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REPORT ON APPROPRIATE TECHNOLOGY DEVELOPMENT

IN

CENTRAL AMERICA

Contract No.: AID 596-456
Project No. : 596-0000.5
Location : ROCAP/Guatemala
Date : March, 1979

Written by:
James S. Monachino

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Annex III

Survey of the State of Appropriate Technology in El Salvador, by James S. Monachino, USAID/ El Salvador Contractor, Project No. 519-177, November, 1978.

I.A. Observations

The following constraints were observed in all the Central American countries with regard to the absorption of appropriate technology by the rural populace and the use of non-traditional energy resources.*

1. Credit: All the major banking institutes believe there is a sufficient supply of money to meet rural credit demands. Money is being provided from both national and international sources. Field observations indicated that most small creditors agree with the banks but have many friends that don't take advantage of the system because:

a) They don't understand how to do the paperwork.

b) Money is not obtained on time or may require a long waiting period.

c) Many rural entrepreneurs operate in a seasonal market and monthly payments are inhibiting.

d) Banks promotional efforts in rural areas are weak.

A large percentage of rural residents are unfamiliar with the concept of institutionalized credit. They may need some basic training on how to manage the credit they receive and bookkeeping. For the majority of people in the rural sector who can't read or write, the banking system is a perplexing institute.

2. Poor access to information/technical assistance: There is an obvious bottleneck of data from the information center to the field. This can be attributed to the following reasons:

a) Weak linkages between resource centers and the rural resident.

b) High cost of maintaining an effective information/technical assistance extension program.

c) Lack of qualified personnel to work in rural areas.

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*NOTE: The degree of the constraints varies among the different Central American countries but generally apply to all.

d) Language barrier. (Many resource centers have information arriving from international sources in the language of the sender.)

e) Lack of adaptative agencies to apply useful data to specific field conditions and solve problems.

3. Marketing system: The primary difficulties encountered are:

a) Each country tends to have an over-developed central market system situated in the capital and underdeveloped market system covering the rural area.

b) The internal market for traditional goods is static and seasonal.

c) Weak development of 3rd class feeder roads connecting to secondary and primary roads.

d) Underdeveloped processing and packaging systems of local goods produced.

e) Strong cultural barriers which obstruct innovation and the planting of more profitable crops.

4. Private Sector: Technological development is primarily fomented through the private sector. This process is being retarded in Central America because many large industries don't believe it is profitable to sell to the rural resident. They list the following reasons why:

a) Large amount of capital investment needed to establish local offices and logistical services.

b) High overhead necessary to maintain the operation.

c) Low purchasing power of rural resident.

d) Traditional culture and low level of education often hamper promotion efforts to sell new products.

e) Profit margins are always lower in the rural area than in the urban area.

I.B. Description of Project

The object of this investigation was to conduct a review of what is happening in appropriate technology (A.T.) and non-traditional energy development throughout Central America. Emphasis was placed on describing constraints encountered by the rural residents in absorption of low-cost technology. The principal areas examined were:

1. Credit facilities
2. Marketing patterns
3. Access to technical assistance/information
4. National research activities
5. Private sector

The investigation involved travel to Guatemala, Honduras, Nicaragua and Costa Rica. The results produced a compendium of A.T. activities in each country. Specific cases of A.T. activities, similarities, and constraints which many of the rural residents of Central America experience are cited.

NOTE: A separate investigation of El Salvador was completed for USAID/El Salvador in November, 1978. The El Salvador report, entitled "Survey of the State of Appropriate Technology in El Salvador", is annexed to this report. The Overview and Summary and Observations of the current report include all the five Central American countries.

I.C. Methodology

A brief survey was conducted in each of the Central American countries. This was accomplished with the assistance of all the USAID Missions in Central America. They provided relevant reading material, advice, and assistance in arranging interviews in each country. Institutions contacted were from both the public and private sector, including:

1. Central Banks
2. Vocational Training Schools
3. Universities
4. International Agencies
5. Private Sector (Primarily Agricultural Distributors)
6. Governmental Planning Offices
7. Others

The result of the survey was a rough composite of A.T. and non-conventional energy activity in Central America. Due to the limited time factor no in-depth analysis was performed on any of the topics discussed. The purpose of the survey was merely to highlight the major A.T. activities and problems encountered by the rural populace with regard to A.T. absorption.

I.D. Summary

The use of appropriate technology and non-conventional energy in Central America is varied and scattered. Government awareness and interest does vary slightly from country to country but the net results are the same. Substantial amount of A.T. oriented activity is not reaching the rural resident though examples of successful projects can be found in every country. Unfortunately, these examples rarely leave the site they are conducted on.

The problems in effectively promoting appropriate technology in the rural areas are multi-dimensional. Certainly the lack of education, reinforced by cultural tradition and low learning motivation, pose difficult problems to gauge and resolve. More conventional constraints encountered by the rural resident are:

a) Lack of credit (or knowledge of how to obtain it).

b) Lack of technical assistance.

c) Lack of useful technical inputs (e.g. equipment, seed, fertilizer).

d) Poorly developed internal marketing structure.

e) Underdeveloped village communication linkages with outside sources.

The resolution of these problems will come about if each Central American country can identify the individual needs of their rural populace and mount a concentrated drive to help solve these problems. The thrust of a strategy should include elements of both the public and private sector. If this is attempted, a regional Central American agency could play a beneficial role in the promotion and dissemination of A.T. and non-conventional energy technologies. It would provide governments and businesses with an opportunity to seek Central American consultation to questions that cannot be resolved at a national level.

I.E. Overview

The non-conventional energy and appropriate technology activity charts on pages 10 and 11 represent only those agencies that were contacted during this investigation. They illustrate the amount of A.T. and non-conventional energy activity taking place throughout the region. Each chart rates the degree of interest demonstrated by each agency listed. This rating was determined by personal interview, reading material and third parties.

The following is a listing of the Central American countries, arranged in order, from most active to least active in A.T. and non-traditional energy activity:

1. Guatemala - is the leading Central American country in A.T. and non-traditional energy activity. This can be attributed in part to two factors:

   a) The 1976 earthquake forced many agencies to use A.T. methods to help solve the tremendous rural housing problems.

   b) Large number of regional Central American offices - this includes organizations such as LAAD, ICAITI, ATI, ROCAP and SIECA, which conduct the bulk of their research and/or spend most of their time in Guatemala and are involved or interested in A.T. projects.

Project Prospects - Guatemala is the third least difficult Central American country in which to plan and administer a major A.T. oriented rural project. The major constraints are:

   a) Weak rural extension system (this includes credit)

   b) Strong cultural barriers

   c) Indian language problem

   d) Low level of education

   e) Poorly developed third-class feeder road system.

Comment - There is a tremendous amount of research and promotion talent in Guatemala. Some of this talent is found in:

   a) ICAITI - Research (some extension)

b) LAAD - Promotion and financing (agro-industry)

c) CEMAT - A.T. field work (non-traditional building materials)

d) OPINA - Ing. Penagos (bio-gas)

These organizations represent specialists of different technology mixes that are underutilized and could help promote an effective A.T. program.

2. Costa Rica - is a close second to Guatemala in A.T. activities that are occuring in Central America. It may soon be first if intra-country collaboration continues to expand.

Project Prospects - Costa Rica is the prime prospect of all the Central American countries for the implementation of an A.T. project. Reasons are:

a) High level of education

b) Developed system of third class all weather roads

c) Excellent central information systems

d) Large percentage of rural landowners

e) Receptive populace

f) Interested governmental support

Comment - ITCR, CONICIT, Peace Corps, and the University of Costa Rica are some of the principal fomenters of A.T. The major constraint of a light capital technology project would be weak information/extension linkages to the rural areas and saturated traditional market system.

The second week in June, 1979 Costa Rica will be celebrating sun week. The purpose is to help raise the level of awareness of solar energy among the populace.

3, El Salvador - is the third most active Central American country in A.T. activity.

Project Prospects - El Salvador is the second most desirable country in Central America for the promotion of a national A.T. project. The principal reasons are:

a) Strong extension service

b) Receptive rural populace

c) Developed rural road system

d) Government support

e) Public and private organization interest

Comment - The major national A.T. organizations in El Salvador are:

a) Catholic University (UCA)

b) CENAP

c) CENCAP

Attempts are being made to increase collaboration between government agencies and the University but process has been slow.

4. Honduras - is the fourth most active country in Central America in A.T.

Project Prospects - Honduras is a difficult country to administer any large scale A.T. activities because of:

a) Low level of rural education

b) Underdeveloped third class road systems

c) Underdeveloped secondary marketing system

d) Strong cultural barriers

e) Limited rural extension

f) Poor access to A.T. information services

Comment - Honduras has a strong cooperative movement which is receptive to utilization of light capital technology practices. They should be considered as a possible conduit for A.T. activities in Honduras.

USAID/Honduras is conducting a major A.T. project in Honduras and is an influential fomenter of light capital technology in the country.

5. Nicaragua - is the country with the least amount of A.T. activity in Central America.

Project Prospects - Due to the country's political instability, A.T. will most likely be limited.

Comment: Nicaragua has the potential for developing light capital technology projects. The USAID Mission in Nicaragua participated with the Ministry of Health in 1976 in an appropriate technology project.* The project was considered a success and reached the rural populace very successfully. INVIERNO is the most active government A.T. group presently operating in Nicaragua.

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* Refer to Section IV.B., number 4, for details.

NON-CONVENTIONAL ENERGY CHART FOR CENTRAL AMERICA
(Not listed by Priority)

NON-CONVENTIONAL ENERGY	GUATEMALA	EL SALVADOR	HONDURAS	NICARAGUA	COSTA RICA
SOLAR ENERGY	(B) 1. Universidad de San Carlos 2. Peace Corps 3. CEMAT 4. ICADA-CHOQUI 5. ICAITI (C) 1. OAS 2. OPINA 3. Solar Energy Association/ Guatemala 4. SIECA 5. UNDP	(B) 1. San Miguel Hospital Project 2. UCA 3. CEL 4. CENAP 5. Univ. Nacional (C) 1. Peace Corps 2. CENTA/Eng. Department 3. CENAP 4. Solar Energy Assoc./E.S.	(C) 1. CDI 2. Peace Corps 3. USAID/H 4. Universidad Nacional 5. CONDEFOR	(B) 1. INVIERNO 2. Private Hotel owner (C) 1. Universidad Nacional	(B) 1. UNDP 2. Peace Corps 3. INCR 4. Universidad Nacional de Costa Rica 5. Universidad de Costa Rica
BIO-GAS	(A) 1. OPINA (B) 1. ICAITI 2. U. de San Carlos 3. CEMAT 4. ICADA-CHOQUI (C) 1. SIECA 2. Peace Corps	(A) 1. Peace Corps (B) 1. ISIC 2. Universidad Nacional 3. UCA 4. CEL (C) 1. BFA	(C) 1. Universidad Nacional 2. CONDEFOR	(C) 1. Ingenio San Antonio 2. Huevos San Francisco	(B) 1. Universidad de C.R. 2. Univ. Nacional de C.R. 3. UNDP (C) 1. CONICIT 2. Peace Corps 3. INCR
WIND POWER	(B) 1. Peace Corps 2. U. de San Carlos 3. CEMAT 4. ICADA-CHOQUI 5. Private Farms	(B) 1. Private Farms (C) 1. CEL 2. Peace Corps 3. UCA 4. Universidad Nacional	(B) 1. Peace Corps 2. Universidad Nacional (C) 1. CDI 2. AID	(B) 1. INCAE (C) 1. INVIERNO 2. Wisconsin Partners	(B) 1. INCR 2. Univ. de Costa Rica
WATER POWER AND OTHERS	(A) 1. ICAITI (B) 1. IDB 2. Peace Corps 3. CEMAT 4. ICADA-CHOQUI 5. Save the Children (C) 1. SIECA 2. INDE	(A) 1. CEL (C) 1. UCA 2. BFA 3. ITCA 4. CENCAP 5. CENTA/Engr. Department	(B) 1. Peace Corps 2. USAID/H 3. IDB 4. CDI 5. CONDEFOR 6. Save the Children	(A) 1. Ministerio de Salud Pública 2. UNDP 3. Mining Companies	(B) 1. Private Company (C) 1. Peace Corps 2. INCR 3. CONICIT 4. Universidad de C.R.

KEY: (A) - Very strong interest/Performed test trials
(B) - Strong interest/Projects planned
(C) - Interest/No projects planned

APPROPRIATE TECHNOLOGY ACTIVITY CHART FOR CENTRAL AMERICA
(Not listed by Priority)

	GUATEMALA	EL SALVADOR	HONDURAS	NICARAGUA	COSTA RICA
INTERNATIONAL INSTITUTIONS	(B) 1. USAID/G 2. IDB 3. OAS 4. Peace Corps 5. Canadian Govt. 6. ROCAP 7. ATI 8. NTIS 9. LAAD 10. World Bank 11. ICAITI (C) 1. SIECA	(B) 1. IDB 2. USAID/ES 3. OAS 4. World Bank 5. NTIS 6. German Mission 7. ATI 8. FAO 9. ITCA	(A) 1. USAID/H (B) 1. Peace Corps 2. VITA 3. ATI 4. NTIS 5. ITG (C) 1. IDB	(B) 1. USAID/N 2. NTIS 3. UNDP 4. IDB	(A) 1. Peace Corps (B) 1. NTIS 2. ATI 3. OAS 4. UNDP 5. CATIE
NATIONAL INSTITUTIONS	(B) 1. Universidad de San Carlos 2. CORFINA (C) 1. Planificación 2. GUATEXPRO	(B) 1. BFA 2. UCA 3. CENAP 4. CENCAP 5. FSDVM (C) 1. Universidad Nacional	(B) 1. CDI (C) 1. Banco Central 2. INFOP 3. CONDEFOR 4. Universidad Nacional 5. Banco Central	(B) 1. INVIERNO 2. INTA 3. FED 4. Ministerio de Salud Pública 5. EXPORTEMOS 6. Banco Central	(A) 1. INCR (B) 1. CONICIT 2. Universidad de C.R. 3. Univ. Nacional de C.R. (C) 1. Banco Central
PRIVATE SECTOR/ VOLUNTARY ORGANIZATIONS	(A) 1. CEMAT 2. National Reconstruction Committee 3. OPINA (B) 1. ICADA-CHOQUI 2. Tecún, S.A. 3. Save the Children 4. World Neighbors	(B) 1. World Neighbors 2. IMACASA 3. Avelar Hnos., S.A. 4. Maquinaria Agrícola 5. R.G.Y. Asociados S.A. de C.V. 6. Saquiro, S.A. de C.V. 7. Technoserve 8. Asociación de Energía Solar (C) 1. IICA	(B) 1. Thirdscale Technology, Ltd. 2. Save the Children (C) 1. SEMPE	(B) 1. Wisconsin Partners 2. INCAE	(B) 1. Worldtech Costa Rica 2. COOPEPINARA 3. TIC, S.A. 4. PACO, S.A.

KEY: (A) - Very strong interest/Performed test trials
(B) - Strong interest/Projects planned
(C) - Interest/No projects planned

II. Guatemala: Activities of various international, national and private institutions in the development of appropriate technology and non-conventional energy sources.

A. International Agencies

1. Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI)
Elías C. Hill, Regional Coordinator of the Transfer of Technology Program (PTT)

The PTT is a division of the Central American Research Institute for Industry (ICAITI). It officially began to function in May of 1976 to provide technical assistance for the small and medium size businesses in Central America. The program is funded by ROCAP and includes an open contract with the Denver Research Institute, the Consortium for the Development of Technology (CODOT), and Georgia Tech to provide complementary technical services for the small businesses. Both the Denver Research Institute and Georgia Tech have provided consultants to help solve A.T. oriented problems.

Payment by small industry for services provided by ICAITI can vary between 30% to 50% of total costs incurred. The remainder is obtained from external funds*. Services take the form of seminars, private business consultations, direct technical or laboratory services, and obtaining and providing reference or research material. ICAITI is an NTIS representative for Central America** and uses this relationship to improve its technical library and to answer requests of interested clientele who are seeking services which NTIS can provide.

The PTT arm of ICAITI represents an aggressive effort by the organization to reach out and provide technical services for all the Central American countries. Emphasis is placed on the small business but ICAITI does provide a full range of services to suit the needs of customers in both the private and public sector. Annex I-B contains a listing of all major research projects being contemplated by ICAITI in 1979.

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* The PTT project covers the bulk of balance.

** See Annex I-A for a listing of all NTIS representatives in Central America.

The placement of PTT agents in each Central American country gives ICAITI a sense of identification with its regional constituency. ICAITI has the potential to become an active regional force in the investigation and dissemination of A.T. and non-conventional energy sources. Much of the success of the PTT program will depend on how well individual countries identify and attempt to solve their national problems.

2. United Nations/UNDP (United Nations Development Program)
Alberto Viladrich Morera, Manager of UNDP Central American Energy Program

The UNDP Regional Energy Development Program (substantially funded by the Organization of Petroleum Exporting Countries - OPEC) represents an effective regional approach to energy problem solving in Central America. The program is integrated and well distributed throughout the region. The response in all the Central American countries toward the project is positive. Each country is aware of what the different participants are doing and are eager to exchange pertinent data at a future date. This investigation is not an example of low-cost technology but does contain elements of non-conventional energy research.

A short budgetary summary of the U.N. Regional Energy Project is on page 14. The results of this project will be monitored by most Central American policy-makers.

3. Latin American Agribusiness Development Corporation, S.A. (LAAD)
Ing. Javier Tessari

LAAD is a private investment and development company. Its shareholders are fifteen leading agribusiness and financial corporations. LAAD finances and develops agribusiness projects in Latin America involving all phases of production, processing, storage, services and marketing in the fields of agriculture, livestock, forestry and fishing.*

Appropriate Technology International appointed LAAD to be their Central American representative in December 1978. Mr. Tessari believes the agro-industrial movement is beneficial to the small farmer in the following ways:

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* Information taken from LAAD 1977 Annual Report.

PHASE II - REGIONAL CENTRAL AMERICAN ENERGY PROGRAM
SUMMARY OF THE BUDGET OF THE GOVERNMENTS IN-KIND CONTRIBUTION

SUBPROGRAMS	COUNTRY	ACTIVITY	GOVERNMENT CONTRIBUTION CA$
I. Development of Basic data for energy	Costa Rica	Planning, balance and training	52,500
	El Salvador	Balance, rational use of energy, and training	84,000
	Honduras	Planning, balance, rational use of energy	46,000
	Nicaragua	Planning, balance, rational use and training	52,000
			234,500
II. Hydrocarbons	Costa Rica	a) Evaluation of petroleum information	4,000
		b) Laboratory experiments of bituminous schist	7,500
	El Salvador	Evaluation, petroleum info.	-
	Nicaragua	Evaluation, petroleum info.	4,000
			15,500
III. Development of geothermal resources	El Salvador	CA trials and training seminars	51,000
	Honduras	Assistance in geothermal development	243,000
			294,000
IV. Studies of the CA Isthmus electrical interconnection 1/	1/	-	-
V. Non-conventional energy sources	Costa Rica	Non-conventional sources (solar, wind, etc.)	16,000
	Guatemala (ICAITI)	Prefeasibility study for an alcohol distillery plant	98,000 2/
	Nicaragua	Alcohol for fuel seminar	8,000
		Development of small hydro-electric plants	127,000
			249,000
		TOTAL CA Contribution	783,000
		OPEC Contribution	1,500.000
		UNDP Contribution	509,000

1/ Same activity for all countries

2/ Includes in-kind contribution of CA$50,000 from ICAITI

a) Helps stabilize the internal market

b) Increases utilization of marginal land and underutilized resources

c) Raises incomes

d) Increases rural employment

e) Elevates quality of produce

The LAAD business portfolio includes a large number of major food producers and processors in Central America. (See Annex I-C for details). Their philosophy is aimed at high capital solutions to low income problems. Ing. Javier Tessari is interested in a closer working relationship with ICAITI to have ICAITI design economic strategy mixes of technology that expanding entrepreneurs could afford. After designs are created, LAAD would help finance and promote them to clients.

The idea has merit. There is a serious vacuum of Central American institutions that can perform competent investigative research. These solutions harnessed with a reputable promoter and financier would encourage Central American firms to seek Central American answers. The biggest question is, can such a system be organized for small business at an affordable cost without the need of constant external funding?

