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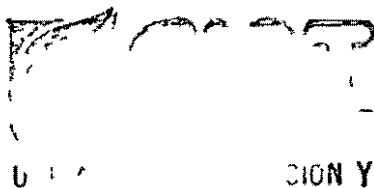
AGRICULTURE TECHNOLOGY TRANSFORMATION PROJECT

SEE PRODUCTION/DISTRIBUTION PROGRAM

Presented to

The Peruvian Mission of the Agency for
International Development

Lima, March 1987



DOCUMENTACION

100165

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SEED PRODUCTION/DISTRIBUTION PROGRAM

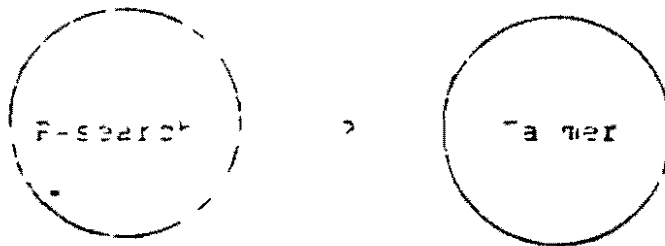
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Explanation of the Seed Supply System

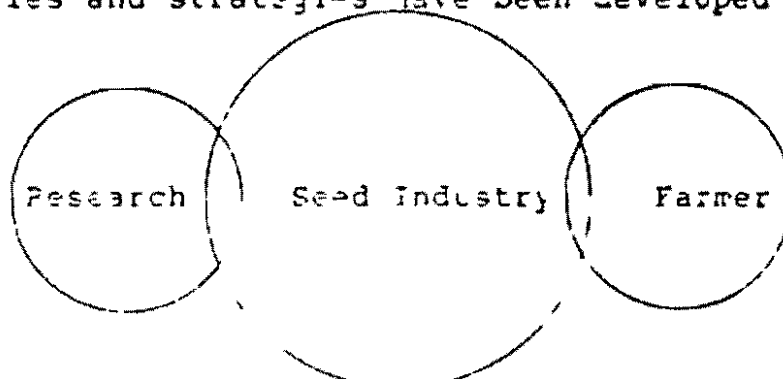
a The Technology Gap

Research on agriculture per-se does not necessarily mean that the new technology will be adopted by the farmer. This is particularly obvious in research on varietal development is studied. Experience has demonstrated that, in many cases, excellent varieties and hybrids have not reached the farmer as fast and as widely as it would have been expected. The slow adoption process indicates that, in addition to developing superior varieties, other complementary activities are needed to facilitate the flow of technology (in this case an improved variety) from the research stage to the farmer's fields. (For the remainder of this report, the term "variety" will be used to refer to open pollinated varieties, hybrids, or other improved plant materials, whatever their form of reproduction.)

The gap between the generation of new technology and the adoption of it, is a dilemma that can be shown as follows:



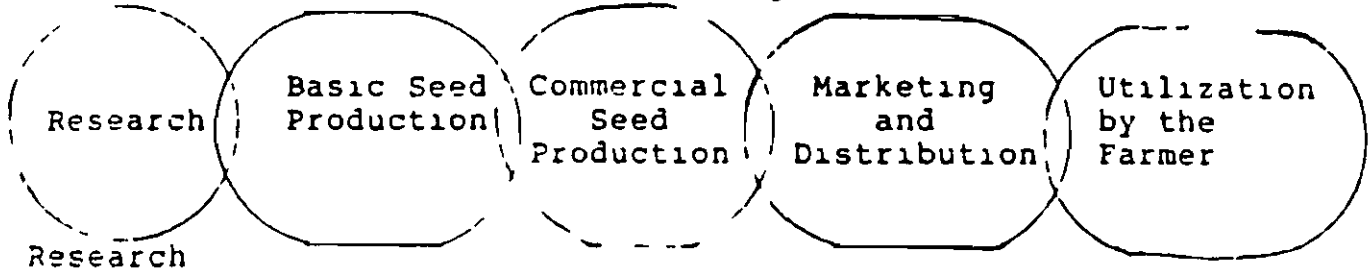
In countries where the importance of the seed industry has been recognized, the necessary resources have been allocated and clear policies and strategies have been developed to close this gap.



The seed industry is an effective bridge between research and the farm. Thus, it becomes a necessary partner of research institutions and an extremely effective mechanism for technology transfer.

b E n e n t s o f t h e S e e d M u l t i p l i c a t i o n C h a i n

The chain of interdependent activities is necessary for the flow of improved varieties to advance from the generation stage to the utilization stage. In the chain, each element accomplishes specific objectives. However, the overall objective of the chain is also common to each one of its component elements.



This activity focusses on the development and the identification of suitable germplasm (varieties, hybrids, species). It also serves to identify the appropriate technology package needed to take full advantage of the potential of the new variety. When the appropriate germplasm is identified for a farming situation, a decision to name it and to release it for commercial use will have to be made. As part of the decision making process, a small quantity of seed (breeders seed) will have to be prepared, and a description of the new variety will have to be developed.

Basic Seed Production

In the very early stages of development, the research program may directly produce some basic seed. In some cases the research group may distribute the seed directly to the farmers. This is usually insufficient, however, when trying to reach the farmers with large quantities of seed. Therefore, as the seed program evolves, and as the need for a more accelerated pace in the development of the seed industry becomes evident, the development of basic seed units, independent from research responsibilities, becomes necessary to reach the goal of producing and supplying basic seeds.

The role of this component is to receive small quantities of breeders seed, and multiply it to obtain the necessary quantities of basic seed. In some instances this component may only provide basic seed, in others, it may also produce some registered seed, depending on the stage of development of the seed industry as a whole. This job needs to be carried out in a highly technical fashion in order to meet the high quality standards that are needed for this class of seed. The high quality standard is of utmost importance to lower the costs of production and to facilitate the production of quality seed in later generations of multiplication.

Another objective of the basic seed units is the continuous and reliable supply of basic seed of commercially used varieties. In this way, the commercial seed grower can go back to using original seed when he needs it.

A specialized basic seed unit will have the necessary experience on the seed production technology aspects of the new

... being released. This experience is of great importance to promote the new variety and to provide follow-up technical assistance to the commercial seed multipliers, as well as feedback information and support to the research programs. Needless to say, a basic seed unit can be effective in capturing financial resources through the sale of seeds, it can also capture royalties from the commercial industry.

To fulfill this role effectively, basic seed programs need physical facilities, an operating budget and a team of experienced personnel.

Commercial Seed Production

Small quantities of basic seed need to be multiplied as many times as technically feasible in order to produce the required quantities of commercial seed. In Peru, different classes of seed, such as certified, authorized, and common seeds are included in the general group of commercial seed.

In the absence of this essential link, the efforts of research, of basic seed production, and of all other components of the seed program would have no impact. Recognizing this fact, the developing countries have been paying special attention to the promotion of this activity in the private sector and, in some instances, with direct support and incentives provided by the government. Some of the incentives developed to attract the interest of the private sector are:

Providing basic seeds of public varieties and hybrids

Providing seed quality promotion services (certification and fiscalization)

Technical assistance, training, education, information

Credit to operate seed production and marketing activities

Credit lines to purchase equipment and build physical facilities

Realistic seed prices and tax exemption for seed enterprises

Farming credit to facilitate the purchase and utilization of improved seeds, etc.

Given clear policies and specific incentives, several countries have experienced a fast entry of the private sector to the seed industry. In a very open system, a wide range of entities (individual farmers, farmers associations, cooperatives, family operations, and others) are attracted. In the early stages, seed growers will depend heavily on public services such as the supply of basic seed of public origin, certification services and, in some cases, seed conditioning services (drying, processing, storage). As the industry evolves, the seed enterprises will install their own facilities. In later stages of development, it will implement its own varietal improvement activity, to have the competitive edge with its own brands.

Marketing and Distribution

Good quality seeds of improved varieties will not have a significant impact unless they are made available where they are needed, when they are needed, in the amounts needed, and at realistic prices for the parties involved. Seed marketing closes the gap between seed production and the farmer.

Seed marketing in developing countries is considered a difficult and risky operation since the average farmer and the majority of small farmers still do not appreciate the value of improved seeds. To facilitate the process, several actions have been taken in some countries:

Credit lines to purchase improved seeds and non-cash trading of grain for seeds

Education to the farmers on the characteristics of improved seeds

Differentiation of the improved seeds through an effective certification service

Utilization of the Seed

The most important element in the chain is, naturally, the farmer. A farmer who recognizes the benefits of using improved seeds to obtain higher production efficiency, is an essential link in the chain. Strong utilization is the reason for developing each previous activity, whereas weak utilization does not stimulate any of the previous activities.

It is increasingly recognized that, for the farmer to use the new improved technology, several conditions need to be met:

The seed should have proven superiority. The farmer should know that, by planting good quality seeds of an improved variety, he will achieve high returns to his investment. It is for this reason that all research and seed production technology efforts have been implemented. But this superiority should be demonstrated either by the public extension services or by the seed enterprises.

The seed must be available. Once the farmer is convinced of its superiority, the seed should be available where he can easily obtain it, when he needs it, and in the amounts and size of containers that are suitable for his particular farming needs.

The seed should be differentiated from common grain (farmers' seeds). There should be a way to differentiate seed from common grains in the marketplace. This will help the farmer to recognize it as being distinct and truly different from the common grain he is used to planting. Since the quality of the seed cannot be assessed by simple visual observation, there will be a need to provide visible signals to assure that the product has undergone a stepwise technological process.

Price and cash flow - The farmer should have the means to acquire the product. Farm credit programs facilitate this process. In some countries, the exchange of seed to return commercial products at the time of harvest and the exchanging of seed for other farm products have been practiced.

The above mentioned five essential activities are necessary for the biological product to be developed, mass produced, and utilized. However, in developing countries, all essential elements of the seed chain are not in place from the outset. Initial assistance of specialized support services is usually needed to effectively strengthen the system, as will be explained in the following section.

c Concept of Quality Promotion and Certification

All seed production programs or systems include some means of checking the quality of seed in different stages of production and distribution. However, these processes are carried out under different institutional arrangements depending on the purposes being pursued and the sources of funds used to provide the services. One purpose of quality testing is to make wise decisions throughout the production process in order to attain the desired quality at reasonable cost. But the need to determine the quality of seed is most acute at the point where it is being distributed for use by the farmers. The farmer cannot visually determine the quality by simple examination, i.e., seed is not an "invisible" good. Only the results of laboratory tests can determine if the seed will germinate, and if the plants will be of uniform type, free from weed seeds, free from disease, etc. Depending on the crop, some aspects may be visible, but usually some critical aspects are not.

