) participate on the research dissemination teams in geographic areas. Furthermore, within target areas, both research and extension personnel actively promote the dissemination of new or modified technologies. All members of the research team make contacts with target group farmers, primarily through direct visits and field days on farms where validation research is

taking place. A direct linkage thus exists between the generation of appropriate agrcultural technologies and their dissemination in the target areas. The incorporation of personnel from MIDA, the BDA, and other organizations on a rotational basis facilitates a wider dissemination of research results when the individuals are reassigned elsewhere or resume their former duties.

The large number of validation farms serve to promote the technological modifications through informal communications channels. In addition to the direct contacts made by IDIAP's technicians and production agents, mass media techniques, especially radio and distribution of simple leaflets are planned to be used. A significant effort will be made to strengthen MIDA/IDIAP capabilities to produce and disseminate mass media materials.

f) Other Research and Extension Models.

Various research and extension models have been developed in the developing countries to fit their particular needs. Projects like Comilla in East Pakistan, Cadu in Ethiopia, Puebla in Mexico, Caqueza in Colombia, and new models developed in Guatemala and Honduras are fully discussed by Whyte 7/. All models have a common goal, that of working with the small and medium size farmers to improve their agricultural production and well-being, although they use different approaches to reach the farmers.

With respect to research, the recent methodology involves two principal elements: (1) a shift in emphasis away from monoculture or single crop research toward research in cropping systems especially adapted to the needs and interests of small farmers, and; (2) a shift in emphasis away from the experiment station toward on-farm research with active participation of small farmers.

In Guatemala, the Institute of Agricultural Science and Technology (ICTA) developed a promising new system of on-farm participating research. ICTA people began with a general sense of direction and then designed and redesigned the system on the basis of active involvement of small farmers. They have been very successful with this approach but have had problems of coordination with the extension service. In Honduras, this problem was addressed differently and some improvements have been made in the research-extension relationships.

The Honduras' leaders profited greatly from their study of the ICTA model, but they do not simply copy that model. Well aware of the deficiencies in the research-extension relations in Guatemala, they developed field operations in which extension agents were no longer passive recipients of ideas and information furnished them by researchers but rather they became

7/ Whyte. Op. Cit.

active participants themselves, together with farmers, in the area farming system surveys. Furthermore, the Honduras' project comprised an integrated rural development program, within which agricultural research and extension play prominent roles. Extensionists also work closely with regional officials and active villagers on problems of credit, marketing, health and education.

Guatemala and Honduras have tried to work with paraprofessional (local farmers to serve as leaders) in the on-farm research and extension programs. The Honduras' model is similar in oganization structure to the Tahal method. The system involves groups of farmers organized in cooperatives.

5. Advantages and Disadvantages of the Extension Models.

As mentioned previously, most of the extension models in the developing countries are adaptations or modifications of the U.S. model, following the recommendations of Bender and Harrison. The resulting extension systems attempt to identify and delineate target groups of farmers and to reach them directly in a systematic way. Although a number of systems have been tried in different countries, this discussion will focus on those proposed for Panama, especially the Training and Visitation models. This model has the following favorable features:

a) Regions are delineated into ecologically homogenous micro-areas, each containing the number of targeted farmers that can be attended by a first-line technology transfer agent using direct and indirect dissemination methods.

b) Farmers are systematically visited at frequent intervals.

c) Demonstration plots are established on the farmers fields, and are used to show the implementability and effectiveness of recommended practices.

d) Extension agents receive intensive and continuous training, particularly in technical matters of immediate application and relevance to farmers.

e) Close coordination is established between extension, research and other service institutions.

f) Field agents are supported by a cadre of subject matter specialists, who are responsible for training of extension agents and providing support for workers in the field.

g) A sound organizational structure is established with close supervision at all levels.

Some of the unfavorable features of the Training and Visitation model are the following:

a) Outreach or diffusion of technology to the peripheral farmers in each group by the farmer leaders or coordinators has proven to be ineffective.

b) Periodic bi-weekly visits to farmer leaders are inflexible, costly, and sometimes are not needed during certain stages of development in the growing season of some crops.

c) Messages given to farmer-leaders are often of dubious relevance, and do not coincide with field activities of all farmers in a given micro-area.

The experience with the Training and Visitation model in Costa Rica has not been very promising, and the Ministry of Agriculture is now introducing drastic changes in the model in order to make it more compatible with the Costa Rican farmers' needs and idiosyncracies (see George Pringle Memo in Annex II.B, Exhibit 2).

The following problems were encountered in Costa Rica in the implementation of the Training and Visitation model:

a) The system was implemented on a national scale without providing the minimum physical and human resources.

b) Training of field personnel was inadequate.

c) Lack of farmer participation in the technology transfer program.

d) Irrelevant and outdated technical messages to the farmers.

e) Outreach or diffusion of technology from farmer leaders to the peripheral farmers was nil or very low. Peripheral farmers preferred to meet the extension agent in a local extension office or on their own farms.

f) Many small farmers did not have the resources needed to establish demonstration plots, which are a key factor in diffusing technology to peripheral farmers.

g) Unflexibility of the visit to farm program. Sometimes bi-weekly visits to farmer leaders were not needed, especially during some stages in the growing or the harvest season of some crops, with the consequent lack of interest of the farmers during unneeded visits.

h) The subject matter specialists worked only with field agents and were not available to farmers with problems beyond the competence of the field agents.

The Soná project has been established too recently to permit comprehensive

evaluation. However, the program has had some difficulties, especially in motivating the farmers to attend scheduled meetings with the rural development agent. Farmer attendance has been a serious problem in some areas and below expectations in others. Owing to the fact that many small farmers are engaged in off-farm employment during the day, the agent has had to arrange farmer meetings during the evenings and weekends. They are now offering the farmer leaders a workshop on motivation.

6. Conclusions.

Various research and extension models that have been tested in developing countries were evaluated during the design of the ATT Project paper. Most of them are variations of the classical European and U.S. extension models. The variations are based on practical and cost-effective ways of reaching the small and medium farmers with low or no technological base.

According to the literature reviewed and the experiences of some other countries, the following are considered as some basic characteristics that an extension model must have in order to be effective under the conditions prevalent in Panama:

a) A research base and, if possible, on-farm research involving the researcher, extensionist and farmer.

b) Demonstration of recommended practices in the farmers' fields.

c) Close coordination with farm services provided by other institutions, especially farm credit.

d) Delineated farming regions and especially targeted farmers.

e) Systematic visiting schedules whereby farmers are frequently visited in a systematic way.

f) Intensive and continuous training for the extension agents.

g) Field agents supported by a cadre of subject matter specialists.

h) A good organizational structure with close supervision at all levels.

i) Farmers are considered as part of a family system.

The success of any technology transfer project has its roots on an extension education service capable of quickly diffusing new technology which meets the specific local needs of large numbers of small and medium size farmers currently using rudimentary crop and livestock production practices. Special efforts must be made to influence traditional attitudes, values, perceptions, and skills to facilitate the transition to new technology, while at the same time recognizing that the small/medium farmer is knowledgeable

about existing production systems, has valuable experience and can provide an excellent source of feedback as regards both the transfer mechanism and the utility of the technologies being extended. Direct and continuous contact between the technology researcher, transfer agent and the farmer is thus critical to the success of a responsive technology development and transfer system.

7. The Proposed Technology Transfer Model (The Chiriquí Model).

The methodology of the proposed model combines the tested and favorable characteristics of the TAHAL, SONA, IDIAP/CIMMYT, and the classical extension models, and borrows from experiences in Costa Rica, Puerto Rico, and elsewhere. The classical U.S. model provides for establishment of local offices or agencies, continuous training of field personnel, use of demonstration plots, farmer groups meetings, field days and farmer tours, and mass media communication and education methods. Concepts such as use of frequent and periodic direct on-farm visits, coordination with other farmer support services, and delineation of micro-areas and specific target farmers to be covered by individual field agents are borrowed from other technology transfer systems of technology adoption. Innovative features such as intensive training of farmers by stages have been developed for the proposed Chiriquí model.

a) Area-Focused Model.

The proposed model is area-focused. Ecological characteristics have been used to divide the Chiriquí Province into four major ecological zones, each of which has been further divided into sub-zones based on the number and density of farmers, dominant crop and livestock enterprises and physical features such as size, farm densities, and access. Each sub-zone is further subdivided into micro-zones consisting of a number of farmers that can be directly attended by individual technology transfer assistant agents. A senior technology transfer agent will be responsible for extension activities carried out in 3 to 5 micro-zones.

A local extension office will be located in each sub-zone. Each local office will be staffed with from 2 to 5 senior technology transfer agents, each of whom will instruct and supervise 3 to 5 assistants who will disseminate technology directly to farmers. Within a given micro-zone, one-third of all farmers will receive direct visits during the first two years of the project, or until improved production practices are adopted. During that period of time other farmers will be reached through other extension methods. Upon completion of the first stage, another third of the farmers in the micro-zone will be visited for another 2-year period. The remaining one-third of farmers will be visited in the following 2-year period or final stage of the project.

Each assistant agent will work directly with 40 or more farmers during each of the three stages of the project, the specific number depending on

the size of the farm, current level of technology, and other factors. Over the life of the project, therefore, an individual assistant agent will directly contact (by frequent visits and other extension methods) and diffuse technological information to a total of not less than 120 farmers.

The assistant technology transfer agent will organize target farmers (those receiving direct visits) in groups of 6 to 8 members, the number depending on the technological level of the farmer, distance between farms and the farming systems. Thus, each assistant agent will work with 5 or 8 groups of farmers. Those groups will be well distributed within the micro-zone. The assistant agents, with the help of the senior technology transfer agents and in consultation with personnel from other institutions in the area, will select the farmers that will be reached in a direct, intensive way. He will also identify two peripheral farmers for each selected farmer. Peripheral farmers will be reached through other extension methods, and along with selected farmers, will be invited to farmer meetings, field days, and field demonstrations. All farmers will be provided with leaflets and other written communications.

The initial target farmers will be selected on the basis of prevailing technological level, attitude toward adoption of new technology, farming system, cultivation of priority commodities, and leadership and status in the community.

One farmer from each group of 6 to 8 members will be selected as leader. A demonstration plot will be estabished in the leader's farm. Results from proven research practices will be carried out on this plot and will serve as demonstration to the rest of the group as well as to peripheral farmers. The assistant agent will be responsible for establishing the demonstration plots in each group, and for their use for demonstration purposes, farmer tours, field days, and other activities. IDIAP's research personnel and the senior agent will assist the assistant agent in the establishment of demonstration plots.

Once the pertinent diagnostic studies are made, the assistant agent in consultation with the farmer and with the help of the senior agent, will prepare a simple farm development plan for each of the intensively assisted farmers under his jurisdiction. This will serve as the basis for technological modifications, farmers' training, and for the proper evaluation and follow-up in the application of the recommended technologies. Written recommendations will be given to the farmer visited. A file will be opened for each of the farmers, where all the information pertinent to his farm, and a copy of the visit report will be kept.

Assuming that an assistant agent can visit an average of 5 farmers per day, and the farmers are visited once per month, about 8 days per month will be needed to visit all target farmers in the agents area of influence. The agent will thus have ample time to make extra visits to

some farmers, if the need arises, and to attend the demonstration plots. He will also have time to attend farmers at the agency office, to visit farmers that are not in the selected groups, to organize and conduct extension activities such as field days, farmer tours, demonstration of results, farmer meetings, and to attend training sessions.

A senior technology transfer agent will be in charge of 3 to 5 assistant agents. Thus, each senior agent will be responsible for an area composed of 3 to 5 micro-zones with a target population of 360 to 700 farmers. Senior agents will be responsible for the technical and administrative supervision of his assistants as well as for the training, technical support, planning and implementation of the technology transfer program. They will participate in the establishment of the demonstration plots, in the organization and conduction of farmers meetings, field days, farmer tours, demonstration practices, and other matters essential to the transfer of technology. The senior agent will help his assistants in the preparation of work plans, annual and monthly reports and any other type of reports required. In addition, he will serve as a technical resource for his assistants with difficult field problems, and for coordination between research and extension activities. He will be directly involved and coordinate with IDIAP, the Faculty of Agronomy of the University of Panama and other research institutions, in the undertaking of research, validation of research, or demonstration of research results established in his area of responsibility. In other words, he will be responsible for the proper coordination and active participation in any research activity or demonstration of research results carried on in his area, and for its use as an extension tool. He will also be responsible for the proper coordination of other agricultural programs and services provided to the farmers for their benefit. The senior extension agent will be directly involved in 15 to 40 demonstration plots.

In each sub-zone office, or "Agencia", one senior extension agent will be in charge of the extension program in the entire area of influence of the office. He will supervise the other senior extension agents localized at the "Agencia", and will respond directly to the regional extension director or coordinator.

All field extension personnel will also be technically supported by a well trained staff of extension specialists. Subject matter specialists with expertise in fields such as plant protection, soils, irrigation, crop production, animal husbandry, horticulture, farm equipment and other fields of specialization will furnish technical support for the technology transfer program. These specialists will conduct training programs for senior and assistant extension agents, assist in the establishment of demonstration plots, participate in special farmer training, and provide specialized technical support to senior and assistant agents. They will respond to national and regional policies and directives, and will furnish technical information for the major commodities and enterprises necessary for the preparation of the field agents' work plan. The extension

specialists will be the link between technology sources and the field extension personnel. They will be in contact with research institutions, researchers, libraries, and will participate in on-farm research in their respective fields of expertise.

Extension specialists will also be responsible for bringing together all the technical information suitable for dissemination, and for translating this to a language that field agents and farmers can understand. They will prepare technical bulletins, leaflets, radio and TV programs and any other appropriate educational material. A communication and audio-visual unit will provide assistance to the specialists and the field agents in the preparation of these materials.

An annual work plan must be prepared for the technology transfer program. The planning and elaboration of this plan must start at the field level, i.e., a "bottom-up" plan.

The assistant technology transfer agent will prepare an annual work plan based on the special needs of farmers in his micro-area and the directives and inputs received from the subject matter specialists, and from officials at the regional and national level. Based on the annual plan of work, and anticipated farmer needs during the year, the assistant agent will prepare a monthly work plan, in which visits to farmers and other pertinent extension activities will be scheduled. The plan may be modified and updated on a monthly basis with the approval of the senior agent.

The senior technology transfer agent will prepare his annual plan of work based on the work plans of his assistants, the proper timing of his activities with those of his assistants, and other related activities. The incorporation of all the work plans of the senior agents will serve as the basis for the work plan of the total program. In this way, a plan of work is developed that could be easily implemented and that will be more responsive to the farmer needs.

Simple monthly and annual reports will be prepared of the work done. Based on the work plan, evaluations can be made of personnel and of the work accomplished.

b) Linkage to on-going research.

In order for the technology to be transferred and adopted by farmers, a well coordinated system involving research and extension programs must exist.

The proposed extension model and the existing research institution, IDIAP, offers a great opportunity for a close coordination of those programs, maintaining IDIAP's research responsibility and the extension program its technology transfer resposibility.

At the national level a senior MIDA executive must represent the Minister and provide leadership in the implementation of the ATT Project. This official can coordinate research/extension activities with the Director of IDIAP and other high level government officials. This will be accomplished through personal contacts and/or through established national committees, such as CAN and CCE.

The Regional Directors of IDIAP and MIDA and a regional director or coordinator for extension can very effectively coordinate the research and technology transfer program at the regional level. This could be reinforced through the existing regional committees. The Regional Director of MIDA has the authority to coordinate all the agricultural programs being developed within his region. In addition, most of the technology transfer specialists will be stationed at the regional headquarters, so that they will be in close contact with their research counterparts.

At the local "Agencia" level, the senior technology transfer agents will coordinate the research and extension activities with the research personnel localized in these communities. This could be accomplished through personal communications or by establishing a technical committee where coordination of research, extension and other programs could be done. Besides these lines of communications, there are other research and extension activities that could well be coordinated at the local level:

- On-farm research program.

  The field technology transfer agents and the technology transfer specialists should participate in the on-going on-farm research program of IDIAP. They could assist the researcher in the selection of the farm and serve as linkage between the researcher and the farmer. They could also serve as technical support for the researcher and use these farms for demonstration purposes.