4. Peace Corps, Guatemala
David A. Coronado, Deputy Director

All Peace Corps Volunteers arriving in Guatemala receive 25 hours of appropriate technology training. It is part of a new instruction program provided by the Center for Human Potential (CHP). Lectures and field instruction are given to all PCV trainees. Some examples of rural implements being built are:

a) Solar fish dryer
Capacity - 60 pounds
Cost - $18.60

b) Out-door Cooler
Size - 4 shelves
Cost - $18.00

c) Solar Fruit Dryer
Size - 2 square feet
Cost - $4.00

d) Incubator
Capacity - 300 eggs
Cost - $32.50

e) Tin-can oven
Size - 25-pound lard can
Cost - $1.75

f) Lorena Stove (mud-stove)
Size - 4 burners
Cost - $4.50

g) Inertia water pump (two types shown on pages 17 and 18)
Size - 4 meters (tubing)
Cost - $11.00

All these implements are made at the training center located in Antigua, Guatemala by the Peace Corps training groups. All the ideas and equipment are field tested. The general reaction to the CHP training program is positive. Many volunteers are eager to learn more. Unfortunately, there is no more information available. Mr. Coronado is expecting some handbooks to be arriving from Peace Corps Washington and VITA, but it is a slow and time consuming process.

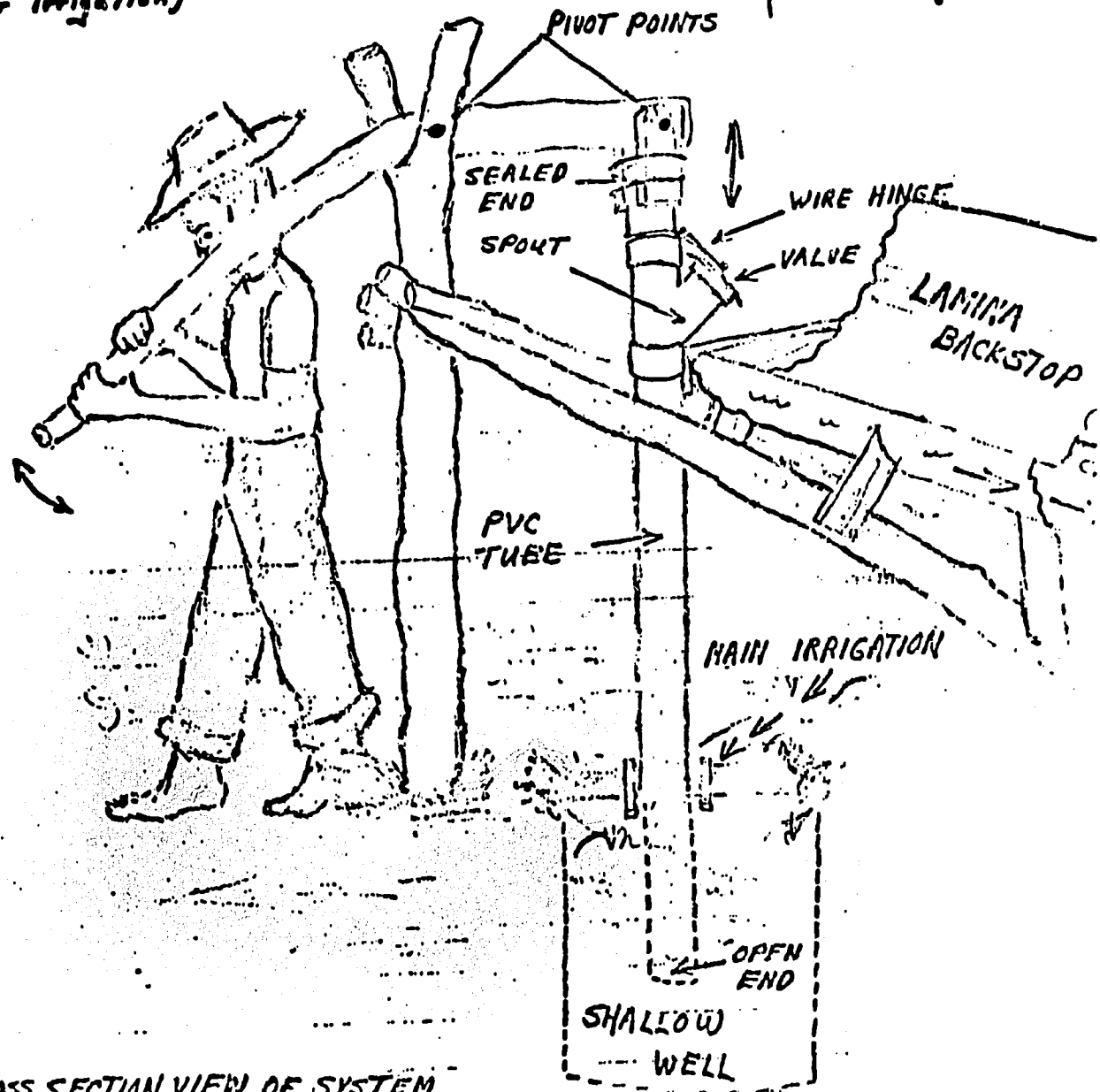
One of the most successful programs by the Guatemala Peace Corps is a reforestation program. Peace Corps Volunteer Mark DesMiceles solved a water problem for a forest nursery in Comalapa by erecting a windmill to pump water. The project was a success and the windmill is still functioning even though Mark went home and was replaced by another volunteer.

The Guatemala Peace Corps is interested in participating in appropriate technology oriented projects. The biggest constraints are lack of A.T. information and funding (depending on the circumstances).

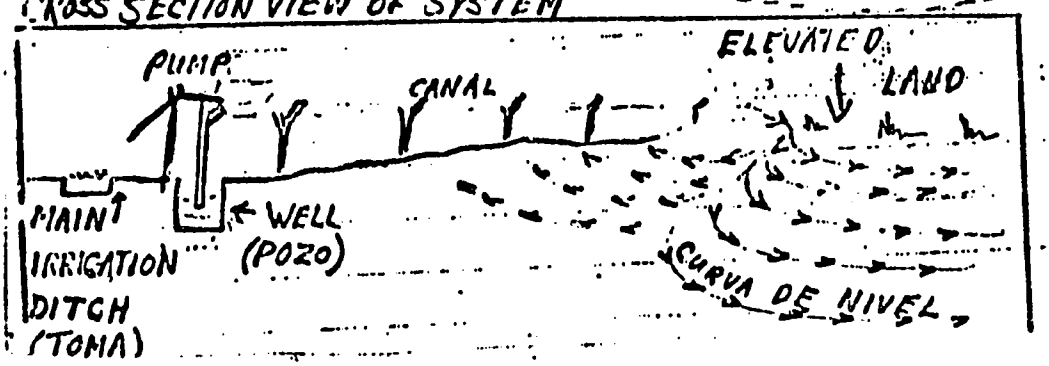
INERTIA PUMP

(For Irrigation)

* Model A



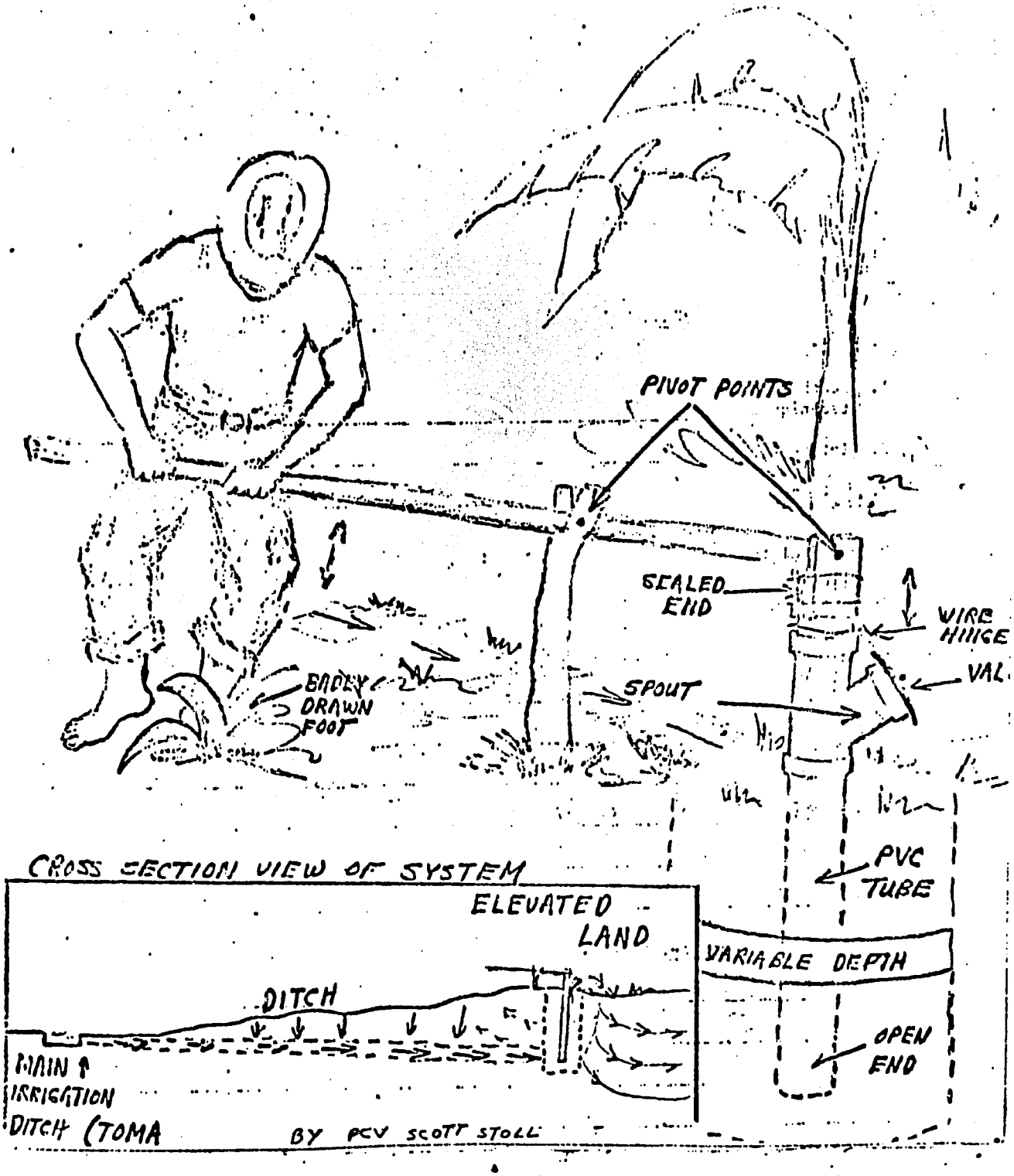
CROSS SECTION VIEW OF SYSTEM



INERTIA PUMP

* Model B

(For Irrigation)



5. Interamerican Development Bank (IDB)
Mr. Alberto Val, Engineering Department
Guatemala City

The IDB response to improving LDC energy programs is to optimize production facilities and promote construction of new programs. These programs should complement existing networks. The Central American regional approach to solving energy problems represents a micro example of the overall global strategy. The following projects are described by Mr. Val as subjects of interest to the IDB in Central America.

a) Use of alcohol as a gas supplement. The UNDP project with ICAITI is a project they will be scrutinizing.

b) Formation of micro turbines - IDB is encouraging INDE (Guatemalan Electric Power Company) to study the potential use of mini hydroelectric generators for use in small communities and isolated areas of Guatemala. Attention will also focus on the UNDP project with Nicaragua which includes research on small hydroelectric turbines.

c) Exploration of petroleum sites - some deposits of petroleum have been found in the Peten region of Guatemala. Additional exploration is expected along the border of Mexico and Guatemala. Officials are speculating there may be oil located south of Mexico*. No official information or figures are available.

Mr. Val expects the following in the next five years:

a) Increased use of geothermal energy throughout Central America.

b) Increased construction of interconnecting power lines between all the Central American countries.

---

* The Mexicans are pumping oil from wells just 60 kms. north of the Guatemalan border.

c) Promotion of mini hydroelectric plants for isolated community needs.

The ultimate phase of energy development in Central America is expected to be the installation of a nuclear power plant just before the turn of the century.

6. Secretaría de Integración Económica Centroamericana (SIECA)
Julio E. Obiols, Dept. of Physical Integration
Guatemala City

Mr. Obiols believes that consumption of oil in Central America will be a continuous and increasing problem. Therefore, development of non-traditional energy sources should be encouraged. This includes:

a) Solar energy

b) Geothermal energy

c) Hydroelectric energy

d) Bio-gas

e) Plant fiber waste

f) Alcohol for fuel

SIECA is actively participating in the UNDP Regional Energy Program. They are attempting to improve regional Central American energy strategies by serving as a conduit for information exchange and dialogue among members. A report entitled "La Situación Energética en Centroamerica y Perspectivas para el Futuro", written in August, 1978, outlines in detail the Central American energy situation and SIECA's position.

Located on page 21 is a chart which shows energy consumption of all the households in Central America. The information was taken from the last housing census. It indicates that the majority of households in Central America still cook with wood. This situation can be ameliorated if A.T. techniques are refined and disseminated to the rural areas. Mr. Obiols would like to see more research in bio-gas, improved (wood burning) cooking devices, and solar energy to help reduce the massive consumption of wood for fuel.

CENTRAL AMERICA: NUMBER OF HOUSES CLASSIFIED BY AMOUNT OF ENERGY USED FOR COOKING AND ILLUMINATION

(Thousands of Units)

Country	No. of Houses	STOVE							ILLUMINATION						
		Wood		Electricity		Kerosene LPG		No. Ind.	Wood		Electricity		Kerosene		No. Ind.
		No.	%	No.	%	No.	%		No.	%	No.	%	No	%	
Guatemala	801	710	88	7	1	64	8	20			173	22	414	52	214
El Salvador	654	501	77	11	2	107	16	35			223	34	408	62	23
Honduras	463	376	81	3	1	70	15	14	107	23	114	25	227	49	99
Nicaragua	302	227	75	2	1	57	19	16			124	41	165	55	13
Costa Rica	231	153	66	59	25	12	5	7			125	54	-	-	106
TOTAL	2 451	1 967	80	82	3	310	13	92	4	23	759	31	1 214	50	455

*Source: Housing Census

Refer to SIECA/78/INF/14 report entitled "La Situación Energética en Centroamerica y Perspectivas para el Futuro", August, 1978

SIECA is interested in helping promote pragmatic non-conventional energy policies in Central America. They should be considered primarily as non-budgetary collaborators in assisting to align upper level political machinery.

7. Organization of American States
Dr. Eduardo Ritter Aislán, Director
Guatemala City

Dr. Ritter Aislán stated that the main objective of the OAS office in Guatemala is to perform administrative functions. He did mention two projects that OAS is involved in.

First: OAS and ICAITI - a small sum of money was granted to ICAITI to conduct research work in the following fields:

a) production of paper from indigenous natural resources

b) investigation of tropical fruit

c) develop information dealing with industrial research

Second: OAS and University of San Carlos, Engineering Department - the University is conducting research in the field of non-conventional energy sources. No details about the project or amount of money involved were disclosed.

The OAS office in Guatemala is participating in some aspects of appropriate technology development but budgetary involvement appears to be low.

B. National Institutions

1. Corporación Financiera Nacional (CORFINA)
Luis Antonio Fernández,
Director of Programming

This bank is located in Guatemala City. It offers a line of credit designed to attract small businesses or cooperatives. USAID/Guatemala is negotiating with CORFINA to increase this line of credit for the use of small entrepreneurs.

Mr. Fernández believes that the bank has enough credit to cover demands of small businesses in Guatemala. He admits that the bank's promotion program to reach areas located outside the capital is weak. Many rural areas are unfamiliar with institutional credit and don't know how to take advantage of credit opportunities. Another barrier that exists in Guatemala is the language problem among the rural indians.

The idea of low-cost technology for rural areas is viewed with some reservation. The use of improved technology for utility articles is welcome but not in the case of artisan handicraft work.

Example 1: There is a small town in Guatemala that makes pots without the use of a potter's wheel. It is a traditional talent that has cultural value. If someone goes to that town and trains those people to improve production by using a potter's wheel they will destroy the value of the pot and the tradition.

Example 2: The old indian designs are slowly phasing out for more marketable western patterns. Buyers are influencing traditional styles and in some cases copying design patterns for mass reproduction elsewhere.

The bank is aware of the problems it must resolve to reach small businesses. It is slowly attempting to reach these rural people. Success will take time and prodding from responsible government leaders.

2. GUATEXPRO
Luis Alberto Noriega H., Deputy Director
Guatemala City

GUATEXPRO is a government organization founded in 1971 for the promotion of national exports. Over 65 percent of their clientele have fixed assets of over 50,000 dollars and are capital intensive in their problem solving methodology.

USAID/Guatemala is considering assisting GUATEXPRO in the promotion and marketing of handicraft items produced by rural industry. A Rural Enterprise Development loan is being negotiated with the Guatemalan government.

Mr. Noriega claims that there is a market for export products in the United States and Europe. The demand is not the problem. He stated that they must improve quality and efficiency to be active in the world market.

GUATEXPRO receives assistance from the International Trade Center (ITC). Through their financial aid various experts from around the world are brought in to give seminars in management, packaging, labeling, promotion, etc. These seminars are aimed at entrepreneurs who have a minimum of a high school education and three years working experience in the field. The seminars are about 50 hours in length and last one week. The entrance fee for courses offered is $50.

GUATEXPRO also receives assistance from the United Nations, the European Economic Community (EEC), Holland, and the United States. These countries provide technical counsel to GUATEXPRO clients. This assistance has resulted in both production and quality increases.

The three most important characteristics that GUATEXPRO seeks in a company are:

a) Quality of its product

b) Quantity it can produce

c) Reliability

Unfortunately, most of these do not exist in rural industry. Some of the problems of rural enterprises are:

a) Lack of administrative skills

b) Language barriers (among the Indian population)

c) Small production

d) Quality control

e) Unreliable production schedules

Mr. Noriega would like to see agro-industry, food processing and the textile industry develop within the next five years to help diversify the economic base of Guatemala.

3. Universidad de San Carlos de Guatemala
Ing. Raúl Francisco Molina Mejía

The University is doing some research in the field of non-conventional energy. Basic data has been collected on solar radiation intensities throughout Guatemala and wind velocities at 14 sub-stations. University personnel interested in the development of low-cost technology include:

Ing. Manuel Ruano - Non-conventional energy sources

Ing. Roberto Lou - Appropriate Technology

Ing. César Barrientos - Appropriate Technology

Funding of research has been provided by the Organization of American States. The university received 14,000 dollars in 1978 and will receive about 20,000 dollars in 1979. Ing. Raúl Molina is interested in participating more actively in A.T. oriented projects but claims research is expensive. He said that the technology issues will be discussed on a regional level in July, 1979, by a proposed conference among the Central American universities. The name of this conference will be the Engineering Energy Seminar for Central America and Panama. It will be sponsored by the United Nations, the Organization of American States, and the Interamerican Development Bank.

4. Consejo Nacional de Planificación Económica
Eduardo Martínez D., Coordinator
Juan Alberto Hernández, Asst. Coordinator
Science and Technology Education, Technical Assistance

Mr. Martínez claims that the two major A.T. groups in Guatemala are the Centro Mesoamericano de Estudios sobre Tecnología Apropriada (CEMAT) and the National Committee for Reconstruction. Mr. Hernández, the assistant coordinator of the Health, Education and Science and Technology Planning Division, explained the role both organizations play. The planning directory lists CEMAT involvement in eight rural studies. The topics include investigation of low-cost building material, promotion of the "Lorena stove", and the study of various "campo" medical practices. The information did not provide specific details on any projects.

The National Committee for Reconstruction is listed for its work with non-conventional building materials. The

program has been successful in the reconstruction of many low-cost rural homes after the earthquake in February, 1976. Mr. Luis Ferraté is the man to contact for more specific details.

The Planning Department is interested in the promotion of appropriate technology but views it as only a small element of a total technological approach. Consequently, official interest is demonstrated but activity is low.