Without a promise or guarantee of quality, most farmers opt for using their own materials, which were held over from the previous harvest to use as seed for the next season. Therefore, quality testing and certification to protect the buyer/client can be a fundamental activity to develop markets by strengthening demand. If new materials are not seen by the farmer as offering some kind of promise or guaranteeing a certain minimum quality, demand may be close to nil.

Established seed companies which have a recognized brand-name carry out internal quality control in order to protect their reputation in the market. In this case, the buyer does not receive a guarantee of quality from a disinterested party, but he has to rely on the honesty and competence of the supplier and on the system of competition among companies. Where competition is strong, firms are usually very protective of their reputations, and therefore the need for certification by a disinterested third party diminishes.

But what if the companies do not yet exist, as is the case in most underdeveloped environments? Capital requirements to set up a seed company and establish a reputation and recognized brand name pose serious limitations to the formation of new firms. A seed company acting alone must develop a product which the farmer

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will learn to recognize as being of superior quality. Developing the product often implies the introduction of varieties adapted to the region. These may have to be demonstrated or promoted in other ways to get the farmer to try them. Where markets are limited in size because of varied microclimates, limited transportation systems, or a tradition among farmers of planting their own materials, the returns to investments of this magnitude may be too low or too uncertain to provide the needed incentive.

In many less developed countries, the "barriers to entry" are strong enough to hinder the private sector from initiating any action, although the potential is there. Often, as in the case of Peru, the public sector has made the necessary investment to introduce varieties adapted to local conditions. But the market for seed is still too limited and uncertain to warrant investments by individual firms. Again, the principal problem faced by new firms is to demonstrate to the farmer that seed produced is, indeed, of high quality and is worth the extra cost.

Certification programs can be used as a means of assuring the buyer that the seed is of high quality. Thus, it serves to protect the buyer from unscrupulous sellers, and of assisting the seller in opening a market for his product. It also reduces one of the greatest barriers to entry into the seed sector--product differentiation.

Certification of the product by a disinterested entity allows smaller firms to enter the market with less initial investment. The certification label becomes a common emblem for all firms, large and small. If this emblem gains the respect of the farmer, then the economies of scale in seed production often become negative, rather than positive, that is, small firms have the advantage over larger ones.

Clearly the seed producers are just as interested as the farmer/client in assuring the quality of the seed sold. This helps increase the use of seed and expand the market. When certification becomes a recognized label known by all seed producers, then all have a stake in assuring only high-quality seed is distributed. One lot of poor quality seed can affect the reputation and sales of all.

In a developing environment, certification services need to be involved in the development of the seed sector in many ways, providing more than just quality testing services for regulatory purposes. Certification personnel should provide technical assistance to seed growers and companies--in the field, conditioning plant, distribution centers, laboratories, meeting rooms, and offices. They should participate in orienting leaders when planning activities and setting policies, and when programming the use of resources. When competent, motivated professionals work in the certification program, it becomes a key element in the seed program, supporting the development of the other elements in the multiplication chain.

If certification helps both the farmer in general and the seed producer in particular, who should provide this service and assume responsibility for funding? The answer is either one, whichever sees the greater need. If the need arises from the farm community in general for greater protection, the service is

usually provided through the public sector. If the initiative comes from seed growers, the services are provided through private collective action, i.e., crop improvement associations and the like.

In most countries, the term "certification service" or "certified seed" cannot be used by the private sector without government approval. The use of these terms is generally interpreted to mean that the government has given its blessing to the norms and standards used in certifying the quality of the seed and it takes the ultimate responsibility for the performance of the certification service. Because of this, seedmen associations which certify seed must usually obtain the authority to do so from the government. Usually the public sector withholds some rights of participation in the system.

Some countries interpret certification to mean governmental regulation of commercial trade of seeds. They are less concerned with the farmer/client recognition of the certification label as a guarantee of quality as they are with their ability to control the movement of seed through commercial channels. In this sense, certification sometimes becomes a means of collecting taxes on imported and locally grown seed, as well as for controlling prices. In this form, certification can also be effective as a consumer protection mechanism. But it does not help in developing markets unless the farmer knows he can rely on the efficiency and honesty of the service.

In the Peruvian case, private firms and several public agencies are providing quality testing services within crop-specific programs. Although they are under public auspices, these efforts were initiated without the governmental authority to certify seed, and therefore do not use the term "certification". They come closer to internal quality control activities leading to distribution under a brand name, such as ECASA and PROGRAMA DE MAIZ (University at La Molina). These brands compete with seed grown by private growers in some areas.

Recently the Ministry of Agriculture has begun certifying seed under the Subdirección de Certificación y Control de Semillas (SCCS), but certification has been interpreted along the lines of a regulatory and taxing agency. As a result, groups interested in developing seed production and distribution programs do not have a service to which they can subscribe to assist them in quality control and testing, or in differentiating their product for distribution and sales. Because of this void, other institutions such as INIPA and some of the farmers' committees at the national and regional level are trying to implement quality assurance services for the crops of interest to them. The former would do so through public mechanisms and the latter through private collective action.

Although the term "certification" is used in Peru to refer to a governmental regulatory function, we will use terms such as "quality assurance", "quality promotion" and "certification service" to mean the process or functions of technical assistance and guidance to the seed producer, education to farmers and other participants, as well as quality testing services. This reflects the wish on the part of the authors to emphasize the importance of the service in its promotional activities, playing down the

regulatory aspect. It also reflects the idea that the door is left open in terms of organizing this activity through public agencies having the political authority to certify seed, through the private sector, or some combination of the two.

d Other Support Services

Several of the services which support the agriculture sector in general also interact with and support the seed supply system. Some of them are extension, credit, education, information, and policy formulation.

Extension services are sometimes instrumental in demonstrating the benefits of new varieties to farmers. This activity is carried out through the methods currently used -- demonstration plots, field days, direct contact with the farmer. This activity, however, does not imply that extension is an appropriate organization to distribute seed. The extension agents should be neutral with respect to recommending seed from a particular source, and work with the farmer to evaluate different alternatives. He should not become a sales representative of seeds of a particular origin, including varieties from public research programs.

Credit programs need to be tailored to the seed producer, i.e., both the contract farmer and the seed company. The contract farmer typically has costs running 10 to 50 percent above those of grain and tuber producers. It is difficult for some growers to carry out required practices without having the capital available to do so. The seed enterprise incurs in post-harvest handling and transportation, conditioning, bagging, storage, distribution, and marketing costs. Seed valued at I/4 00 when it leaves the field might be worth I/10 00 to I/20 00 by the time the farmer receives it.

The need for education and training is obvious, however, most universities in Peru do not currently have seed courses as part of the agronomy curriculum. There is also a need for specialized training for professionals who are already engaged in different activities in the seed supply system. Universities are not usually oriented to meet this need. It is recognized that both high-level officials as well as technical staff require continual training.

Information needs fall mostly in two categories: new technology and market intelligence. This is often one of the last activities to receive attention when developing new programs. However, the needs become acute as the program matures.

Policy formulation includes the development of seed laws, orientation of support services, development of organizational capacity, fomenting participation of farmers in decision making, attracting investment from private and public sectors, facilitating market development, consensus-oriented planning, and others. These activities often require much more effort by local leaders from the public and private sectors than anticipated at the beginning of a program. Usually, it is not possible to reach decisions on all these policies at the outset. Instead, the program must be reevaluated constantly and strategies must be adapted to new conditions as they arise.

c Categories of Seed

Generally all seed that is produced under a program supervised by a certification service are referred to as "certified seeds". However, to attain the necessary increase from the tiny amounts which the plant breeder or researcher works with to the large volumes needed by the agriculture sector, several multiplications are needed. The names applied to the different multiplications of seed through the chain vary from one crop to another, and one country to another. The terminology used most commonly for grain seeds are as follows:

- Breeders or Genetic seed
- Basic or Foundation seed
- Registered seed
- Certified seed or other commercial seed

All commercial seed produced under a certification system does not necessarily have to be in the "certified" category. That is, other categories of commercial seed are used for different reasons. Therefore, they are authorized for distribution under different names, such as "fiscalized seed", "authorized seed", etc. Under particular circumstances, any of these categories may be useful in the system. All of these categories at the end of the multiplication chain (certified, fiscalized, authorized, or other) are referred to as commercial seed because these are distributed to the farmer for production of grain or other products. The previous categories, by contrast, are intermediate steps in the production system, and are passed from one seed grower to another for the next multiplication.

In Peru, the categories used by the Ministry of Agriculture are similar to those mentioned above -- Genetic Seed, Basic Seed, Registered Seed, and Certified Seed. The variations of the latter are as follows:

Authorized Seed is that which meets quality standards, but for which parental materials are of private origin (not in public domain). The "pedigree" cannot be verified in the early categories by the official certifying agency.

Common Seed also meets quality standards, but the producer has not applied for certification. He has opted for paying a lower fee (0.5% of the value rather than 3.0%). Sale of common seed is authorized by the MA, but the distributor is legally bound to use the term "Common Seed" on the label.

Seed in all three categories -- Certified, Authorized, and Common -- meet minimum standards. But beyond that, the categories do not say which is of better quality, and in what ways better, except to verify the origin of the material. Therefore, the categories do not convey the kind of information needed by most farmers when making a decision to buy. They do not help the seller differentiate his product by using the term "Certified Seed", because the other categories, including "Common Seed" may

be just as good. The official certification is visible to the buyer only as a small rubber stamp over the producer's label. Hence, the official certification is not being used to promote the use of high quality seed by the farmer.

2 Assessment of the Current Situation in Peru

a Coastal Region

Seed of some important crops is being produced in this region, notably corn, cotton and rice. The table below gives a fair idea on the percentage of area planted of these three crops in the coastal region which is established with purchased seed, as opposed to materials saved by the farmer from his previous harvest. These levels of utilization can be compared with those of beans, which is only about 5 to 10 percent.

	Percent of Area Planted Using Purchased Seed
Cotton	84
Corn (semi-flint)	90
Rice	80

Sources: Cotton: Ministerio de Agricultura, 1984.
Corn, and Rice: Interviews with INIPA technicians

Use of vegetable seed is naturally high, mostly from imports. Supply of vegetable seed does not represent a major problem because of its small volume and ease of transport. Some species could be produced in Peru, and local production can probably expand. However, because of the small quantities required and very specialized techniques needed for production of each species, vegetable seeds do not offer potential as the foundation for a seed program. Therefore they will not be dealt with extensively here. Potato seed use is also high, but since the source of this seed is the Sierra, this crop will be discussed in the next section.