- Validation of research program.

  The technology transfer field personnel and specialists must participate in this program with IDIAP's research people. As in the research program, they could serve as technical support and use those farms for demonstration purposes.

- Demonstration plots.

  Once the research results are validated, research people could work together with the technology transfer agents in the development of demonstration of research results for technology transfer to other farmers.

- Technical support.

  Researchers could assist the technology transfer personnel when problems arise at the field that could not be handled by them.

- Training support.

  The research specialists could help in the subject matter training of technology transfer personnel.

- Personal contact between researchers and technology transfer specialists.

  The technology transfer specialists could be stationed at research stations or at the regional office where they will have personal contact with the researchers. They should participate in the research program at the experiment stations and field stations, in the on-farm research, the validation of research plots and demonstration of results plots.

- Use of specialized personnel in joint research and extension activities.

  Arrangements should be made so that specialized and capable personnel could be used in both functions, i.e., as researcher and as extensionist subject matter specialists. If a researcher was chosen to serve as extension specialist, he should be trained in extension methodology.

- Other Research-Extension activities.

  Research people and extension specialists should work together in the development of field tested technological packages. They can also work together in the publication of research results for extension educational purposes as well as other educational material.

c) Linkage to other farm services.

Extension services appear to perform the essential extension function best when the services have been linked spontaneously or by design to research, farm supplies, credit and marketing institutions in profitable production programs. For this purpose, close coordination with other farmer support institutions such as BDA, ISA, ENASEM, and IMA is contemplated. The participation of extensionists at all levels, from the local to the national scene through existing or modified coordinating committees such as the Comité Agropecuario Nacional (CAN) and the Consejo Consultivo Agropecuatio (CCA) at the national level, and the Comité Agropecuario Regional (CAR) at the regional level. At the local level, a technical

committee composed of the local personnel of different institutions will be created to coordinate activities.

This coordination could be carried out through meetings of different committees, and through joint activities such as seminars so that everybody will know all programs and can advise the farmers how to make good use of the services available in their communities.

One of the most critical programs for the success of any agricultural enterprise, especially when modern technology is applied, is credit. Special efforts will be made to coordinate very closely the credit programs, particularly the credit offered by the Banco de Desarrollo Agropecuario (BDA), with the extension program. A memorandum of understanding will be worked out with BDA so that the extensionist will provide some kind of credit supervision, especially to those farmers that are directly assisted by the extensionist.

d) Linkage to other programs.

One of the most effective ways to introduce new technology is by means of youth groups. There is a youth program being developed for the region of Chiriquí that will be used in this technology transfer program. This youth organization, known as PANAJURU, will be involved in animal and crop production projects. The extension agent can provide technical assistance to those projects and use them for demonstration purposes.

Since most of the farmers' support institutions at the regional level are under the jurisdiction of the Regional Director of MIDA, this in effect comprises a mechanism to coordinate the extension program with other programs at regional and local levels.

e) Delivery of technologies and farm services.

The traditional problem of how to make research and farmer services relevant to farmers' problems is one of communication. When there is a constant interchange or dialogue between the farmer, the researcher and the extensionist, production constraints are generally solved by means of appropriate and timely research and other producer inputs. The new agricultural research and extension models are set up specifically to solve this major constraint by getting the farmer, the technology transfer agent, and the researcher to work together as a team in the farmer's fields on specific problems to come up with simple, practical and economical solutions to the most pressing production constraints.

A diagram depicting the flow of information from the office and laboratories to the experiment stations, to on-farm experiments, to farmer plots, to farmers and their interaction between each other and between the research and extension team is shown in figure 1.

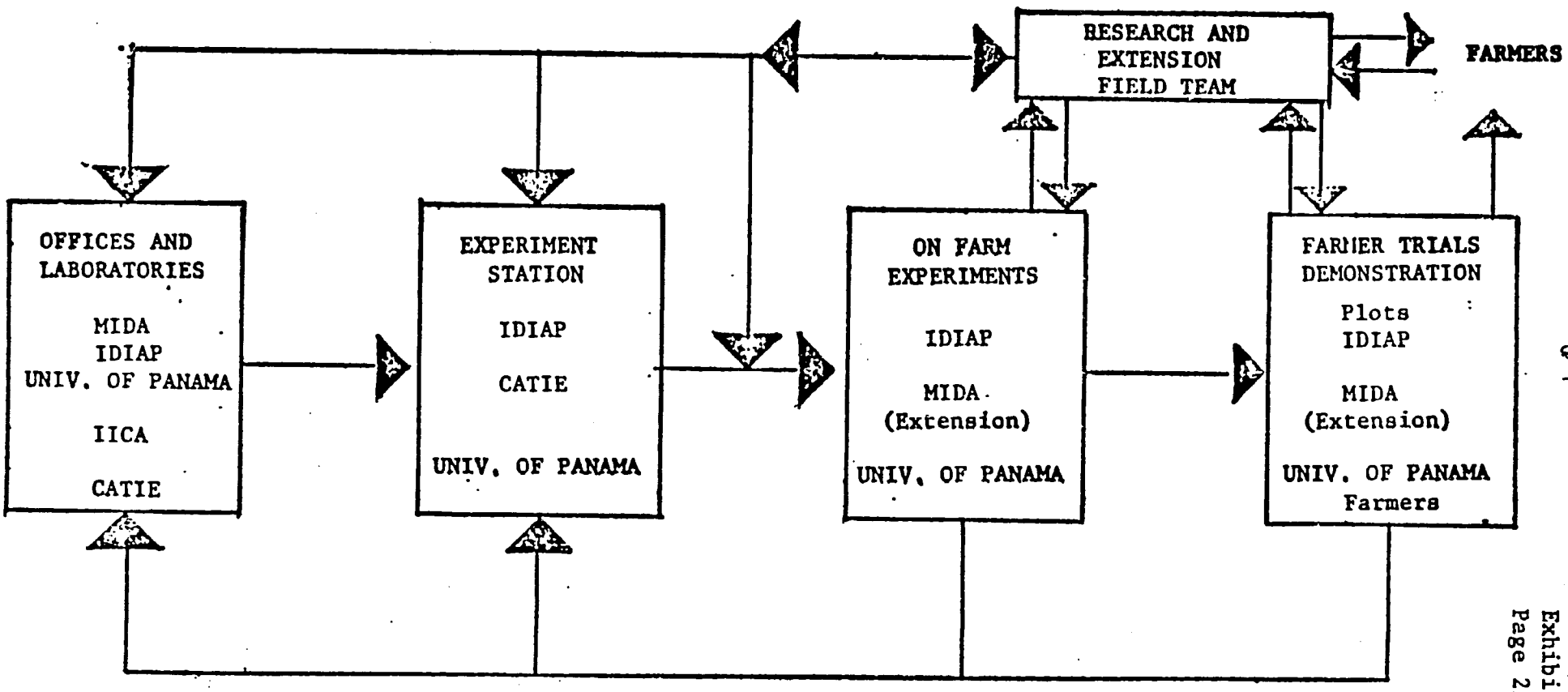


Fig. 1 New Agricultural Technology Development and Transfer Model.

As shown in figure 1, going from left to right, the offices and laboratories at MIDA, IDIAP, University of Panama, and other international research institutions will generate ideas and research needs to be done at the experiment stations, where IDIAP, CATIE and the University of Panama can work together; those in turn will provide some research needs that should be done on the farmers plots. At this stage, IDIAP researchers, extension specialists and farmers can work together in developing new farm technology. Once new technology is developed it will be transferred to the next stage, the farmer trials for the validation of research. This offers a great opportunity for researchers and extensionists to work together with farmer participation. The extensionist could use those farms for demonstration purposes.

The technology developed at the farmer trials will be transferred to other farmers by extension agents utilizing other dissemination methods including the establishment of demonstration plots within their micro-zones.

The unanswered problems or new problems will pass back through different paths to the on-farm experiments, the experiment stations and to the laboratories to search for an answer. In this way feedback from the farmers and field personnel is obtained at the experiment stations and research laboratories.

July 12, 1982.

George Pringle, Team Leader/ATT Team

Trip of the Technology Transfer Team to Costa Rica during July 3-7, 1982.

Robin Gomez,
Director

A trip was made to San Isidro, Costa Rica for the purpose of meeting with personnel of the Costa Rican Extension Service to discuss their experiences with the Training and Visitation (C&V or TAHAL) methodology for transfer of agricultural technology. Expertise at the meeting included J. Román, AID Extension Specialist; R. Vásquez, AID Research/Extension Specialist; G. Pringle, AID Farm Management/Agricultural Economics Consultant; R. Castrellón, Veterinarian and Regional Director, Chiriqui Province, Panama; G. Araya, Agronomist and Regional Extension Director, South Pacific Region, Costa Rica; R. Carranza, Regional Extension Veterinarian, Costa Rica; and G. Jiménez, Regional Extension Specialist, Costa Rica.

The C&V method, as established in Costa Rica, comprises the following essential features:

1. Farming regions are delineated into ecologically homogeneous micro-areas, each containing approximately 400 farmers. Of the target population in each micro-area, 40 farmer-leaders are selected as linkages. Eight fixed routes, each containing the farms of 5 leaders, are established in each micro-area;

2. Extension workers visit farmer-leaders, who are expected to adopt recommended technology, establish demonstration plots, serve as contacts from which technology will outreach to 10 peripheral farmers, and provide a site where peripheral farmers may meet with extension workers. Farmer-leaders are visited bi-weekly;

3. Extension workers receive intensive and continuous bi-weekly training on problems relevant to farmer-leaders. A written message with detailed instructions concerning activities to be carried out over the next two weeks are left with the farm leader;

4. Field extension workers visit 5 farmer-leaders per day, cover 4 set routes per week, and 8 routes every two weeks. One day per fortnight is set aside for training, and one day to allow agents to return to the field to visit farmers that were missed on the scheduled visit. With this scheme, one agent theoretically diffuses technology to 400 farmers (5 x 8 x 10);

5. A cadre of subject matter specialists is established to train and capacitate field extension workers.

Extension personnel of Costa Rica reported that the C&V method had been unsuccessful in transferring technology to small limited-resource farmers. The following reasons were given for this failure:

1. The system had been implemented on a national scale without providing the minimum resources in personnel, vehicles, and other inputs needed to diffuse technology to farmer leaders on a systematic bi-weekly basis;

2. Training of extension field personnel was inadequate, and did not prepare field workers to meaningfully respond to farmer needs;

3. Lack of thorough in-service training contributed to problems of diffusing technology to farmer-leaders. Agents often did not fully understand the bi-weekly messages that were extended to farmers. One consequence was low credibility of field extension workers with farmers;

4. Farmer needs and wants were not fully understood;

5. Technological practices often did not apply to specific micro-areas, and were not adapted to non-land resources of farmers;

6. Outreach or diffusion of technology from farmer-leaders to the 10 peripheral farmers was nill or very low. Farmer-leaders were often poorly selected owing to the requirement that each agent fulfill a quota of 40 farmer-leaders. Peripheral farmers preferred to meet agents in a local extension office or on their own farms. However, the C&V method eliminated local extension offices under the belief that peripheral farmers would meet agents on the leaders' farm;

7. Messages given to farmer-leaders were often of dubious relevance, and did not coincide with field activities of all farmer-leaders in a given micro-area;

8. Many small farmers did not have the resources needed to establish demonstration plots, which are a key factor in diffusing technology to peripheral farmers;

9. Weather conditions at times precluded visits to crops or demonstration plot sites;

10. Bi-weekly visits to farmer-leaders were costly, and were not needed during the growing season for some crops. Lack of relevant messages during unneeded visits contributed to low credibility of extension field workers;

11. Subject matter specialists worked only with field agents, and were not available to farmers with problems beyond the competence of the field agent.

In consideration of the above, the following changes are being made in extension methods in Costa Rica:

1. Local extension offices will be reestablished to provide a site where farmers needing help may locate an extension agent;

2. Frequency of visitation by agents to farmer-leaders will be determined by farmer needs;

3. Agents and specialists will again work with classroom groups of farmers as in classic extension model;

4. Agents will be given more freedom of action, and will use an integrated whole-farm approach;

5. Extension methods will include farmer tours, taking farmers to visit examples of successful technology in other areas;

6. Extension specialists and Agronomists level will attend difficult cases where more expertise is required, and the better groups of famers;

7. Periodic messages will be tied to what is going on in the field, and may be given on a weekly, bi-weekly or monthly basis, depending on crops cycles and real needs.

The Technology Transfer team proposes a "Chiriquí" model which comprises the best of the C&V as well as traditional extension methods. This system will include the following essential features:

1. At the field level, individual agents will be assigned to delineated homogeneous-ecological areas. The size of a

micro-area will depend on various criteria, but will include a number of farmers that agents can reasonably attend, considering farmer density, current technological sophistication of farmers, and prevalent crop and livestock systems;

2. Extension agents will work with farmer-leaders, and with farm groups within their designed areas;

3. Centralized extension offices will be established to provide a site where farmers can locate an agent;

4. Periodic visits will be made to 24-40 selected farmers per year per agent on fixed routes. Frequency of visits will be determined by crop cycles and farmer needs;

5. Demonstration farms will be established on the land of leader-farmers. If needed, material inputs will be provided for establishment of demonstration plots;

6. Model farmers will be established in each regional district to integrate IDIAP/MIDA activities, to provide for multi-locational testing and demonstrations, to anticipate problems in transferring new technology, and to strengthen extension confidence in results of research;

7. Field extension agents will be thoroughly trained in extension methods, identification of farmer problems, commodity-oriented technology, and other matters prior to project implementation in the field;

8. A corps of extension specialists will be provided to train field extension agents in the application of new technology, solve problems beyond the abilities of field agents, provide classroom extension training to groups of farmers, and to coordinate and participate in activities in which extensionsists and researchers can work jointly.

9. Rural youth organizations such as PANAJURU will be sponsored. Youth projects will be integrated, when possible, with demonstration plots.

10. Field agents will be given freedom of action to deal with integrated production systems in which adoption of technology for one crop may impact on all other parts of the system.

cc: AGR:Dr. L. Harlan Davis
Technology Transfer Team

June 22, 1982

George E. Pringle,
Team Leader
IDIAP/CIMMYT Methodology

Robin Gomez,
Director

Listed below are the essential features of the IDIAP/CIMMYT Methodology used in the Caisán Project.

-- "Dominios de Recomendación", or domains of recommendation are first delineated. These are areas consisting of fairly similar soils, climate, topography and other conditions, and with fairly homogeneous farmers.

-- Identification of circumstances confronted by farmers is then made and technological problems requiring research are selected. Circumstances include markets for farm products, availability of inputs, farming practices, equipment, and other factors affecting choice of crop and livestock enterprises.

-- Experiments, on relevant problems are conducted on land of farmers, using farm practices representative of the area or domain of recommendation.

-- Findings are extended to farmers across the domain of recommendation through field days, visits, and the visual demonstration effect of field plots located near rural roads.

A survey by IDIAP/CIMMYT of the Caisán domain of recommendation disclosed that corn followed by "frijol" was the most common cropping pattern. Corn was selected for intensive study, with emphasis on the following four variables:

-- Weed control
-- Plant population, along with planting in rows
-- Nitrogen
-- Phosphorus

In addition to the above experimental variables, no-tillage cultivation methods were studied and research was undertaken to reduce the height of native corn. Visits on June 17 by the AID/MIDA technology transfer team to

several farms in the Caisán domain of recommendation disclosed that no-tillage cultivation methods and planting in rows have been widely adopted.

Note: This type of research is very site-specific, and results apply primarily to the domain of recommendation.

cc: L. Harlan Davis, Chief, AGR
D. Mackenzie, ODR

DETAILED DESCRIPTION OF PROJECT
HUMAN RESOURCE DEVELOPMENT ACTIVITIES

Human Resources Development.