C. Private Organizations

1. Centro Mesoamericano de Estudios sobre Tecnología Apropriada (CEMAT)
Dr. Rodolfo Castillo
Guatemala City

This organization began to function in February 1976 after the Guatemala earthquake. It is considered by many policy makers in Guatemala as the leading A.T. organization in the country. The main objectives of CEMAT are:

a) Investigate affordable technology alternatives for the rural populace,

b) Use available resources,

c) Promote the dissemination of low-cost technology,

d) Seek simple, labor-intensive solutions to solve rural technology problems, and

e) Improve the basic level of life

The most significant areas of study being pursued by CEMAT are:

a) Construction: Development of low-cost building material for rural structures. CEMATITA is a cement that was developed by CEMAT using only local materials. This cement is being produced in some rural areas for the manufacture of building blocks. The cost of each block is 8 cents versus 15 cents for conventional blocks.

b) Health - Several studies have been conducted on the use of traditional medicine in the rural areas. The purpose is to implement a gradual upgrading of health by refining the traditional system. This is accomplished by complementing existing deficiencies with modern inputs.

c) Energy - Investigation of non-traditional energy sources for the rural area. There has been some work done with solar energy implements, bio-gas, and the mud stove ("Lorena Stove").

d) Nutrition - Volunteers are attempting to improve the level of village nutrition by teaching the women of the community how to cook easily-grown plants.

e) Non-Formal Education - The object is to increase the level of working skills used in the "campo". Seminars and test trials of work-related subjects are held to assist the rural resident. Audio-visual implements, cassette tapes and simple pamphlets are used during these classes.

The extension work performed by this organization is basically conducted in Guatemala. They are collaborating with Appropriate Technology International on the possible formation of an international information system but no action has resulted. Additional international agencies that CEMAT has contact with are:

a) GRET - Grupo de Investigación sobre Técnicas Rurales, Paris, France

b) ITDG - Intermediate Technology Group , England

c) Basic Research Institute - McGill University, Canada

d) VITA - Volunteers in Technical Assistance, USA

e) TOOL - Stichting Technische Ontwikkeling Ontwikkeling Landen , Holland

f) CEESTM - Centro de Estudios Económicos y Sociales del Tercer Mundo , Mexico

CEMAT is interested in collaborating with other Central American countries for the promotion of A.T. Unfortunately, the organization has very limited financial, physical and personnel resources to be considered of strong regional influence.

2. ICADA - CHOQUI Experimental Station
Quezaltenango, Guatemala

This is a small research development organization which operates on a local level. They collaborate with CEMAT and the Guatemala Peace Corps on various projects. Their biggest success story is the mud stove, i.e. the "Lorena Stove", which improves cooking efficiency and decreases wood consumption. The stove is constructed out of local materials. Additional activities of the group include:

a) Work with small wind units

b) Bio-gas - Ing. Penagos, consultant

c) Solar energy implements

d) Low-cost building materials

ICADA-CHOQUI receives most of its funds from the Canadian Government. On weekends volunteers occasionally offer appropriate technology courses on how to use and build different rural implements. Entrance fees vary from free to $5.00. Some of the members of this organization are Hugo Pineda, Manuel Tay, Donald Wharton, and Santos Colop García.

This group is not as well known as CEMAT but people who work with them praise their accomplishments. The organization has a limited outreach program in Guatemala but is considered a fomentor of A.T.

D. Private Sector

1. Oficina Profesional de Ingeniería
y Agronomía (OPINA)
Mario David Penagos G., Ing. Agrónomo

Ing. Penagos is the prime fomentor of bio-gas in Central America. He has been studying the construction and production of bio-gas since 1956. He has traveled to Germany, England, France, Spain, and Portugal studying different systems of production.

The first contract he received was in 1958. He was contacted by the government of El Salvador to build a compost plant. The deal never materialized because of distrust by government officials in Mr. Penagos' abilities to perform the work. Since that time he has built about 20 bio-gas plants throughout Guatemala. All have been for the private sector. He came close to building a large methane gas plant for Guatemala City in 1967 but never finished construction because of internal government disagreement.

A functioning example of a bio-gas plant built by Mr. Penagos is at the Finca "El Trebol" located on Km. 18 of the road to San Juan just outside of Guatemala City. The plant was constructed in 1964 at a cost of $8,000, and produces 50 cubic meters of methane per day.

The following lists the potential energy in one cubic meter of bio-gas in relation to other energy sources:

1 cubic meter bio-gas = 1.1 liters of alcohol
" " " " = .8 liters of gasoline
" " " " = .6 liters of diesel
" " " " = 1.4 kilograms of charcoal
" " " " = 2.2 kilowatt-hours of electric energy

Mr. Penagos is doing consulting work for both CEMAT and CHOQUI-ICADA. His latest project is for a large cotton grower and cattle rancher on the Pacific coast. The owner's name is Mr. Milton Molina and a design is being made for construction of a $1,000,000 unit.

Bio-gas has a tremendous potential in Central America because of the ideal climatic conditions. The biggest constraint Mr. Penagos has encountered is the amount of ignorance that exists on the subject. He said people just don't believe it can be done.

2. Técnica Universal, S.A. (TECUN)
Otto Mittelstaedt S.,
Manager/Agricultural Machinery
Guatemala

TECUN is one of the largest distributing companies in Guatemala. They carry a full line of equipment to satisfy the needs from homemaker to farmer. The central office is located in Guatemala City but the strength of company sales lies in its 250 dealers scattered around the country.

Mr. Mittelstaedt stated that the smallest tractor TECUN sells is a 25 horsepower import from Japan. The name of the company is SATOH. The tractor sells for about $6,650.00, with a planter, disc and plow. It can be purchased with 30% to 40% down and two years financing. The sales record for this tractor is under 10 units a year.

Since the company does have a large outreach program, promotion and marketing is beginning to focus on the small farmer. TECUN believes the small tractor is too expensive for the average farmer. They are thinking about opening up a new department that will cater to the small landowners needs more productively. Two manufacturing companies are being considered to fill that role. One company is TATO from Brazil and the other is International Modern Machinery located in Beaumont, Texas. These manufacturing companies offer a full line of hand-operated and animal-drawn equipment. This includes:

a) Plows

b) Discs

c) Harrows

d) Fertilizer distributors

e) Planters

f) Cultivators

TECUN is interested in selling low-cost technology to the small farmer. It is examining its options and planning a marketing strategy for Guatemala.

3. AGROFORD, S.A.
   Carlos E. Sol, Sales Manager
   Guatemala City

Mr. Carlos E. Sol believes there is a limited market for small-scale farm equipment. His company previously carried a line of small tractors made by Honda but stopped importing them after two years of poor sales records.

The limited market described by Mr. Sol consists of small agricultural landowners* who are primarily located in

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* Those who own between 2 to 9 hectares.

the Atitlán Highlands of Guatemala cultivating vegetables. Farmers owning an excess of 10 hectares should consider purchasing a larger horsepower unit (50 h.p. to 70 h.p.) and renting the tractor to his neighbors.

Another class of farmers interested in the small tractor (25 h.p. and below) are the sugarcane growers. They prefer the smaller unit to perform specific jobs such as cultivating between the rows of cane while it is growing. Unfortunately, low market prices on sugarcane have produced a lag in capital investment by these farmers.

The two major companies that are selling small tractors in Guatemala are KUBOTA and SATOH. Both of these Japanese companies export a full line of equipment which cost about 5 to 8 thousand dollars depending on the unit's size and accessories that are purchased.

IMMACASA is a company located in El Salvador which is exporting a full line of discs to Guatemala. The discs are manufactured in El Salvador. Unfortunately, lack of raw materials has forced the company to import nearly everything needed to manufacture the units. Prices are very competitive with other brand name competitors. The success of these discs in Guatemala is still too premature to gauge but buyers do seem reluctant to purchase them. The reason is the untested quality and the low price difference from international brand name products.

AGROFORD has no interest in selling small agricultural farm implements because of the low profit margins involved. Lack of rural regional offices makes the idea of selling small farm implements to the poor landowners impractical.

III. Honduras: Activities of various international, national and private institutions that are related to the development of appropriate technology and non-conventional energy sources.

A. International Agencies

1. Agency for International Development/Honduras
Mr. Richard Fera, VITA Consultant/USAID/H

Mr. Fera is working on a joint contract with the Denver Research Institute for USAID/Honduras. The object of his contract is to examine existing information networks that are operating in Honduras and recommend improvements. Emphasis is being placed on an information system that will be useful to the small entrepreneur. The study terminates in March 1979. All interested parties should contact Mr. Anderson of USAID/Honduras for more details. The contract number is 522-0000.1.

The principal constraints of most rural technology programs listed by Mr. Fera are:

a) No one institution appears capable of mounting an effective program,

b) Multi-agency involvement is difficult to achieve,

c) There is a difficulty in obtaining problem solving information,

d) Absence of local adaptative mechanisms inhibit efficiency of technological absorption.

The whole philosophy behind A.T. is fluid movement of ideas. Institutions should be able to go into an area swiftly and economically. Once the assigned task is completed another site should be sought.

2. Peace Corps, Honduras
Nicholas S. Metes, Associate Director

The Honduras Peace Corps is interested in adopting a more aggressive stand for the promotion of appropriate technology in the rural areas. Some examples of activities done by volunteers are:

a) Ram pump - PCV Todd Rasimussen built a small ram pump for a farmer in the northern section of Honduras. The farmer was irrigating his field by long gravity canals. Todd wanted to improve the system by adding the pump. The farmer never accepted the idea. The pump represented something that he did not understand or felt he needed.

b) Hand operated washing machine - This VITA model washing machine was built by Todd Rasimussen. The purpose was to lessen the workload of the women of the village. The idea never caught on because the women felt threatened that their jobs might be lost (this group represented women that washed clothes for a living). Also, they were afraid that the device would never allow them to leave the house and chat with friends. Most women in this village wash their clothes in the river. The idea was not a success.

c) Lorena Stove - Save the Children in Honduras arranged a stove construction demonstration at the Peace Corps Office in Honduras. The object of the demonstration was to teach volunteers how to build the stove. The results were successful and some volunteers will be field testing the idea at their sites.

   The instructor who gave the demonstration learned how to build the stove in Guatemala. Señora Juana V. de Manzano's trip was paid for by Save the Children, Honduras. Peace Corps, Save the Children, WID (Women in Development) and CONDEFOR are interested in disseminating this stove out to the rural areas.

d) Tree Trials - The Peace Corps in Honduras will be participating with COHDEFOR in a tree species trial. There will be over 80 small plots planted with the purpose of determining the best variety that could be used for firewood.

The Honduras Peace Corps has participated in various flurries of A.T. activities. It has the potential to expand. The principal constraint appears to be the lack of information and technical knowledge on the subject.

3. Interamerican Development Bank
Manuel Mariño, Sub-representative
Tegucigalpa, Honduras

IDB/Honduras is not directly involved in any A.T. oriented activities. They are participating in a large hydroelectric project. The name of the site is "El Cajón". The completion date of this project is scheduled for the early 1980s. The impact of this hydroelectric plant will be a larger electrical surplus. This surplus will be sold to Nicaragua and perhaps to Guatemala if interconnecting lines are constructed.

When questioned about non-traditional energy activities in Honduras Mr. Mariño reported the following information:

a) Geothermal Energy - there is no site available that offers a high enough potential to construct an energy plant,

b) Wind-power - no activity,

c) Bio-gas - no activity,

d) Solar Energy - The national University is doing some field experiments but nothing in-depth.

No other relevant information was available.

4. Agency for International Development (AID)
Tegucigalpa, Honduras

The following information represents a brief overview of USAID light technology activities in Honduras*.

a) An operational program grant project - Program is with the Community Development Foundation and involves the application of appropriate technology. The major thrust of the project is in Community Development.

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* Information is taken from the text of a telegram labeled, "TEGUCIGALPA 0134", 9 January 1979.

b) Small Farmer Technology Project 0123 - this program has a research and development element with the Ministry of Natural Resources, National Research Program. It involves the development, adaptation and testing of on-farm implements and mechanical technologies.

c) Rural Technology Program - The mission is in the process of developing a project paper which is designed to stimulate small scale industrial development in the rural area.

For additional information and details about these major A.T. activities at USAID/Honduras Mission, contact Mr. Donald Anderson, Senior Advisor.

B. National Institutions

1. Universidad Nacional Autónoma de Honduras
Engineering Department
José Germán Vallecillo

The University of Honduras is not actively participating in any significant A.T. or non-traditional energy projects. It has been restricted by budgetary constraints. Last year there were some experiments conducted with wind velocities. This year the program has been cut due to lack of funds.

The University is interested in collaborating with A.T. oriented agencies provided funding could be secured. Another constraint is limited research facilities. Projects proposed for research investigation would have to be carefully tailored to match the University's capabilities.

The NTIS representative is located at the University library. The University libraty and the library at the Central Bank represent the two main sources of technical information and reference in Honduras.

2. Central Bank of Honduras
Lilia Valentina Meíía
Director of Industrial Investigations
Tegucigalpa, Honduras

The Central Bank of Honduras believes that light capital technology would be most effective in the rural areas. The Bank's approach to most problem solving activities is

capital-intensive. It has a large technical library that specializes in scientific research and reference materials. Reproduction facilities are available. The library is used by many people from the scientific community.

No specific cases of bank involvement with light capital technology or non-conventional energy sources were mentioned.

3. Centro de Desarrollo Industrial (CDI)
Dorcas G. González, Director
Tegucigalpa, Honduras

The Industrial Development Center of Honduras should be considered one of the principal collaborators and disseminators of A.T. in Honduras. The institute collaborates with a variety of A.T. oriented organizations around the world. These organizations include:

a) Volunteers in Technical Assistance (VITA), U.S.A. - They provide CDI with informational material and occasional consultation.

b) Intermediate Technology Development Group (ITDG), England - Representatives from this group have helped CDI improve production systems of some rural industries.

c) Instituto Tecnológico de Costa Rica (ITCR) CDI maintains open correspondence with the institute and does exchange program ideas.

d) Appropriate Technology International (ATI), U.S.A. - ATI has helped sponsor some light capital technology projects with CDI.

e) Instituto Centro Americano de Investigación y Tecnología Industrial, ICAITI - CDI is collaborating with ICAITI in the construction and dissemination of water purifiers for rural residents.

f) USAID/Honduras - CDI and USAID Honduras are negotiating an A.T. oriented project which would increase the CDI outreach program and promote the dissemination of A.T. projects at selected rural sites. Contact the USAID office in Honduras for details.

The methodology employed by CDI is to:

a) Locate a rural group of people,

b) Identify a need,

c) Prescribe a method to correct the problem,

d) Explain the benefits,

e) Provide technical assistance for treatment of the problem,

f) Provide partial funding received from external agencies (such as ATI) to pay for material costs.

CDI is looking for light technology projects. They want field tested ideas. The director explained that the limestone oven project almost failed because the design that CDI originally received from VITA was not suitable to local conditions. The problem was finally corrected but at considerable loss of time and expense. Dorcas G. de González stated that it is better to have a few field tested ideas than a lot of theories that can be very expensive and risky.

4. Corporación Hondureña de Desarrollo Forestal (COHDEFOR)
Lic. José Alberto Equigurens
Director of Planning

The yearly consumption of firewood in Honduras is about 6,000 cubic meters annually. It is used by:

a) Brickmakers,

b) Bakers,

c) Homemakers (cooking),

d) Rural industry, and

e) Others.

In many cases trees are indiscriminately cut to serve the immediate needs of the rural resident. COHDEFOR is attempting to cure some of these problems by:

a) Recommending fast growing tree varieties to be planted near the home for fuel.

b) Promoting construction of the Lorena Stove in areas where it is applicable.

c) Providing technical assistance for the care and planting of trees.

d) Exploring what role the use of non-conventional energy source might play in decreasing the wood consumption in the rural areas. This includes use of solar energy, bio-gas, and wastes from plant fibers.

All of the non-traditional energy programs are still being discussed. No actual field testing has been performed.

COHDEFOR is interested in non-conventional energy sources. They have an effective outreach program and might prove to be a capable promoter if a strong program plan is written to include feasible non-traditional energy sources in their extension work.

C. Private Sector/Organization

1. Private Organizations interest in A.T.
Judy Stallmann, Michigan State University representative, USAID/Honduras

The following list represents private volunteer organizations that are interested in the use of low-cost technology in Honduras. Additional details about each organization can be found in the USAID/Honduras PVO Directory written by Judy Stallmann.

a) Instituto Hondureño de Desarrollo Rural

b) Unión Nacional de Campesinos

c) Comité Evangélico de Desarrollo y Emergencia Nacional

d) Centro de Adiestramiento Rural del Sur

e) Asociación "San José Obrero"

f) Asociaciónde Promoción Humana

g) Asociación Nacional de Campesinos de Honduras.

Judy Stallmann provided the names of all the organizations listed above. She believes that these organizations are interested in applying A.T. in the field. What they lack is information and technical assistance.

2. Small Handicraft Shop
Santos Emilio López
Tegucigalpa, Honduras

Mr. López owns a small artisan shop in downtown Tegucigalpa. He purchases all his straw articles at a large factory on the northern coast of Honduras and makes most of the wood carvings himself. His three principal constraints are:

a) Few resources,

b) No credit, and

c) Lack of modern equipment.

Mr. López does not understand how to use the banking system. He said his friends all told him that you have to fill out a lot of forms, answer many questions, and wait a long time. Another discouraging factor is his lack of confidence in the shop's monthly earning power. Since business does fluctuate from month to month he feels incapable of making monthly payments.

Supposedly, if Mr. López got credit all his problems would be solved. He would have money to buy new equipment and more raw materials to increase his production. But he never mentioned where he would market his increased output. The wood-carving market in Honduras is very limited and the tourist trade is low.

3. Agencia Marinaky, S.A.
Rodolfo Guerrino S., Assistant Manager
Tegucigalpa, Honduras

The company imports a small 25 horsepower diesel tractor from Japan. The manufacturer's name is

Himomoto. They provide a full line of equipment for their tractor. Estimated cost of tractor, plow, planter, and disc is about $6,000.00. The main customers that buy these units are:

a) Golf course owners,

b) Cemetery owners, and

c) People who own small gardens.

Terms of payment are 30% down and 24 months of financing. The two largest constraints against the purchase of this tractor by small farmers are:

a) People are mentally conditioned to want big equipment. They don't blieve a smaller unit can do the job.

b) Unless the small landowner is growing a cash crop, such as vegetables, he can't afford to buy it.

The total sales record of Himomoto tractors in Honduras is about 10 per year. The distributor of the tractor is not optimistic about its future. (See Annex I-D for a picture and dimensions of the tractor).

Mr. Guerrino stated that it is very difficult to sell equipment to most small landwoners. They need someone to show them how to do everything. That takes time. His company does not have a large enough budget to pay for that time.

4. SEMPE
Humberto Díaz
Agricultural Machinery Division
Tegucigalpa, Honduras

This company is one of the largest distributors and sellers of agricultural equipment in Honduras. It has five full service branch offices located outside of Tegucigalpa.

The smallest tractor that SEMPE sells is a 50 HP Massey Fergusen. Sales run about 10 to 15 units a year. It is not a good mover. Recently, two Japanese companies

approached the company. They want SEMPE to start handling smaller horse power tractors for them in Honduras. SEMPE did not give an answer to the Japanese manufacturers. They are reportedly studying the market.

Mr. Humberto Díaz was a former agricultural extension in Honduras. He is now a salesman and claims that the small farmer has an abundance of conventional technology available. The problems are:

a) He does not know what equipment is available to improve his production,

b) Often lacks sufficient technical skills to maintain and operate the equipment he purchases, and

c) He is traditionally bound to his agricultural system.

5. Thirdscale Technology, Ltd.
Melbourn Bury
Royston, Herts S G 8 6 DE
Great Britain
Anthony Hopkin

Mr. Hopkin has been visiting different institutions in Honduras demonstrating the advantages of a low-cost paper recycler. The machine sells for about $600.00 and does not require a large amount of technical training to operate and maintain it. The end product is used primarily for packaging purposes.

IV. Nicaragua: Activities of various international, national and private institutions that are related to the development of appropriate technology and non-conventional energy sources.

A. International Agencies

1. Interamerican Development Bank (IDB)
Ing. Raúl Chacón, Director
Managua, Nicaragua

Mr. Chacón said that there are no current projects going on in Nicaragua dealing strictly with the development of appropriate technology. A $12 million loan to the GON Fondo Especial de Desarrollo (FED), provides money to different financial institutions who provide credit to small businessmen. The loan is expected to be completed by February 1979.

Mr. Chacón said that the IDB is under a mandate to try and promote loan projects that would utilize labor-intensive methods. This philosophy, however, should be carefully analyzed in relation to each system. Heavy employment systems undercut efficiency and are less economical.

2. Peace Corps, Nicaragua

The Director of the Nicaragua Peace Corps, Rose-Auila Magdaleno, had been in Managua only three months when notified of the Corps pull out from the country. He felt that the Peace Corps would have attempted to participate more strongly in A.T. oriented projects in Nicaragua if they had had the opportunity.