Corn seed production and distribution has grown up through the importation of hybrid lines from private and public sources for production locally. Three private companies and one public program that works like a private firm produce and distribute corn seed, and one more is starting. The private firms are Hortus, Hopeta, and Villanueva. The public program is the Programa de Maiz (PM) of the University at La Molina (UNA). The PM has an integrated program which supports about 20 independent growers with locally-developed hybrid lines, quality control services and a common brand name and logo, processing and storage facilities, and assistance with policies and marketing.

What makes the PM unusual is that it receives help from public sources through the UNA and also from international

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donors, yet its services and support are extended to only one group of growers who compete for the market with local private companies. Most of the PM operating costs to supply services to its growers is paid by the growers, themselves, through a patent fee charged for parent materials. The group of growers that works with PM has formed an association known as APROSESEM.

The private companies producing corn seed are of medium size. They have their own processing facilities and carry out their own internal quality control programs without any external assistance. They market under their own brand names and also use that of the firm that supplies the parent material--Pioneer, Northrup-King, Cargill. These firms also produce sorghum seed, but otherwise are only slightly diversified. For instance, Hortus and Villanueva distribute some agricultural inputs other than seed. The shifts of acreage from rice to corn a year ago (because of limited water supplies for growing rice) has given new impetus to all of these firms, including the PM. However, before last year the corn seed market was more limited in size, and the lack of diversification was being felt by some firms, i.e., stocks of seed were not being sold.

Cotton seed production is well established under the producers association, FUNDEAL. It receives help in introduction of varieties and supply of foundation seeds from several other entities, including INIPA, and the Association of ICA Farmers (AAI). FUNDEAL has a long history in seed production, supply and quality assurance, therefore cotton seed was not included in the terms of the project design.

Rice seed production is the most recently formed program. Three entities are currently involved in commercial production--the parastatal company responsible for rice milling and marketing, ECASA, and two private seed firms. INIPA develops improved varieties and makes them available through its basic seed unit at Vista Florida near Chiclayo.

ECASA produces rice seed with contract farmers, processes in their own facilities, and markets under their own label. Internal quality control is carried out by ECASA's own staff. Seed is distributed directly to farmers from ECASA warehouses. Prices of seed are 1.68 times the value of grain. Since the climate in the region is more accommodating to seed production than in the tropics, and rice seed is not as delicate as some others, one might expect the price to fall between 2 to 2.5 times the price of grain. Therefore, the experience of the authors suggests that the current price levels in the coastal region imply a subsidy. However, ECASA technicians and officials indicate that their desire is for private firms to move into seed production, and when that happens, public sector competition will be withdrawn.

Two private firms have also started up very recently, both in the northern coastal area. Both firms sell seed slightly above the ECASA price (1/9 00 versus 8 40 per kilo). Semillas Peruanas, located in Chiclayo, was formed by three young professionals who gained experience and a reputation with farmers while working in the public sector. The manager indicated that neither the certification label from the MA nor the name "Semillas Peruanas" carry much weight so far with the buyer. Instead, the farmer has

confidence in the seed because he personally knows the individuals who are responsible for producing it. Apparently the other firm, Semillas del Norte, located in the Department La Libertad has had a similar history.

In the Chiclayo area, ECASA and Semillas Peruanas have entered into an agreement with the Banco Agrario to require the purchase of rice seed in order to obtain production credit for rice. The farmer can choose what seed and from whom he wishes to purchase. The going rate of each supplier is then figured into the value of the loan.

Another crop of potential importance for seed production is beans. There are varieties widely accepted by the grower and the consumer. There are also new, improved varieties recommended by INIPA. However, seed production of this crop is far less developed than the crops discussed above. In years when water is insufficient to plant rice, farmers look for alternatives. Sometimes water is not even sufficient for corn, and farmers turn to bean production. However, no consistent seed supply system has been developed for this crop. Consequently, the farmer acquires edible beans in the market for planting purposes, often with negative results.

The main problem faced by bean growers related to seed quality is virus infection, which weakens the plant and greatly reduces yield. Virus is transmitted through the seed from one year to the next and by aphids from plant to another. Production of virus seed (lower infection rates) requires growing a few plants in screen houses. Seed from this material must be multiplied in areas far from other bean fields, with strict aphid control. Special care must be taken in cultivation practices and irrigation methods to avoid reinfection. A second problem is related to maintaining germination and vigor of seed during storage from one year to the next. In the best of cases, seed must be stored about six months.

INIPA has initiated the Edible Legume Program (Programa de Menestras) based in Chincha on the Central Coast. This program has begun to produce basic seed using the system described above. This is distributed to farmers who wish to produce commercial seed. INIPA provides technical assistance and guidance and has plans to provide conditioning services and storage. A summary of the different groups participating in seed multiplication of major crops on the coast is shown in the diagram on the following page.

In general, research and foundation seed production are carried out very well with many institutions participating. In corn, the same firms that do the research recover their investment by carry through with the multiplication and distribution of commercial seed of their patented materials. In cotton and rice, multiplication and distribution are done by different institutions than those that carry out the research.

VARIETY TESTING AND
FOUNDATION SEED
PRODUCTION

MULTIPLICATION,
CONDITIONING, AND
DISTRIBUTION

COTTON

IAI, Ica	_____	
INIPA, La Molina	_____	
Asoc Agri Canete	_____	
UNA, La Molina	_____	
UNT, Piura	_____	
UNPRG, Lambayeque	_____	
		FUNDEAL

CORN

PM	_____	PM, APROSEM
Servicios Villanueva (Pioneer)	_____	Servicios Villanueva
Hortus SA (Northrup-King)	_____	Hortus SA
GENTEC	_____	HOPETA
Cargill (imported)	_____	Cargill (imported)

RICE

INIPA	_____	ECASA
	_____	Semillas Peruanas
	_____	Semillas del Norte

BEA'S

INIPA	_____	Semillas Peruanas
	_____	Individual Farmers, Chincha

Most private seed companies sell through farm supply distributors (stores specializing in agricultural inputs), which number between 350 and 400 in the entire country (including Sierra and Selva). The PM and APROSEM, besides selling through dealers, are contemplating distribution of corn seed through ENCI. For all three crops, seed seems to flow fairly freely up and down the coastal region. Some firms also produce in more than one department. For instance, PM produces in the central and northern coast areas. FUNDEAL produces cotton seed in several areas. This is a characteristic one expects to find in places where the seed supply system is fairly well developed.

Seed production has grown in the Coastal Region without any deliberate or consistent support from the government. Only in the case of cotton seed have farmers used private collective action to advantage. With the exception of two new firms producing rice seed in the north coast, seed supply systems are dominated by larger entities and medium-size firms which have sufficient capital to become established as distribution channels are being developed. Although they are poorly diversified, their size has allowed them to survive even when markets have been unstable.

The seed programs are specific to each crop, having no common services, or means of mutual support. Even the four firms producing corn seed (including the PM) operate completely

separately from the another Except for cotton farmer associations (Committees) are not involved to any extent, i.e., they do not provide support or services to seed growers. As a result, the momentum created by the activities in these three crops is not being carried over to others which have weaker seed markets and organizations--beans, wheat, soybeans, peas and others. The technical expertise, organizational capabilities, physical infrastructure and funding generated in one commodity does not transfer to the next. Each commodity program must start over from ground level with a weaker base than the one before it. Since it is impossible to sustain separate programs in all commodities, most crops are left with no means of organizing a seed supply system.

b Sierra Region

Major crops in the mountain and highland region of the country are potato, barley, wheat, pastures, floury corn and Andean crops. Transportation among departments is poor within the region. Instead, the main connections are from each departmental capital to the coast. Therefore, market areas within the sierra are somewhat limited in size. The three areas which drew the attention of the design team were the potato seed growing area in the central sierra (Huasahuasi and Huancayo), Cusco and Cajamarca. Time only allowed a visit to Cusco, but one of the authors is also somewhat familiar with Huancayo. The major concern was to identify areas where there is already and effective demand for seed or where the demand is currently developing, and where the levels of seed production could expand to reach a threshold level to a program. By threshold, we mean a volume of seed large enough to support the basic services of a seed program with local financing. The exact level would vary greatly from one country to another, but the experience of the authors suggests that when working with low valued cereals or oilseeds, a reasonable level is about 1,000 metric tons. A potato seed program probably has a higher threshold.

The only crop having major seed production activities is potato, produced in the Central Sierra for sale in the coastal region. In Huasahuasi and Huancayo area, there are about 200 that produce potatoes to provide seed for the coast. The varieties are originated by INIPA, although most growers do not obtain basic seed every year to replace the material. Farmers on the coast who are interested in obtaining seed traditionally visit the central sierra to locate fields that appear to be good for seed. When potatoes are harvested, the seller selects for size and the buyer picks up and transports the seed to its destination. About 20,000 metric tons are sold each year as seed to plant around 7,000 hectares on the central and southern coast. This is valued at over 6 million dollars per year in the place of origin. This system evolved without any deliberate support in terms of quality control.

Because of the lack of quality control, and of a clear sequence in the multiplication chain, potatoes have been brought back from the coast to the sierra, for planting. This brings in harmful pathogens (bacteria, nematodes, and viruses). The sierra region has traditionally been relatively free from these pathogens, which is the reason why it is a good area for

producing seed. Therefore, the flow of potatoes from the coast poses a threat to the system.

Currently, INIPA is implementing a major basic seed production program based in Huancayo, in the central sierra. This program provides a basic seed source that can strengthen the existing system as well as lend support to the initiation of a similar system in other regions.

Barley seed is produced and distributed by the malting and beer producing companies, as part of their integrated programs. Since this seed is not sold to another party, the need for outside support services and assistance is greatly diminished. Only 15 percent of the 150,000 metric tons of barley produced in Peru is utilized for malting, which requires improved seed. Most barley is for direct human consumption and for animal feed.

Variety testing is carried out for potato, wheat, barley, forage crops, flourey corn, grain legumes, and Andean crops (quinoa, kiwicha, canihua, etc.) by INIPA and some universities. For several of these crops, INIPA produces small amounts of seed of recommended varieties and distributes it to the farmers directly. Varieties sometimes gain acceptance in specific areas and pass from farmer to farmer. Use of improved seed is very low and highly atomized. Current levels of area planted with improved seed are roughly as follows.

barley	15 percent
wheat	10 percent
flourey corn	10 percent
grain legumes	5 percent
others	negligible

The Cereals Program of UNA is evaluating the possibility of extending the production of wheat in expanding natural grassland areas of the highlands (altiplano, especially around Puno and Junin). If successful, a strong demand for wheat seed will be created.