In order to implement an effective technology transfer system in the Chiriquí Region, a staff of 160 professional and sub-professional personnel is required. This staff will consist of 109 assistant technology transfer agents, with professional preparation at the bachillerato, técnico or vocational level; 27 senior agents with college degrees in agricultural sciences (e.g. Ingeniero Agrónomo), and 24 extension specialists with college degrees (Ingeniero Agrónomo) and specialized training in subject matter areas. Owing to MIDA's limited experience in transfer of technology, both short and long-term training is required to prepare existing and prospective staff with the capability to undertake a program that will effectively transfer technology to small and medium size farmers. Most MIDA personnel lack experience in extension methodology, and do not have expertise in specific or subject matter areas.

In addition to training of personnel for the Chiriquí Region, a limited number of personnel from the regions of Coclé, Herrera, Los Santos, and Veraguas will be trained in extension education and methodology during the first 2 years of the program, and will comprise a vanguard upon which the program may be extended to those regions during the third project year. To that end, two professionals with a college degree (Ingeniero Agrónomo) will be selected from each region to pursue long-term training at the MS level. In addition, the Director and Sub-director of each region will receive short-term training in extension organization, planning, and administration. Thus, a total of 16 professionals from other regions will receive short and long-term training during the first two years of the program. Upon completion of training, these persons will begin to organize and create extension programs for their respective regions. A groundwork mechanism will thus exist to expand the extension program to a national level. Personnel trained for the Chiriquí region may provide additional technical assistance for the implementation of extension programs in other regions.

In general, the following training program is planned:

a) Pre-program Training

Four weeks of intensive training will be given to 160 extension staff to familiarize them with program goals, adult education methods, philosophy of extension, group organization techniques, project methodology, problem indentification and diagnosis, work organization

and planning, and coordination of farmer support services. During subsequent years this training will be offered annually to approximately 25 replacement personnel.

b) Technical Training

All field staff will receive approximately 2 days training per month, or 4 weeks training each year, in the production, management, and marketing aspects of priority crops and livestock enterprises. This training will be given at frequent intervals, judiciously timed in accordance with the informational needs of farmers during crop cycles. Topics will include soil preparation and management, soil fertility and fertilizer practices, crop protection, irrigation and drainage, handling and marketing of agricultural crops, pasture and rangeland management, dairy and beef cattle production and management, farm management, and use of agricultural chemicals. This training will be given by extension specialists once they are adequately trained, although assistance from IDIAP, the Faculty of Agronomy, and other institutions will be sought if necessary.

c) Preparation of Specialists

Short and long-term training for entrant and senior extension specialists (training of trainers) will consist of special courses that will be developed and given by IDIAP's Technology Transfer Directorate, the Faculty of Agronomy of the University of Panama, other institutions, and visiting extension specialists. This program will include training visits to other countries, and formal academic (including advanced degree) instruction in universities in the United States and elsewhere.

During the first year of the project, short-term training of 3 to 6 months duration will be provided for 12 subject matter specialists from the Chiriquí region, the Sub-Director of the Chiriquí regional office, and the Directors of the Chiriquí, Coclé, Herrera, Los Santos and Veraguas regions. The regional administrators will be trained in extension education and in the management and supervision of extension programs. The 12 specialists will be trained in extension education, written extension communication, audio-visual extension communication, extensio supervision (planning, programming, evaluation), plant pathology, entomology, soil fertility, marketing of agricultural commodities, horticulture (vegetables), horticulture (coffee), agronomy (field crops), and forage and rangelands management.

Training at the M.S. level for the first year is contemplated for 8 specialists or agents from Chiriquí and 8 professionals from the other 4 regions at a cost of $416,000. Four of the specialists from Chiriquí will be trained in extension communications (written, audio-visuals), extension supervision, and extension education (methodologies); the other will be trained in extension education (methodology), and in the management and supervision of extension programs (planning, programming, evaluation).

During the second year of the project, special short-term courses will be given to 15 persons. Of these, 11 wil be specialists from Chiriquí and 4 will be the Sub-Directors of other regions. Administrators from the other regions will be trained in extension education and supervision. Subject matter specialists will be trained in fields such as beef and dairy cattle management, farm management, irrigation and drainage, soil conservation and management, farm mechanization, poultry production and management, nematology, horticulture (fruits), farm structures, and integrated pest management.

At the M.S. level 8 additional candidates from Chiriquí will be sent for training during the second year, and 16 from the previous year will continue studies at this level. The new candidates will be trained in agronomy (field crops), horticulture (vegetables and coffee production and management), forage and rangeland management, dairy and beef cattle production and management, farm management, and irrigation and drainage.

From the third to fifth year of the program short-term training will be given to 14 persons each year, all from the Chiriquí region. Persons selected will be trained in any of the specializations included in the first 2 years, plus natural resources conservation and management, or any other field of specialization for which a need is detected during the development of the project.

Four additional candidates from Chiriquí will enter the M.S. program during the third year, and together with 8 remaining from the previous year, will form part of a group of 12 persons in this program. It is estimated that a master degree will require 2 years for completion.

During the fourth year, four additional persons will join the M.S. program, and with the 4 who began studies the previous year, will make a total of 8 students receiving graduate training. These will be trained in horticulture (fruits), natural resources management, agricultural engineering (farm structures), and entomology (integrated pest management).

In the fifth year of the project, 4 students will finish their M.S. programs.

A summary of this detailed training program is depicted in Tables 1, 2, 3, and 4. Table 1 shows that a total of 75 persons will participate in short-term training. Of these, 8 trainees will be from the provinces of Coclé, Herrera, Los Santos and Veraguas, and the rest from Chiriquí.

Table 2 shows the distribution by years of persons participating in the M.S. program. Eight of the persons trained will be from the regions of Coclé, Herrera, Los Santos and Veraguas, and the rest from Chiriquí. A total of 32 students will be trained to the M.S. level, the majority being trained during the first 2 years of the program.

Table 3 provides a prioritized list of fields of specialization for short-term training periods. The list of priorities for the M.S. program is shown in Table 4.

The aforementioned training program has the following important features:

a) An induction training for all the personnel during the first year of the program, and for all new personnel in subsequent years.

b) Continuous subject matter training for all field personnel, to be offered at opportune times during the year in accordance with farmer needs.

c) Continuous short-term training for specialists and selected personnel to keep them abreast with evolving technology and programs.

d) Intensive academic training at the M.S. level to provide adequate preparation for subject matter specialists.

In order to develop this training program, a unit for training or human resource development must be organized. This unit will be responsible for the preparation of all training courses, selection of trainers, selection of trainees, and other matters dealing with the professional improvement of project personnel. Two outside consultants with ample experience in training and human resources development will be hired, for 10 week tours of duty, to assist in the program development and as teaching resources for the training courses offered locally. Their honoraria are included in the estimated training budget.

TABLE 1

Short-term training (3-to-6 months) participants throughout the five-years of the extension program.

	1983		1984		1985		1986		1987		1988		1989	
Months	3	6	3	6	3	6	3	6	3	6	3	6	3	6
	Number of participants													
Region														
Chiriquí	4	7	4	7	8	4	5	2	5	2	5	2	5	2
*Other Regions	4	-	4	-	-	-	-	-	-	-	-	-	-	-
Sub-totals	8	7	8	7	8	4	5	2	5	2	5	2	5	2
Total/year	15		15		11		7		7		7		7	
P/M	24	42	24	42	24	24	15	12	15	12	15	12	15	12

* Other regions included are Coclé, Herrera, Los Santos, and Veraguas.

Total P/M: 288.

TABLE 2

Long-term training (MS level) participants throughout five-year period of the extension program.

Group	1983	1984		1985		1986		1987	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
	Number of Participants								
First 1/	16	16	16	16					
Second			8	8	8	8			
Third					8	8	8	8	
Total	16	16	24	24	16	16	8	8	
P/M	96	96	144	144	96	96	48	48	

1/ Of this group, 8 students will be from Chiriquí, and 8 from the regions of Coclé, Herrera, Los Santos, and Veraguas. The following groups will be from Chiriquí.

TABLE 3

Selected field of specialization for the short-term training, by priorities.

First year:

Extension education and methodology.
Extension communication (written).
Extension communication (audio-visual).
Extension supervision (planning, programming, evaluation).

Plant Pathology.
Entomology.
Soils (fertility).
Agricultural economy (marketing).
Horticulture (vegetables).
Horticulture (coffee).
Agronomy (field crops).
Forage and rangelands management.

Second year:

Extension education and supervision.
Livestock production and management (dairy cattle).
Livestock management (beef cattle).
Agricultural economics (farm management).
Irrigation and drainage.
Soils (soil conservation and management).
Farm mechanization.
Poultry production and management.
Nematology.
Horticulture (fruits).
Agricultural Engineering (farm structures).
Entomology (integrated pest management).

Third, Fourth, and Fifth years:

Natural Resources Conservation and Management and any course from the above list that may be necessary.

TABLE 4

Selected field of specialization for the M.S. program, by priorities.

First year:

Extension education and methodology.
Extension communication (written).
Extension communication (audio-visual).
Extension supervision (planning, programming, evaluation).

Plant Pathology.
Entomology.
Soils (fertility).
Agricultural Economics (marketing).

Second year:

Agronomy (field crops).
Horticulture (vegetables).
Horticulture (coffee).
Forage and rangelands management.
Livestock production and management (dairy cattle).
Livestock management (beef cattle).
Economy (farm management).
Irrigation and drainage.

Third year

Soils (soil conservation and management).
Farm mechanization.
Poultry.
Nematology.

Fourth year:

Horticulture (fruits).
Natural resources conservation and management.
Agricultural Engineering (farm structures).
Entomology (integrated pest management).

TABLE 5

DISTRIBUTION OF TECHNOLOGY TRANSFER PERSONNEL BY SUB-AREA

Sub-Area	Senior Agents	Assistant Agents	Total
Alanje	3	13	16
Progreso	3	13	16
San Juan	3	10	13
Gualaca	3	10	13
Potrerillos	4	15	19
Concepción	2	8	10
San Andrés	4	14	18
Volcán	3	12	15
Boquete	2	8	10
Río Sereno	2	6	8
TOTAL	27	109	136

FIELD PERSONNEL NEEDS

Taking into consideration the targeted farmer population in the ecological zones and the proposed extension model where 40 farmers are intensively assisted in three periods of two-years each by an assistant technology transfer agent, it was estimated that 109 assistant agents and 27 senior agents were needed to adequately assist the targeted farmer population.

To determine those figures it was assumed that an assistant agent would attend 40 farmers in the group of farmers with 5 hectares or less and an average of 32 farmers in the group with more than 5 hectares. This was subsequently changed to no less than 40 farmers per assistant agent, regardless of farm size.

The number of senior technology transfer agents was based on the proposed extension model where each agent will have under his supervision 3 to 5 assistant agents.

To estimate the number of senior agents needed it was assumed that a senior agent would have 5 assistants under his supervision when working with groups of farmers with farm sizes of 5 hectares or less and an average of 4 assistants of these working with farmers with more than 5 hectares. For the distribution of senior and assistant agents by ecological zone see Table 1.

TABLE 1

DISTRIBUTION OF SENIOR AND ASSISTANT TECHNOLOGY TRANSFER AGENTS BY ECOLOGICAL ZONES

Ecological Zone	Assistant technology transfer agents	Senior technology transfer agents
E-1	67	16
E-2	19	5
E-3	8	2
E-4	15	4
TOTAL	109	27

TABLE 2

DISTRIBUTION OF TARGET POPULATION BY FARM SIZE AND SUB-AREA

	Farm size (hectares)				
	Less than 5	5 - 19	20 - 49	50 and over	Total
Alanje (1)	1,460	865	393	277	2,995
Progreso	1,918	900	345	219	3,382
San Juan (2)	992	438	400	342	2,172
Potrerillos	1,286	561	248	153	2,248
Concepción	1,368	454	197	126	2,145
San Andrés	1,166	489	273	200	2,128
Volcán	817	550	302	199	1,868
Gualaca (3)	710	434	284	261	1,689
Boquete	516	305	188	146	1,155
Río Sereno	225	238	204	164	831
T O T A L (4)	10,458	5,234	2,834	2,087	20,613

(1) Alanje, 539 farms of less than 0.5 ha. were eliminated from the David Precinct.

(2) San Juan, 443 farms of less than 0.5 ha. were eliminated 132 from Remedios, 170 from San Félix, 86 from San Lorenzo y 55 from Tolé.

(3) Gualaca, 80 farms of less than 0.5 ha. were eliminated from the Precinct of Chiriquí.

(4) A total of 1,062 farms of less than 0.5 ha. were eliminated.

Assumed land resources so poor in above areas that a farm of less than 0.54 ha. has no chance of comprising an economic unit.

TABLE 3

PROFILE OF AGRO-ECOLOGICAL AREAS OF CHIRIQUI PROVINCE

Ecological Area	Climate	Temperature	Altitude (meters above sea level)	Topography
EA1	Tropical Savannah	Over 24° C	Less than 400	Level to moderate slopes.
EA2	Humid	8° to 24° C	400 - 800	Moderate to steep.
EA3	Arid Temperate	15° - 18° C	800 - 1,000	Steep to very steep slopes.
EA4	Humid Temperate	8° - 18° C	Over 1,000	Very steep to rugged escarpments.

TABLE 4

PROFILE OF SOIL CAPABILITY CLASSES IN CHIRIQUI PROVINCE
BY AGRO-ECOLOGICAL AREA

Agro-Ecological Area	Soil Capability Class							Total Surface area
	II	III	IV	V	VI	VII	VIII	
EA1	15.5	17.7	13.7	7.2	15.3	28.2	2.4	399,636
EA2	0.2	4.4	13.0	0.5	22.0	44.8	15.1	98,067
EA3	0.1	2.4	14.4	0.0	25.2	47.8	10.1	33,175
EA4	1.3	1.9	9.8	0.0	13.8	60.5	12.7	56,951

TABLE 5

DISTRIBUTION OF FARMS IN CHIRIQUI PROVINCE, BY FARM SIZE AND AGRO-ECOLOGICAL AREA

Ecological Agro-Area	Farm size (hectares)					
	Less than 5	5 - 19	20 - 49	50 and over	Total	Percent of total
EA1	8,536	3,411	1,691	1,260	14,898	72.2
EA2	1,278	648	399	264	2,589	12.5
EA3	347	290	226	178	1,041	5.1
EA4	1,273	484	273	76	2,106	10.2
T O T A L	11,434	4,833	2,589	1,778	20,634	
Percent of Total	55.4	23.4	12.6	8.6	100%	

TABLE 6

SURFACE AREA OF FARM UNITS IN CHIRIQUI PROVINCE BY FARM SIZE AND AGRO-ECOLOGICAL AREA

Ecological Agro-Area	Farm size (hectares)					
	Less than 5	5 - 19	20 - 49	50 and over	Total	Percent of total
EA1	9,434	32,356	48,565	232,382	322,737	68.4
EA2	2,423	8,164	13,475	40,903	64,965	13.7
EA3	682	3,440	7,835	20,178	32,135	6.8
EA4	3,674	5,554	12,254	30,681	52,163	11.1
T O T A L	16,213	49,514	82,129	324,144	472,000	
Percent of Total	3.4	10.5	17.4	68.7	100%	

Table 7

DISTRIBUTION OF CONTACT FARMS BY SIZE AND SUB-AREA

Sub-Area	Farm size (hectares)				
	Less than 5	5 - 19	20 - 49	Over 49	Total
Alanje	292	692	314	222	1,520
Progreso	383	720	276	175	1,554
San Juan	198	350	320	274	1,142
Gualaca	355	347	227	209	1,138
Potrerillos	1,029	449	198	122	1,798
Concepción	273	363	158	101	895
San Andrés	933	391	218	160	1,702
Volcán	654	440	241	159	1,494
Boquete	413	244	150	117	924
Río Sereno	180	192	163	131	665
T O T A L	4,710	4,187	2,305	1,670	12,832

Selection of Target Farmer Groups

The farmer population of the Chiriquí Province were classified for technology transfer purposes in different groups according to the size of the farm and the ecological zone. From those, farmers were selected for the outreach of technology taking into consideration the following criteria:

In the ecological zone E-1 (for description of ecological zones see section on description of target areas) 20% of farms with 5 hectares or less and 80% with more than 5 hectares were selected for technological outreach. In the rest of the ecological zones, 80% of the total farms were selected for technology transfer purposes. The selected number of farms in each ecological zone is as follows: 6,791 farms in ecological zone E-1; 2,071 in E-2; 832 in E-3 and 1,684 in E-4; for a total of 11,384 in the Chiriquí Province (see table 1 for distribution according to size). In ecological zone E-1, only 20% of the farms with less than 5 hectares was taken due to the fact that most of these farms are small size lots that are not use for farming purposes.