The Peace Corps Volunteers themselves claimed that people in the rural areas were receptive to new ideas as long as the benefits were readily visible. Cultural differences, however, presented difficult obstacles that had to be overcome.

EXAMPLE: A Peace Corps couple had been working on the eastern part of the country for nearly two years. They found the populace very willing to experiment with growing vegetables close to their home. The people liked the idea of growing vegetables as a cash crop but not for internal consumption. They were perfectly

content with a diet of corn, rice, beans and fish. Gradually, people in the area had begun to eat vegetables but the process would take time. Meanwhile, most of the vegetables grown were sold to the small non-indigenous population who lived in the immediate marketing area.

Mr. Magdaleno felt that there were many areas in Nicaragua that would have been able to implement low-cost technology with the aid of proper technical guidance. This guidance could have been provided by the Volunteers.

3. Programa de las Naciones Unidas
para el Desarrollo (UNDP)
Roberto Mac Eachen, Resident Representative
Managua, Nicaragua

Currently, there are no projects being administered by the United Nations office in Nicaragua that are specifically A.T. oriented.

The regional UNDP energy program consists of:

a) Alcohol for fuel seminar,

b) Development of small hydro-electric plants,

c) Evaluation of petroleum exploration, and

d) Planning of Energy Resources.

Mr. Mac Eachen believes use of low-cost technology in the rural areas is necessary. He listed the following constraints as obstacles of program implementation in Nicaragua:

a) Low educational level of target populace,

b) Political instability, and

c) Lack of funds.

A general conference was held in Managua, in November 1978 on Science and Technology. The conference was sponsored by the United Nations and indirectly discussed some element of the appropriate technology philosophy. See Annex I-E for a resume of the conference.

B. National Institutions

1. INVIERNO (Campesino Development Institute)
Ing. Rudy A. Mairena
Chief of Rural Engineering

This organization was founded in 1975 with the assistance of AID funding to provide the following services:

a) Credit,

b) Technical assistance, and

c) Rural community development services

It operates in two major regions of the country and attempts to coordinate government infrastructure assistance. INVIERNO provides technical advice for 10,000 people plus those associated with the Agrarian Reform Institute (5,000 people).

The institute is interested in Appropriate Technology and would like to apply it. Ing. Rudy A. Mairena is working on a grain drying unit which can be manufactured from local materials and serves to dry corn and beans.* The construction cost is about $100. The unit is simple and easy to maintain. If final testing results are positive, Mr. Mairena would like to offer the small farmer a package of technology with credit to purchase and install the needed equipment. Included in that package would be the grain dryer plus small metal silos. Mr. Mairena reasons that the farmer needs to know how to dry his grain as well as store it. The two systems go hand in hand. The results of the research performed here could prove helpful to other small farmers throughout Central America.

2. National Institute for Agricultural Technology (INTA)

This Institute has 35 extension agencies scattered all over the country. They are spread thin but reach about 194 communities with 12,000 people.

The Institute is interested in extending appropriate technology to the people but is faced with the following problems:

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* See Annex I-F for details.

a) Not all the small farmers have access to the additional credit needed to implement the prescribed system.

b) The Institute has little access to useful technologies which would be applicable to specific situations.

c) Many farmers are hesitant about trying different cropping systems, especially if it increases risk.

d) Farmers who don't own their land or have small land holdings are looking for short term gains which they can immediately profit from.

e) Weak underdeveloped marketing systems in most AID target group areas do not encourage increases in production.

Many of the problems encountered by INTA are representative of similar problems encountered by their Central American counterparts.

3. Universidad Nacional Autónoma
Nicaraguense (UNAM)
Lic. Salvador Méndez, Administrator
Juan Sánchez, Sec. Faculty

There appears to be strong interest at the University in the use and application of light capital technology. However, the political situation of Nicaragua apparently prevents any possible worthwhile activity.

4. Ministry of Health, Nicaragua

In April, 1976, AID and the Ministry of Health signed an agreement which would maximize existing resources out in the rural communities.

Method: "Campesino Congresses" were held to:

a) Assist refinement of regional program goals,

b) Maximize utilization of central government health resources on a national basis,

c) Simulate/motivate competition between community committees, and

d) Exchange ideas in A.T. for implementing community health projects.

The program attempted to involve a wide variety of groups which were active in the target area. Selected members of the communities were trained to be local health promoters. These promoters then assisted in the dissemination of practical health education through the use of the radio media ("radiophonic schools"). Classes were given by the promoters at convenient times over the local radio stations on pre-recorded cassettes. These "radiophonic schools" utilized culturally tailored broadcasts to assist in the development of general community health knowledge or the planning/implementation/maintenance of local health programs.*

Another interesting aspect of this project was the various attempts to develop low-cost pumps for village-level use. The following units were used during this program:

a) Locally produced BATTELLE/USAID Pump - This project initiated the production of small hand pumps at a local metal fabricating plant. The production technology and testing was guided by ICAITI and Phillip Potts, a Georgia Tech representative. The result was a simple low-cost unit that was produced in-country ($75.00 for shallow pump and $105 for deep well pump) at a price considerably lower than the Brazilian import ($250).

b) IDRC Wooden Block Pump - This pump was designed by the Canadian International Development Research Centre. It was made of locally available metal or plastic pipe and wood. (Cost: $25 - $55; designed by Timothy Journey).

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* For additional details refer to "Utilization of Appropriate Technology for Rural Health Services in Nicaragua" AID, Nicaragua, 1976.

c) Peace Corps Pump - This pump was made of local materials and can also be manufactured locally. (Cost: $65)

d) Field engineers from American Ag International (Engineer Daniel Gerhardt) added a new A.T. dimension in rural areas by not using pumps. This organization used horizontal drilling techniques to obtain water for rural villages. They instructed Nicaraguan engineers on the drilling and maintenance methods they practiced.

(See pages 49-51 for pictorial reference).

The A.T. rural health project was considered a success by AID officers. Mr. Anselmo F. Bernal, Population and Family Planning Officer felt that the project had a lot of positive aspects worth continuing.

5. EXPORTEMOS, Nicaragua
Lic. Norman Caldera, Director

This government agency coordinates with the Central Bank in the promotion of products made in Nicaragua for export. The main function of EXPORTEMOS is to promote national export. It does not provide technical assistance or contracting services.

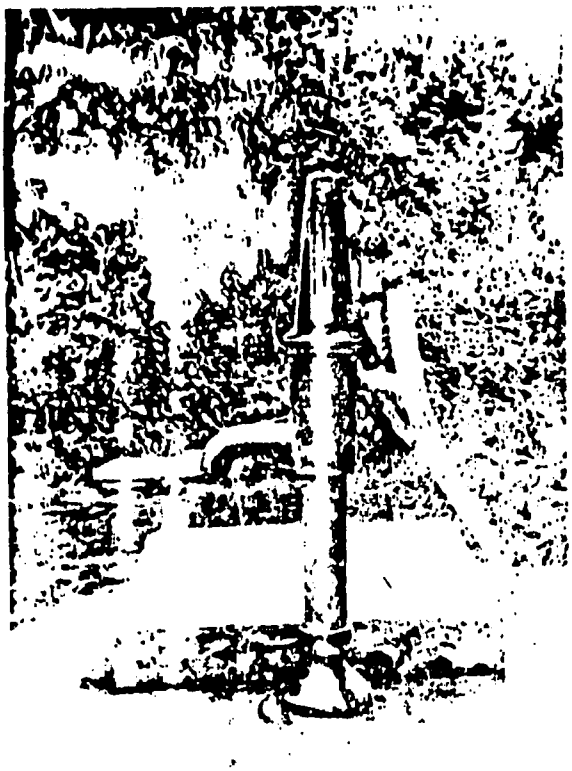
Problems faced by this agency are:

a) People are distrustful of the government agencies,

b) People who are involved in artisan work usually have been doing it for generations and are culturally bound to various production patterns,

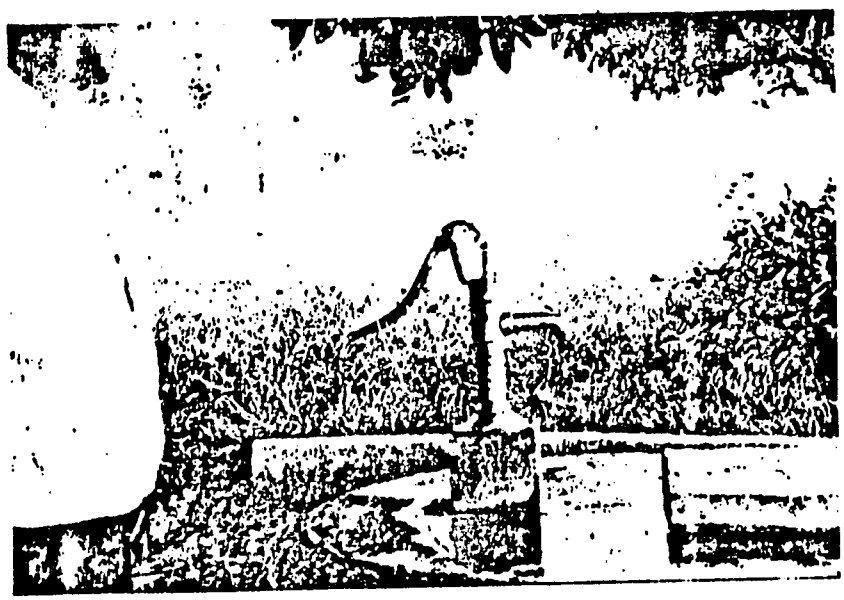
c) Many artisan operations are not conducted in a businesslike manner. Production is sporadic and difficult to project, and

d) Most artisans do not believe they can increase production.



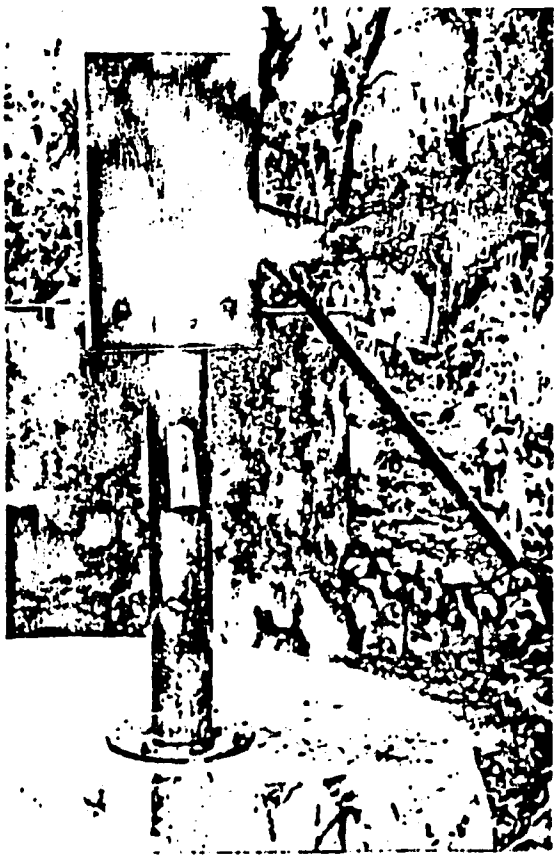
Locally produced Battelle/USAID Pump

Cost: $75.00 for shallow pump
$105.00 for deep well pump



Alternative Brazilian Model

Cost: $250.00 dollars

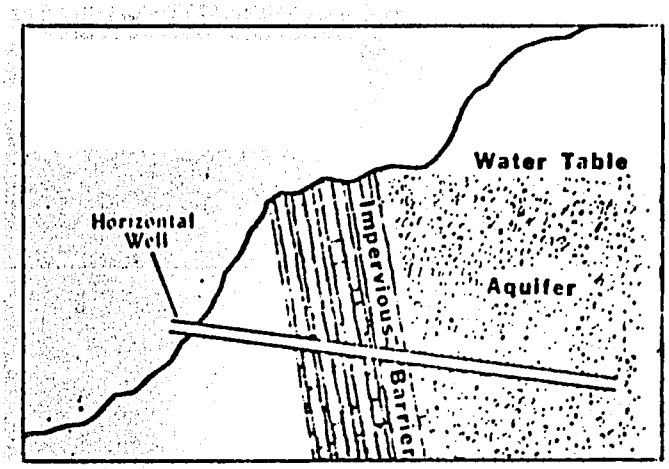


IDRC Wooden Block Pump

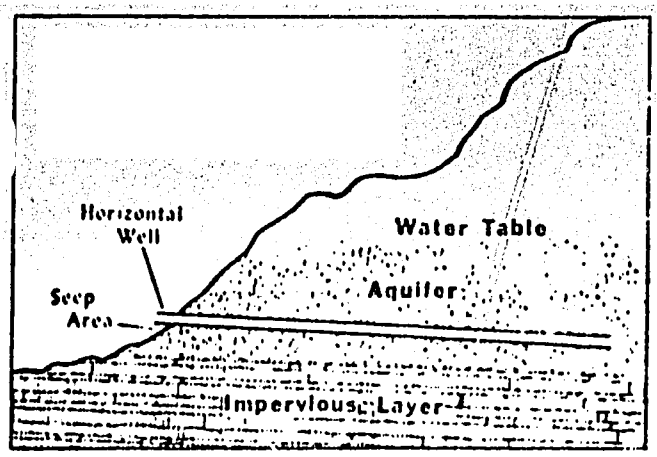
Cost: $25.00 to 50.00 dollars depending on materials

Testing Peace Corps' Pump prior to installation

Cost: $65.00 dollars



Dike spring formation



Contact type of spring formation.

Field engineers from American Ag International (work done by Daniel Gerhardth) designed wells which did not need pumps.

Mr. Caldera stated that the market has a lot to do with the way the producer responds.

EXAMPLE: If a man receives an order of 25 tables to be produced in six weeks and that order is equal to his total work output for the same amount of time, he will most likely be affected by the following process: a) Miss six weeks competition at his traditional market place; b) His competitors may jointly increase production enough to cover his absence and attempt to crowd him out; c) When he enters the market again he will have to fight to regain his position on the market and at a production level perhaps less than his competitors.

A temporary increase in demand does not always represent a benefit to the producer. The internal market he is operating under is usually limited and can be saturated easily, so he makes no attempt to improve production. There is a definite external demand for handicraft products but to get people to increase and maintain production is difficult. Last year, EXPORTEMOS received an order for 50,000 hammocks from West Germany but found national production levels to be about 300 hammocks per month. Needless to say, the order was not filled. Other problems are high cost and unreliable supply of raw materials.

Some ways to help resolve these problems are:

a) Establish a central supply area where products can be purchased on a steady basis from the artisan to insure steady production and sale when conditions are favorable.

b) Hire a promoter to assist in the design and utility of the products being made. The promoter should be able to tell officials or cooperative members what is going on in the world market, what is new, and what can be done.

c) After establishing a strategy the level of technology should be increased to match the expected increase demands.

d) Market the product: An excellent place to enter the world market is on the 85th floor

of the World Trade Center in New York. There the people are accustomed to third world products and understand problems that arise from new operations. The products will receive a lot of exposure to world-wide buyers.

The handicraft industry could become a very positive aspect in a country's economy but it must be developed intelligently.

6. Fondo Especial de Desarrollo (FED)
Special Development Fund

This institution is a semi-autonomous government agency created in April 1972. It is an agent of the Central Bank and implements credit programs to stimulate production and export. It operates through the national banking system. As of December 1977, FED has financed 2,000 projects in industrial development, agro-business, livestock, and development of tourism, valued at 56.7 million dollars.

The director of the small business section of FED, Alvaro Ramírez, stated that small businesses are a possible excellent market for the banking institutes. He described a small business as an organization having fixed assets under $60,000. When questioned about the risk taken by banks to small-account creditors, he stated that losses are not any greater than with larger creditors. Small businessmen know that if they fail to make payments, they won't receive any more credit. Consequently, most loans that are not repaid are because of very strong reasons such as major family problems, natural disaster, robbery, etc...

FED has a line of credit for intermediate credit institutions but does not provide direct credit to small businessmen. People who seek to utilize these funds must go to a participating lending institute which FED supplies. FED received their money from IDB and hopes to renegotiate another loan similar to the one they have now.

A limited amount of technical assistance is available to the small businessman primarily through the Central Bank. It maintains a technical staff of extension agents to assist a potential client. Outreach is limited and concentrated in the Managua area but efforts are being made to expand the radius.

C. Private Sector

1. Nicaragua Machinery Company
José Cardenal V., General Manager

This company handles a variety of agricultural equipment including John Deere and International Harvester. They have one central office located in Managua and two other regional offices. All are full service outlets. Nicaragua Machinery Company has a clientele of about 800 people.

Mr. Cardenal stated that John Deere International offers a small 19 H.P. tractor from Japan but his company does not handle the item because it is not a profitable unit. He listed the following reasons why:

a) Lower profit margin

b) Repair and maintenance costs

Reason: It often takes just as much time to fix the small unit as it does the larger more expensive unit.

c) No established market volume to make it worthwhile to handle the tractor.

The smallest tractor sold is a 50 H.P. diesel John Deere model. It is a good little unit that can plow about 10 manzanas* of land a day.

Nicaragua Machinery Company has sold some tractors to a few cooperatives (80 - 100 H.P. units) but not without problems. Mr. Cardenal claims that the area where they are used most is a little dry, and the people are not familiar with the equipment. Consequently, they made a lot of mistakes in the care and operation of the equipment. It takes a lot of time to train most cooperative personnel in the care and maintenance of the equipment they purchase. Unfortunately, the company does not have a lot of time to offer.

Nicaragua Machinery Co. caters primarily to the cotton grower on the Pacific coast. They pay 40% down

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* A manzana is equivalent to 7,000 sq. meters.

and the company provides two years financing. The most popular units range between 70 - 80 horsepower. Additional customers include:

a) Sugarcane growers,

b) Rice growers, and

c) Cattle ranchers (over 1,000 manzanas).

The Nicaragua Machinery Company at one time agreed to provide mechanic instruction for a small number of young boys (14-16 years) from a vocational training school called INTECNA. It was run by Spanish technicians. These boys used to spend their afternoons at the company shop. It was a two-year program which produced a qualified agricultural mechanic with plenty of practical experience. Mr. Cardenal stated that "it was a productive idea, but we had to stop it because of the high cost factor". The company just couldn't afford to continue the training for free.

2. Huevos San Francisco
Managua, Nicaragua

This is one of the largest egg producing operations in Nicaragua. Located outside Managua, the owner of the company is interested in exploring the possibility of producing methane gas from chicken manure. The gas would be used to provide electricity for his operations. All excess power would be sold to a nearby town.

3. Ingenio San Antonio
Nicaragua, Near the Pacific Coast

This is one of the largest sugar cane processing operations in Central America. They are interested in using the mill and refinery wastes for the production of energy.

4. INCAE - Central American Graduate School of Business Administration

The school has shown an academic interest in the use of wind for power generation. Apart from this, no details are available.

5. Windmills

Use of wind power for water lifting devices can be spotted along the Pacific coast primarily in the cattle raising areas of Nicaragua.

6. Coal and Oil

No known coal deposits have been found in Nicaragua. Oil exploration is still continuing on the east coast. No major oil deposits have been found but investigators are hopeful.

7. Mining Companies
Nicaragua

There are a small number of mining companies operating in the interior of Nicaragua. Three companies are: "La Luz", "La Rosita", and "Bonanza". The principal mineral mined is gold. After being extracted from the ground the gold is processed and flown out to market.

These mining operations represent islands of development amidst an underdeveloped background. They generate their own power for processing the gold and transport all goods, from basic foods to multi-ton mining machinery, themselves. Unfortunately, time did not permit an opportunity to talk with anyone from these companies.

8. Wisconsin - Nicaragua Partners
Ned Wallace, Director
Department of Anthropology,
University of Wisconsin

This group is working on an appropriate technology program concentrated on the Miskito coast of Nicaragua. The program is geared toward improving the health, nutrition and agricultural practices of the inhabitants. A preliminary A.T. investigation was done in October, 1977, written by Tim Burns, entitled "Report on the Evaluation of an appropriate technology program for Cender".

The methodology employed by the group is:

a) Multi-sector approach,

b) Seek simple solutions to problems encountered, and

c) Increase A.T. information linkages to influential community leaders on the east coast of Nicaragua.

The current status of the program is unknown due to political disruptions which are taking place in Nicaragua. The program's main coordinator was a Peace Corps Volunteer. The Nicaragua Peace Corps was terminated in February 1979.

Some of the organizations past accomplishments include: building schools, donating clothing, and providing para-medical training to various individuals in isolated communities.