In the Cusco region potato, corn, small cereals, and Andean crops are grown. Potato reaches about 20,000 hectares, corn about 15,000 hectares, and barley about 11,000 hectares. There are several institutions working on research to develop the appropriate varieties in the region, such as the University of San Antonio de Abad, CIPA, and others. The varieties developed and recommended for this area are adapted to similar climatic conditions of nearby departments. Small amounts of seed of undefined quality have normally been produced by the research institutions. With the exception of barley, where the private malting company produces seed for its contract farmers, no identifiable commercial seed growers exist for the other crops. No seed certification services are available to support the system. Farmer to farmer movement of seed is the normal pattern of adoption of new varieties, which slows down tremendously the speed of adoption of varieties. Frequently, when the new variety reaches the farmer, it already is mixed. These factors reduce considerably the net return of the research efforts, although there are extensive numbers of recommended varieties.

In the case of corn, the Urubamba Valley has been known as the best source of local native varieties. These varieties are widely accepted in the lower valleys of the whole sierra area. In the past few years, corn grain produced in this region has gained acceptance in overseas markets such as Japan, which creates additional markets to the already existing market for this type of corn within the country.

Currently, the principal crop for which an effective demand has been demonstrated is potato, for the coastal region. Demand for seed of most other crops is weak and highly atomized.

c Selva

Colonization into the eastern jungle and lowland areas of Peru is continuing to open new lands for agricultural production. Rice and corn are the two most important crops. The Loreto and San Martin departments are the most important in terms of the volume of agricultural products. The San Martin department offers more possibilities for the development of agricultural programs, because of its transportation linkages and level of development. Therefore, this section will concentrate only on this department.

About 80,000 hectares are cultivated in the San Martin department, all of which are utilized in winter and about 47,000 in summer. Winter refers to the high rainfall season from February to June. Summer refers to the drier season from August to January. Of the total area planted in winter, 30,000 hectares are planted to rice and 50,000 to corn. In summer, 17,000 hectares are planted to rice and 30,000 to corn. Therefore, the total area planted to rice each year is 47,000 hectares, and to corn 80,000 hectares. Other crops are of minor significance.

The government has made a determination that expansion of rice production is to take place in the tropics. As a result, prices paid locally to the farmer are 10 percent higher than prices paid on the coast. The price of seed and of other inputs are subsidized also. Credit and other supports are being made available. Major limitations to increasing production are

Availability of hand labor for transplanting and harvesting

Water supply, especially in the summer

Supply of good quality seed of disease-resistant varieties

Most farmers in the region are from the coastal areas, and still follow the practice of transplanting which is used there. On the coast, transplanting is necessary because water is not available for field irrigation for direct seeding. Using seedbeds for transplanting, the farmer gains a full month's growth with less water. However, volume and timing of water supply is not a problem in la Selva.

Transplanting uses about 18 person-days per hectare, which poses a serious labor problem limiting the total amount of rice grown in the area and the amount that each farmer can grow. In

this system, 80 kilograms of seed per hectare are being used, which is far more than what it should be. Seed quality problems are suspected. Direct seeding requires about 100 kilograms of seed per hectare. Because of the influence of coca production in the region and of the lack of manpower, the cost of person-day of labor is over I/100, compared with I/35 in Chiclayo. Therefore, direct seeding using high quality seed could mean savings to the farmer.

Ideally, farmers in the humid tropics would replace varieties every 3 to 4 years, due to disease problems, mainly fungal diseases. New disease tolerant varieties are needed to maintain yields. There are no other economically effective ways for the farmer to control the disease. About 329 metric tons were produced and distributed by ECASA in 1986. These would only plant about 9 percent of the area. Therefore, the farmer is obtaining new varieties "second hand", i.e., he buys it from a neighbor who obtained it from ECASA. This informal system is working slowly, many farmers are still planting susceptible varieties.

ECASA is the only supplier of rice seed at the present time. The source of new varieties is the National Rice Program of INIPA, based at El Porvenir experimental station. Contract growers produce the seed in a similar manner as used in the coastal areas. Seed produced in the tropics requires special drying and storage facilities to maintain quality after harvest. However, ECASA does not have these facilities and therefore is currently concentrating on cleaning.

Price of rice was I/5.50 per kilogram in February 1987, and seed was being distributed to the farmer at I/7.50, a difference of only 36 percent. Usually, we would expect seed to be sold at, perhaps, 3 to 4 times the value of grain in the tropics, assuming very high quality. (It is impossible to achieve high quality without the facilities for timely harvest, drying, and conditioned storage.) ECASA's current costs might be similar to what they are on the coast (plus 10 percent for the increased price paid to contract growers). Therefore, seed is greatly subsidized.

The demand for corn seed has been low in the past, but is expected to rise very rapidly, especially with the price incentives given by the government for grain. Less than 10 percent of the area planted is established with purchased seed.

Limiting factor for higher yields in the jungle is the poor final stand at harvest. This low population of plants per hectare is the result of the tendency of farmers to plant in wide spaces between hills and of poor germination of bad quality seed. With the assurance of high quality seed of shorter varieties, the final population density will be high, resulting in better yields. Another benefit of using improved varieties in the jungle is reflected in the quality of the grain obtained. Better resistance to fungus is one characteristic of improved varieties. Less rotten ears and damaged grains are expected.

Increased demand has already begun to be felt. Modest amounts of seed are being sold for I/20 per kilogram compared with the ENCI price of grain at I/4.60 per kilogram. A new

variety has been popularized and it is known to farmers by the name of "Marginal 28". A recent protest by farmers in the region cited the shortage of Marginal 28 seed. Farmers may also be learning to recognize the limitations of saving their own materials from one harvest to the next. The high humidity and temperatures in the area lower germination values of stored corn seed within 2 to 3 months

Two private companies are involved in corn seed distribution in the department, SETSA and Hortus. Hortus brings seed produced on the coast to the region for sale through agriculture supply distributors. They obtain basic seed of Marginal 28 from INIPA in Tarapoto and multiply it into commercial seed categories on the coast in one generation. The reason for this is to use materials that are adapted to the selva. Repeated multiplication on the coast might result in a "genetic drift" toward more favorable conditions, losing its adaptation to the humid tropical regions. SETSA is a very small company established recently only for the purpose of producing and distributing corn seed. Its first year of operation was 1986, in which SETSA produced a very modest amount of seed through contract growers. Rudimentary conditioning was done through IST, a local vocational institute. SETSA sells directly to farmers from its base in Tarapoto. At least five other independent growers have multiplied the basic seed obtained from INIPA and produced commercial seed for sale in the region. They produced about 30 tons in 1986. Although the volume is low, and the production system informal, sales were made as far away as Moyobamba and Iquitos.

The El Porvenir Experimental Station is headquarters for the National Maiz Program and the Selva Rice Program of INIPA. Research in both crops is concentrated here. Sufficient numbers of new varieties are being introduced, and basic seed is produced at the station. The station is implementing a small unit for drying, conditioning, and conditioned storage of basic seed. Hybrids may be introduced soon for corn. Initial indications suggest that they will be very rapidly accepted among farmers.

Conditioning is provided by INIPA, ECASA and, in a limited way, by IST. No drying or conditioned storage facilities and no seed testing laboratory are available in the region. Farm equipment for timely harvesting of rice is also absent.

Quality control and technical assistance to the seed grower are carried out to some extent by INIPA for corn, and by ECASA for rice, as part of its internal quality control system. The SCCS is not participating thus far in seed production programs.

B. RECOMMENDED PROGRAM

1. Program Description

a Objectives and Methodology

The objective of the program is to strengthen the seed supply system, especially the phases of commercial multiplication and distribution. This builds on previous efforts in Peru which have helped develop the capacity to test new varieties and introduce them through the provision of basic seed in many important crops.

The program should have a national impact, working in the Selva, Sierra and Coastal areas. It should lead to the improvement of plant materials used by farmers in major crops. From this base, it should diversify and expand to include more and more commodities. That is, the focus of the program is on SEEDS, and is not limited to any one type of crop, nor any particular regions. It should be geared to grow to its full potential by encompassing more crops and more regions as resources and organizational and technical capabilities permit.

The program should promote investment, mostly medium and small scale, in self-financing, sustainable commercial activities. It should also strengthen services needed in support of production systems through private collective action and public programs where farmers participate in decision making and financing. Services should be extended to all enterprises--private, public, parastatal, cooperative, associative, large and small.

The methodology followed was to identify the areas in each region which have the greatest potential for assembling the elements of the seed supply chain within a short time. Therefore, emphasis was placed on looking for crops where seed supply systems are in place, but in need of assistance, or are just getting started. Lead crops are identified mainly on the basis of the projected demand for seed. Demand is stronger when the following factors are present:

* The product which the farmer produces and sells is physically distinct from seed--cotton, vegetables and forages as opposed to beans, cereals and potatoes.

* Seed is otherwise differentiated in the farmer's mind from other materials--hybrids, new varieties with a popularized name, seed having a place of origin thought to be a good source of material, or a recognized label, such as certified seed.

* Varieties become susceptible to disease and must be replaced periodically, or seed cannot be stored from one season to another without losing quality. Therefore the option of using materials saved from the last harvest for planting the following season is limited.

* Crops are produced for market, rather than for subsistence.

* Farmers produce for markets which are demanding in terms of meeting standards of the final product--export markets, agroindustries.

Naturally there are other factors, such as product prices, climatic conditions and access to areas where seed is to be used. Technicians, farmers, researchers and other persons working in the regions were asked to respond to questions about yield responses and improvement in quality of final products due to better seed and new varieties, seeding rates with lower and higher quality seed, and other aspects. These appreciations were used to arrive at rough estimates of the potential strength of demand, not in terms of quantities, but in terms of the value of high quality seed. These are expressed as a ratio of the value of seed to the price of grain. Current prices of seed were also expressed as a ratio to the price of grain. Both measures give an idea among crops and sometimes regions as to the relative strength in demand for seed.

The results are shown in the table below. The first column is based on current prices, the second was calculated from the appreciation of the factors mentioned by persons interviewed.

RATIO OF SEED VALUE TO PRODUCT VALUE FOR SELECTED CROPS

	Price of Seed/Price of Product	
	Current Prices	Calculated Maximum
Corr (Yellow flint)		
Hybrid	5.85	22.0
Varieties	4.35	
Rice		
Coast-ECASA	1.68	
Coast-Private	1.80	6.5
Selva-ECASA	1.36	
Beans		
North Coast	2.20	4.3
Central Coast	1.55	3.0
Potato (in the field)		
Sierra Central	1.36	1.8

Note: the calculated maximum values for corn and rice are based on interviews mostly with persons in the Selva, but may roughly reflect the general situation.