Table 1

Targeted farmers for technology outreach according to farm size and homogeneous ecological areas.

*Ecological Zone	Number of Farmers with 5 hectares or less	More than 5 hectares	TOTAL
E-1	1,707	5,089	6,796
E-2	1,022	1,049	2,071
E-3	277	555	832
E-4	1,018	666	1,684
Total	4,024	7,360	11,384

* For description of ecological zone, see section on description of target areas.

Table 2

DISTRIBUTION OF TECHNOLGY TRANSFER PERSONNEL
BY LOCAL AGENCY AND AGRO-ECOLOGICAL AREA

Agro-Ecological Area	Number of Persons		
	Senior agents	Assistant agents	Total
AE_1			
Progreso	5	21	26
Alanje	4	17	21
Gualaca	3	12	15
San Juan	3	13	16
Sub-total	15	63	78
AE_2			
Concepción	2	8	10
San Andrés	2	7	9
Potrerillo	2	8	10
Sub-total	6	23	29
AE_3			
Río Sereno	2	8	10
AE_4			
Volcán	2	7	9
Boquete	2	8	10
Sub-total	4	15	19
TOTAL	27	109	136

NATIONAL SOIL TESTING PROGRAM

A national program of soil testing is a valuable tool for use in agrotechnology transfer. A widely used program of soils analysis is a primary mechanism for assessment of soils resources and establishment of research priorities and production recommendations. Of special importance to this project is the value of a national soil testing program as a technology transfer and education process.

A soils analysis program and the accompanying recommendations provides and excellent opportunity for contact between farmer and agronomist. The sampling process exposes the farmer to variability of soils on the farm and to other more general agronomic problems. It also initiates and stimulates contact between the extensionist and the agricultural producer. The analytical and recommendation process provides research and extension personnel a better knowledge of local and regional variability in soil physical and chemical properties. And the report/recommendation process promotes further farmer/extensionist contact. Discussion of soil analysis results and crop production recommendations focuses the farmer's attention on soil-related agronomic problems but also provides an opportunity for questions and discussion of a broader nature.

The value of this contact and these discussions cannot be overemphasized as an agrotechnology transfer tool. These contacts stimulate awareness in both the farmer and the extension specialist. Basic soil chemical and physical properties as well as special agronomic problems are inventoried and available for review by researchers as and aid in appropriately focusing research emphasis.

A soil analytical laboratory is operated by IDIAP in Divisa and the facility currently processes 4,000 - 5,000 samples annually. An effort is underway by IDIAP to improve the facilities and to develop a national soil testing program. Thus, the focus of the Technology Transfer project will primarily be in training IDIAP and MIDA personnel in soil fertility related disciplines. The primary goal of this training support would be to enhance the capacity of the national soils testing program to analyze soils and to extend recommendations to producers.

The emphasis in support and development of a national soils testing entity should clearly be in establishing an educational and technology transfer mechanism. A strong scientific soils research program must underly this process as a basis for sound recommendation information. The difficult task for MIDA/IDIAP personnel will be to design and implement an appropriate technology transfer program that although based on scientific information is understandable by the agricultural producer. This project seeks to reinforce these efforts through training agronomic and technology transfer personnel.

METODOLOGIA PARA DETERMINAR LA CANTIDAD NECESARIA DE AGENCIAS DEL MIDA

Los criterios para determinar la cantidad necesaria de agencias del MIDA fueron los siguientes:

a) Número de fincas existentes según área ecológica por rango de finca.
b) Red de carreteras existentes en la provincia.
c) Distribución de sucursales del BDA y estaciones y campos experimentales del IDIAP.

La conjugación de estos tres criterios determinó el número y distribución de las agencias expuestos en el Cuadro No. 1.

Cuadro No.1

DISTRIBUCION DE POBLACION POR TAMAÑO DE FINCA Y SUB-AREA

	Tamaño de Finca (hectareas)				
	Menos de 5	5 - 19	20 - 49	Más de 49	Total
Alanje (1)	1,460	865	393	277	2,995
Progreso	1,918	900	345	219	3,382
San Juan (2)	992	438	400	342	2,172
Potrerillos	1,286	561	248	153	2,248
Concepción	1,368	454	197	126	2,145
San Andrés	1,166	489	273	200	2,128
Volcán	817	550	302	199	1,868
Gualaca (3)	710	434	284	261	1,689
Boquete	516	305	188	146	1,155
Río Sereno	225	238	204	164	831
T O T A L	10,458	5,234	2,834	2,087	20,613

(1) Alanje, 539 fincas de menos de 0.5 ha. fueron eliminadas del Corregimiento de David.
(2) San Juan, 443 fincas de menos de 0.5 ha. fueron eliminadas 132 de Remedios, 170 de San Félix, 86 de San Lorenzo y 55 de Tolé.
(3) Gualaca, 80 fincas de menos de 0.5 ha. fueron eliminadas del Corregimiento de Chiriquí.

Se asume que los recursos agrícolas en las areas que anteceden son tan pobres que una finca de menos de 0.54 ha. no tiene capacidad para constituir una unidad económica.

Cuadro No.2
NUMERO DE FINCAS POR AGENCIAS DEL MIDA, SEGUN CORREGIMIENTO

AGENCIA DE ALANJE

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Alanje (cabecera)	1	150	64	26	23	263
El Tejar	3	97	41	16	15	169
Guarumal	4	190	82	33	29	334
Palo Grande	5	76	32	13	12	133
Querévalo	6	96	42	16	15	169
Santo Tomás	7	66	28	11	11	116
Tijera **	18	-	-	-	-	-
Bágala	12	112	58	28	14	212
San Carlos	41	159	63	30	21	273
San Pablo Viejo	43	178	71	34	23	306
David	34	125	49	24	16	214
Las Lomas	39	341	137	65	44	587
Pedregal (David)	40	32	13	6	4	55
Boquerón (cabecera)	11	217	110	55	29	411
Pedregal (Boquerón)	17	97	50	24	13	184
TOTAL		1,999	865	393	277	3,534

* El número corresponde al mapa de las Areas Ecológicas.
** Información no disponible.

Agencia de Gualaca

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Gualaca (cabecera)	51	136	105	79	81	401
Hornitos	52	45	25	24	26	120
Paja de Sombrero	54	40	31	24	24	119
Cochea	36	159	63	31	20	273
Los Angeles	53	53	42	31	32	158
Bijagual	35	96	38	18	13	165
Rincón	55	69	54	40	41	204
Chiriquí	37	192	76	37	24	329
TOTAL		790	434	284	261	1,769

Agencia de Volcán

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Paraíso	16	25	13	7	4	49
Cordillera	13	23	10	9	5	47
Volcán	33	658	428	230	141	1,457
Cerro Punta	25	111	99	56	49	315
TOTAL		817	550	302	199	1,868

Agencia de Río Sereno

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Río Sereno	61	85	90	77	62	314
Cañas Gordas *	63	-	-	-	-	-
Monte Lirio	64	88	93	80	65	326
Plaza Caisán	65	52	55	47	37	191
TOTAL		225	238	204	164	831

* Cañas Gordas: Información no disponible.

Agencia de Potrerillos

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Potrerillo Abajo	48	61	26	12	7	106
Potrerillo Arriba	47	121	53	22	14	210
Rovira	49	124	48	17	22	211
Dolega	44	347	147	64	36	594
Dos Ríos	45	104	44	20	10	178
Los Anastasios	46	117	50	21	13	201
Guabal	14	-	-	-	-	-
Guayabal	15	167	85	42	22	316
Guacá	38	147	59	28	19	253
Tinajas	50	98	49	22	10	179
TOTAL		1,286	561	248	153	2,248

Agencia de San Juan

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Boca del Monte	81	68	24	34	42	168
San Lorenzo (cabecera)	78	56	20	27	34	137
Boca Chicha	79	12	5	6	7	30
San Lorenzo	87	89	31	44	54	218
San Juan	86	64	23	32	39	158
Juay	74	41	7	8	5	61
San Félix	77	139	26	25	20	210
San Félix (cabecera)	67	224	42	43	29	338
Remedios (cabecera)	56	224	26	26	28	304
El Nancito	58	40	5	5	4	54
Tolé (cabecera)	89	312	150	100	50	612
Lajas de Tolé	96	67	32	20	12	131
Quebrada de Piedra	100	99	47	30	18	194
TOTAL		1,435	438	400	342	2,615

Agencia de Boquete

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Boquete (cabecera)	19	362	242	151	114	869
Caldera	20	82	33	20	17	152
Palmira	21	72	30	17	15	134
TOTAL		516	305	188	146	1,155

Agencia de Progreso

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Divala	2	237	102	40	37	416
Puerto Armuelles	8	1,017	483	185	110	1,795
Limones	9	126	60	22	14	222
Progreso	10	538	255	98	58	949
TOTAL		1,918	900	345	219	3,382

Agencia de Concepción

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
Concepción	22	360	120	52	33	565
Sortová	32	167	55	24	16	262
Santa Rosa	30	114	38	17	10	179
La Estrella	27	294	98	42	27	461
Santa Marta	29	247	82	35	23	387
Santo Domingo	31	125	41	18	12	196
Bugaba	24	61	20	9	5	95
TOTAL		1,368	454	197	126	2,145

Agencia de San Andrés

Corregimiento	No.	Menos de 5	5-19	20-19	Más de 50	Total
San Andrés	28	215	72	30	20	337
Gómez	26	188	62	26	18	294
Aserrio Griché	23	623	207	89	58	977
Breñón	62	29	31	27	22	109
Santa Cruz	66	111	117	101	82	411
TOTAL		1,166	489	273	200	2,128

NECESIDADES DE RECURSOS HUMANOS EN RELACION AL PROGRAMA DE TRANSFERENCIA DE TECNOLOGIA

REGION No.1, CHIRIQUI

Disciplina	Total Requerido	Disponibilidad Actual en la Región	Reubicación al Proyecto de T. Tecno-	Solicitar Vacante/MIDA
Ing. Agrónomo	11	16	8	3
Ing. Agrónomo Zootecnia	8	1	1	7
Ing. Agrónomo Fitotecnia	4	-	-	4
Bachiller Agropecuario	56	39	39	17
T.M.U. Bovino Tecnia	34	20	20	14
Secretaria	6		2	4
T/Manual	8		1	7
TOTAL	127	76	71	56

Total de Ing. Agrónomos ..... = 23

Total de Técnicos Médicos (T.M.U. + Bach. Agrop.) ... = 90

DESCRIPCION GENERAL DE LA PROVINCIA

Localización.

La provincia de Chiriquí está localizada al suroeste de la República de Panamá; limita al norte con la provincia de Bocas del Toro, al este con la provincia de Veraguas y al oeste con la República de Costa Rica.

Relieve.

En el relieve chiricano existen tierras altas de origen volcánico y tierras bajas de origen sedentario. En las tierras altas, las formas dominantes de relieve están constituídas por una cadena montañosa formada por los siguientes cerros: Picacho (2,874 M), Santiago (2,826 M), Pando (2,468 M), Chorcha (2,230 M), Horqueta (2,231 M). A este sistema montañoso pertenece el Volcán Barú, punto más alto del país, con 3,475 M, de donde se desciende por un suave plano inclinado con amplias gradas de ligeras ondulaciones hasta llegar a las llanuras costeras que se extienden a través de los distritos de Barú, Alanje, David, Gualaca, San Félix, San Lorenzo y Remedios.

Clima.

Chiriquí goza de varios tipos de clima, a saber:

Clima templado húmedo (CF de Kopen), el cual se encuentra en las tierras ubicadas a más de 1,000 M de altitud, y en donde se dan temperaturas que oscilan entre 8° y 18° C.

Clima templado árido (CW), el cual se desarrolla en tierras con altitudes comprendidas entre 800 y 1,000 metros. Las temperaturas van de 15° a 18° C.

Clima templado lluvioso (AM) y clima tropical de sabanas (AW), dos tipos climáticos que se encuentran en tierras bajas con menos de 400 metros de altitud. Las temperaturas son superiores a los 24° C.

En la provincia, las precipitaciones oscilan entre 2,000 y 4,500 milímetros al año; sin embargo, existen una seca bien definida que comienza en el mes de enero y termina en marzo.

Suelos.

Aproximadamente el 55% de la superficie de las explotaciones agropecuarias tiene suelo de origen sedentario, siendo el resto de origen volcánico. La clasificación de los suelos según su capacidad agrológica se define en el tema siguiente.

Definición de Areas Ecológicas.

Atendiendo a variables agrometeorológicas que no pueden ser modificadas por el hombre a corto plazo, como son el clima, altitud y pendiente, se han identificado cuatro áreas ecológicamente homogéneas en la provincia de Chiriquí.

En el Cuadro No.1 se identifican estas áreas ecológicas.

CUADRO No. 1

AREAS ECOLOGICAS DE LA PROVINCIA DE CHIRIQUI

Area	Clima	Altitud (metros)	Pendiente	Area	Número de Explotaciones
EA1	Tropical de sabanas (Temp.sobre 24° C)	Menos de 400	De plano a suave (2 a 20%)	68.4%	72.2%
EA2	Templado lluvioso (Temp. 18-24° C)	400 - 800	Mediana a fuerte (20 to 50%)	13.8%	12.5%
EA3	Templado árido (Temp. 15-18° C)	800 - 1,000	Fuerte a muy escarpada (50 to 75%)	6.8%	5,1%
EA4	Templado húmedo (Temp. 8-18°)	Más de 1,000	Escarpada a muy escarpada (50 y más de 75%)	11.0%	10.2%

Fuente: Este trabajo.

Con respecto a la clase de suelo existente en cada área ecológica, se presenta en el Cuadro No.2, que es la universalmente aceptada y se refiere únicamente a la capacidad de uso, sin guardar una estrecha relación con la fertilidad de los mismos.

Fernando Suárez De Castro, en su libro "Conservación de Suelos", 1980, define cada clase de suelo en la siguiente manera:

Clase I: Terrenos apropiados para el cultivo del maíz, frijol, tabaco, papa, etc. No necesitan prácticas especiales de conservación de suelos; en general son terrenos de pendientes muy suaves (0 - 6%), fáciles de trabajar y con suelo profundo.

Clase II: Terrenos apropiados para cultivos que exigen mucha limpieza, como los mencionados en la Clase I, pero necesitan prácticas sencillas de conservación de suelos. Son terrenos de pendiente moderada (6 - 20%) con mediana profundidad del suelo.

Clase III: Terrenos apropiados para cultivos que exigen mucha limpieza, necesitan el uso de prácticas intensas de conservación de suelos, ya que son susceptibles a la erosión severa. De mediana pendiente (20 - 35%) y poca profundidad.

Clase IV: Terrenos apropiados para vegetación permanente y algunos cultivos limpios mediante el uso de prácticas intensivas de conservación de suelos. La pendiente varía entre mediana y fuerte (20 - 50%), medianamente profundos y desfavorables para la retención de agua.

Clase V: Terrenos impropios para cultivos limpios pero utilizables para vegetación permanente como bosques y potreros. Tienen poca pendiente (20 - 35%) y no están sujetos a erosión apreciable. Los cultivos mecanizados no son posibles debido a la excesiva pedregosidad o humedad.

Clase VI: Terrenos impropios para cultivos limpios, pero utilizables para la vegetación permanente mediante el uso de prácticas moderadas de conservación de suelos. Su pendiente en general es fuerte (35 - 50%), suelo poco profundo y de poca resistencia a la acción desprendedora del agua. Los potreros que en ellos se establecen deben rotarse cuidadosamente.