V. Costa Rica: Activities of various international, national and private institutions that are related to the development of appropriate technology and non-conventional energy sources.

A. International Agencies

1. UNDP/Special OPEC Funds
United Nations

The following activities are scheduled for Costa Rica under the UNDP special OPEC fund contract:

a) Planning and balancing country energy needs,

b) Evaluation and exploration for petroleum in Costa Rica, and

c) Development of alternative energy sources in Costa Rica such as solar energy, biogas and wind power at the National University Engineering School located in San Jose.

For additional details about the U.N. project, contact Alberto Viladrich Morera, Program Coordinator for the United Nations UNDP Central American energy project, Guatemala City, Guatemala.

2. Peace Corps, Costa Rica
Barney Hopewell
Program Officer for Education

Mr. Hopewell is the man who designed the Costa Rica Peace Corps appropriate technology program. The object of the program is to increase technological alternatives for the small entrepreneur. Volunteer specialists were requested from Peace Corps, Washington, D.C. to accomplish this goal.

The program was developed with the Technological Institute of Costa Rica. The Institute was chosen because of its strong interest in the utilization of appropriate technology. The director of DIDET*, Ing. Gustavo Prifer, wanted the volunteers to fill technical gaps and assist in the

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* DIDET is a division of Technological Investigation, Development and Extension within the Institute.

development of an A.T. strategy. It is still too early to tell just what kind of impact the volunteers will have in relation to the development of A.T. at the Institute of Costa Rica, but Mr. Hopewell is optimistic. See Annex I-G for additional details about the individual volunteers participating in the project.

3. Regional Office for Central American Programs (ROCAP)
James Murphrey, Program Coordinator
San Jose, Costa Rica

ROCAP/Costa Rica is not directly involved in any A.T. oriented project. They are monitoring and participating in various research and development projects at IICA and CATIE.

Instituto Interamericano de Ciencias Agrícolas (IICA)

This institution is the agricultural arm for the OAS. Its primary objectives are to promote rural development in all the member countries of OAS through:

a) Teaching,

b) Research,

c) Training, and

d) Consultation.

ROCAP is working with IICA in developing a systematic approach to collecting information in Central America. ROCAP funds are being used for collection and processing of information dealing with soil, topography, climate and socio-economic profiles of each Central American country. The purpose is to standardize information and collection systems in Central America.

The project is not directly related to appropriate technology but data gathered from this project might assist A.T. designers by providing necessary background information about particular sites. : IICA is an excellent scientific research institute oriented towards capital intense study. Funding is primarily from OAS and other international agencies.

Tropical Agriculture Research and Training Center (CATIE)

CATIE is conducting research and training efforts concentrated on assisting the small farmers of Central America by raising their agricultural production. The institution has three divisions called the Agricultural Silvial Pastoral system*:

a) Annual crops and perennial plants,

b) Cattle and small animals, and

c) Renewable natural resource program.

The CATIE library contains 90,000 volumes and 3,000 journal titles. It is considered one of the best in Central America. CATIE does collaborate with ROCAP on various small farmer projects involving new, appropriate farming systems, for small farms, and should be considered a prime collaborator for A.T. agricultural projects in Central America.

B. National Institutions

1. Instituto Tecnológico de Costa Rica
Kent Smith
Peace Corps Volunteer/Information Specialist
Cartago, Costa Rica

The Technological Institute's main campus is located in Cartago, a small city just outside of San José. There are 1,000 students studying at the main campus and 500 more at the two branch schools in San Carlos and San Jose. The functions of the institute are:

a) Teach students technical skills,

b) Perform investigative research, and

c) Provide technical extension to the small businesses of Costa Rica.

Mr. Smith said that the objectives of the research department of the school are:

* Information provided by Steve Indrick, PCV; page 9 of "Cumulative Notes on Technical Orientation for A.T.", Costa Rica Peace Corps, 1978.

a) Identify basic needs of Costa Rica,

b) Adapt technology for Costa Rica, and

c) Develop a stronger national technology base to free Costa Rica from high cost foreign technology.

The Institute's library contains 13,000 volumes with 25,000 volumes to be acquired shortly in all fields of study. There is very little material on appropriate technology. To help compensate, the institute has established an agreement with VITA to provide necessary technical material.

The extension arm of the Institute is the Division of Technological Investigation, Development Extension. It is one of the foremost advocators of appropriate technology in Costa Rica.

2. University of Costa Rica
Engineering School
Ing. Jose J. Chacón, Director
San Jose, Costa Rica

The University of Costa Rica has been experimenting in the utilization of solar energy for five years. One course on solar energy is on the curriculum. It has been offered three semesters with full attendance each session. Some examples of work being performed are:

a) Drying of fruits,

b) Drying of grains, and

c) Experimentation of different food concentrates for industry.

There is some cross-collaboration of activities between the University and the Instituto Tecnológico de Costa Rica.

The examination of wind power as an alternative energy source for Costa Rica is being investigated, but work will halt soon because of lack of funds.

Some activity is being done in the use of biogas as an energy source under the UNDP regional project. UNDP funds are also being used for some of the solar energy research.

Mr. Chacón anticipates the formation of a Costa Rican Solar Energy Association in April, 1979. The association will have a difficult task to perform. It must try and coordinate solar activities around the country in a logical fashion. Central America no longer needs general seminars on non-traditional energy. It needs specific answers to specific problems. The following elements need to be developed in Costa Rica and all Central America:

a) Improved access to relevant information,

b) Increased communication among researchers in homogeneous fields of study, and

c) Promotion of seminars on alternative energy sources where topics have a narrow focus to permit increased absorption of scientific data and less dialog.

Ing. Chacón contends that interest in non-traditional energy sources is on the rise. Unfortunately, however, Mr. Chacón stated that many people from various national and international institutions keep stopping by his office to talk about A.T. but nothing has resulted.

3. Central Bank of Costa Rica
Lic. Maria Cecilia Oconitrillo M.
Sub-Directora
Departamento Crédito Agropecuario

Lic. Oconitrillo stated that the development of a strong productive agricultural sector in any country takes time. In her view, the following list represents problems the small farmer in Costa Rica must overcome:

a) A seasonal market,

b) High profit for the middle man,

c) Saturated internal market of traditional crops, and

d) Lack of easy access to technical assistance.

Lic. Oconitrillo stated that there is plenty of money available for the small farmers. Therefore she does not believe there is a credit shortage but believes that the development of the agricultural sector does need:

a) To establish a stronger agro-industrial sector to stabilize the seasonal market,

b) To improve research to increase farmer production, and

c) Extension: The dissemination of practical agricultural information and assistance should be improved to reach more farmers.

The Ministry of Agriculture's program to increase the production of coffee has reportedly been a successful project. The number of people planting coffee has increased along with higher yields. The bank does collaborate with various agricultural agencies and has some interest in appropriate technology for the small farmer.

4. Ministerio de Agricultura y Ganadería (MAG)
Ing. Willy Loría Martínez
Vice-Ministro de Operaciones
San Jose, Costa Rica

The Ministerio de Agricultura y Ganadería is keeping a low profile on the utilization of low-cost technology for agriculture. Emphasis is placed on developing the use of high capital inputs for agricultural problem solving.

Ing. Willy Loría Martínez claims the three main problems encountered by the small farmer are:

a) Lack of credit: The system needs to be developed to increase its outreach.

b) Saturated internal market: The internal market on traditional crops is static. Costa Rica must develop an external market and crops to sell to that market.

c) Lack of technical assistance: MAG would like to expand its manpower out in the field but is held back by budgetary restrictions.

The coffee promotion project initiated by MAG is considered a successful program. The ministry is recommending, in areas where it is applicable, the planting of coffee. The results have been an increase in coffee

production and number of farmers planting the crop.

Future agricultural development efforts will be in agro-industry, vegetables, fruits, and milk production. Consideration will also be given to developing internal and external markets for farmers.

5. Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT)
Lic. Mariano Ramírez, Executive Secretary
San Jose, Costa Rica

CONICIT is the Costa Rican equivalent to the National Science Foundation in the U.S.A. It began functioning in 1974 and is funded by the government. It is also the NTIS representative in Costa Rica.

The USAID/Costa Rica Mission is negotiating a project that will make CONICIT more active in the promotion of science and technology development. There are provisions in the agreement which will encourage the investigation of non-traditional energy sources and appropriate technology for the rural areas. For additional details contact Dave B. Straley, Capital Development Office, USAID/Costa Rica.

The main objectives of CONICIT are:

a) Promote development of technology,

b) Encourage efficient use of labor,

c) Sponsor Science and Technology oriented seminars, and

d) Provide scientific information to interested parties

The organization works together with the GOCR Planning Department in coordinating and promoting the development of science and technology in Costa Rica.

C. Private Organizations

1. COOPEPINARA, R.L.
Cooperativa de Pequeños Industriales, Artesanos y Artistas, R.L.
José J. Campos, Gerente
San José, Costa Rica

There are over 325 members in COOPEPINARA. They manufacture or produce a variety of products. This includes anything from handicraft items to small generators. The two principal problems of the cooperative are credit and high cost of raw materials.

Credit: Credit is available only to people who own property and have tangible assets. Unfortunately, many of the members working in arts and crafts don't have tangible assets. Also, there is the deluge of red tape and questions that require answering.

EXAMPLE: a) How many units will you sell in the next three years?

b) Show all receipts of items purchased last year

c) What will be your total gross income this year?

The questions and red tape are confusing to many of the members of COOPEPINARA. Members complain that even when all the forms are complete, they still must wait. Most members can't operate their business and are forced to examine other methods of obtaining credit since they lack working capital. Mr. Campos is trying to encourage the banking system to decrease the waiting period and reduce the red tape.

Raw Materials: The mark-up on raw materials in Costa Rica can vary significantly depending on the quantity of materials one buys and where.

EXAMPLE: Mr. Campos showed me the receipts of José F. Hoffmann who manufactures transformers. In 1976 he purchased copper for his company's needs only. Now he purchases the copper from the cooperative which buys it in bulk for all members. The results are a substantial savings for everyone.

The cooperative is attempting to lower raw material costs for members by purchasing in bulk and ordering material directly from the suppliers.

COOPEPINARA is expanding and is confident that problems can be resolved if they work together.

2. Worldtech Costa Rica, S.A.
Apartado No. 488, Centro Colón
San Jose, Costa Rica

This organization has offices located in the U.S.A., Colombia, Canada, Guatemala, Israel, India and Costa Rica. The group offers consulting services on a wide variety of A.T. oriented subjects and is beginning to solicit contracts in Costa Rica.

D. Private Sector

1. FACO, Apartado 1766
Juan P. Vasquez,
San José, Costa Rica

Mr. Juan P. Vasquez is the Regional Manager for FACO, a company that sells small motors and equipment. Mr. Vasquez has over 20 years experience with John Deere and has participated in a few AID vocational training programs in South America.

Mr. Vasquez stated that the problem facing many rural residents is that their standard of living is lower than their urban counterparts. Hence, there are a lot of people who want to leave the rural area and migrate to urban areas. Many vocational training programs over-train prospective rural candidates on what they need to know about doing particular tasks. The candidates can't keep up or, after completion of the course, he soon leaves his rural setting for better wages in the city. For example, a tractor driver needs to know a few basic rules about operating and maintaining a tractor. He doesn't have to know how the piece operates. Emphasis should be placed on heeping the training material simple and practical. Problems arise when the courses become too complicated.

Mr. Vasquez believes that the private sector and public sector can work together in the transfer of technology. Dialogue must be encouraged so that particular constraints on both sides are undersood and resolved.

2. FERTICA, S.A.
Ing. Carlos M. Ortiz
Supervisor of Area Sales
San Jose, Costa Rica

FERTICA maintains 500 agro-distributors all over Central America and Panama. This includes 23 storage and regional branch offices providing additional support to the distributors. The company has traditionally sold to both large and small farmers and has participated in various governmental and international fertilizer experiments throughout the region.

Mr. Ortiz outlined the following problems encountered by "campesinos" in Central America:

a) Lack of knowledge about available products,

b) Directions written on the labels for correct dosage applications are not followed,

c) Not familiar with certain problems and use of wrong chemicals.

He feels that some of these difficulties can be improved if the government continues to visually demonstrate to farmers what effects are produced with correct usage of fertilizers and pesticides.

FERTICA, S.A. is in the process of reorganizing its distribution structure. There will be a considerable reduction in staff and territorial office outreach. The net result will be a lower overhead with fewer distributors in each of the Central American countries.

3. Talleres Industriales Carazo, S.A. (TIC)
San Jose, Costa Rica

The factory is equipped with a small capacity foundry for melting bronze, aluminum, and cast iron. The foundry includes a core molding facility for the manufacture of various parts.

The machinery is from Germany, Taiwan, England, Spain, Costa Rica and U.S.A. The equipment includes vertical and horizontal milling machines, lathers, drill presses and special purpose cutting machines. The principal product of the factory is "molinos" for sugar mills.

TIC represents the type of Central American company that might be enticed into manufacturing A.T. oriented implements. They are a small manufacturing company selling to the regional markets located in Central America.

4. Mr. Carlos Front*
Barrio La Uruca
San Jose, Costa Rica

Mr. Front owns a small business that sells generators, welders, water tanks, etc. He also carries a line of specialty equipment which includes some appropriate technology implements.

EXAMPLE: a) Windmills: Circa 1910 manufactured in Ohio, U.S.A.
Cost: $3,529.40
Includes tower and pump

b) Ram Pumps: These small units list price for about $300.00

5. Tablacel, S.A. Maderas Aglomeradas
San Joaquín de Flores*

This factory does not practice low-cost technology but does make use of a natural resource which is currently under utilized in Costa Rica. The product is wood wastes from local saw mills.

Production: 20,000 m^3/year of panels of particle board

Investment: Three million dollars

Machinery : German, Wurtex

Technology: Swiss

Employees : 75

Sales : Two million dollars annually

Product : Medium density particle board panels of varying densities. Generally suitable for structural use.

Process : Wood is chopped, sorted to size, dried to 2-4% , mixed with an urea resin "formal", laid out in sheets, pressed, trimmed, finished, and sold

*Information is taken from Peace Corps, Costa Rica "Cumulative Notes on Technical Orientation for Appropriate Technology", Summer 1978.

ANNEX I

ANNEX I-A

NTIS COOPERATING AGENCIES IN CENTRAL AMERICA

List I - Agencies with Operational Agreements as of July 10, 1978

GUATEMALA

Instituto Centroamericano de Investigación y Tecnología Industrial (ICAITI)
Documentation and Information Division
Avenida la Reforma 4-47, Zona 10
Apartado Postal 1552
Guatemala City

Instituto Técnico de Capacitación (INTECAP)
12 Calle y 4a. Avenida, Zona 1
Guatemala City

EL SALVADOR

Centro Nacional de Productividad
Information Department
Avenida España 732
San Salvador

HONDURAS

Universidad Nacional Autonoma de Honduras
Centro de Información Industrial
Tegucigalpa

NICARAGUA

Banco Central de Nicaragua
Centro Nicaraguense de Información Tecnológica (CENIT)
Apartado 2252 Banco Central
Managua

COSTA RICA

Consejo Nacional de Ciencia y Tecnología (CONICIT)
Apartado Postal 10318
San Jose

PANAMA

Centro para el Desarrollo de la Capacidad Nacional en la Investigación (CEDICANI)
University of Panama
Panama City

ANNEX I-B

Instituto Centroamericano de Investigación y Tecnología Industrial
(ICAITI)

RESUMEN DE PERSPECTIVAS DE ACTIVIDADES
PARA EL AÑO 1979

Guatemala, 9 de noviembre de 1978

RESUMEN DE PERSPECTIVAS DE ACTIVIDADES PARA EL AÑO 1979

Introducción

Además de la continuación de los proyectos que se contrataron en el año 1978, cuya finalización se prevé para el año 1979, y de los servicios tradicionales que presta el ICAITI, tales como control de calidad, análisis, normalización, información, etc., cabe señalar las áreas de trabajo que se enumeran a continuación. Los proyectos específicos que se indican se encuentran en diversas etapas de negociación. A estas alturas es sumamente difícil predecir con certeza qué proyectos (salvo los ya contratados) serían puestos en marcha a partir de 1979. Con estas salvedades, la lista que se presenta a continuación depara una panorámica relativa a estos nuevos proyectos, sin excluir, desde luego, que en el curso del año pudieran presentarse nuevas posibilidades que no hayan sido anticipadas. Esta lista comprende, entre otros, los siguientes proyectos:

1. Alcohol etílico para carburante — Central American Development Bank

Se trata de la puesta en práctica de los proyectos relativos a la utilización de alcohol etílico para carburante mezclado con la gasolina para vehículos automotores. Este programa de trabajo tiene dos vertientes complementarias que no están relacionadas entre sí, pero que sería muy deseable que ambas pudieran ser llevadas a la práctica:

a) Estudios de factibilidad para la realización del concepto del diseño único para Centroamérica

b) Estudios de investigación para mejoramiento del proceso industrial para la producción del alcohol.

Aunque no para combustible, pero sí derivado del alcohol etílico, es posible que se continúen los estudios, a nivel de factibilidad, para la conversión de este alcohol en etileno y así suplir con la materia prima básica a la industria petroquímica en Centroamérica.

2. Contaminación ambiental metropolitana ROCAP
German Government

Se trata de lograr obtener la línea básica de contaminación ambiental en las cinco áreas metropolitanas de Centroamérica en lo respectivo a residuos sólidos, agua potable, aire, ruido, vibraciones, a fin de sentar las bases para la legislación y futuras reglamentaciones en forma unificada para toda Centroamérica.

3. Pulpa y papel a partir de los desperdicios de banano OPEP

Los experimentos de laboratorio para la utilización de los desperdicios del banano, como fuente de materia prima para la elaboración de pulpa para papel, han dado resultados muy promisorios y, por lo tanto, se espera poder llevar a la práctica en el curso de 1979 el proyecto de establecimiento de una planta piloto para este propósito.

4. Aspectos de contaminación ambiental por control integrado de la mosca del Mediterráneo FAO

La invasión de la mosca al área Centroamericana forzará a la utilización de insecticidas con la esperanza de que pueda hacerse dentro de un con-

cepto de control integrado. A fin de poder seguir de cerca los efectos ambientales que ello pueda traer, se espera poder iniciar en 1979 un programa relativo a este importante tema.

5. Programa de transferencia de tecnología — ROCAP
Status: on-going project

En el año 1979 se incrementará y ampliará el programa de transferencia de tecnología que en forma inicial se ha venido desarrollando en el área Centroamericana. Un componente importante de esta ampliación es el enfoque hacia actividades relacionadas con la pequeña industria.

6. Tecnología Apropiada — Interamerican Development Bank
Status: signed

Se espera durante el curso del año 1979 entrar a la Fase II del programa de tecnología apropiadas que contempla la construcción de prototipos para evaluar su factibilidad de su introducción a Centroamérica. Dentro de este programa se espera que al menos los cuatro siguientes proyectos puedan ponerse en marcha:

- Producción de combustible a partir de desperdicios agrícolas
- Utilización de secadores solares para la conservación de granos
- Utilización de pulpa de café como forraje y/o abono orgánico
- Purificación de agua para consumo humano por medio de filtros domésticos

7. Energías no convencionales ROCAP

Se espera poder tener la oportunidad de iniciar un proyecto de evaluación que permita determinar la posibilidad de introducción en Centroamérica de energías no convencionales tales como:

- Eólica
- Hidráulica en pequeña escala
- Carbón vegetal por pirólisis de desperdicios de campo de las cosechas mayoritarias
- Celdas fotovoltaicas para zonas rurales remotas, etc.
- Otros

8. Laboratorio textil centroamericano INTECAP
Chamber of Industry

Por arreglos que se están haciendo en el Instituto de Productividad (INTECAP) de la República de Guatemala, se espera poder incrementar las facilidades físicas del laboratorio textil, actualmente en operación en el ICAITI, y poder ofrecer a Centroamérica una más amplia gama de servicios de control de calidad en el área textil.

9. Laboratorios aduaneros SIECA

Dependiendo de las resoluciones que finalmente adopten los países para la puesta en marcha de un programa uniforme de operación de los laboratorios

aduaneros, el ICAITI podría prestar el servicio técnico que implica la utilización de sus laboratorios ya existentes y en operación para contribuir con un servicio de referencia, de arbitraje, de asesoría, y de mecanismo de mantenimiento de un sistema uniforme para la operación de los laboratorios en cada país.