The figures reflect the strong demand for corn seed, which gives rise to the interest taken by the private sector in this crop. Hybrids are predominant on the coast, while varieties are starting to be used in the Selva. Rice seed prices reflect the extent of current subsidies, but the figure in the second column suggests that demand may warrant higher prices that could stimulate private investment to a greater extent.

The types of beans grown on the north coast are distinct from those grown in central coast areas. It appears that the demand is stronger for seed of ~~the~~ the north coast type bean. Both current prices and calculated values seem to reinforce this conclusion. Values for potatoes seem low compared to other crops, but here total volumes become a factor. Whereas 20 kilos of corn seed is used per hectare, 3 tons of potato seed is used. Although margins are low per ton, volumes become overwhelming. The current potato seed prices are attractive, especially given that they are in place of origin, not at place of use by the farmer, as is the case with the other crops.

Once lead crops are chosen, others that can be brought into the program to allow for expansion and diversification are identified to ensure that the program has the potential of reaching a minimum threshold level. By threshold we mean a volume of seed large enough to justify and partially finance basic support services. The exact level would vary greatly from one country to another, but as a general guideline when dealing with cereals and oilseeds, a minimum level is about 1000 tons. Minimum levels to sustain a potato seed program are higher, while those of forages and other high valued crops are lower.

The table on the following page summarizes the relative magnitudes of seed production activities in terms of volumes of commercial seed distributed to farmers.

The concept of developing complete seed programs in selected areas is to provide a solid base from which to grow, and models which can be adopted by other neighboring regions. After a few regions achieve a reasonable level of sophistication, they usually require more deliberate coordination at the national level. Through a national organization, they are able to provide orientation and financial support to other regions where seed programs are being formed.

In Peru, the stage of development of different areas and different crop programs vary widely. Some crops on the coast have advanced seed programs and require little assistance from the project, while others are just beginning. It is important, however, for the national seed program to encourage improvement in all crops throughout the entire country. The crops which already have strong programs can be brought in with relative ease to establish the basic services. These services can then be more readily extended to other crops. In areas where this strategy is not possible, seed programs will usually progress more slowly.

b. Approach for the Selva--Department of San Martin

1) Objectives

The agricultural development of the San Martin Department in the last ten years especially in maize and rice can form a solid base for a regional seed program. Rice expanded from 7 to 47 thousand hectares and corn from 17 to 65 thousand hectares during this period. A seed program in this region can be a model for other tropical areas of eastern Peru, such as Loreto or Ucayali. Meanwhile the Tarapoto area is providing corn seed to Yurimaguas, Iquitos and Pucallpa, which are behind in seed technology.

VOLUMES OF SEED PRODUCED IN PERU, SELECTED CROPS

	Regional sub-total	National Total
	(metric tons)	
Rice		6020
Selva (mostly San Martin)	443	
Coast	5577	
Cotton		9226
Piura	3332	
Lima	3324	
Ica	2580	
Corn (Yellow Flint)		2600
Coast	2500	
Sierra	50	
Selva	50	
Potato		NA
Central Sierra for sale to Coast	20,000	
Corn (Floury)		NA
Cusco for sale to other departments	150	
Beans		NA
Sierra		NA
North Coast		40
Central Coast		85
South Coast		NA

Sources: Rice--ECASA for 1984. Levels for 1985 were about half as much which is not typical. Amounts shown are seed distributed, not amounts produced which are much higher

Cotton--Unpublished AID Report "Estudio de Mercadeo Agrario SEMILLAS"

Yellow Flint Corn--Interviews with seed companies

Potato--CONAPAPA

Floury Corn--Interviews with INIPA technicians

Beans--Semillas Peruanas and INIPA

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Current situation of the seed program is poor. Nearly all corn is planted with varieties introduced 20 years ago, which are largely degenerated. The development of new varieties of short stature by INIPA makes it possible to differentiate the plant type, and consequently an easy identification by the farmer of the improved crop. ?
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Currently corn seed growers depend on INIPA or ECASA to process their seed. Scarce technical assistance is given by INIPA. No drying facilities are available and storage of seed presents major limitations. The Porvenir Station is able to do laboratory testing, but no field inspections are being performed.

Rice seed, although less perishable compared to corn, is usually held by ECASA for six months. Since currently there are no drying and cold storage facilities, farmers complain about the quality of the seed, and full potential of varieties has not been exploited.

Emphasis on quality should be the goal in the case of rice seed. Having the support of the project, individual seed growers who began with corn will enter into the seed business. Seed prices have to be improved to permit development of private firms. Other crops like beans and soybeans will be added as the program develops.

2) Actions and Resources Required

Technical assistance for private seed growers with other services provided by the project will stimulate the formation of small or medium size enterprises. Drying, conditioning and cold storage services are necessary. Advice in marketing will complete the producer-consumer chain. A quality promotion program has to be established to ensure the prestige of the seed.

As stated before, seed production in the San Martin region is difficult due to the lack of infrastructure for this special purpose. Traditional small farmers have not felt the need for artificially drying grain, and therefore seed growers do not see the need for drying seed. They wait for days with enough sunlight to proceed with harvest. Sometimes corn remains in the field for several weeks until harvest when weather permits. Seed fields must be harvested as early as possible after reaching physiological maturity to obtain quality materials. This calls for the use of artificial drying equipment. Promoting drying among seed growers is a critical first step in the program.

Within the San Martin department most rice production is in the Alto Mayo area. However the consensus among local technicians is that this area is too humid for seed production. Instead the areas around Tarapoto and Central Huallaga are superior for this purpose.

The strategy adopted is to stimulate individual growers and small enterprises to enter into the seed business, therefore drying services at a seed conditioning plant and portable equipment should be made available. The latter is needed because

rains sometimes make transportation of the harvested crop to the conditioning plant impossible. A conditioning plant should be built at the beginning of the project in Tarapoto to perform custom cleaning services for seed growers.

Maintaining quality for any length of time after conditioning in humid tropical regions is possible only with environment-controlled storage. If seed is to be held for more than one or two months, it must enter cold storage immediately after processing. A small capacity storage unit of 400 tons, divided into two units of 200 tons each should be built adjacent to the plant. Storage services for a monthly fee should be available to growers. Both conditioning and storage capacity will be adequate for only the first two to three years of the project.

The project should operate these facilities through independent management at the outset. Each service can be provided independently, and not as a package. Service fees must be realistic to promote the development of enterprises with their own partial or complete infrastructure. For example, some growers might install their own drying facilities, others might add storage space or send seed to another warehouse, perhaps in the sierra region for storage. When project facilities reach capacity, prices for different services can be adjusted to promote the purchase of equipment among private firms who might see advantages of performing services for their own seed or doing custom work for other growers.

Behind this process, an effective quality assurance and certification program has to be implemented for all phases of seed production and distribution. Field inspections, sampling, lab testing, and tagging are needed. The quality assurance service should work with both corn and rice from the outset. A Seed Board formed by all parties integrated at the departmental level should be established. Representatives of the MA, INIPA, Seed enterprises, Farmers Committees, BAP and the project should conform this board.

A seed grower association is expected to arise during the third year of the project. Support is to be provided for travel, training, and managerial guidance.

Enterprises which start in corn will begin to help ECASA cover the effective demand for seed in the second year of project implementation. Having access to support services, some of the farmer/cooperators already producing rice seed might produce on their own. Other companies, such as agricultural supply distributors, might also contract with these growers.

The chart on the following page presents schematically the various actions and resources required to carry out the program. For each activity the current situation is stated, then immediate requirements for direct project support are identified. By direct project support we are implying not only the use of AID funds but also local counterpart funds generated by the program. This will be explained more fully in the project management section. Finally the probable uses of additional funds from various public and private sources promoted as a result of project activities are shown.

ACTIONS AND RESOURCES REQUIRED IN THE SAN MARTIN AREA

ACTIVITIES	CURRENT SITUATION	REQUIRED FROM PROJECT	STIMULATED LOCALLY
Basic Seed Production	INIPA is providing	Minor installations for post-harvest handling	Seed enterprises could also produce
Commercial Seed Production	ECASA, INIPA, few seed enterprises seed growers	Technical advice	Formation of new seed growers and enterprises
Drying		Seed drying units & portable equipm	On-farm drying units
Conditioning	ECASA Cleaner, gravity table treater INIPA Cleaner	Processing plant for corn, rice, beans, etc Equipm. for lease	Private conditioning plants
Storage	INIPA 2 small rooms with air-conditioned	400 Tons cold storage	Private storage with air-conditioned
Distribution and Marketing	ECASA, INIA Seed enterprises Seed growers Ag input suppliers	Guidance to improve marketing based on quality seed	Enterprises with brand names
Quality Assurance, Certification Technical Assist to Seed Growers	INIPA (limited) ECASA for own growers	2 vehicles Operating expenses Seed Laboratory Office space and furniture	2 seed specialists
Seed Board Formation	Not conformed	Advice Travel expenses for members	Operating expenses Leadership
Organization of Seed Growers Association		Organization of meetings Funds for travel & others	Local leadership and participation
Training and Education	Does not exist	Program for seed specialists, seed growers, distributors and others	

A technical advisory team made up of both foreign and local advisers would support all of the activities. The principal role of these advisers is to support and orient local leaders, entrepreneurs, and technicians in developing a coherent integrated seed supply system. This implies not only technical aspects related to production, but also involvement and strengthening of organization, management, planning of activities, coordination with various institutions and channeling resources.

c. Approach for the Sierra

1) Objectives

Potato seed grown in the central sierra (principally Huancayo and Huasahuasi) has a strong demand on the coast because buyers recognize the area as providing tubers relatively free from disease. However, this seed supply system has many weak points and problems. Potatoes are grown with no particular effort to produce good seed. Materials planted are not necessarily basic seed provided by research institutions. There is no special protection from planting infected seed that may flow back from the coastal areas or elsewhere. No inspections are carried out to verify that seed is produced following recommended technical guidelines. At harvest time the market is anticipated and tubers are selected for size. But otherwise, they are handled just like potatoes for human consumption. When seed move into market channels, there is no emblem or symbol to recognize which materials are appropriate for planting. Therefore the buyer has no means of distinguishing between good and bad seed except by size and general appearance. This is a reason why buyers have traditionally visited the specific sites where potatoes are grown in the central sierra to visually select seed lots. If infected seed lots were sold to the coast, buyers there could lose confidence in the central sierra as a reliable source of seed.