Clase VII: Terrenos impropios para cultivos limpios pero utilizables para vegetación permanente con fuertes limitaciones y mediante el uso de prácticas intensivas de conservación de suelos. Su pendiente en general es muy fuerte (50 - 75 , de escasa profundidad y poca resistencia a la acción erosiva del agua. Los potreros que en ellos se establezcan exigen prácticas similares a la clase anterior, pero aplicadas en formas más intensas.

Clase VIII: Terrenos inapropiados para la agricultura o la ganadería. Quedan en ella incluídos pantanos, playones de arenas, áreas muy escarpadas, (más de 75%). Todos ellos donde no es posible establecer económicamente un cultivo.

CUADRO No.2

CLASE DE SUELO SEGUN AREA ECOLOGICA

Area	Clase de Suelo (%) I	II	III	IV	V	VI	VII	VIII	Total (has.)
AE1	15.5	17.7	13.7	7.2	15.3	28.2	2.4	2.4	399,636
AE2	0.2	4.4	13.0	0.5	22.0	44.8	15.1	15.1	98,067
AE3	0.1	2.4	14.4	0.0	25.2	47.8	10.1	10.1	33,175
AE4	1.3	1.9	9.8	0.0	13.8	60.5	12.7	12.7	56,951

Fuente: Dirección de Catastro Rural del MIDA.

Nota: Se refiere a la superficie de la provincia, incluyendo tierras nacionales, bosques y montes. No incluye la zona indígena.

Descripción de las Areas Ecológicas.

a) Area Ecológica 1 (menos de 400 metros)

La AE1 sobresale porque en ella se encuentra el mayor número de explotaciones agropecuarias de la provincia (72%) en una superficie que ocupa el 68% de la extensión total de las explotaciones agropecuarias.

Geográficamente se extiende oeste-este de los límites de la República de Costa Rica y el filo del distrito de Tolé, y de sur a norte: del litoral pacífico hasta las tierras ubicadas a una altura no mayor de los 400 metros.

Desde el punto de vista del uso de la tierra, la ganadería vacuna de doble propósito constituye el componente productivo más importante, le siguen granos básicos, caña de azúcar, banano, plátano y naranja.

Desde el punto de vista del número de explotaciones dedicadas a una actividad agropecuaria, la agricultura es la más importante, sobre todo la referida a granos básicos donde el arroz es el cultivo dominante, luego el maíz y el frijol.

Entre los cultivos temporales identificados en esta área: arroz, maíz, frijol de bejuco, poroto, tabaco, tubérculo y piña; el tabaco es el de mayor impacto económo para las finca menores de 20 has. y el arroz y

maíz para las mayores de 20 has.

En los cultivos permanentes cuyas siembras se efectúan en el predio del habitat familiar, a excepción de la caña de azúcar con fines industriales, se identificaron plátano, naranja, aguacate, café, banano y pixbae. Estos cultivos constituyen un importante ingreso para las explotaciones menores de 50 hectáreas, la producción de éstos se presenta en una combinación de tres o más cultivos, actuando como base unas veces el plátano y otras la naranja.

b) Area Ecológica 2 (400 - 800 metros)

La AE1 es la segunda en tamaño (13.86%) y también la segunda en cuanto al número de explotaciones agropecuarias (12.5%).

Se localiza entre los 400 y los 800 metros de altura, de forma más o menos contínua sobre la superficie de la primera área ecológic descrita.

Dada su topografía, en esta área se definen dos zonas perfectamente diferenciadas entre sí: una con pendientes medianas y otra con pendientes fuertes.

En la zona de pendiente mediana sobresale la actividad ganadera con fines de cría, ceba y doble propósito. En los cultivos temporales predomina el maíz, le sigue el poroto; los demá cultivos temporales son de poca importancia comercial.

En cuanto a los cultivos permanentes, ha de manifestarse que es la zona donde se encuentra la mayor producción de naranja de jugo en la provincia, luego le siguen a distancia el café y la caña para la producción de panela o raspadura, observándose en esta última un marcado incremento de su actividad comercial dentro de la provincia.

La otra zona definida por sus pendientes fuertes, en su mayoría está cubierta por praderas y ocupada por fincas ganaderas de doble propósito. Los cultivos temporales de mayor importancia comercial son: maíz, poroto y tomate de mesa.

Y en relación a los cultivos permanentes, se identificaron los mismos que en la zona de pendiente mediana; también son de interés el aguacate, plátano y maracuyá.

c) Area Ecológica 3 (800 - 1,000 metros)

Esta área ecológica es la menor en cuanto a superficie y número de fincas,

6.8% y 51% respectivamente; sin embargo, es la que mejor distribuída tiene la tierra conforme se expone en los cuadros subsiguientes a la descripción de las áreas ecológicas.

Al igual que en el área ecológica 2, en este conjunto se describen dos zonas: una loclizada en la ladera sur del Volcán Barú y otra, en la ladera occidental.

La primera zona, que es la menor en superficie, tiene como principal rubro agropecuario la ganadería vacuna de cría y ceba, la cual se desarrola en potreros de mucha pendiente, alcanzando hasta un 75% de declive. En los cultivos temporales se fija en orden de importancia, al maíz y poroto, aunque se cultivan papas y hortalizas, su insidencia comercial tanto dentro como fuera de la zona bajo observación, es de escasa importancia. Sin embargo, cultivos permanentes como café, naranje y caña para la elaboración de panela, son de gran significación económica en dicha zona.

En la segunda zona, predomina la ganadería de leche y doble propósito, encontrándose características generales de mejor manejo del hato con respecto a las otras ganaderías ubicadas en el resto de las áreas ecológicas analizads hasta ahora.

En los cultivos anuales, el poroto, maíz y tomate de mesa son los de mayor relieve económico y, en cuanto a cultivos permanentes, es el café el de mayor aporte económico; tanto es así que, en la cosecha 1979-80, esta zona produjo aproximadamente el 40% del total producido en la provincia.

d) Area Ecológica 4 (más de 1,000 metros)

Esta última área ecológica, que se localiza a más de 1,000 metros de altitud y que es el límite con la provincia de Bocas del Toro, se distingue, entre otras cosas, por tres particularidades:

- Es la fuente principal de hortalizas del país y además la única zona donde se produce la papa que se consume en Panamá.

- Es el área donde se localizan las mejores ganaderías de leche.

- Es la principal área donde se cultivan flores en pequeña escala con fines comerciales, sin llegar a cubrir la demanda nacional.

CUADRO No.3

SUPERFICIE, NUMERO Y TAMAÑO DE LAS EXPLOTACIONES
SEGUN AREA ECOLOGICA, POR RANGO DE FINCA

AREA ECOLOGICA 1
(rango en hectáreas)

Descripción	menos de 5	5 - 19	20 - 49	más de 49	Total
Superficie	9,434	32,356	48,565	232 382	322,737
No. de Fincas	7,807	3,694	1,851	1,478	14,830
Promedio	1.2	8.7	26.2	157.2	21.7

AREA ECOLOGICA 2
(rango en hectáreas)

Descripción	menos de 5	5 - 19	20 - 49	más de 49	Total
Superficie	2,423	8,164	13,475	40,903	64,965
No. de Fincas	1,169	702	437	310	2,618
Promedio	2.1	11.6	30.8	131.9	24.8

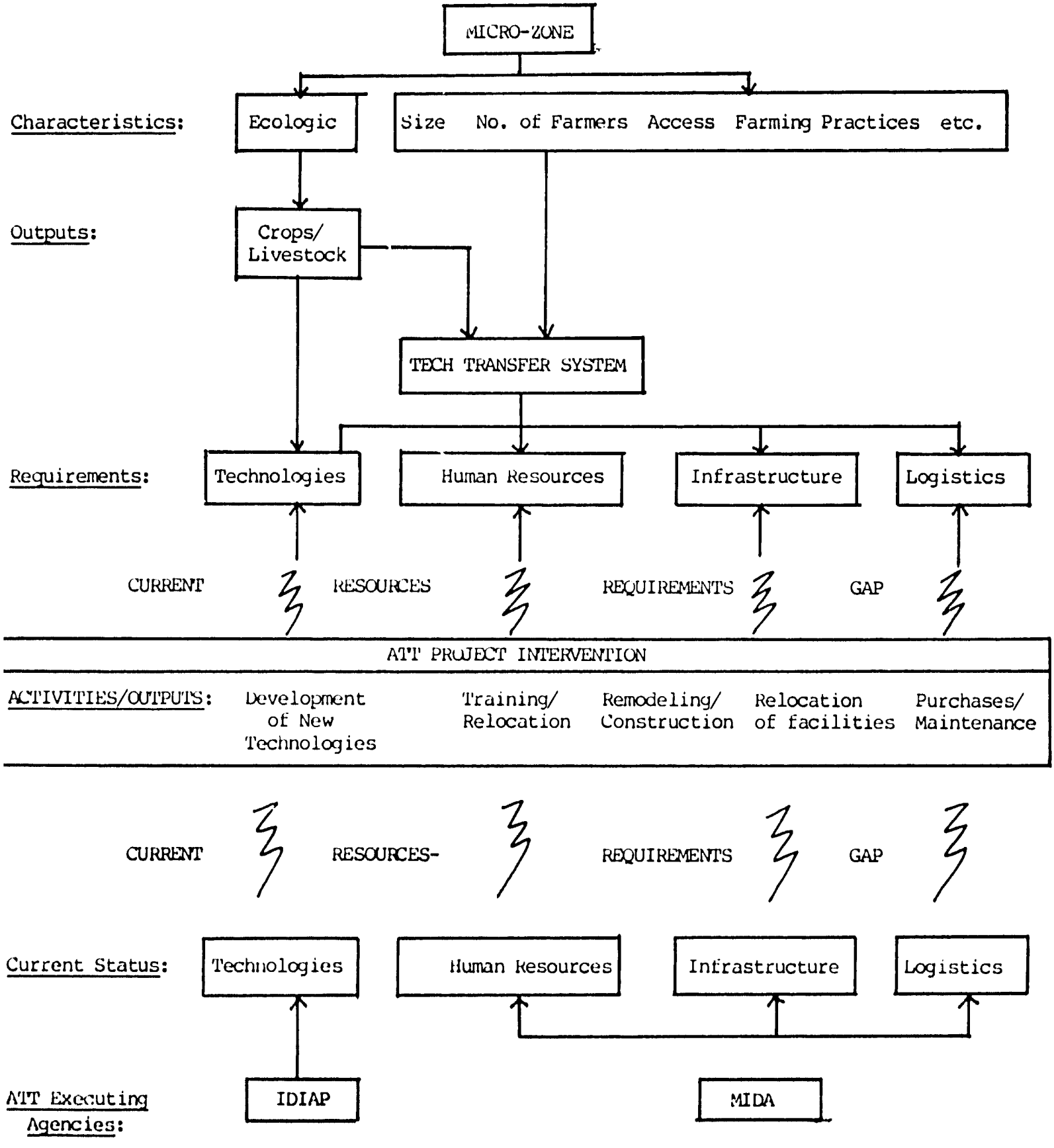
AREA ECOLOGICA 3
(rango en hectáreas)

Descripción	menos de 5	5 - 19	20 - 49	más de 49	Total
Superficie	682	3,440	7,835	20,178	32,135
No. de Fincas	317	314	247	210	1,088
Promedio	2.2	10.9	31.7	96.1	29.5

AREA ECOLOGICA 4
(rango en hectáreas)

Descripción	menos de 5	5 - 19	20 - 49	más de 49	Total
Superficie	3,674	5,554	12,254	30,681	52,163
No. de Fincas	1,165	524	299	89	2,077
Promedio	3.1	10.6	41.0	345	25.1

ATT: Project Design Process



ECONOMIC ANALYSIS

A. Introduction

The purpose of this project is to establish an operational technology transfer system in the Province of Chiriqui. Establishment of this system has the explicit objectives of increasing agricultural output and incomes of small and medium size producers in the province. Implicit objectives include increased national food availability, reduced dependency on imported food, and expanded agricultural exports.

The essential means for achieving project objectives is through farmer adoption of improved agricultural technologies and management practices. New technologies and improved managerial capabilities have two direct impacts: Output per unit of input increases i.e., technical efficiency improves, and/or cost per unit of output falls i.e., economic efficiency improves. In practice, a combination of the two impacts usually occurs when new technologies and/or improved mangerial practices are introduced into a production system. For example, an improved corn variety may result in greater output from the same level of inputs consumed by an unimproved variety. If this occurs, per unit production costs decline. Both technical and economic efficiencies are realized and social benefits accrue to the producer and/or the consumer of the corn. Such benefits are realized, however, only if improvements in both technical and economic efficiency occur. A simple improvement in technical efficiency alone has no social value unless the improvement is accompanied by greater economic efficiency. In sum, new technology and managerial practices must be both technically and economically feasible if society is to gain.

This analysis examines the economic feasibility of the project, that is the direct output and income impacts arising from the adoption of new technologies and managerial practices by small and medium size farmers in Chiriqui. No attempt is made to quantify overall social impacts. Thus, for purposes of this analysis benefits arising from increased food availability to consumers, reduced import dependency, and expanded agricultural exports are disregarded. Although these benefits are likely to be quite substantial, their quantification and measurement are beyond the scope of this analysis. Also ignored are the distributional impacts of benefits among different social groups, e.g., producers and consumers.

Project economic feasibility is analyzed at the aggregate project and the farm level. The two analyses are interdependent and complementary: the former examines the overall economic feasibility of the project; the latter analyzes the micro-economic viability and provides insight into actual on-farm income and output impacts.

The primary beneficiaries of the project are the small and medium agricultural producers of Chiriqui. For purposes of this project, the target population is defined as producers operating predominately crop farms of less than 50 hectares, or predominately livestock operations of less than 100 hectares.

Small and medium farmers play a key role in Chiriqui's agriculture. In total, they produce an estimated 70% of the value of the crop and livestock output of the province. (Table 1) In the case of cowpeas, potatoes, and tomatoes, over 80% of total production comes from farms of less than 50 hectares. Although rice and cattle production are regarded as "large" farm enterprises, an estimated 69% of the rice and 41% of the cattle are produced on small and medium sized farms.

Calculation of aggregate project benefits accruing to the beneficiary group takes into account three key variables: 1) current crop and livestock production levels for each priority crop and livestock enterprise; 2) current and projected priority crop yields, milk production per cow per lactation, and beef and hog slaughter/herd extraction rates; and 3) projected rates of adoption of new output-increasing technologies and managerial practices. Based on these variables, projected value of production changes per period are determined, holding prices constant at 1981 levels. Farm gate prices utilized for the analysis appear in Table 2.

B. Project Benefit and Cost Calculations at the Aggregate Level

The aggregate project analysis takes into account two primary factors: 1) the flow of total estimated project benefits over time, and 2) the flow of total estimated project costs over time. Total benefits are defined as the value of all additional priority crop output resulting from yield changes and the value of all additional priority livestock production due to inventory and herd extraction rate changes. Total costs are the sum of project operational and capital costs, disregarding project capital depreciation. The benefits and costs are then subjected to IRR analysis. Average per farm project costs and benefits are determined by dividing total costs and benefits by the number of farms impacted.

Crop yield projections for the target beneficiaries are based on research results generated by IDIAP and on current yields presently obtained under different technological levels in the province (Tables 3 and 4). Thus, projected yield increases are judged to be quite conservative. In all cases, many producers are already obtaining or exceeding yield levels projected for the beneficiary group. For example, corn yields of project-impacted small and medium farmers are projected to increase from 26 to 40 hundredweight per hectare. This projected yield amounts to only 65% of the yield now achieved by the "better" corn producers in the province. Similar conservative projections are made for other crops.

Table 1

ESTIMATED VALUE OF PRODUCTION OF PRIORITY COMMODITIES:
TOTAL CHIRIQUI PROVINCE AND BY
FARMS OF LESS THAN 50 HECTARES,
(AVERAGE PRODUCTION 1978-80 AT 1981 PRICES)

COMMODITY	Value of Production ($) Total (A)	Farms Less Than 50 ha. (B)	% B/A
Rice	16,401,000	11,283,890	68.8
Corn	2,435,670	1,809,700	74.3
Cowpeas	509,400	464,058	91.1
Kidney Beans	519,255	324,000	62.4
Potato	3,161,700	2,535,678	80.2
Tomato	437,340	360,800	82.5
Onion	345,495	240,465	69.6
Coffee	5,853,360	3,699,280	63.2
Other Crops	742,648	742,648	100.0
Cattle	13,720,500	5,625,405 (1)	41.0
Hogs	1,205,400	938,500	77.9
Milk	5,700,000	2,337,000 (1)	40.5

(1) Production value by farms less than 100 hectares.