10. Oportunidades de industrialización de recursos disponibles en las zonas rurales de menor ingreso en Centroamérica

Interamerican Development Bank Status: signed

Cubriendo dos aspectos que hasta el presente no se han atendido de modo suficiente, la evaluación de recursos físicos y la asistencia a la posible promoción de actividades, se está gestionando la asistencia financiera para desarrollar un programa orientado exclusivamente hacia las zonas rurales más deprimidas. En concreto, se atenderían los aspectos siguientes:

- Analizar la situación económica de los medios rurales y jerarquizarlos en función de sus niveles de ingreso; investigar los posibles recursos factibles de ser puestos en explotación o suceptibles de admitir una mayor agregación de valor a través de industrializaciones que pudiesen efectuarse con recursos físicos y/o humanos de la zona; el establecimiento de proyectos industriales para las oportunidades identificadas, y finalmente, diseñar y poner en operación los mecanismos de promoción que permitan pasar de los correspondientes estudios de inversión a realidades operativas.

11. Sensores remotos Interamerican Development Bank

El Banco Interamericano de Desarrollo (BID) otorgó a los países

centroamericanos fondos no reembolsables para un proyecto sobre el uso de las técnicas de sensores remotos (o teledetección) para la evaluación de recursos naturales. En el convenio respectivo se prevé que el ICAITI como institución subregional estará informada de los resultados del proyecto. Por este motivo funcionarios del ICAITI se han mantenido en contacto con el Director del Proyecto, Ing. Ricardo Isla.

El énfasis del proyecto ha sido el de entrenar profesionales de diversas disciplinas en las técnicas de teledetección.

El proyecto terminará en enero de 1979 y existe interés tanto de parte del BID como del ICAITI en que se negocie una nueva fase, no sólo con proyectos a nivel nacional, sino también a nivel regional.

Uno de estos podría ser la elaboración del mapa geológico de América Central a escala 1:1 000 000. El ICAITI en 1969 publicó el mapa metalogenético a escala 1:2 000 000. Posteriormente efectuó una compilación a 1 000 000 que cubre parte de México, todo el territorio centroamericano y una pequeña parte de Colombia. Por falta de fondos ese mapa no se pudo actualizar ni publicar. Con base a la compilación existente y la información de sensores remotos, se podría elaborar un mapa actualizado a una escala que podría ser útil para diversos usos prácticos, tales como prospección de recursos minerales, petróleo y planificación física regional.

12. Recursos minerales de Costa Rica

Durante una reunión en que participaron el Segundo Vicepresidente de Costa Rica, Lic. José Miguel Alfaro, el Ministro de Economía Industria y Comercio, señor Fernando Altmann, el Presidente de CODESA, señor Richard Beck, el Presidente de RECOPE, Licenciado Fernando Ortuño, y el Director y el Gerente del ICAITI, se discutieron diversos asuntos respecto a que las entidades gubernamentales de Costa Rica hicieran mayor uso de los servicios del ICAITI. Se concretó un primer posible programa sobre recursos minerales que sería financiado por CODESA y RECOPE. Posteriormente el ICAITI hizo una propuesta preliminar para discusión, y actualmente un experto de ICAITI está elaborando con funcionarios de CODESA los términos de referencia para una serie de actividades específicas de evaluación de recursos minerales.

13. Programa energético centroamericano del PNUD

Status: project in progress

Como resultado de una de las resoluciones del Comité de Cooperación Económica del Istmo Centroamericano celebrada en mayo de 1975, el ICAITI colaboró con CEPAL y SIECA en la preparación de los términos de referencia para un estudio regional de recursos energéticos. En esa oportunidad el PNUD no pudo financiar el estudio.

Posteriormente el PNUD con apoyo financiero de la OPEP, formuló un proyecto diferente, el cual ha sido aprobado por los países centroamericanos. En el proyecto se prevé la colaboración del ICAITI como "Organismo Regional Asociado", además se han tenido conversaciones con el Director del Proyecto, Ing.

Viladrich para posible contratación del ICAITI en la ejecución de algunas de las actividades específicas.

14. Comisión guatemalteca de normas

Está pendiente de aprobación, con el Gobierno de Guatemala, un proyecto de asesoría del ICAITI a la Comisión Guatemalteca de Normas (COGUANOR) a efecto de colaborar con esta Institución en los aspectos técnicos relativos a la preparación de las normas y así poder introducir adicionalmente (precisamente por la colaboración de ICAITI) el concepto de regionalización para que las normas guatemaltecas sean semejantes a las de los otros países centroamericanos.

15. Grupo Asesor de Proyectos Industriales

De acuerdo con lo solicitado por el Banco Centroamericano de Integración Económica, se participará, durante el tiempo que sea necesario, en el Comité Consultivo de Instituciones Subregionales de Integración que actuará dentro del esquema operativo previsto, para llevar a cabo las tareas de identificación y preparación de proyectos de interés subregional, según Convenio sobre cooperación técnica no reembolsable entre el referido Banco Centroamericano y el Banco Interamericano de Desarrollo.

ACTIVIDADES DE CARTERA/
CARTERA AGROINDUSTRIAL (US$ 000)

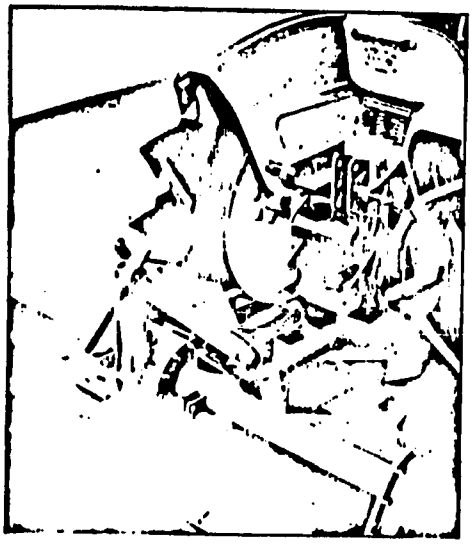
ANNEX I-C

Company Compañía	Purpose/Proprietario	Equity Capital	Financial Investment	Total
COLOMBIA				
Productos Agrícolas de Exportación Ltda.	Flowers/Flores	—	250.0	250.0
***COSTA RICA**				
Alimentos de Costa Rica, S.A.	Rice Milling/Molino de Arroz	—	230.0	230.0
American Flower Corporation	Flowers/Flores	—	62.5	62.5
Banco de Costa Rica	Agriculture/Agricultura	—	500.0	500.0
Banco de Crédito Agrícola de Cartago	Various/Varias	—	500.0	500.0
Central American Meats, S.A.	Slaughtering/Matanza	231.0	167.0	398.0
Follaje Inc., S.A.	Farm/Follaje	—	15.0	15.0
Frigoríficos Técnicos, S.A.	Frozen Foods/Alimentos Congelados	—	186.7	186.7
Ganadera Chiquita, S.A.	Cattle/Ganado	—	4.8	4.8
Ganadera San Jerónimo S.A.	Rice/Arroz	—	750.0	750.0
Hacienda La Trampa, Ltda.	Dairy Cattle/Ganado Lechero	—	600.0	600.0
Hacienda Las Delicias S.A.	Cattle/Ganado	—	500.0	500.0
Inversiones Corobici S.A.	Cattle/Ganado	—	600.0	600.0
Karajeke, S.A.	Cattle/Ganado	—	400.0	400.0
Retuelo Prieto S.A.	Wood Furniture/Muebles de Madera	—	240.0	240.0
Rico Tico Alimentos S.A.	Specialty Foods/Alimentos Preparados	—	50.0	50.0
Tenería Gisa S.A.	Tannery/Tenería	—	400.0	400.0
DOMINICAN REPUBLIC				
Stefanutti-Hormel, S.A.	Meat Processing/Procesamiento de Carne	—	450.0	450.0
Financiera Agroindustrial, S.A.	Agriculture/Agricultura	—	700.0	700.0
*** EL SALVADOR**				
Avícola Salvadoreña, S.A.	Chickens/Pollos	—	30.0	30.0
Financiera de Desarrollo e Inversión, S.A.	Farm Equipment/Equipo Agrícola	—	500.0	500.0
Financiera Salvadoreña S.A.	Farm Equipment/Equipo Agrícola	—	500.0	500.0
Quiñonez Hermanos S.A.	Frozen Foods/Alimentos Congelados	—	400.0	400.0
*** GUATEMALA**				
Agrícola La Primavera S.A.	Vegetables/Hortalizas	—	14.0	14.0
Agropecuaria El Naranjo Ltda.	Cattle/Ganado	—	60.0	60.0
Alimentos Congelados Montebello S.A.	Frozen Foods/Alimentos Congelados	—	494.0	494.0
Arrocera Los Corrales y Cía, Ltda.	Rice Milling/Molino de Arroz	—	500.0	500.0
Comercial Agrícola El Escobillo, S.A.	Agriculture/Agricultura	—	150.0	150.0
Compañía Comercial e Industrial de Supermercados S.A.	Supermarket/Supermercados	—	55.0	55.0
Compañía de Distribución Centroamericana S.A.	Food Distribution/Distribución de Alimentos	—	168.8	168.8
Conservas de Centroamérica S.A.	Canned Foods/Alimentos Enlatados	—	400.0	400.0
Desarrollo Ganadero Chiquibul, S.A.	Cattle/Ganado	—	800.0	800.0
Industrias Tropicales S.A.	Rubber Processing/Procesamiento de Hule	—	400.0	400.0
Jardines Mil Flores S.A.	Seeds/Semillas	—	76.5	76.5

AS OF OCTOBER 31, 1977 A OCTUBRE 31, 1977

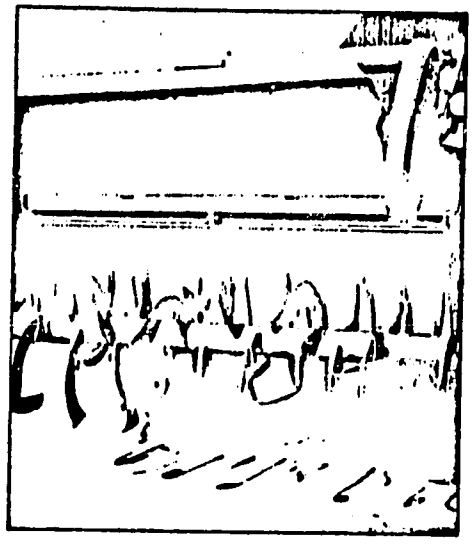
Company Compañía	Purpose Propósito	Present Holding [illegible] Equity Capital	Loan Préstamo	Total
Las Flores S.A.	Flowers Flores	—	82.6	82.6
Los Pinos S.A.	Mushrooms Hongos	—	11.6	11.6
Manuel Roldo Ochoa e Hijos	Rubber Hule	—	150.0	150.0
Neil Porter P.	Cattle Ganado	—	75.0	75.0
Productos Alimenticios Grandel y Alpina S.A.	Meat Processing Procesadora de Carne	—	96.4	96.4
Promotora Agrícola Básico de Guatemala S.A.	Vegetables Hortalizas	—	48.0	48.0
Remote Sensing Engineering Ltd.	Aerial Surveying Aero Fotogrametría	—	60.0	60.0
Santa Lucrecia S.A.	Cattle Ganado	—	286.4	286.4
HAITI				
[illegible] Nationale S.A.	Canned Food Alimentos [illegible]	—	10.0	10.0
[illegible] Agricole S.A.	Agriculture Agricultura	—	61.0	61.0
[illegible] Tractor & Equipment Co. S.A.	Farm Equipment Equipo Agrícola	—	200.0	200.0
*** HONDURAS**				
Agrícola de Honduras S.A. de C.V.	Vegetables Hortalizas	—	265.9	265.9
A[illegible] Agrícola S.A. de C.V.	Ag[illegible] Productos Para [illegible]	—	27.8	27.8
Banco Financiera Hondureña S.A.	[illegible]	—	500.0	500.0
[illegible] La Capitalizadora S.A.	Agri[illegible]	—	327.3	32[illegible]
Compañía Agrícola Industrial Ceiba[illegible] S.A. de C.V.	[illegible]	250.0	—	25[illegible]
Compañía Azucarera Hondureña S.A.	Sugar [illegible]	—	50[illegible]	50[illegible]
Empacadora de Carnes Carnilandia S.A. de C.V.	Slaughter[illegible]	—	6[illegible]7	[illegible]
Fomento Internacional S.A. de C.V.	Financial Services [illegible]	50.0	71.4	12[illegible]
International Wood Products S.A. de C.V.	W[illegible]	2[illegible]	6[illegible]	2[illegible]
Leche y Derivados S.A.	Dairy Products [illegible]	—	25[illegible]	25[illegible]
Mejores Alimentos de Honduras S.A. de C.V.	Food Processing [illegible] de Alimentos	—	409.5	40[illegible].5
Fábrica de Muebles Contessa S. de R.L.	Wood Furniture Muebles de Madera	—	500.0	50[illegible]
MEXICO				
P[illegible] de Sinaloa S. de R.L.	Hog Fattening Engorde de Cerdos	—	94.1	9[illegible]
*** NICARAGUA**				
Agrícola San Enrique S.A.	Cattle [illegible]	—	300.4	300.[illegible]
Atlantic Coast Chemical Company S.A.	Naval Stores [illegible]	—	41.5	[illegible]
Enrique [illegible] y Sucesores	[illegible] de Ajo [illegible]	—	300.0	300.0
Haciendas Ganaderas S.A.	Cattle Ganado	—	44.4	4[illegible]
Hielera Siqueira S.A.	Ice Production Producción de Hielo	—	77.8	77.8
Instituto de Fomento Nacional	Vegetables Hortalizas	—	500.0	500.0
Mayorga Hidalgo y Compañía	Agriculture Agricultura	—	400.0	40[illegible]
Productos Sanitarios de Nicaragua S.A.	Cotton Products Productos de Algodón	200.0	200.0	40[illegible]
PANAMA				
American Flower Shippers Inc.	Flowers Flores	50.[illegible]	—	50.0
[illegible] Industriales [illegible] S.A.	Eggs Huevos	—	2[illegible]	2[illegible]
TOTAL		[illegible]	[illegible]	[illegible]

QUE DIFERENCIA TIENE HINOMOTO COMPARANDO CON LOS OTROS!



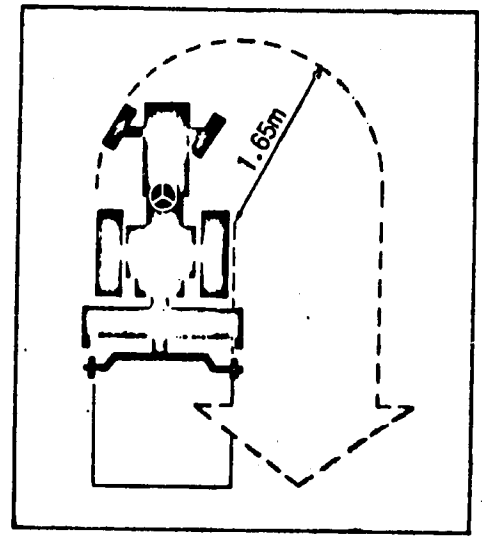
■Sistema de acoplamiento de un solo toque, para su rapido enlace y desenlace

Retrocediendo simplemente su tractor hasta el implemento requerido, se conectan la barrilla de levantamiento y unión universal sin herramientas ni problema alguno.



■Uñas rotatorias de máximo rendimiento

Uñas rotatorias tan originales de Hinomoto aseguran a su acabado perfecto con su mayor ancho laborado.



■El mecanismo de volante ó timón de Hinomoto como único.

Frecuentes enfrenamientos no se requieren mayor problema pués las ruedas delanteras pueden gírarse en un ángulo más agudo sin rastrillar. El uso de las llantas de orejas altas incrementa su maniobrabilidad y eficiencia.

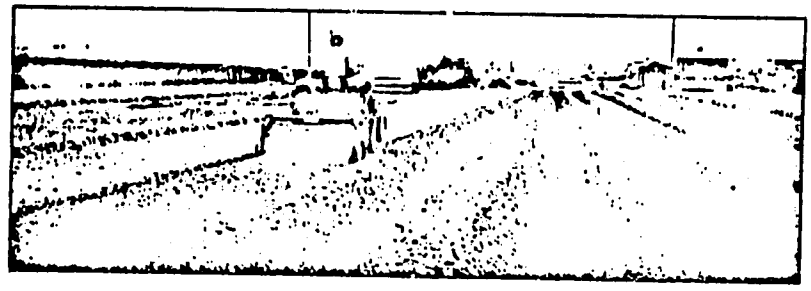
■**Especificaciones (E18)**

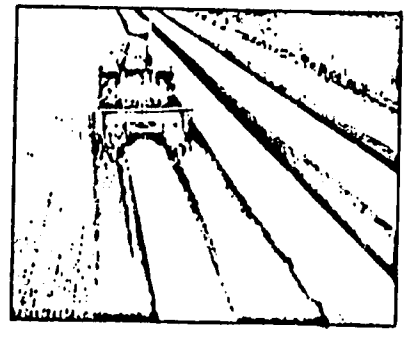
(Sujeto a cambio sin previo aviso).

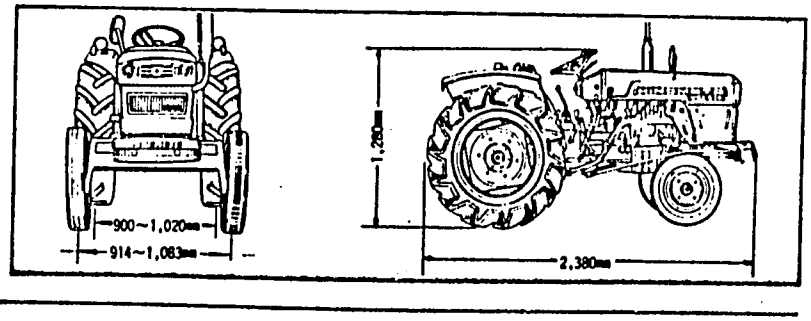
Tipo de motor	Diesel
HP Máximo (SAE)/rpm	20/2.300
Sistema de enfriamiento	Con agua
No. de cilindros	2
Calibre x carrera de embolo	86 x 95
Desplazamiento total (cc)	1,103
Bomba de inyección	Bosh tipo-A
Limpiador de aire	Centrifuga o ciclón de tipo seco
Arranque	1.4KW
Sistema de embrague	Tipo seco, de placa simple y de fricción
Veloudad de operación (Adelante)	6 veloudades
Veloudad de operación (Reverso)	2 veloudades
Radio mínimo de giro (mm)	1.650
Sistema de diferencial	Engranaje cónico
Trabador de diferencial	Trabador de EJE
Ancho entre ruedas (Delanteras)	914 ~ 1,083mm
Ancho entre ruedas (Traseras)	900 ~ 1,020mm
Llantas (Delanteras)	4.00 – 12, 4PR
Llantas (Traseras) – Orejas altas	8.3/8 – 24, 4PR
Llantas (Traseras) – Orejas bajas	8.3/8 – 24, FSLW, 4PR
Longitud total (mm)	2.380
Ancho total (mm)	1.130
Altura total (mm)	1,280 (Hasta volante)
Base de ruedas (mm)	1,345
Espacio libre de la tierra (mm)	290
Peso (kgs)	720
Neloudad P.T.O.	3 velocidades
Sistema hidráulico	Control de posición
Bomba hidráulica	Bomba rotativa de engranajes
Dispositivo de levantamiento	Enganche de tres puntos, cat-1.

■**(VELOCIDAD DE RECORRIDO)** Km/Hr.

	1	2	3	4	5	6
Adelante	1.03	1.7	2.6	4.6	7.5	13.5
Atrás	2.4	10.7				







TOYOSHA CO. LTD

ANNEX E

MONOGRAFIA NACIONAL DE NICARAGUA

PARA LA

CONFERENCIA DE NACIONES UNIDAS

SOBRE CIENCIA Y TECNOLOGIA PARA EL DESARROLLO, 1979.

R E S U M E N

DIRECCION DE PLANIFICACION NACIONAL
División de Investigaciones Económicas y Sociales
Unidad de Ciencia y Tecnología.

Managua, Noviembre de 1978.

R E S U M E N

1. La Monografía Nacional que Nicaragua preparó para la Conferencia de las Naciones Unidas sobre Ciencia y Tecnología para el Desarrollo, examina algunos aspectos de la experiencia nacional en la aplicación de la ciencia y la tecnología; discute las áreas de Ciencia y Tecnología que han influído o podrían hacerlo en el desarrollo y las características principales de los problemas que éste plantea. Asímismo, suministra los antecedentes de Nicaragua en este campo y la organización y metas Científicas y Tecnológicas en el país. También, plantea la necesidad de una infraestructura de científicos y tecnólogos capacitados para adecuar y adoptar el uso y difusión de Ciencia y Tecnología.