There is a clear need to improve the existing informal system. This improvement could be achieved especially in terms of seed quality, rather than quantity. One important linkage is to promote the use of new disease-free basic seed materials already being produced by the INIPA-COTESU project in the same area. There is a need for technical assistance to growers throughout the multiplication phase so as to avoid reinfection. Effective quality assurance services need to be implemented in support of the grower as well as the buyer.

The National Potato Growers Committee (CONAPAPA) has recognized the potential risks of the current informal system, and intends to implement technical assistance services to growers and certain control of marketing channels to identify the origin of materials being shipped for planting. Ideally these activities would be integrated into a certification system.

Another subregion that shows an initial level of seed activity is Cusco, in the southern sierra. Similar to the existing informal seed production and marketing of the central sierra, the Cusco area has been traditionally recognized as the

source the most sought after varieties of fresh corn-on-the-cob, such as Blanco UruBamba and Cusco Gigante. Buyers typically visit the Urubamba valley to purchase seed directly from farmers. The buyers use these materials to produce fresh corn-on-the-cob for urban markets throughout the country.

Another crop with potential for commercial seed production in the Cusco area is potato. Basic seed is already being produced by INIPA as part of the National Potato Program. This source would be valuable in supplying growers for commercial multiplication. Potential markets for commercial seed are within the Cusco area, neighboring departments such as Arequipa, Puno, Apurimac, Ayacucho and Moquegua, and perhaps as far away as the southern coast. So far, there are no commercial seed growers, as such, nor defined markets outside of markets for consumer potatoes. Therefore, the demand for seed and the size of these potential seed markets has not been determined.

Other crops that might be assisted in the sierra in general are wheat and andean crops. Both the central and southern sierra sub-regions already have some capacity to produce seed, but again, demand for commercial seed is very low and poorly differentiated from grain for food.

Because corn seed reaches only 150 tons, and growth of effective demand for others is not known, the design team was not able to determine that the threshold level can be reached within the LOP. Still, we feel strongly that the potential exists in the southern sierra, based in Cusco. Therefore, despite the lack of a complete strategy for the project design, we will propose the resources for a seed program. During the early stage of project implementation, the advisory team should seek out the best methods for initiating work in the sub-region.

2) Actions and Resources Required

The proposed goals for the central sierra can be achieved through the integration of key components in the region. INIPA should provide the basic seed of potato, which is already being produced. This seed should be allocated (sold) to the commercial seed growers. This activity would bring revenues to INIPA. If sufficient quantities of basic seeds are marketed for a realistic price, the basic seed operation of INIPA would become selfsustaining in a short time. This should be a clear objective for INIPA.

Private seed growers that are currently producing and marketing potatoes for seed to the coast and within the same agricultural region, should be encouraged to utilize the high quality basic seeds produced by INIPA. This points to one of the roles of an effective certification service which provides technical assistance and market orientation. There may be a need in some cases to implement minimum seed handling facilities (for sorting, treating, for greensprouting, etc.).

Since the components are already initiated, impact within the first two years can be obtained. The clear chain linking basic seeds with commercial seed production and marketing and certification will have been established within the first half of

in other regions of the sierra Any new technology arising at the research stage in the future would flow at a faster rate to farmers.

In the sierra region especially the certification service should be focused as a truly promotional, support and educational service. The service should carry out the following.

Provide orientation as to the importance of planting basic seed of reliable source

Train farmers how to protect seed lots from reinfection

Teach post harvest handling methods

Provide an emblem that should be placed on the container to symbolize that it is high quality seed.

In addition, the certification service would be adapted to the reality and stage of evolution of the Peruvian potato seed market. This is to say, that the service should be dynamic, non-restrictive, and flexible, allowing the system to get initiated to later carry out the improvements as the experience and market demands. *How?*

The certification service should be implemented in collaboration between CONAPAPA, the local grower committees, and the MA as an integrated service at the departmental level. Therefore, a seed board should be formed in the Junin Department with representation from MA, INIPA, Local Seed Growers, BAP, project staff and others.

Having these services in place will permit the branching out to support farmers interested in the production of seed with native varieties for local use. Some of these have great acceptance among consumers, and highly valued by farmers in specific areas.

The chart on the next page is similar to that presented for the San Martin Department.

For the Cusco area, we feel that a similar strategy can be followed, beginning with corn seed for Fresh corá as described above. Potato is the next crop in this region, which could be produced to supply seed to other areas. However, the design team could not determine the potential growth for either of these crops, nor identify other crops which might enter the program in the near future. Therefore, the project staff that implements the program should define the specific actions to be carried out. It is anticipated that a solid plan will be developed within the first year of the project, requiring direct technical advisory support in the area beginning in the second year. Therefore, this support is planned for in the program budgets.

ACTIONS AND RESOURCES REQUIRED IN THE JUNIN AREA

ACTIVITIES	CURRENT SITUATION	REQUIRED FROM PROJECT	STIMULATED LOCALLY
Basic Seed Production	INIPA producing		Seed enterprises could produce seed
Commercial Seed Production	Private growers	Technical advice	Financing production improved quality, specialization
Storage	Not available	Technical advice	Storage facilities
Distribution and Marketing	Informal channels	Advice on marketing	Organization of channels Differentiate product, brand names
Quality Assurance, Certification, Technical Assist to Seed Growers	Not organized	3 vehicles Office space and furniture	3 specialists operating funds
Seed Board Formation	Not conformed	Advice. Travel expenses for members	Operating expenses Leadership
Organization of Seed Growers Association	Not organized	Advice	Local leadership and participation
Training and Education	Limited	Program for seed specialists, seed growers and leaders	Seed courses in UNCP

d Approach Taken for the Coastal Region

1) Objectives

Seed supply systems are already established and operating in corn and cotton. However, seed producers are paying fees for certification services, but are not receiving assistance with their production programs, training of personnel, nor with quality testing services. The certification label is not useful to them as a means of differentiating high quality seed from other materials because it is not recognized by farmers as a guarantee of quality, and does not distinguish the best seed from that which barely passes minimum standards. Therefore, the fees paid for certification services are viewed by seed producers as a tax, rather than as a fee for services. It becomes another barrier to entry by smaller, poorly capitalized firms, rather than a support mechanism to reduce start-up costs and risks.

The limitations are being felt in rice seed, where the market is weaker than for corn and cotton. Private firms have been less attracted to enter into production, a parastatal still produces nearly all the rice seed. Utilization is high on the coast for two reasons. the Banco Agrario requires use of purchased seed for obtaining loans, and prices of seed are subsidized. Both mechanisms tend to increase utilization, but give no incentive to improve quality of seed. Representatives of ECASA expressed a desire to stimulate private initiative in rice seed production and gradually withdraw from this activity as conditions permit. Two small firms recently formed are receiving support from both ESCASA and INIPA

Bean seed production is at minimal levels, but can be increased modestly, as, perhaps can that of other minor crops. Several individual private farmers and some small companies are attempting to produce bean seed. Mechanisms for quality promotion and product differentiation is the factor that most limits private initiative. Other crops are very minor by comparison and can only be developed through diversification of existing enterprises.

Certification and Quality Promotion Services should be implemented for corn and cotton, taken together as lead crops. From this base, services can be extended to rice, beans and perhaps others. Besides certification and quality promotion services, other services can be provided to the various participants in the seed sector. These include assisting in the supply of publicly originated basic seeds, and assisting in providing facilities and/or services for conditioning and storage. For instance, if custom cleaning services were available, then entrance to the system would be facilitated for individual farmers and companies with very limited capital.

The coastal region can be broken down into three sub-regions north, central and south. The northern region produces cotton, corn and rice, with some beans. Nine enterprises and organizations are involved in seed production there. In the central coast, cotton and corn predominate, with some bean production. At least five major institutions are working in seed production. In the southern coast, rice is the primary crop, with some wheat and bean. Only two institutions are involved

The north coast offers the best opportunity of implementing the above strategies. The program can work with the two lead crops, corn and cotton, and extend the services and activities rapidly to rice and beans. Improvements made in rice seed will impact on the entire coast, since seed is distributed from the north coast to other areas. Institutions in the area are in the process of decentralizing services and are searching for the means of operating locally through a systematic program. The area can become a model for others on the coast and the rest of the country within a short time.

2) Actions and Resources Required

The project will emphasize the establishment of a quality promotion and certification service for corn and rice. The reinforcement of activities for quality assurance will regain the confidence in the certification label, with constant guidance to the seed growers through professional technical assistance in all steps of seed production, while helping to meet certification standards by newcomers in seed production.

All these actions will provide a basis for privatizing the rice seed industry. The project should promote private investment in conditioning equipment to add to and eventually replace the capacity of ECASA's aging equipment. The project will help enterprises with designs, feasibility studies, obtaining credit, and using lease-purchase arrangements for the installation of new conditioning plants with adequate storage capacity.

A department or regional board as advisory bodies with wide participation of all sectors involved in the seed industry should be formed as soon as possible. Representatives from MA, INIPA, seed enterprises, seed traders, seed growers, farmer committees, BAP and the project could conform this board.

In the initial phase, the program should begin in the Lambayeque Department. This model should be easy for some neighboring departments to follow. Piura, for example, already has important amount of cotton and rice seed. Other neighboring departments, such as La Libertad, would have two options for their development. If seed activities grow to a threshold level, they can organize separate programs at the departmental level. If the volumes of seed are lower, several departments could join into a subregional program.

A seed growers association (including individual growers and seed enterprises) has to be organized. The project should help with travel, training and guidance.

A training program including seed specialists, seed growers and distributors will help enhance the entire perspective.

The specific actions and resources required for the Lambayeque departmental program are described on the following page

ACTIONS AND RESOURCES REQUIRED IN THE LAMBAYEQUE AREA

ACTIVITIES	CURRENT SITUATION	REQUIRED FROM PROJECT	STIMULATED LOCALLY
Basic Seed Production	INIPA is providing		Seed enterprises could also produce
Commercial Seed Production	ECASA, INIPA Seed enterprises	Technical advice	Formation of new seed enterprises & seed growers
Conditioning	ECASA, INIPA Obsolete equipment	Minor repairs Plant design Equipm. for lease	Improved repairs New equipment for new enterprises
Storage	ECASA, INIPA		Improve current facilities Increase capacity
Distribution and Marketing	Channels already established	Guidance and coordination	New channels for Rice seed Enterprises with brand names
Quality Assurance, Certification, Technical Assist to Seed Growers	M A ECASA (for own growers) INIPA Seed enterprises (only assistance) UNPRG Laboratory	3 vehicles Office space and furniture Lab. equipment	3 seed specialists operating funds
Seed Board Formation	Not conformed	Advis. Travel expenses for members	Operating expenses Leadership
Organization of Seed Growers Association	Not organized	Organization and meeting	Local leadership and participation
Training and Education	Does not exist	Program for seed specialists, seed growers, enterprises & distrib	Seed courses in UNPRG

2. Rationale

a. Advantages of Approach Taken

The approach of building on existing capacity in areas where results can be shown within a short time leads to a national program, covering all crops and regions. It has the advantage of generating capacity--technical, organizational, financial, and entrepreneurial. If skillfully implemented, the program will gain momentum each year, and at its best, can even influence the execution of other programs in the agriculture sector

Especially through the formation of organizations at the local level--private enterprises, certification services, seed boards, seed growers associations and others--leadership is identified and developed. In the long run, these people will determine the success of the efforts of the project.