Source: Estimated from data obtained from the Contraloría General, Dirección de Estadística y Censo.

Table 2

PER UNIT FARM GATE PRICES OF PRIORITY COMMODITIES, CHIRIQUI, 1981

COMMODITY	Unit	Price ($)
Rice	cwt.	10.00
Corn	"	10.00
Cowpeas	"	18.00
Kidney Beans	"	45.00
Potato	"	13.50
Tomato	"	20.00
Onions	"	15.00
Coffee	"	80.00
Cattle	"	35.00
Hogs	"	50.00
Milk	liter	0.15

Source: Dirección de Estadística y Censo, "Precios Recibidos por el Productor Agropecuario", Various issues, 1981 and Field Surveys conducted by A. Espinosa, 1981.

Table 3

PROJECTED PROJECT IMPACT ON AVERAGE CROP YIELDS
PRIORITY CROPS, CHIRIQUI PROVINCE (*)

CROP(cwt./ha.)	Without Project	With Project	T% Change
Rice	48	70	45.8
Corn	26	40	53.8
Cowpeas	9	18	100.0
Kidney Beans	10	20	100.0
Potato	315	350	11.1
Tomato	300	385	28.3
Onion	350	400	14.3
Coffee (1)	15	40	166.7
Coffee (2)	40	82	105.0
Coffee (3)	15	45	200.0

* Based on crop yield by technological level (Table 4)
(1) Ecological Areas No.2 and 3
(2) Ecological Area No.4
(3) Total Chiriquí

Table 4

CHIRIQUI: YIELDS OF PRIORITY CROPS
BY TECHNOLOGICAL LEVEL

CROP (cwt./ha.)	Technological Level					
	1	2	3	4	5	6
Rice	48	55	70	82	85	83
Corn	26	28	33	40	52	62
Cowpeas	9	12	18	25	--	--
Kidney Beans	10	17	20	25	--	--
Potato	--	--	315	350	385	--
Tomato	--	--	300	385	456	--
Onion	--	--	350	400	--	--
Coffee	10	15	30	40	80	82

Source: Espinosa, A., "Informe sobre Producción Agropecuaria en la Provincia de Chiriquí" (Mimeo) 1982.

The first step in the process to calculate the benefits or income changes resulting from the project was the estimation of the expected yield changes from existing agricultural farm budget data. These are shown in tables 3 and 4 for eight crops. The yield changes were next applied to the production figures for Chiriquí shown in Table 1 in order to obtain an estimate of the changes in total revenue. To estimate the agregate changes in total cost, a cost factor was developed for each crop from the representative farm budgets which was then applied to the change in total revenue figure. The results of these calculations are shown in Table 5. The table also reveals the assumption that only 80% of the small/medium farmers will be reached by the transfer of technology mechanism. Similar calculations were made for cattle, hogs and milk and collapsed into one livestock category.

The second step concerned the timing and magnitude of the income and cost changes by crops, coffee and livestock. Tables 6 and 7 contain the calculations for the total revenue and total cost changes for production. For crops it is assumed that the technology is first adopted in the second year on 10% of a farmer's land. In the next three years, three additional segments of 20, 20, 10 per cent respectively are covered by the new technology, bringing to sixty percent the total land area using the new technologies. A similar procedure, beginning in year four, is used for coffee. For livestock, it is assumed that total revenue increases annually by 1%, 2%, 3% and 4% of the livestock's compounded value for the years 2-5 of the project.

Projected livestock productivity changes are difficult to estimate. Very little data are available on livestock production and productivity. In the absence of a suitable data base, estimates of potential and likely increases were obtained from livestock producers, IDIAP researchers, and other knowledgable individuals. Although there is little basis for determining if these percentage estimates are realistic, even significant error in the estimates would have relatively minor impact on estimated benefits: Livestock output accounts for less than 4% of current total value of agricultural output of target beneficiaries.

Finally in Table 8, the additional costs and revenues resulting from the increased production are combined with the project costs to produce the IRR calculation of 15%. As noted in the text and discussed at the beginning of this annex, extremely conservative values were used in the analysis -- the logic being that if the project proved feasible with such conservative productivitiy changes, there would be not question regarding its economic viability. In addition, by using productivity figures currently obtained by many of the better farmers, the issue of productivity-increase guestimation is considerably reduced. Hence, in practice the IRR obtained under the project is quite likely to be much higher than the 15% figure obtained in the above analysis.

Table 5

TOTAL REVENUE AND TOTAL COST OF PRODUCTION CHANGES RESULTING FROM THE PROJECT 1/

	(Col. 1) Total Revenue in 1981 for all farmers 50 has. or less	(Col. 2) % Change in Total Revenue divided by 100	(Col. 3) Change in Total Revenue	(Col. 4) %Farmers Reached divided by 100	(Col. 5) Adj. Change in Total Revenue Col 4 x Col 3	(Col. 6) 10% of Col. 5	(Col. 7) Change in Total Cost Factor	(Col. 8) Change in Total Cost Col 5 x Col 7	(Col. 9) 10% of Col.
Rice	11,283,890	0.458	5,168,022	0.8	4,134,418	413,442	0.75	3,100,814	310,081
Corn	1,809,700	0.538	973,619	0.8	778,895	77,890	0.30	233,669	23,367
Cowpeas	464,058	1.0	464,058	0.8	371,246	37,125	0.43	159,636	15,964
Kidney Beans	324,000	1.0	324,000	0.8	259,200	25,920	0.38	98,496	9,850
Potatoes	2,535,678	0.11	278,925	0.8	223,140	22,214	0.77	171,818	17,182
Tomatoes	360,800	0.283	102,106	0.8	81,685	8,168	0.52	42,476	4,248
Onions	240,465	0.143	34,287	0.8	27,510	2,751	0.62	17,056	1,706
Coffee	3,699,280	1.67	6,177,798	0.8	4,942,238	494,224	0.36	1,779,206	177,921
				0.8		1,081,834			560,319
				0.8	Less coffee	494,224		Less coffee	177,921
				0.8		587,610			382,398
Cattle	5,625,405								
Hogs	938,500								
Milk	2,337,000								
Total Livestock	8,900,905	0.01	89,009	0.8	71,207		0.2153	15,333	

1/ Sources: Tables 1 and 3 for revenue change. The projected project impact tables for the representative firms were used to obtain cost figures.

Table 6

CROP, COFFEE, AND LIVESTOCK BENEFITS 1/

Year	(Col. 1) % Adoption rate crops	(Col. 2) Yearly crop change	(Col. 3) Total crop value	(Col. 4) Adoption rate coffee	(Col. 5) Yearly coffee change	(Col. 6) Total coffee value	(Col. 7) Value of livestock	(Col. 8) Yearly % change total revenue	(Col. 9) Total livestock value Col. 7 x Col. 8	Crop, coffee, livestock production benefits Cols. 3+6+9
1										
2	10	587,610	587,610				7,120,724	1	71,207	658,817
3	20	1,175,220	1,762,830				7,191,931	2	143,839	1,906,669
4	20	1,175,220	2,938,050	10	494,224	494,224	7,335,770	3	22,073	3,652,347
5	10	587,610	3,525,660	20	988,448	1,482,672	7,555,843	4	302,234	5,310,566
6			3,525,660	20	988,448	2,471,120			302,234	6,299,014
7			3,525,660	10	494,224	2,965,344			302,234	6,793,238
8			3,525,660			2,965,344			302,234	6,793,238
9			3,525,660			2,965,344			302,234	6,793,238
10			3,525,660			2,965,344			302,234	6,793,238
11			3,525,660			2,965,344			302,234	6,793,238
12			3,525,660			2,965,344			302,234	6,793,238
13			3,525,660			2,965,344			302,234	6,793,238
14			3,525,660			2,965,344			302,234	6,793,238
15			3,525,660			2,965,344			302,234	6,793,238

1/ Explanatory Notes:

A. % adoption rate: incremental percent of land using the new technologies.

B. Yearly Crop (Coffee) Change: the increase in total revenue due to productivity improvements durings the years 2-5 (years 4-7 for coffee).

C. Total Crop Value: the cumulative increase in total revenue. After year 5 there are no more increases in total revenue. Hence, from year 5 onward the yearly extra total crop revenue resulting from the project is $3, 525,000 ($2,965,344 for coffee beginning in year 7).

D. The $587, 610 figure for crops, the $494,224 for coffee, and the $71,207 for livestock are derived from Table 5.

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Table 7

CROP, COFFEE, AND LIVESTOCK COSTS1/

Year	(Col. 1) Adoption rate crop	(Col. 2) Yearly crop change	(Col. 3) Total crop cost	(Col. 4) Adoption rate coffee	(Col. 5) Yearly coffee change	(Col. 6) Total coffee cost	(Col. 7) Yearly % Change in total cost livestock2/	(Col. 8) Total livestock cost	(Col. 9) Total crop, coffee and livestock prod. costs Cols. 3+6+8
1									
2	10	382,398	382,398				1	15,333	397,731
3	20	764,796	1,147,194				2	30,925	1,178,119
4	20	764,796	1,911,990	10	177,921	177,921	3	47,316	2,137,227
5	10	382,398	2,294,388	20	355,842	533,763	4	64,980	2,893,131
6			2,294,388	20	355,842	889,605		64,980	3,248,973
7			2,294,388	10	177,921	1,067,526		64,980	3,426,894
8			2,294,388			1,067,526		64,980	3,426,894
9			2,294,388			1,067,526		64,980	3,426,894
10			2,294,388			1,067,526		64,980	3,426,894
11			2,294,388			1,067,526		64,980	3,426,894
12			2,294,388			1,067,526		64,980	3,426,894
13			2,294,388			1,067,526		64,980	3,426,894
14			2,294,388			1,067,526		64,980	3,426,894
15			2,294,388			1,067,526		64,980	3,426,894

1/ See Table 6 for explanation of headings.

2/ These figures are obtained by applying the 0.2153 change in total cost factor derived in Table 5 to the livestock value in Column 8 of Table 6 and then multiplying by 1, 2, 3, and 4 % respectively as shown above.

Table 8

PROJECT RATE OF RETURN ANALYSIS

Year	Institutional Costs 1/	Production Costs 2/	Total Costs	Total Benefits 3/	Net Benefits Col 4 - Col 3
1	2,439,000	-0-	2,439,000	- 0 -	-2,439,000
2	3,724,000	397,731	4,121,731	658,817	-3,462,914
3	1,811,000	1,178,119	2,989,119	1,906,669	-1,082,450
4	1,683,000	2,137,227	3,820,227	3,652,347	-167,880
5	1,445,000	2,893,131	4,338,131	5,310,566	972,435
6	1,356,000	3,248,973	4,604,973	6,299,014	1,694,041
7	1,382,000	3,426,894	4,808,894	6,793,238	1,984,344
8	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
9	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
10	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
11	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
12	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
13	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
14	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344
15	1,171,000	3,426,894	4,597,894	6,793,238	2,195,344

IRR = 15%

1/ For the first seven years the costs are loan project costs including GOP counterpart. For the remaining eight years the costs included operating expenses for the various government agricultural offices and vehicle replacement.

2/ These costs represent the additional production costs required to obtain the additional benefits shown in column 4. Their derivation is explained in the text.

3/ The major assumptions are: 80% of all small/medium farmers will receive technical assistance under the project; and each of these farmers on the average will apply new practices to 60% of the land under production.

C. Representative Farm(s) Analysis

The farms of Chiriqui are highly heterogeneous in size, production systems, types of enterprises, and income earning capacity and potential. Given such heterogenity, the concept of an "average" farm for the province is invalid. No one farm grows all of the crops produced in the province, nor does any single farm utilize all of the diverse livestock production systems available in the province. However, relatively homogeneous types of production systems can be identified within the province. Altitude above sea level is an important determinant of these systems in that climate, soils and the general biological environment all vary as a function of this single factor. Thus, while no farm is "average" for the province, distinct farm types can be identified as being representative of the farms in given altitude ranges. For purposes of this project, four different altitude/ecological zones are identified. This analysis utilizes one representative farm from each zone to examine the micro-economic feasibility of the project.

The four representative farms are synthetic, hypothetical units for each of the four project ecological zones. They are not necessarily average in terms of size or any other single characteristic. But in terms of predominant enterprises, production-management systems, and product composition, the four farms can be described as typical and representative of the farms and the agriculture of each zone.

Development of each representative farm was based on available data. A large sample survey of Chiriqui farms conducted in 1981 provided an important source of micro-economic data.(1) These data combined with Contraloría production, area and yield figures for crops, and herd and slaughter numbers for livestock served to identify typical farm units for each zone. Farm plot test data provided by IDIAP assisted in determining potential production increasing impacts of new technology.

Two scenarios--"without project" and "with project"--are developed for each representative farm. The "without project" scenario describes present farm organization, enterprises and production systems. The "with project" scenario describes the same farm unit after adoption of new technologies. Both scenarios assume constant 1981 prices for inputs and outputs.

The "with project" scenario assumes adoption of new technologies for all priority commodities relevant to a given zone. For any specific farm this assumption is clearly quite optimistic. However, the magnitudes of the projected adoption impacts are quite conservative (see aggregate project

(1) Source: Espinosa, A., "Informe sobre Producción Agropecuaria en la Provincia de Chiriquí" (Mimeo) 1982.

analysis). A given farmer may not adopt new technology for all of the commodities produced on the farm. But for those commodities of primary importance to the farm, the magnitude of the impact may well be greater than that projected for the representative farm. Thus, project impacts projected for a representative farm appear realistic for the totality of farms and the agriculture in a given ecological zone.

As noted previously, the representative farm(s) analysis assumes no "staging" in the adoption of new technology. Rather, the analysis is based on the projected impact on a representative farm at the end of project year 6. This precludes calculation of cost-benefit ratios or internal rates of return. Both calculations require period by period estimates of project benefits and costs. These values are not estimated. As has been indicated, the purpose of the representative farm(s) analysis is to illuminate project impact at the micro-economic farm level and not evaluate the economic feasibility of the project in aggregate.

1. Representative Farm Number 1

a. Description:

Representative farm number 1 is located in the central western part of Zone 1. It is a predominantly subsistence level unit providing family food needs plus limited cash sales. Farm organization, enterprises and resources are noted in Table 9.

Rice, corn and cowpeas are the principal crops grown during the two cropping seasons. These crops are usually rotated from one cropping season to another on about 5 hectares of the total 8 hectares of land area suitable for cropping. Fallow land is used for pasturing livestock, supplementing the native-grass permanent pasture area.

Average yields of rice, corn and cowpeas are, respectively, 48, 26, and 9 hundredweight per hectare (Table 9). Rice and corn yields are somewhat above the zone's average due to the use of some post-planting chemical weed control. Cowpea yields are about equal to the zone average. Seed for all three crops is selected and saved

from the previous harvest. No fertilizers, pesticides, or other modern inputs are used except for mechanized plowing of the cropped area twice a year. All planting and harvesting is by hand.

Total value of production of rice, corn, and cowpeas is about $3,300 per year. After deducting production costs, seed, and value of family labor, net value of production is about $850 per year. Root crops (yuca and yam) and tree crops (oranges, bananas, plantain) grown near the family dwelling provide food and additional annual returns valued at about $200.