2. En la elaboración del documento se contó con la participación de profesionales de entidades públicas y privadas, académicos y ciudadanos con intereses en aspectos científicos y tecnológicos, quienes al conocer los objetivos de la Conferencia, aunaron esfuerzos con la finalidad de que el contenido del Documento reflejara la realidad científico-tecnológica nacional y su vinculación con el desarrollo del país.

3. En el documento se analizan algunos aspectos relevantes del estado actual de la economía nicaragüense, relacionados principalmente con los sectores agrícola, industrial, salud y nutrición, comunicación y transporte, energía y recursos naturales y su relación específica en cuanto a Ciencia y Tecnología. También se describe ampliamente la situación actual de la Ciencia y Tecnología en el país mencionando casos en los cuales ha prestado colaboración, como la prevención de desastres naturales; siendo este aspecto de sumo interés para el país, ya que hemos sido víctimas de múltiples movimientos sísmicos que han ocasionado grandes pérdidas, de vidas humanas y materiales. De igual manera se destaca la relevancia de la ciencia y la tecnología en los sectores "salud y energía".

4. En Nicaragua, la utilización de la ciencia y la tecnología como instrumento de desarrollo no ha sido satisfactoria probablemente por la ausencia de una política y planificación científica y tecnológica explícita que orientara los esfuerzos realizados, en este campo, hacia el logro de las metas y objetivos de los planes nacionales de desarrollo económico y social a pesar de que en algunos sectores, se ha explícitado la necesidad de utilizar el conocimiento científico y tecnológico, como elemento dinamizante del desarrollo.

5. El análisis de la situación actual de la ciencia y la tecnología deja entreve que: i) no se han utilizado racionalmente los escasos recursos científico-tecnológicos del país; ii) los esfuerzos realizados por el gobierno no parecen ser adecuados para obtener óptimos resultados en la aplicación de los factores ciencia y tecnología; iii) la vinculación entre los sectores productivos y dichos factores, no está claramente definida y iv) hay necesidad de recursos humanos altamente calificados en los centros de Investigación y Desarrollo. Debido a la falta de divulgación e información tecnológica, a nivel centroamericano, no se aprovecha la existencia de instituciones que ejecutan actividades científico-tecnológicas.

6. La primera acción dirigida a explicitar ciencia y tecnología como factores dinámicos del proceso de desarrollo, sería la realización de un Seminario Nacional sobre Ciencia y Tecnología con énfasis en tecnología apropiada para Nicaragua, en el cual participarían las instituciones que integran la comunidad científico-tecnológica local. El principal objetivo del Seminario sería conocer el estado en que se encuentran los diferentes sectores en relación con el actual desarrollo del país y las dificultades encontradas para el logro de los objetivos nacionales que se persiguen, para ver de qué manera Ciencia y Tecnología pueden contribuir a su solución.

7. Posteriormente, se crearía la Comisión Nacional de Ciencia y Tecnología (interinstitucional e interdisciplinaria) que se encargue de orientar, coordinar y supervisar las acciones relacionadas con los aspectos científico-tecnológicos considerados fundamentales para el desarrollo. Esta Comisión, unida a la Dirección de Planificación Nacional, se encargaría de elaborar la Política y Planificación de la Ciencia y Tecnología del país, debiendo considerar la participación de la comunidad científica, pública y privada.

8. Además fortalecer la Unidad de Ciencia y Tecnología de la Dirección de Planificación Nacional, la que se encargaría de los aspectos operativos de la coordinación y supervisión del proceso científico y tecnológico en el cual el Gobierno haya depositado sus esperanzas de progreso económico-social. Además servirá de enlace con todos los organismos subregionales, regionales e internacionales, vinculados con la ciencia y tecnología, para el mejor uso de la asistencia técnica y financiera que puedan brindarnos para actividades desarrolladas en este campo a nivel local.

9. En vista de la importancia de la Conferencia, el Gobierno de Nicaragua ha depositado todo su empeño en la preparación de su documento y espera que los resultados que de ella surjan, sean de gran beneficio para todos los países del orbe.

10. Nicaragua asistirá a la Conferencia animada del propósito de que en ella se logren encontrar soluciones internacionales apropiadas a los principales obstáculos que enfrentan los países en desarrollo para fortalecer y ampliar la base de su desarrollo científico y tecnológico y acelerar su evolución socio-económico.

11. Es de sumo interés para el país que en la Conferencia sean considerados los principios que están dando origen al Nuevo Orden Económico Internacional, integrando los aspectos científicos y tecnológicos como elementos impulsores del desarrollo económico y social.

12. Nicaragua estima necesaria la aprobación de un Código de Conducta para la Transferencia de Tecnología procurando que éste establezca las reglas de intercambio y cooperación equitativa y proteja así los intereses de países en desarrollo. También se desea que en la Conferencia se discuta el comportamiento de las Empresas Transnacionales, depositando nuestro entero apoyo a la formulación de un Código de Conducta de tales empresas que considere las necesidades del desarrollo económico y social de los países en desarrollo.

13. De igual manera, sugerimos el establecimiento de un Fondo Internacional para el Desarrollo Tecnológico que cumpla con el objetivo de fortalecer la capacidad propia de desarrollo científico-tecnológico de países en desarrollo. Este fondo financiaría las actividades de investigación y desarrollo tecnológico e impulsará la cooperación técnica entre esos países.

14. Finalmente, se insta a la Organización de las Naciones Unidas que revise su política de cooperación técnica principalmente en relación a Ciencia y Tecnología, y sugerimos el establecimiento de un mecanismo que coordine las actividades de la ONU en ese sentido, para beneficio de los países en vías de desarrollo.

A LOW COST
Grain Dryer
FOR TROPICAL CLIMATES

by Wesley Peterson PCV/Dahomey

In West Africa corn (maize) usually matures in late summer but, because of rain, does not dry sufficiently for harvesting until a month later. It is during the weeks that the mature grain remains in the field that extensive insect damage begins. An effective grain-drying system is therefore especially needed so the grain may be harvested before that damage beings, but while the moisture content remains high.

The unit described in Wes Peterson's article is not a prototype. It has been used extensively during the past four years in Nigeria, Togo, and Dahomey. Wes' design includes modifications on the original plan and should be applicable to any humid tropical area.

In tropical climates, there are two important problems in the storage of cereal grains such as corn, rice and sorghum and legumes such as peanuts and beans. Due to the high humidity during both the harvest and the storage of these products, there is great danger of in-storage losses to rotting and fungi. In addition, moisture damage is usually compounded by losses to storage pests such as insects and rodents. If the farmer can dry his harvested grains prior to storage his losses will be considerably reduced because dry grain will not rot. In addition, drying will reduce insect damage in four ways. First, it generally drives off and kills insects present in the grain. Second, dried grain is harder and therefore less susceptible to insect attack. Also, drying permits the farmer to harvest his still humid crop before there has been substantial insect damage in the field, rather than waiting to harvest until the grain has been slightly dried by the sun and wind. Finally, dried grain may be stored in sealed, air-tight containers, silos or storage bins which effectively protect the grain from insect and rodent attack, but which cannot be used to store moist grains.

Thus, drying crops is an important means of reducing in-storage losses. In many parts of the world, sun drying of crops is practiced, but this process is slow, rather impractical for large quantities of grain and may not be possible at certain seasons of torrential rains. These facts point to the need for a means of artificially drying grain. Obviously, in many regions it is impossible to utilize the expensive mechanical systems commonly found in the United States.

The small low-cost crop dryer described here can be used to dry rice, corn, sorghum and any other cereal grain as well as beans and peanuts. It was first developed by USAID in Nigeria to respond to the need of small farmers for a low-cost drying mechanism for relatively small amounts of grain. Skilled labor is not needed to build the dryer and many of the materials may be found around the construction site. It is impossible to give an exact cost analysis since the prices of the materials may vary enormously. The cost in Dahomey is about $25.00.

Materials Required:

1. 3 oil drums (200 liter)
2. 5 packages of cement
3. 2 strips of chicken wire, 8 inches wide by 6-1/2 feet long.
4. About 20 feet of baling wire
5. 4-1/2 yards of 1/2 inch wire mesh
6. One piece of corrugated sheet metal
7. About 600 Cinvaram or adobe bricks.

Construction:

The construction of the dryer is fairly simple. With six to ten men, it can be built in about five working days.

1. Choose a site which is slightly elevated and well-drained. The dryer must be oriented so that the firebox and draught openings will face into the prevailing winds.

2. Dig a hole three feet wide, six feet long, and four and a half feet deep. Remember to orient this hole so that the prevailing winds will enter the end (i.e., the wind direction is parallel to the long sides).

3. Dig out the sides of this hole to form regular sloping walls. On the surface this hole will now be square with each side having a length of six feet. At the bottom of the hole the shape is rectangular, 3 feet by 6 feet. (Figure 1)

4. At the front of the hole, dig a large square pit 6 feet by 6 feet and 4-1/2 feet deep. This pit should be in line with the first one and separated from it by about 1-1/2 feet. (Figure 1)

* This model represents the basic design he is attempting to adapt for the small farmer.

5. Dig a small chimney hole, 3 feet deep, 2-1/2 feet wide and 2 feet long in the end of the first hole opposite the second pit. (Figure 1)

6. Dig out the middle of the wall separating the two large pits. This opening should be 3 feet wide and in the center of the dirt wall. (Figure 1)

7. Dig three steps into the end of the second hole which is farthest away from the first pit. The completed holes should look like those in Figure 1.

8. The three oil-drums may now be put in place. These drums will form the firebox and will resemble a large tube. Cut both ends out of two of the drums and flatten the edges to avoid cut fingers. Cut only one end out of the third drum and flatten the edges. In the unopened end of this third drum, cut a small circular hole with an 8 inch diameter next to the rim of the drum. Just inside the rim on the opened end of this third drum, punch 10 holes evenly spaced around the rim. Punch ten evenly spaced holes around the edges of both ends of one of the other oil drums. The remaining drum should have 10 holes punched around the rim on one end and at the other end only 2 holes a few inches apart.

9. Now place the third oil drum in the firebox pit. The end with the 8 inch circular hole should rest in the chimney hole at the end of the firebox pit. The small hole in the end of the drum must be at the uppermost side of the drum—the smoke must be able to go out of this hole and up the chimney. Place stones or bricks under the open end of the drum so that it rests evenly and slants very slightly toward the stoking pit. The middle drum (the one with holes punched around both ends) should be placed with one end resting on the stones holding the third drum and the other end should be supported with another set of stones or bricks. Using baling wire, link these two drums by passing the wire through the holes in the ends of the two drums. Wrap a narrow band of chicken wire around this joint passing it between the barrels and the stone support, and fasten it tightly. This chicken wire will help hold on the cement which must be

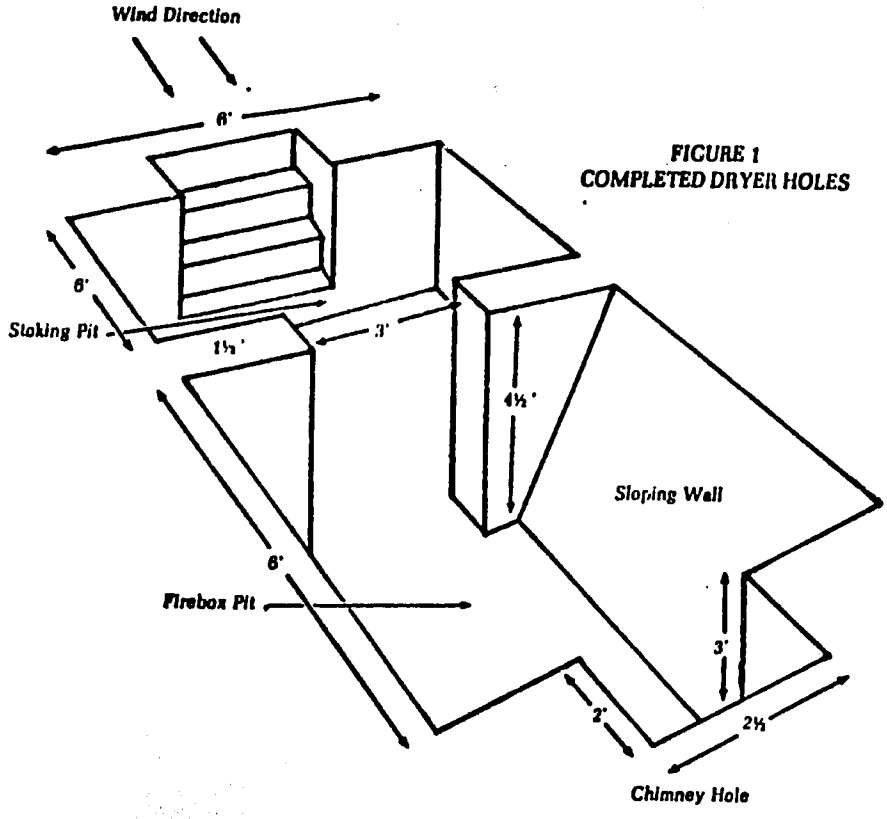


FIGURE 1
COMPLETED DRYER HOLES

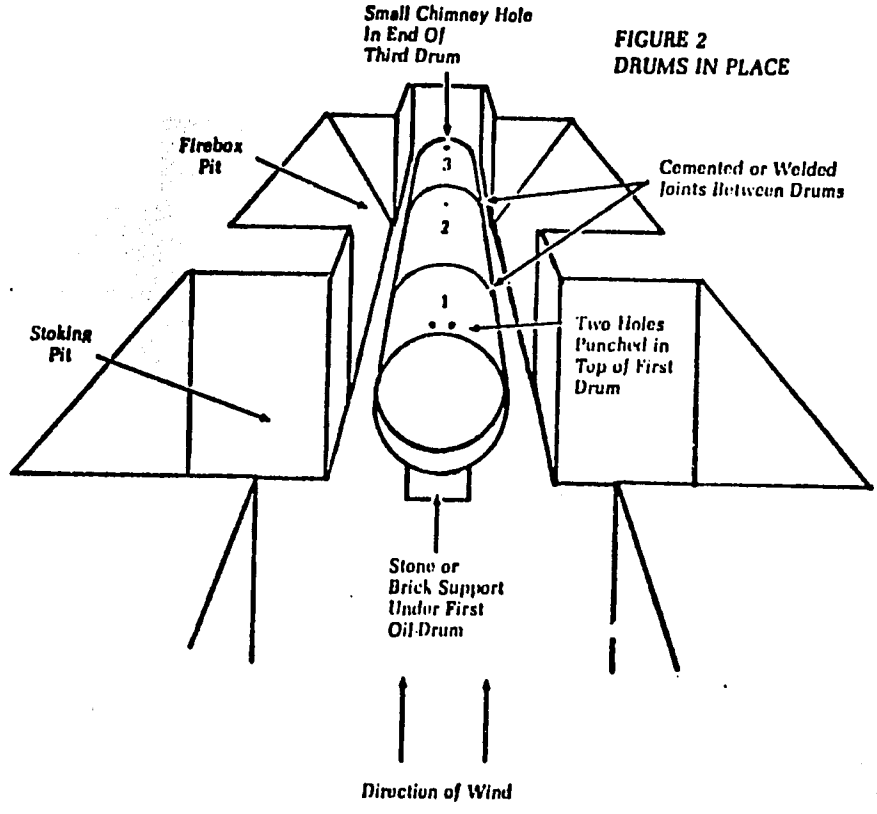


FIGURE 2
DRUMS IN PLACE

put around the joint on both the inside and outside. Before cementing, be sure the chimney hole is still in position and that the barrels are lined up straight in the firebox pit.

10. The remaining drum is attached to the other two in the same way. Make sure that the end with only two holes extends slightly into the stoking pit and that the two holes are on top of the drum. The ends of this drum also rest on stones or bricks and after linking it to the middle drum with baling wire and putting the chicken wire around the joint, the two are cemented together. It will not be possible to put the cement all the way around the joint. However, the cement put on the outside must overlap sufficiently with that on the inside to make an air-tight seal. The firebox should be cemented to the supporting stones or bricks and it should slope slightly toward the stoking pit. (Figure 2) N.B. As an alternate method, the drums can be welded together.

11. The next step is to construct a wall around the hole containing the firebox. These walls can be built of mud bricks or adobe depending on the amount of money available and local building techniques. I will describe the construction in bricks but the system is the same even if the walls are to be built up in mud layers or by any other means. Where possible mud brick construction is preferable since it is more durable.

FIGURE 4
BEGINNING OF DRYER WALLS AROUND FIREBOX PIT

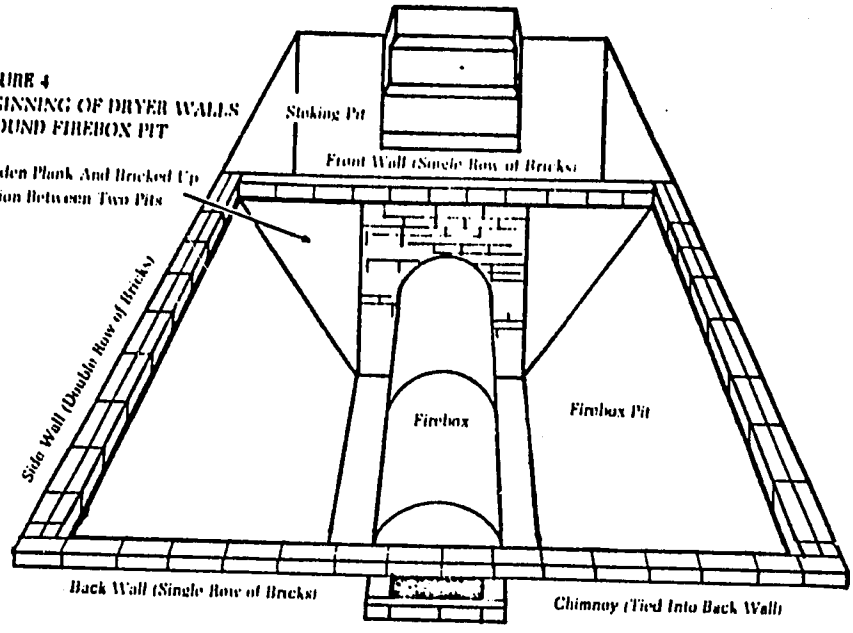


FIGURE 3
FRONT VIEW OF FIREBOX AND WALL BETWEEN STOKING PIT AND FIREBOX PIT

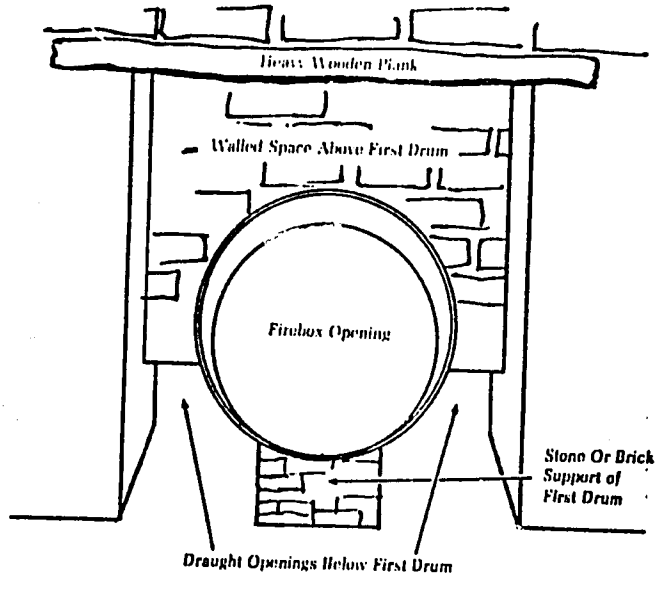
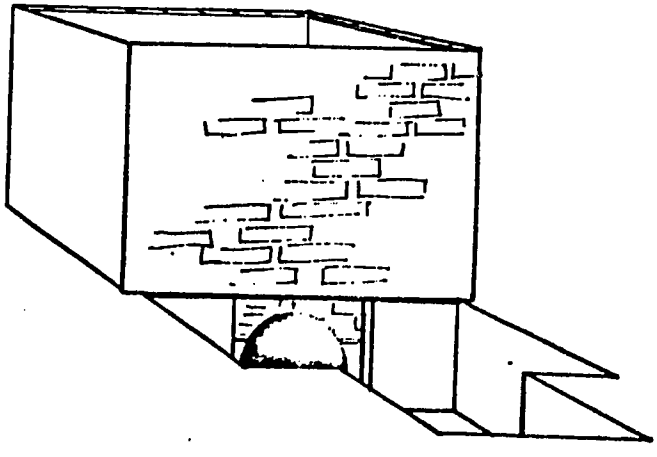