The seed industry lends itself to the formation of small and medium size firms. Therefore the needs for large-scale investments through public channels or sources of foreign capital are minimal. Even countries less developed than Peru can implement excellent seed supply systems and have a major impact on agricultural productivity. Small enterprises can develop when they receive support services, creating a healthier, more dynamic environment. Competition among firms usually leads to better quality seed, and often helps expand utilization by the farmer. Economies of scale in seed production are negative in most cases, leading to greater efficiency with smaller and medium size enterprises (Economies of scale are strong with plant breeding programs. For private plant breeding to take place, firms recover their investment through sale of patented commercial materials. But in the actual production of commercial seed, as opposed to plant breeding, size is usually no advantage.)

As the reader can see from the above, a change in the focus of certification services in Peru is central to the approach taken by this program. Instead of being a regulatory agency of the central government, Peru needs more technical assistance, quality assurance, promotion and support at the seed grower level. Program needs to be close to the farmer. Solid certification programs that gain credibility of farmers in each department will lead to recognition of the certification as a symbol of quality. Once this is achieved, a series of events follow:

- o More firms can enter into production because start-up costs are lower.

- o More crops can enter program because the reputation gained in some crops transfers to others through use of the certification label.

To make these things happen, local seed boards need to be formed to accomplish three different functions:

- * Coordination of activities among numerous private and public institutions.

- * Participation of growers in decision-making in implementation of the certification service.

- * Financing of the certification service through private and public means

The government of Peru has established fees for certification. The program proposes using these resources to expand support services for the seed supply system. The funds collected would be put to use at the departmental level under the auspices of the local seed board. Hence, local seed boards would be authorized by the Ministry of Agriculture to be the official certifying agency within their local area, and the boards would retain the fees collected to expand and improve services.

The seed boards should operate much like crop improvement associations which carry out certification in some other countries. The crop improvement association model cannot be implemented directly, however, because seed growers do not yet exist in many parts of the country. The precise legal form for the boards to take has to be developed within the scope of the program. The project advisory team and others should be involved in providing guidance in this area.

The management section of this program design suggests carrying this process another step further by integrating project management into institutional formation and strengthening.

To summarize, some of the most important advantages of this approach are:

Plant materials from all sources will be utilized -- UNA, INIPA, and private industry, local traditional materials, and others.

Responsibility will be decentralized to a level close to the farmer

Project investment will stimulate other private and public investment.

Activities will continue after the end of the project.

b Alternatives Considered

The alternative of working only with crops which currently have little activity in seed production was considered at the very beginning of the design effort, but was rejected within a short time. The possibilities of developing selffinancing support services and attracting investments in crops with weak demand for seed are very limited. On the other hand, even crops with strong demand for seed and on some seed

production activities do not have the support services. By building up the seed supply system and services around major crops, a base can be developed to extend rapidly to minor crops.

The possibility of working only in regions which are less developed in the Sierra and Selva was rejected because we feel the investments in time and resources will be more than what the project and other sources are willing to provide. However, if the more developed regions establish a model for the others, then the seed supply system will tend to expand to more and more crops and areas. The less developed areas will be reached more rapidly through this mechanism.

Implementation of quality promotion services only through a central government institution, such as the MA or INIPA, was rejected. For these services to be meaningful to the farmer who purchases seed, they must gain a great deal of credibility. The only way this is achieved within a short time is for the farmer to be involved in the organization of the services through his local leaders. Therefore, the team reached the conclusion that the department is the correct geographical base from which to begin.

The option of working at the departmental level in the sierra and selva while working at the regional level on the coast was first thought to be appropriate, but later rejected. The feasibility of achieving a dynamic, solid organization at the departmental level is much greater than at the regional level. The farmer will participate more readily, and the local board and services will gain credibility when closer to the farmer.

Although seed flows freely up and down the coast as a fluid market area, the tendency is for each company and program to concentrate production in certain areas. This tendency will become more marked as existing firms install conditioning and storage facilities in secondary centers and new firms enter the market to produce and sell in a more limited area. Therefore the environment seems to lend itself to starting at the local level and, perhaps, working up to subregional or regional organizations when and if needed.

A possibility considered by the design team was seed being produced on the coast for sale in the selva region. This could be an alternative for a firm already established on the coast. The cost of transport for corn seed will represent only 1/20 of the selling price, however in rice 1/7 goes to transport, making it too expensive due to quantity needed for planting an hectare. However the risk of interrupted roads is present all times, especially during rainy season. On the other hand the dependence on seed produced outside the region, should not be the policy. In fact farmers in the Coast might find a more profitable crop and discontinue corn seed production for San Martin. The building of a solid seed program with all elements will help the simultaneous production of seed from other species which otherwise will not develop, like beans, cowpea, soybeans among others.

3 Expected Outputs

The specific milestones that can be identified in each area or department are organization of seed boards, organization of certification services, etc. But more meaningful milestones can be developed in each commodity program within each area in terms of quantities and quality of seed utilized by the farmer. In some areas, especially San Martin, emphasis is placed on increasing quantities of high quality seed. In others, such as Lambayeque, emphasis is on improving quality over roughly the same volumes already being produced. In the case of Junin, emphasis is on maintaining quality in potato and reducing marketing costs and risks. A program in Cusco would focus mainly on increasing volume of quality seeds.

Below, we suggest what some of the expected outputs are for the crops where impacts are expected first. In all cases, the idea is to form a program based on these crops, and then expand to others.

Junin

Outputs for the Junin Department are more difficult to express without additional information. Perhaps the ideal would be to have a measurement of volumes of seed by categories which reflect the quality, that is, of the 20,000 tons produced, perhaps 20% is currently in the premium category, 50% in the good category and 30% in poor category. Outputs could then be stated in terms of increasing the amounts in the premium and good categories, and eliminating the poor seed category. Indeed, this is the nature of the task to be carried out.

In the execution of the program, the project staff will obtain the above information as a result of the certification efforts. Therefore it becomes a matter of relative ease to set specific, measureable goals from one year to the next.

For the purposes of project design, we can generally suggest that the expected outputs are.

- * improvement in quality of potato seed sold to coastal markets over about the same quantities as currently produced
- * protection of the buyer and seller in the marketplace, assuring that the seed supply system does not break down in the future
- * reduced costs on the part of the buyer in obtaining seed

San Martin

A seed program with corn as the lead crop, but including rice, will expect to have a major impact in the San Martin region. In the absence of a seed program, new varieties will continue to be slowly adopted, but quantities of high quality materials will not improve. Therefore, outputs can be stated in terms of volumes of high quality seed produced.

The total use of planting materials and possible use of seed with the program are shown in the two tables below.

PROJECTIONS OF CORN SEED PRODUCTION IN SAN MARTIN

Year	Area Planted to Corn	Volume of Materials needed for Planting	Projected Volume of Improved Seed	Percentage Utiliz- ation
	(hectares)	(metric tons)		(percent)
Current	80,000	1600	50	3
1	87,500	1750	150	9
2	95,000	1900	300	16
3	102,500	2050	600	30
4	110,000	2200	1000	45
5	117,500	2350	1500	64

Note. The current year roughly reflects the expected situation in 1987. The projections assume an effective seed supply system being developed over the life of project (LOP).

PROJECTIONS OF RICE SEED PRODUCTION IN SAN MARTIN

Year	Area Planted to Rice	Volume of Materials needed for Planting	Projected Volume of Improved Seed	Percentage Utiliz- ation
	(hectares)	(metric tons)		(percent)
Current	47,000	3760	600	16
1	50,000	4000	760	19
2	53,000	4240	933	22
3	56,000	4480	1120	25
4	59,000	4720	1322	28
5	62,000	4960	1538	31

Lambayeque

The outputs which can be achieved within the life of project within the northern coastal region are as follows:

* For cotton no important impacts on seed quality and utilization are foreseen

* In corn established companies will benefit from additional support, as will the few smaller firms intending to enter the market. The improvements in utilization and seed quality will be modest.

* For rice, nearly all commercial seed production can be produced by the private sector with competition among several firms (three or four at least). Quality of rice seed will improve.

* For beans and other, seed production can be increased in modest amounts. Expected levels for beans are shown below.

PROJECTIONS OF BEAN SEED PRODUCTION ON THE NORTH COAST

Year	Area Planted to Beans	Volume of Materials needed for Planting	Projected Volume of Improved Seed	Percentage Utiliz- ation
	(hectares)	(metric tons)		(percent)
Current	10,000	600	40	6
1	10,000	600	54	9
2	10,000	600	72	12
3	10,000	600	90	15
4	10,000	600	108	18
5	10,000	600	126	21

A rough estimation of the magnitude of the impacts of the program can be made, referring only to selected crops within the three departments. The table below presents the results of this analysis, using the area to be planted with improved seeds at the end of the five year project and the increase in yield expected as a result of the program.

The increase volumes produced are valued at current prices in Peru. However, it is worth noting that current prices in Peru are nearly double international prices for many crops, and therefore do not represent the "opportunity cost" to the country for obtaining these products. A closer estimate of the gross impacts of the program, therefore, could be made using international prices plus transport costs.

VALUE OF INCREASED PRODUCTION FROM AREAS PLANTED WITH HIGH
QUALITY SEED AS A RESULT OF THE PROJECT
Current Prices in
Peru converted to US Dollars

Area/ Crop	Area Planted	Increase in Yield	Current Price	Gross Impact
	(Hectares)	(Kg/ha)	(\$us/ton)	(\$us)
Sierra Potato	7,000	2000	250	3,500,000
Selva Maize	75,000	300	250	5,625,000
Rice	19,200	300	275	1,584,000
Coast Rice	35,000	300	250	2,625,000
Beans	2,100	200	500	210,000
TOTAL				13,544,000

For the central sierra region, Junin, the sum of the various impacts mentioned above were included in a very general way as if the program causes an increase in yield of about 10 percent in potato. In reality, the farmer using the seed may achieve a 50 percent increase in yield, a 50 reduction in production costs.