Table 9

BASIC DATA: REPRESENTATIVE FARM NUMBER 1

Farm Organization

Location: Ecological Zone No. 1
Farm Size: 10 hectares
Cropped Area: 8 hectares
Pasture and other: 2-4 hectares

Principal Crops Grown on Farm	Land Area (ha.) 1st crop	2nd crop	Total/Year
Rice	3	1	4
Corn	2	2	4
Cowpeas	-	2	2
Other *	-	-	1

Principal Livestock Activities	Number
Cows (dual purpose)	4
Hogs	2
Chickens	20

Project Impacts

Farm Enterprise	Productivity Without Project	Productivity With Project
Rice	48qq/ha.	70qq/ha.
Corn	26qq/ha.	40qq/ha.
Cowpeas	9qq/ha.	18qq/ha.
Milk	2.5/day/lac.	3.5/day/lac.
Beef	.33/yr./cow.	.5/yr./cow.
Hogs	200 lbs/yr.	300 lbs/yr.

* Bananas, Plantains, Oranges, Yuca, Yam, Fruits and Vegetables.

Cattle inventory consists of four criollo cows. Each cow (bred to a neighbor's bull) produces one calf about every two and one-half to three years. After calving, the cow shares her milk between the calf and the family; the latter's share from once-a-day milkings amounting to an average of 2.5 liters for 120 to 140 days. Milk provides about one-third of total annual value of the cattle enterprise, the rest comes from sales of the calves at weights averaging about 800 pounds.

The cows and calves are fed no grain or supplement. However, production costs are relatively high due to the need for frequent internal parasite and tick control, fence repairs and mineralized salt purchases. Net returns to the cattle enterprise are about $25 per year per adult head (Table 10).

Table 10

PROJECTED PROJECT IMPACTS: REPRESENTATIVE FARM No.1

	Without Project ($)			With Project ($)			Change
CROPS	Gross Returns	Production Costs	Net Returns	Gross Returns	Production Costs	Net Returns	in Net Returns($)
Rice	1,920	1,425	495	2,800	2,088	712	217
Corn	1,040	749	291	1,600	919	681	390
Cowpeas	324	256	68	648	395	253	185
Other	-	-	200	-	-	200	-
LIVESTOCK							
Cattle	580	474	105	854	522	332	227
Hogs	200	120	80	300	180	120	40
Poultry	-	-	20	-	-	20	-
TOTALS	4,064	3,024	1,259	6,202	4,104	2,318	1,059

Other livestock include two hogs and a number of chickens. The hogs are purchased at weaning for about $30 per head, fed table scraps, grain gleanings, yuca and yam and sold several months later for about $100 per head. The chickens produce eggs for family use or sale and an occasional hen for the pot.

b. New Technology Impacts:

New technologies to increase the yields of rice, corn and cowpeas on this farm have recently been developed, but generally have not been widely disemminated by IDIAP. with the new disease resistant rice varieties, average yields of rice in the zone increase by 15 to 20%. This yield advantage over the traditional variety makes fertilizer use a more economical proposition. Combining the disease resistant varieties with medium levels of fertilizer application and chemical weed control increases yields from around 48 to over 70 hundredweight per hectare. Per hectare production costs rise as well, but per unit costs remain unchanged.

IDIAP has also developed new varieties and technological packages for corn and cowpeas on a nearby farm. The representative farmer has already adopted chemical weed control for corn, but has not had access the improved seed varieties of either crop. The new corn varieties offer obvious advantages in that plant height is sharply reduced, thus nearly eliminating loss due to wind blowdowns. The new varieties also respond to fertilizer application by setting more grain rather than simply growing taller stalks.

IDIAP farm field tests over the past two years show that even with low levels of fertilization, area corn yields could rise to a minimum of 40 hundredweight per hectare. Cowpea varieties being tested by IDIAP offer potential for reducing or nearly eliminating the yield reducing effect of many of the diseases prevalent in the area's crop. Preliminary research results indicate that these new varities coupled with modest levels of fertilization could easily double average area yields.

New livestock technology development is being approached on several fronts by IDIAP. The single most promising development appears to be pasture improvement. Improved pastures offer the potential for better animal nutrition. In turn, better nutrition will enhance reproductive capacity, increase milk production and weight gain and reduce animal stress. Without changing to improved breeds, the average cow in the area could likely produce a calf every 15 to 18 months, increase milk production from 2.5 to 3.5 liters per day and remain in lactation for a longer period. Preliminary IDIAP data indicate that pasture improvement is highly cost effective.

The economic impact of the new technology on Representative Farm number 1 is significant (Table 10). Net value of production increases by over $1,000--an increase of 84%. Per unit production costs of the principal commodities produced by the farm decline or remain unchanged. The primary impacts are marked increases in rice, corn and cowpeas, the key outputs of the farm. With increased production

of these crops, more grain gleanings are available to feed another hog thus increasing cash income earning capacity from this enterprise. The farm continues to remain a subsistence unit, although at a level very considerably above that of its present state.

2. Representative Farm Number 2

a. Description:

Representative farm number 2 is located at an altitude of about 600 meters above sea level in the rolling central-western part of Zone 2. It is typical of the area in that the soil is fairly fertile, though the land is rolling to steep. Average slope of the 15 hectare farm averages 20 degrees. The farm is the primary source of food and income for the family.

Rice, corn, cowpeas and kidney beans are well suited to the semi-temperate, rainy climate of the area. Coffee, planted on steep hillsides two to three decades ago, is an important cash crop even though traditional plant- ings tend to be marginally productive. A host of tree crops--avocado, plaintain, oranges and other citrus--are found around homesites, but rarely in commercial plantings.

The principal crop of the farm is corn (Table 11). It is grown on half of the 6 hectares of cropped land during the first planting and at least a third of the land in the second planting season. It is typically rotated with cowpeas and/or kidney beans from one planting season to another and may be rotated with rice from one year to another.

Rice, cowpeas and kidney beans account for the remaining land planted to "annual" crops. The proportion of corn to rice area varies little from year to year. Relative annual planted area of cowpeas and kidney beans depends on weather, market, pest and disease conditions of the former and/or present period.

Although the four crops are planted during the best moon cycle with carefully selected seed from the previous harvest, yields are relatively low. In fact, yields have steadily declined over the past decade or so. The same crops produced in neighboring Costa Rica, less than 80 kilometers away, yield about twice those of the representative farm.

Livestock on the farm consists of 6 cows, 2 hogs and a few chickens. The livestock production systems are very similar to those of farm number 1. However, because of better year-around native pasture, milk production not consumed by the calf averages around 3 liters per day. Calf weight gain is also faster due to more milk and forage consumption.

Traditional technology and management practices prevail in both crop and livestock enterprises. On occasion, attempts may be made to control pests on the pulses using a backpack sprayer and a pesticide purchased from a local general store. The same store also sells veterinary supplies the farm uses to control cattle parasites and is the primary source of any modern farm inputs used as well as information about how to use them. In turn, the store owners obtain their merchandise and information from traveling agricultural chemical company representatives.

b. New Technology Impacts:

On a nearby farm, IDIAP is researching improved varieties of corn, rice and pulses. A new open-pollinated corn variety shows considerable promise. It is nearly two meters shorter than the native variety which grows to over five meters in height. It has the characteristics desired by the farmer--a tight husk and hard kernel to resist insect damage and a thick stalk to reduce lodging from windstorms. Under fertilization at moderate levels it outyields the native variety by a factor of two. IDIAP has experienced some difficulty in seed multiplication because of "disappearance" of the mature ears on field plots. Several small fields of the new variety are evident on nearby farmers' fields.

IDIAP research on rice and the area's two important pulses is taking place on several fronts. Fertilization trials based on soil tests and using native varieties have shown that yields can be nearly doubled. Disease resistant new varieties of pulses are being tested, but are not yet ready for release to farmers. However, chemical weed control research has proven very successful if judged on the basis of farmer imitation. A third of the nearby farmers are now using a system of zero tillage in their corn and pulse crops. This practice was not evident two years ago. It has sharply reduced soil erosion on the sloping lands. Too, it frees the farmer from trying (and often failing) to contract for hired plowing and discing at the precise times required in the cropping season.

One of the most promising sources of new technology is coming from nearby Costa Rica in the form of new coffee varieties and coffee management systems. The farms in the area that have adopted the complete new coffee technology package have achieved yields of up to 80 cwt. per hectare. Compared to average area coffee yields, this represents a more than four-fold yield increase. With average management it is is expected that yields of 40 to 50 cwt. per hectare could be sustained from the new technology and management system.

New livestock technology draws from IDIAP research from Zone 1. In Zone 2, pasture fertilization appears to be very cost effective. At moderate levels, fertilization alone increases growth by 50%. Coupled with new forages, productivity can be increased twofold.

Table 11

BASIC DATA: REPRESENTATIVE FARM NUMBER 2

Farm Organization

Location:	Ecological Zone No. 2
Farm Size:	15 hectares
Cropped Area: Annuals	6 hectares
Cropped Area: Coffee	2 hectares
Other Crops:	.5 hectares
Pasture and Other	6.5 hectares

Principal Crops	Land Area (ha)		
	1st crop	2nd crop	Total/Year
Rice	3	-	3
Corn	3	2	5
Cowpeas	-	2	2
Kidney Beans	-	-	2
Coffee	-	-	.5
* Other	-	-	1

Principal Livestock Activities	Number
Cows	6
Hogs	2
Chickens	20

Project Impacts

Farm Enterprise	Productivity Without Project	Productivity With Project
Rice	48qq/ha.	70qq/ha.
Corn	26qq/ha.	40qq/ha.
Cowpeas	9qq/ha.	18qq/ha.
Kidney Beans	10qq/ha.	20qq/ha.
Coffee	15qq/ha.	40qq/ha.
Milk (liters)	3.5/day/lac.	4.5/day/lac.
Beef (800 lbs)	.33/yr./cow.	.5/yr./cow.
Hogs	200 lbs/yr.	300 lbs/yr.

* Plantains, Oranges, Avocado, Yuca, Pixbaye, Fruits and Vegetables.

The adoption of the various new technologies on the representative farm impact sharply on income (Table 12). Net returns more than double. Nearly 60% of the increase is a result of increased coffee income. Greater cash returns from this crop enhance the financial position of the farmer and, in turn, increase the liklihood of purchasing modern inpu for use on other crops. More cash income also permits buying improved-breed cows, upgrading pastures and increasing hog numbers. In short, the impact is one of disturbing a long-standing equilibrium and vicious circle of low income and low productivity of the farm.

Table 12

PROJECTED PROJECT IMPACTS: REPRESENTATIVE FARM No.2

	Without Project ($)			With Project ($)			Change
CROPS	Gross Returns	Production Costs	Net Returns	Gross Returns	Production Costs	Net Returns	in Net Returns($)
Rice	1,440	1,068	372	2,100	1,566	534	162
Corn	1,300	937	363	2,000	1,149	851	488
Cowpeas	324	256	68	648	394	253	185
Kidney Beans	900	409	491	1,800	749	1,052	561
Coffee	2,400	2,535	(-135)	6,400	3,987	2,413	2,548
Other	-	-	400	-	-	400	-
LIVESTOCK							
Cattle	933	711	222	1,344	782	562	340
Hogs	200	120	80	300	180	120	40
Poultry	-	-	20	-	-	20	-
TOTALS	7,497	6,037	1,801	14,592	8,807	6,205	4,324

2. Representative Farm Number 3

a. Description:

Representative farm number 3 is a 25 hectare market-oriented unit located at an altitude of between 900 and 950 meters above sea level in the central part of Zone 3. Land used for crops is sloping, but generally fertile. Pastureland is very steep with many outcroppings of rocks and boulders.

The farm is a mixed crop/livestock unit (Table 13). Corn and kidney beans are the predominant "annual" crops. Coffee--occupying one-fifth of the farm area--is the traditional cash crop. However, sugarcane grown for making panela ("brown" sugar boiled down from sugarcane juice) produces more cash income for the farm. This enterprise provides a steady year-around net cash flow of about $100 per month (Table 14). The livestock inventory consists of 10 cows, a

bull and four hogs. Milk is sold in the local village and to one of the major buyers of milk for industrial uses. Sales of milk, hogs and eggs supplement monthly cash income received from panela and from the sale of fruits and vegetables.

The level of technology used on the farm is typical of the region. Fertilizer is not used. Some pesticides and fungicides are sprayed on kidney beans. Native varieties are used to plant corn and kidney beans. Vegetable crops are seeded with imported, but not necessarily adapted varieties. Coffee plantings are old and badly deteriorated. Crop yields are generally low in part due to heavy weed infestation. Milk production from the mixed-breed cows averages 3.5 liters per cow over the 140 day lactation period. Hogs receive a small amount of corn to supplement their gleanings from the household and farmyard.

b. New Technology Impacts

Representative Farm number 3 is generally using the best available technology known to the area. IDIAP researchers confirm that few economically feasible gains could be realized from simply reorganizing current production systems. Required are new and complete technology and management packages. For this reason, IDIAP is focusing research efforts on farmer field testing of new crop varieties, new disease and pest control measures, new weed control methods and new soil conservation practices. Preliminary new technology-management packages for corn and kidney beans snow promise of easily doubling yields while greatly reducing soil loss. New coffee technology and management practices transferred directly from Costa Rica can triple area yields and also minimize soil erosion. As in zones at lower altitudes, pasture productivity can be significantly improved through the use of forages now unknown to the area. Directed cross breeding of cattle has demonstrated potential to increase both milk and beef production efficiency. Introducing higher percentages of European breeds in cattle, coupled with improved pastures offers the possibility to increase beef extraction rates 50% and milk production one-third or more.

Increasing corn yields by about 50 percent and doubling kidney bean yields from 10 to 20 hundredweight per hectare increases farm net returns from these two crops by over $2,200 (Table 14). Coffee yield growth from 15 to 40 hundredweight per hectare adds another $6,3[illegible] of net return. Pasture improvement increases returns to cattle by over $500. All of these productivity increases result in a lowering of per unit production costs. Total net farm income rises by 120% from the adoption of new and economically feasible technology. The farm unit provides a net return to family labor and management exceeding the average national per capita income level.

Table 13

REPRESENTATIVE FARM NUMBER 3

Farm Organization

Location:	Ecological Zone No. 3
Farm Size:	25 hectares
Cropped Area: Annuals	6 hectares
Cropped Area: Coffee	5 hectares
Cropped Area: Cane	2 hectares
Pasture and Other:	12 hectares

Principal Crops	Land Area (ha.)		
	1st Crop	2nd Crop	Total
Corn	4	2	6
Kidney Beans	2	4	6
Cane	-	-	2
Coffee	-	-	5
* Other	-	-	.5

Principal Livestock Activities	Number
Cows	10
Bulls	1
Hogs	2
Chickens	20

Project Impacts

Farm Enterprise	Productivity Without Project	Productivity With Project
Corn	26 qq./ha.	40 qq./ha.
Kidney Beans	10 qq./ha.	20 qq./ha.
Cane (panela)	11,520 lbs./ha.	11,520 lbs./ha.
Coffee	15 qq./ha.	40 qq./ha.
Milk (liters)	3.5/day/lac.	4.5/day/lac.
Beef (800 lbs.)	.33/yr./cow	.5/yr./cow
Hogs	400 lbs./yr.	500 lbs./yr.

* Passion fruit, oranges, avocado, yuca fruits and vegetables.

Table 14

PROJECTED PROJECT IMPACTS: REPRESENTATIVE FARM No.3

	Without Project ($)			With Project ($)			Change
CROPS	Gross Returns	Production Costs	Net Returns	Gross Returns	Production Costs	Net Returns	in Net Returns($)
Corn	1,560	1,124	436	2,400	1,379	1,021	585
Kidney Beans	2,700	1,228	1,472	5,400	2,246	3,155	1,683
Coffee	6,000	6,338	(-338)	16,000	9,967	6,033	6,371
Cane	1,728	576	1,152	1,728	576	1,152	-
Other	-	-	800	-	-	800	-
LIVESTOCK							
Cattle	1,659	1,186	474	2,345	1,304	1,041	567
Hogs	400	240	160	500	300	200	40
Poultry	-	-	20	-	-	20	-
TOTALS	14,047	10,691	4,176	28,373	15,771	13,422	9,246

3. Representative Farm Number 4

a. Description:

Representative Farm number 4 is situated on a mountainside in the northern-most area of the province. Less than half of the farm area is in crops (Table 14). The remaining area still has some standing native timber on the steep, rocky slopes above the homesite. The altitude of 1,200 meters makes the climate temperate with narrowly fluctuating daytime temperatures the year around.