FIGURE 5
COMPLETED DRYER WALLS



12. First dig down a few inches until solid earth is reached and level off this earth all the way around the firebox pit. The space above the first drum should be filled in with bricks making sure to leave openings under this drum. After filling in this

part of the wall between the two pits, place a heavy wooden plank or several straight logs of about two to three inches diameter on top of the bricks and dirt wall. (Figure 3)

13. At the chimney end of the firebox a small square chimney should be built around the chimney hole. Fill in the area around the end of the drum with dirt until bricks may be placed around the hole. This small chimney should be built up to the level of the soil where it ties into the back wall of the dryer. (Figure 4)

14. Using mud bricks lay a foundation all the way around the firebox pit. The walls should be square and measure about 6-1/2 to 7 feet on the inside. The side walls should be double the width of the end walls for the first several layers. As the walls are built up, measure the distance between the top of the firebox and the top of the walls. When this distance reaches 40 inches the inside row of bricks on the side walls is stopped. This inside row of bricks will form a ledge on the inside of each wall. Continue laying bricks until the height of the walls is about 4-1/2 feet or 40 inches above the ledges on the side walls. The chimney should of course rise as part of the back wall. The resulting structure will be square with a chimney on the rear wall and a ledge on the inside of each of the side walls. (Figures 4 and 5)

15. The walls may be plastered with cement or earth although this is not essential.

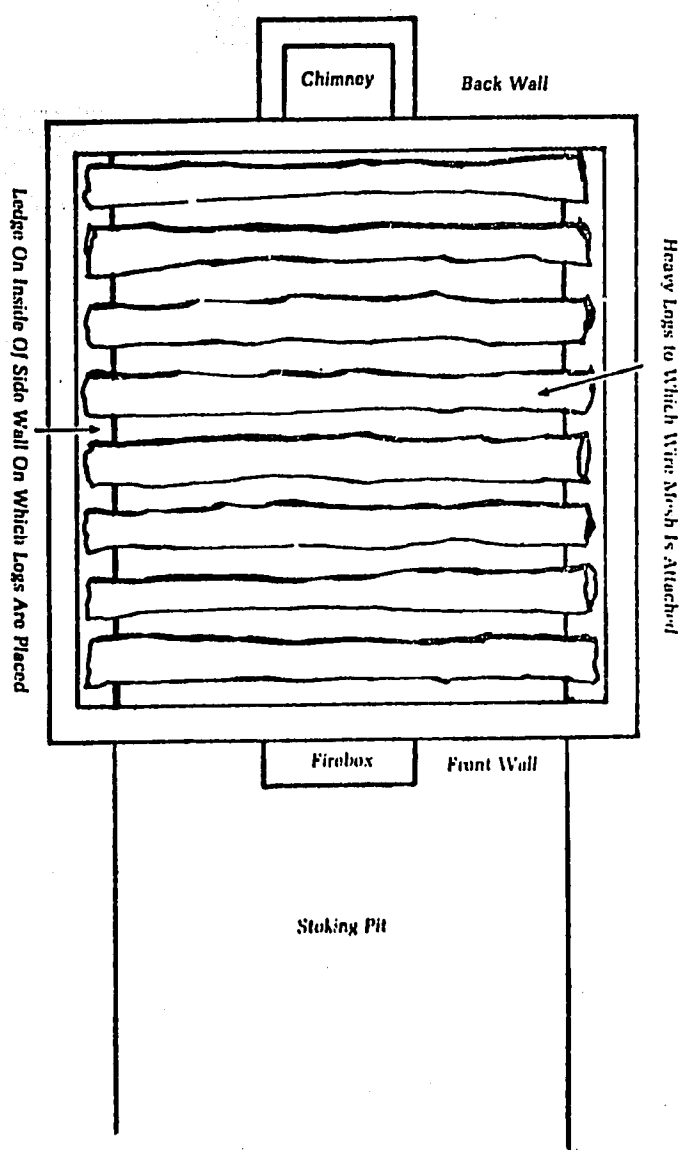
16. Using one of the ends removed from the oil drums make a door for the firebox. Punch two holes in the edge of the oil drum end and hang it with baling wire in the opening of the first drum of the firebox using the two holes on the top edge of the drum to hold the door.

17. The chimney may be continued in bricks or you can roll the sheet metal, fasten it with baling wire and place it in the chimney opening to give added height to the chimney. The sheet metal must be cemented in place so that no smoke can escape around the edges.

18. Place 8-10 large straight logs on the ledges inside the side walls across the space above the firebox. (Figure 6) Attach the heavy wire mesh to these logs so that it covers the entire inside area of the dryer. The mesh should actually be larger than the surface area to be covered so that no grain will fall through at the edges. The logs and screening will hold the crop suspended about 40 inches above the firebox. As a cheaper alternative, a split bamboo mat can be used in place of the screening. Depending on the crop being dried, screening or bamboo mats with smaller openings may have to be used to keep the grain from falling through the floor.

19. Build a roof to cover the entire dryer. It is suggested that this roof be rather large in order to provide space to store wood or the next load of grain to be dried. The ends of the roof should be open to allow a free circulation of air. A sheet metal roof is strongly recommended. Thatch or woven palm branches may be used, but extreme care must be exercised because of the fire hazard. The chimney should pass through the roof and an insulated sheet metal guard should be placed around it where it goes through the straw as it will become very hot. A conical

FIGURE 3
DRYER FLOOR SEEN FROM TOP



metal hat placed on the open end of the chimney is advisable to keep out rain. If construction is to take place during the rainy season it may be necessary to build the roof first and then construct the dryer underneath.

20. The completed dryer should have the following dimensions:

Interior walls: 6-1/2 to 7 feet x 6-1/2 to 7 feet
Height of walls: About 4-1/2 feet
Height of walls above screen floor: 40 inches
Height of floor above firebox: 40 inches

Larger or smaller dryers may be built by using 2 or 4 barrels rather than 3. The construction is the same but the dimensions of the holes and walls must be adapted to the new length of the firebox now made of either two or four oil drums.

How to Use the Dryer

This dryer has been used mainly for corn and peanuts but by introducing a fine screening, other cereals such as rice and sorghum may also be dried. Corn (maize) is dried on the ear and can be placed in the dryer to a depth of 3 feet. For peanuts, beans, rice and sorghum, the depth should not exceed a foot and it is necessary to stir up the grain from time to time. Drying time will vary with the crop, the quantity of grain being dried and the initial moisture content of the grain. In general, it is a matter of three or four days. It is preferable to dry slowly since a large fire in the firebox could scorch the grain.

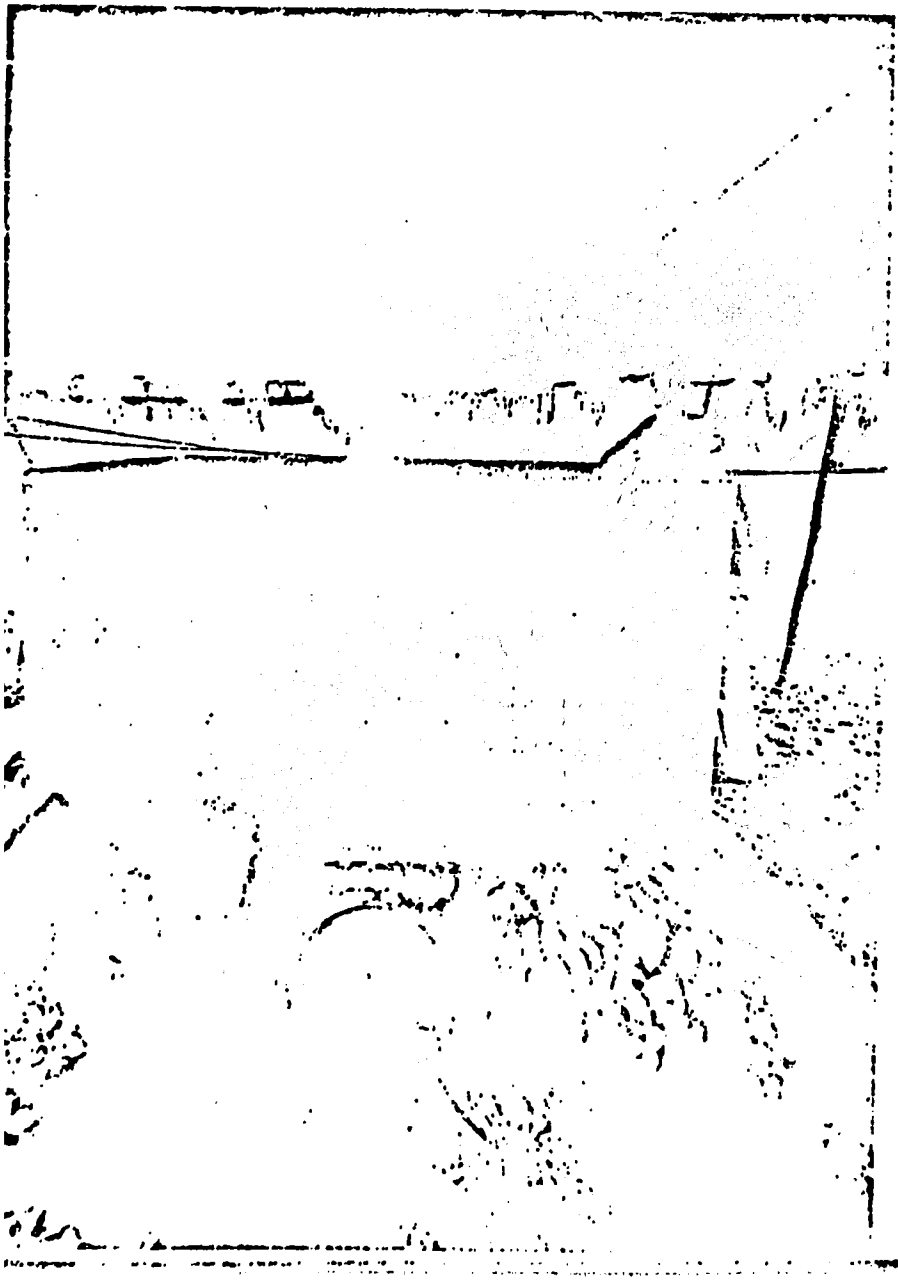
The dryer functions by convection. The wind enters the heating chamber below the crop by the draught openings below the first oil drum. This is why it is very important that this space be left open (see Figure 3) and that the dryer be oriented to face the prevailing winds. The cold air is heated by the fire and rises through the dryer floor into the grain. Since warm air can contain more moisture than the cool air around the grain, moisture moves out of the grain into the warm air. The warm humid air is then forced upward by newly heated air from the heating chamber.

Before using the dryer make sure that there are no materials around which could cause accidental fires and that water is handy in case of fire. The door to the firebox can be propped open with a stick while the fire is built. A large fire may be built at first since much of the initial heat is lost in the walls of the pit. However, once the pit is sufficiently heated, the fire should be kept small to avoid burning the grain. By opening and closing the firebox door, the draught and consequently the fire size can be regulated. The fire can be kept going day and night or extinguished at night and restarted the next day, but it must be under constant surveillance.

Corn (maize) may be dried with or without the husks. When the husks are left in place it is possible to have a larger fire since the husks protect the grain from scorching. Drying time in either case will be about the same. For initial trials, it is useful to have a moisture tester to determine the moisture content of the grain. With practice, one should be able to estimate the moisture content without using a moisture tester. Since there is no way of regulating the temperature, it is unwise to dry seed grains by this method. The grain may get too hot and germination will be destroyed.

Maintenance of the dryer is important. The heavy logs which hold

PCV Wes Peterson and his Dahomian counterpart with a completed dryer. Both this dryer and the unit pictured on the opposite page are slightly larger than the one described in Wes' article.



the screening and the crop may be attacked by termites or they may rot. They should be checked before and after each drying season and any that seem weakened should be replaced. At the same time the joints on the firebox can be checked and any cracks filled in. After several years it may be necessary to replace one of the oil drums. To do this, the bricked up section above the first oil-drum can be removed without knocking down the entire front wall. A new drum may then be substituted for any of the originals which may have rusted or burned out. General maintenance of the dryer walls and roof is also necessary. If these precautions are observed, the dryer should last for many years.

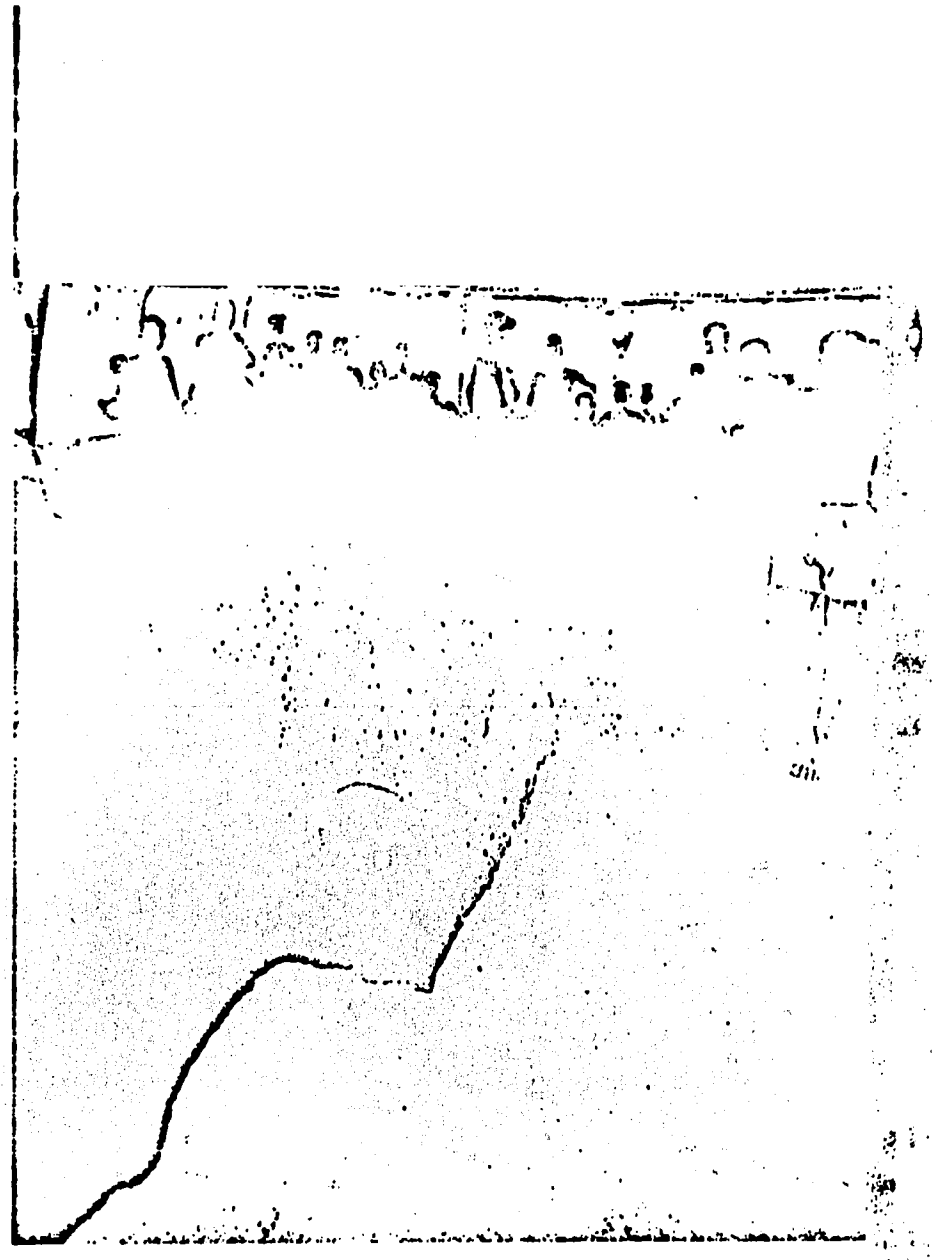
A Word on the Storage of Grains

Once the grain has been dried, it can be stored in a variety of ways. However, the dried grain is only safe from rotting if it is kept dry and it still may be damaged unless something is done to protect it from storage pests. Any storage unit should, therefore, have at least the following qualities:

1. It must keep moisture out of the stored grain.
2. It must prevent storage pests from getting into the grain.
3. It must permit the use of chemical products which will eliminate any storage pests present in the grain.
4. It must be easy to fill and empty.

In order to use any sealed container for storage, the grain must first be dried. Some storage units (for example, metal oil drums) seal hermetically and are especially efficacious, since any insects present will suffocate from lack of air, making it unnecessary to treat the grain. However, seed grains should not be stored for long periods since the germination may be destroyed. With storage units which are not completely hermetic, there is enough air to insure the survival of any insects, or their eggs, which may be present. Hence it is generally necessary to treat grains stored in these units. Obviously, precautions must be taken in the use of chemical products since most stored grains will ultimately be eaten. DDT for example is not recommended for the treatment of food products. Fumigants such as phostoxin are probably the best means to eliminate storage pests.

Whatever the storage unit, it is always helpful to dry the grain first. In any container which seals tightly, it is absolutely essential that the grain be dry. In order to store grain safely in tropical climates, the following things should be done. First the grain must be harvested early to avoid the insect attack which takes place in the fields. Second, it must be dried. Third, it must be placed in a storage unit which will keep out storage pests and moisture. Fourth, any insects which may be present in the grain must be eliminated through the use of a fumigant or through suffocation, depending on the storage unit being used. Finally, it must be checked periodically to make certain that the grain is still in good condition. Any storage problems that may have developed must be corrected.



A drying unit completed except for the chimney. Notice the mud-plastered walls and the draught openings beneath the fire-box.

PEACE CORPS PROJECT OVERVIEW:

Appropriate Technology
Instructors

In October of 1977, the Technological Institute of Costa Rica and the Peace Corps agreed to work together for a period of five years on a project that brings Peace Corps Volunteers to train Institute faculty and students and to conduct research in the theory and application of intermediate or appropriate technology, and to provide technical assistance to small and medium sized manufacturers and to small farmers through the Institute's extension division. This project, entitled Appropriate Technology Instructors, was designed to cover several areas of activity at the Institute and the Peace Corps was able to successfully recruit the following Volunteers who arrived in Costa Rica in July of this year for training:

John DeClue;

Metallurgical Engineer who will assist in setting up the department of metallurgy and will provide technical assistance for the recycling of ferrous metals.

Steven Indrick;

Soil Science Instructor, will teach soil analysis and soil improvement using organic methods to students at the branch agricultural campus and will provide extension work in soil improvement to area farmers.

John Mechlin;

Wood Technologist, will specialize in the development of technologies for utilizing what is now waste products in the wood industry.

Donald Peterson;

Renewable Energy Resource Instructor, will conduct research and provide technical assistance in technologies that use solar, wind, water and biomass energy sources to produce power or heat.

Kent Smith;

Information Science Specialist, will develop and maintain contacts with institutions throughout the owrld and region that are active in promoting intermedicate technologies.

These Volunteers will be joined this month by three more Volunteers who will complete the appropriate technology team:

Leticia Garcia:
Community Relations Specialist, will assist in planning and conducting conferences, awareness days and work projects in the community that raise the understanding of the general public about the appropriate use of technology.

Roy Lang and Keith Wilson:
Metal Mechanics Instructors, will work on the adaptation of and creation of new small machine implements useful to agriculture and industry in Costa Rica.

Project coordination at the Institute is the responsibility of Sr. Gustavo Peifer, Director of the Division of Research, Information and Extension.

Although only in its beginning stages the project has received the attention of the Second Vice-President of Costa Rica, Sr. José Miguel Alfaro, who attended the swearing in ceremonies of the initial group of volunteers and spoke of the importance of the concept of self-reliant communities inherent in appropriate technology to a country such as Costa Rica that is so dependent upon foreign technology.

ANNEX II

LIST OF NAMES AND ADDRESSES OF PERSONS CONTACTED DURING THIS INVESTIGATION

GUATEMALA

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AGUA DEL PUEBLO
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Executive Director
Chimaltenango, Guatema

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Roberto Medina Herrera
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ANNEX III

SURVEY OF THE STATE OF APPROPRIATE TECHNOLOGY

IN

EL SALVADOR