The farm's principal enterprise is coffee. It clearly dominates in contributing to gross and net farm returns (Table 15). Horticultural crops--tomatoes, onions, potatoes--are marketed commercially as are others such as cabbage, carrots and lettuce. Corn and kidney beans are grown primarily for family consumption. The three Holstein cows provide milk for the family and for sale to neighbors. Three improved-breed hogs are fattened on household and farmyard scraps and a daily half-pound per head ration of corn.

Coffee yields are currently averaging around 40 cwt. per hectare. This is somewhat above the area average. However, Costa Rican coffee technology is being rapidly adopted by many farmers in the area. Their yields, under relatively careful management, range from 80 to 100 cwt. per hectare.

Table 15

REPRESENTATIVE FARM NUMBER 4

Farm Organization

Location:	Ecological Zone No. 4
Farm Size:	15 hectares
Cropped Area: Coffee	4 hectares
Cropped Area: Annuals	5 hectares
Pasture and Other:	6-9 hectares

Principal Crops	Land Area (ha.)		
	1st Crop	2nd Crop	Total
Coffee	-	-	4.0
Kidney Beans	2.0	-	2.0
Corn	1.0	1.0	2.0
Tomato	0.25	.25	0.5
Onion	0.25	.25	0.5
Potato	0.50	.50	1.0
* Other	0.50	.50	1.0

Principal Livestock Activities	Number
Cows (dual purpose)	4
Hogs	2
Chickens	20

Project Impacts

Farm Enterprise	Productivity Without Project	Productivity With Project
Coffee	40 qq./ha.	82 qq./ha.
Kidney Beans	10 qq./ha.	20 qq./ha.
Corn	26 qq./ha.	40 qq./ha.
Tomato	300 qq./ha.	385 qq./ha.
Onion	350 qq./ha.	400 qq./ha.
Potato	315 qq./ha.	350 qq./ha.
Milk (liters)	6/day/lac.	7/day/lac.
Hogs	300 lbs/yr.	400 lbs/yr.

*Lettuce, cabbage, carrots, miscellaneous vegetables and temperate fruits.

Table 16

PROJECTED PROJECT IMPACTS: REPRESENTATIVE FARM No.4

	Without Project ($)			With Project ($)			Change
CROPS	Gross Returns	Production Costs	Net Returns	Gross Returns	Production Costs	Net Returns	in Net Returns($)
Coffee	12,800	7,973	4,827	26,240	10,016	16,224	11,397
Kidney Beans	900	409	491	1,800	749	1,052	561
Corn	260	187	73	800	460	340	267
Tomato	3,000	1,431	1,569	3,850	1,874	1,976	407
Onion	2,625	1,433	1,192	3,000	1,664	1,336	144
Potato	4,253	3,734	519	4,725	4,096	629	110
Other	-	-	1,000	-	-	1,000	-
LIVESTOCK							
Cattle	655	356	300	924	391	533	233
Hogs	300	180	120	400	240	160	40
Poultry	-	-	20	-	-	20	-
TOTALS	22,666	13,836	9,851	39,501	17,742	23,079	13,228

The level of technology used in producing horticultural crops is high. Imported seeds are generally used as is fertilizer and plant protectants. Although the crops are rotated each year, some disease and pest problems persist. Disease problems in potato production are especially prevalent.

b. New Technology Impacts:

Except for the new Costa Rican coffee technology-management system, there are no new technologies available to markedly impact production and/or factor productivity on Representative Farm number 4. IDIAP is just beginning research on potato genetic material obtained from CIP in Peru. Studies are also being initiated on soil nematode problems in horticultural crops. Some potential exists for increasing horticultural crop yields via trace element addition, but research is still in the embryo stage. IDIAP has no highly trained horticultural specialists and research to date has been largely limited to plot trials of imported genetic material.

If the farm were to achieve maximum area yields, potato, tomato and onion yields would increase by only 11, 28 and 14% respectively. The total economic impact would amount to about $700 in annual farm income. Clearly, the major payoff lies in the adoption of the new coffee technology-management system. Additional net returns from this new technology amount to over $11,000 or nearly 90% of the increase in net returns attributable to all new technology adoption. The impact of new coffee technology is thus responsible for increasing net farm return to a level of over $23,000 per year. At this level, the farm is a very viable commercial enterprise.

TECHNOLOGY TRANSFER PROJECT
PROJECTIONS OF EXPENDITURES BY INPUT
(US $ 000)

Project Year =	FY 83		FY 84		FY 85		FY 86		FY 87		FY 88		FY 89		TOTAL		PROJECT GRAND TOTAL
	AID	GOP	AID	GOP	AID	GOP	AID	GOP	AID	GOP	AID	GOP	AID	GOP	AID	GOP	
A. Human Resources Develop.	752	112	956	138	833	94	531	83	323	67	219	56	219	56	3,833	606	4,439
1. Technical Assistance	-	-	41	-	-	-	-	-	-	-	-	-	-	-	41	-	41
2. Training	752	112	915	138	833	94	531	83	323	67	219	67	219	56	3,792	606	4,398
B. Infrastructure	600	26	575	-	-	-	-	-	-	-	-	-	-	-	1,175	26	1,201
1. Local Agencies	600	-	400	-	-	-	-	-	-	-	-	-	-	-	1,000	-	1,000
2. I E & C Center	-	-	175	-	-	-	-	-	-	-	-	-	-	-	175	-	175
3. Land	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	26	26
C. IE&C	51	45	66	73	15	78	15	104	15	144	15	155	15	155	192	757	949
1. Equipment	30	-	27	-	-	-	-	-	-	-	-	-	-	-	57	-	57
2. Materials	-	-	18	-	15	-	15	-	15	-	15	-	15	-	93	-	93
3. Tech. Asst.	21	-	21	-	-	-	-	-	-	-	-	-	-	-	42	-	42
4. Salaries	-	48	-	73	-	78	-	104	-	104	-	155	-	155	-	757	757
D. Logistical Support	372	7	1,067	60	40	60	124	135	70	135	85	135	40	135	1,798	667	2,465
1. Office equipment	157	-	106	-	-	-	-	-	-	-	-	-	-	-	263	-	263
2. Field materials	-	-	15	-	20	-	20	-	20	-	20	-	20	-	115	-	115
3. Office materials	20	-	35	-	20	-	20	-	20	-	20	-	20	-	155	-	155
4. 4-wheel drive	195	-	630	-	-	-	-	-	30	-	45	-	-	-	900	-	900
5. Motorcycles	-	-	240	-	-	-	-	-	-	-	-	-	-	-	240	-	240
6. Fuel	-	7	-	60	-	60	-	60	-	60	-	60	-	60	-	367	367
7. Maintenance	-	-	-	-	-	-	-	75	-	75	-	75	-	75	-	300	300
8. Repair Equip.	-	-	-	-	-	-	84	-	-	-	-	-	-	-	84	-	84
9. Tech. Asst.	-	-	41	-	-	-	-	-	-	-	-	-	-	-	41	-	41
E. Institutional Cont'd.	54	-	54	-	35	-	35	-	35	-	35	-	35		283	-	283
1. Tech. Asst.	21	-	21	-	-	-	-	-	-	-	-	-	-	-	42	-	42
2. Conferences	25	-	25	-	25	-	25	-	25	-	25	-	25	-	175	-	175
3. Visitors	8	-	8	-	10	-	10	-	10	-	10	-	10	-	66	-	66
F. Evaluation Phase 2 Design	-	-	123	-	5	-	5	-	5	-	5	-	76	-	219	-	219
1. Evaluations	-	-	-	-	5	-	5	-	5	-	5	-	76	-	96	-	96
2. Phase 2 Design	-	-	123	-	-	-	-	-	-	-	-	-	-	-	123	-	123
G. Operational Salaries	-	417	-	612	-	651	-	651	-	651	-	651	-	651	-	4,284	4,284
1. Field Staff	-	375	-	563	-	602	-	602	-	602	-	602	-	602	-	3,948	3,948
2. Support Staff	-	42	-	49	-	49	-	49	-	49	-	49	-	49	-	336	336
TOTAL	1,829	610	2,841	843	928	883	710	973	448	997	359	997	385	997	7,500	6,340	13,840

SALARIES BY PROJECT COMPONENT,
FUNCTIONAL CLASSIFICATION AND FISCAL YEAR
(US $ 000)

Project Year =	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88	FY 89	TOTAL
A. Human Resources Development	112	138	94	83	67	56	56	606
1. Pre-Program	47	-	8	8	8	8	8	87
2. Technical	-	47	-	-	-	-	-	47
3. Training of trainers	5	5	10	10	20	34	34	118
4. Short-term	35	35	25	14	14	14	14	151
5. Long-term	25	51	51	51	25	-	-	203
B. IEC	48	73	78	104	143	155	155	757
1. Prep. materials	24	36	39	52	71	78	77	378
2. Prep. training	24	37	39	52	72	77	78	379
C. Operational	417	612	651	651	651	651	651	4,284
1. Assistant Agents	261	392	417	417	417	417	417	2,738
2. Senior Agents	114	171	185	185	185	185	185	1,210
3. IEC Admin.	26	26	26	26	26	26	26	182
4. Administration	16	23	23	23	23	23	23	154
Total								5,647
D. Assistant Agents	294	425	425	425	425	425	425	2,844
1. Pre-program/technical	33	33	8	8	8	8	8	106
2. Operational	261	392	417	417	417	417	417	2,738
E. Senior Agents	128	185	185	185	185	185	185	1,238
1. Short-term	114	171	185	185	185	185	185	1,210
2. Operational	14	14						28
3. Pre-program								
F. Subject-Matter Specialist	113	164	164	179	203	203	203	1,229
1. Training of trainers	5	5	10	10	20	34	34	118
2. Short-term	35	35	25	14	14	14	14	151
3. Long-term	25	51	51	51	25			203
4. Prep. material	24	36	39	52	72	78	77	278
5. Prep. training	24	37	39	52	72	77	78	279
G. Administration	42	49	49	49	49	49	49	336
1. Regional Office	16	23	23	23	23	23	23	154
2. IEC	26	26	26	26	26	26	26	182
Total								5,647

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PRESUPUESTO DE FUNCIONAMIENTO 1982
RESUMEN POR PROGRAMA
REGION 1 CHIRIQUI.
(EN BALBOAS)

CODIGO		Total 1981	Total 1982	01 Admón Regional	02 Produc. Agrícola	03 Produc. Pecuaria	04 Reforma Agraria	05 Desarrollo Social	06 RENARE	07 Ingeniería
0	SERVICIOS PERSONALES	210,150.-	244,710.-	244,710.-	-	-	-	-	-	-
001	Sualdos Fijos	210,150.-	242,310.-	242,310.-	-	-	-	-	-	-
030	Gastos de Representacion.		2,400.-	2,400.-						
1	SERVICIOS NO PERSONALES	34,515.-	74,621.-	14,267.-	15,228.-	21,817.-	6,389.-	9,481.-	5,129.-	2,310.-
.100	Alquileres	900.-	1,080.-	1,080.-						
120	Impresión y Encuadernación.	150.-	1,207.-	659.-	205.-	185.-	48.-			110.-
130	Información y Publicidad.									
140	Viáticos	28,520.-	62,476.-	10,087.-	12,972	18,600.-	5,608.-	8,580.-	4,529.-	2,100.-
150	Transpr. Personal y Bienes.	1,575.-	4,379.-	501.-	1,200	2,315.-	263.-	-	-	100.-
180	Mant. y Reparaciones	3,370.-	5,479.-	1,940.-	851.-	717.-	470.-	901.-	600.-	-
2	MATERIALES Y SUMINISTROS	62,421.-	279,247.-	81,834.-	49,285.-	59,614.-	18,230.-	26,950.-	39,070.-	4,264.-
200	Alimentación		5,000.-					5,000.-		
220	Combustibles y Lubricantes.	38,743.-	215,901.-	60,648.-	40,046.-	49,900.-	12,240.-	18,600.-	31,967.-	2,500.-
230	Papelería	9,821.-	10,239.-	3,000.-	1,667.-	1,693.-	1,640.-	1,080.-	1,036.-	123.-
240	Productos Químicos	150.-	2,431.-	315.-	1,453.-	435.-	-	-	228.-	-
250	Mats. de Construcción	-	2,250.-	300.-	-	-	-	900.-	1,050.-	-
260	Productos Varios	949.-	2,443.-	500.-	618.-	50.-	275.-	-	1,000.-	-
270	Utiles Diversos	3,090.-	7,197.-	1,488.-	1,185.-	2,578.-	724.-	100.-	622.-	500.-
280	Repuestos	9,668.-	33,786.-	15,583.-	4,316.-	4,958.-	3,351.-	1,270.-	3.167.-	1,141.-
	TOTALES:	307,086.-	598,578.-	340,811.-	64,513.-	81,431.-	24,619.-	36,431.-	44,199.-	6,574.-

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Annex II.C
Exhibit 2
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Table

PROJECT FINANCED TECHNICAL ASSISTANCE

Project Component	p/m	Activity Area or Field of Expertise	Cost ($)
Human Resources Development	2.5	Pre-program Training	18,000
Human Resources Development	2.5	Initial Technical Training	18,000
Development of IE&C	2.5	Materials Development	18,000
IE&C Center/Directorate	2.5	Administration	18,000
Project Evaluation and Phase 2 Design	3.0	Agricultural Economist	22,000
Project Evaluation and Phase 2 Design	3.0	Extension Specialist	22,000
Project Evaluation and Phase 2 Design	3.0	Farm Management/Farming Systems	22,000
Project Evaluation and Phase 2 Design	3.0	Adult Education	22,000
Project Evaluation and Phase 2 Design	3.0	Communications	22,000
Logistics Support	5.0	Admin./Financial Mgmt.	38,000
Institutional Coordination	5.0	Extension Administration	38,000
Final Project Evaluation	10.0	Team of Experts	70,000
		Contingencies (10%)	37,000
Total	45.0 p/m		$365,000

Table

CALCULATION OF MINIMUM FUEL COSTS FOR MOTORCYCLES AND 4-W DRIVE VEHICLES

Vehicle	User	Minimum Number of Vehicles	Miles per Year	Miles per gallon	Fuel Cost per gallon	uel Costs
Motorcycle	Assistant Agent	85 1/	587,520 2/	30	1.65 4/	32,313
4-W Drive	Assistant Agent	24 1/	165,888 2/	15	1.36 5/	15,040
4-W Drive	Senior Agent	16	101,088 3/	15	1.36 5/	9,165
4-W Drive	Specialists	10	26,000	15	1.36 5/	2,340
4-W Drive	Administrators	2	12,000	15	1.36 5/	1,080
					TOTAL	59,938

1/ Assumes use of 85 motorcycles and 24 4-W drive vehicles per week.

2/ Assumes 4 days per week in field, 30 miles per day, plus 20% other project related travel.

3/ Assumes 104 days year in field, 30 miles per day, plus 20% other project related travel.

4/ Gasoline.

5/ Diesel.

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TABLE 5

Cost of Training of Personnel per year and Distribution of Persons/month.

Type of training	Year							
	1983	1984	1985	1986	1987	1988	1989	Totals
				Dollars ($)				
Pre-program	120,000 1/	31,000	31,000	31,000	31,000	31,000	31,000	306,000
Subject-matter	120,000 1/	100,000	80,000	80,000	80,000	80,000	80,000	620,000
Short-term (3 to 6 month)	304,000 2/	264,000	202,000	108,000	108,000	108,000	108,000	1,202,000
Graduate program (M.S. level) 3/	208,000	520,000	520,000	312,000	104,000	-	-	1,664,000
Total	752,000	915,000	833,000	531,000	323,000	219,000	219,000	3,792,000
				Person/Month				
Pre-program	160	25	25	25	25	25		
Subject matter	160	160	160	160	160	160	160	
Short-term	76	66	50	27	27	27	27	
Graduate school	96	240	240	144	48	-	-	768

1/ Estimated cost of first time course for 160 participants.
2/ Estimated cost $4,000 per month per participant
3/ Estimated cost $26,000 per academic year per participant