As can be seen in the table, total gross impact is highest in San Martin, second for Junin and lower in Lambayeque, where seed programs are already advanced.

From these gross figures, the increased costs of producing seed should be subtracted. This represents the increased resources which the Peruvian society had to apply to bring about the above impacts. But this only estimates the additional use of resources reflected in the price of seed. Public investments not recovered within the program, including donations from international institutions should also be subtracted.

The additional use of resources required on the part of seed producers can be projected by estimating the increased efforts required above those currently made. That is, if farmers are currently producing 1000 tons of corn for grain (which is used for planting) worth \$250 per ton, and the program will cause them to produce 1000 tons of seed worth \$1000 dollars, then the increase in resource utilization has been \$750 times 1000 tons, or \$750,000. This is a local investment generated by the program, but which should be subtracted from the gross impacts stated above.

The following table presents the figures consistent with the current situation

INCREASE IN ANNUAL LOCAL INVESTMENT REQUIRED BY SEED PRODUCERS

Area/ Crop	Volume of Seed	Price of Material Currently Produced	Increased Resource Utilization Expected	
			Percent	Total
	(metric tons)	(\$us/ton)	(percent)	(\$us)
Sierra				
Potato seed	20,000	300	10	600,000
Selva				
Maize grain	1500	250	300	1,125,000
Rice seed	330	375	100	123,750
Rice grain	1208	275	200	664,400
Coast				
Rice seed	2100	420	50	441,000
Bean grain	126	500	150	94,500
TOTAL				3,048,650

Again, these figures are influenced upwards by the inflated prices of agricultural products in Peru. The projections suggest that a conservative estimate of the net impact of the program before subtracting non-recoverable public investments is around 10 million dollars per year by the end of the project valued in current Peruvian prices. This may be closer to about 6 million dollars if international prices plus transport were used.

An advantage seen in the above is that three months are allowed for project start-up and three months for closeout.

Short-term advisory assistance would be used to a limited extent, largely in support of investment projects for seed production programs and installation of facilities, both by the project and by seed enterprises. A summary of the TA efforts is as follows:

Long-term Technical Assistance	Person-Months
Expatriate Advisors	
Seed Technologist for Coast/Selva	48
Seed Technologist for Sierra	48
Chief of Party/Agricultural Economist, Organizational Development	60
Sub-total	156
Local Advisors	
Seed Technologist for Sierra	48
Seed Technologist for Selva	48
Sub-total	96
Total Long-term TA	252
Short-term Technical Assistance	
Feasibility studies for financing seed production, conditioning, storage and distribution programs	18
Seed marketing studies and policy analysis	6
Conditioning plant and storage space design and installation	15
Seed program and institution building	3
Farmer Organizations	3
Total Short-term TA	45

b. Training

Training activities are designed to create the awareness and support at high levels, and the necessary skills to carry out the specific jobs by the technical staff. The activities can be carried out at the sub-regional level, national level, and outside the country. Both in-country and outside training should place special attention to training of new

The training plan envisioned for the program is as follows.

ACTIVITY	YEAR OF PROJECT IMPLEMENTATION					TOTAL
	1	2	3	4	5	
(person-months)						
Seminars, Workshops, Conferences						
In Peru	1	3	3	2	1	10
Outside		1	1	1	1	4
Intensive Seed Technology Courses						
In Peru	20	100	100	100	60	380
Outside	20	20	20	20	20	100
Travel Study outside Peru						
		5	5	5	5	20
Travel for Meetings and organizational development in Peru						
		20	20	20	20	80
(person years)						
Masters degree training		2	2	2	2	8

Activities for leaders should be very intense in first years and taper off in later years. Starting the second year the leaders should participate in local seed boards, associations and assist evaluation and planning of the subregional project. A key strategy should be the participation of the leaders from the public and private sectors, including farmer leaders.

The intensive technical courses within the country should address the specific technical problems that needs to be overcome in each region, for the crops involved. These activities can be carried out by the advisory team in collaboration with other local specialists. Assistance can be obtained from international centers. Intensive courses outside the country should expose trainees to working models and advanced seed industries.

The degree training should emphasis grain crops such as rice, corn and beans. Specialized personal for potatoes is already available in Peru. It is anticipated that M.S. is a sufficiently high level.

c Organizational Support

A modest amount of funds are needed for office space and other budetary support for some of the certification services and organizations (seed boards and seed growers associations) during the first year or two after formation.

d. Equipment, Vehicles and Facilities

A short-term consultant should arrive within the second month of the project for the design of the conditioning plant and storage facilities in Tarapoto. Construction of the plant will start immediately after. Procurement and installation of the equipment will follow by the end of the first year.

Additional conditioning will be purchased by the project during the first, second and third years to facilitate services in places where they are lacking. This equipment will be offered to private enterprises on a lease or lease-purchase arrangement.

The schedule of requirements for equipment, vehicles, construction and installations is shown below by year:

Equipment, Vehicles and Facilities	Estimated price (000 dollars)
First Year	
Seed drier, oil fired	10
Portable seed driers (3)	18
Air screen cleaning	25
Gravity table	12
Indented cylinder for rice	8
Mist-o-matic treater	8
Sewing machine w/accessories	2
Baggage scale	4
Elevators (8)	8
Bins locally made (8)	10
Air condition & dehumidifiers	18
Conditioning equipment for leasing	60
Vehicles 4WD 5 passenger (5)	75
Minimum seed lab & supply (3)	30
Furniture & equipment for Certification offices (2)	10
Construction of the plant and cold storage in Tarapoto	150
Install & repair of seed conditioning equipment at national level	145

Second Year

Vehicles 4WD 5 passenger (9)	135
Furniture & equipment for Certification offices (2)	10
Conditioning equipment for leasing	60

Third Year

Vehicles 4WD 5 passenger (10)	150
Conditioning equipment for leasing	60

5. Cost

The cost breakdown for TA and training is found in the next two tables. Then a final table showing costs per year is given

Long-term technical assistance

(000 dollars)

Expatriate	12,500/month	156 months	1,950
Local	5,000/month	96 months	480

Short-term technical assistance

Expatriate	12,500/month	27 months	337.5
Local	5,000/month	18 months	90

Total technical assistance 2,857.5

Training	person-months	\$us/month	Total Cost
			(000)
Seminars, Workshops, Conferences			
In Peru	10	1500	15
Outside	0	1500	18
Intensive Seed Technology Courses			
In Peru	380	1000	380
Outside	100	3500	350
Travel Study outside			
Peru	20	4500	90
Travel for Meetings and organizational development in Peru	80	700	56
	person years	\$us/year	Cost (000)
Masters degree training	8	25,000	200

ACTIVITY	YEAR OF PROJECT IMPLEMENTATION					TOTAL
	1	2	3	4	5	
	(000 dollars)					
Long-term TA						
Expatriate	375	450	450	450	225	1,950
Local	30	120	120	120	90	480
Short-term TA						
Expatriate	125	62.5	62.5	62.5	25	337.5
Local		30	30	30		90
Total TA						2,857.5
Training						
Seminars, Workshops, Conferences						
In Peru	1.5	4.5	4.5	3	1.5	15
Outside		4.5	4.5	4.5	4.5	18
Intensive Seed Technology Courses						
In Peru	20	100	100	100	60	380
Outside	70	70	70	70	70	350
Travel Study outside Peru		22.5	22.5	22.5	22.5	90
Travel for Meetings and organizational development in Peru		14	14	14	14	56
Masters degree training		50	50	50	50	200
Total Training						1109
Organizational Support	20	20	10	10		65
Equipment	593	205	210			1008
GRAND TOTAL						5039.5

6 Implementation Plan

a Management of the Program

The institutional linkages established for the management of the Seed Production/Distribution component of the AIT Project are interrelated with the alternatives for development of support services in the seed sector. Of special importance is the institutional base of the certification services. Around North and South America, there are examples of certification services in both the public and private sectors. Those in the private sector are implemented by crop improvement associations or seed grower associations. That is, they are carried out through private collective action. Other arrangements are mixed -- private and public -- through seed boards. Though the latter is ideal in theory, it can be messy in practice because of the lack of clear rules controlling the organization of the board or boards.

In Peru, certification services must be organized at the departmental level to be effective. (There may be some variations in particular cases, but certification must be as close to the farmer as possible.) Since the Project largely works through the Certification Services, project management must also be focused as directly as possible to the local or departmental level. In each area, certification personnel will promote seed production activities, working directly with INIPA and seed enterprises, giving technical assistance to seed growers, analyzing seed through laboratory tests, tagging seed lots according to quality standards, and orienting participants in the system. Hence, certification supports all the elements of the chain.

- INIPA/SENASE in production of basic seed
- Individual Growers in production of commercial seeds
- Seed Enterprises in production, conditioning and distribution of commercial seed

There are many alternatives for organization of certification services, and for project management. Three options are presented below. As explained earlier, implementation of certification directly through a single national public institution is not viable. Therefore, the option of implementing the project through a public institution at the central level is very weak, but a possible scheme has been included for reference. Therefore the three options discussed are public, mixed and private. Some aspects are common to all three options.

* The AID Mission signs the Project Agreement with the MA (and in two cases with ONA)

* The MA delegates the responsibility for certifying seed to a local organization (local seed boards or local seed growers committees)

* The AID Mission implements the Project through a "TA Team and Project Staff", that is, through a technical and administrative team contracted for this purpose.

* The support supplied by the Project goes through the Project staff and TA Team directly to the local level. Local Seed Boards or Local

Seed Growers Committees and Certification Services (Some support also goes directly to INIPA, seed enterprises and distributors, this is not shown in the diagrams)

* Local Seed Boards or Local Seed Growers Committees collect fees (now established at 3% of the value of seed) for certification services. At least 2/3 of these funds remain at the local level to finance the services.

The differences among the three options are in terms of the institution that takes responsibility for implementing certification services, and the institution which coordinates on project implementation.

Alternative A Public

The AID Mission under agreement with MA implements the Project through a contractor which supplies TA and Project implementation staff to support local seed boards in the four regions. In the ProAg the MA agrees to transfer the certification responsibilities to the local seed boards. These boards are mixed, i.e., representatives from the MA Regional, CIPA, BAP, Seed Growers, Farmers & Project staff will conform to certification staff at local level promote production of all types of certified seed, execute the quality services and assist seed growers in all steps of seed production and distribution. Certification fees will be changed for the service. Local boards will have the authority to collect these fees and use them exclusively for seed purposes.

The National Seed Commission, currently constituted according to the Seed Law, has to be changed over time in its composition, increasing private sector representation to equal that of the public sector. This commission shall coordinate with TA and Project staff for the development of the Project.

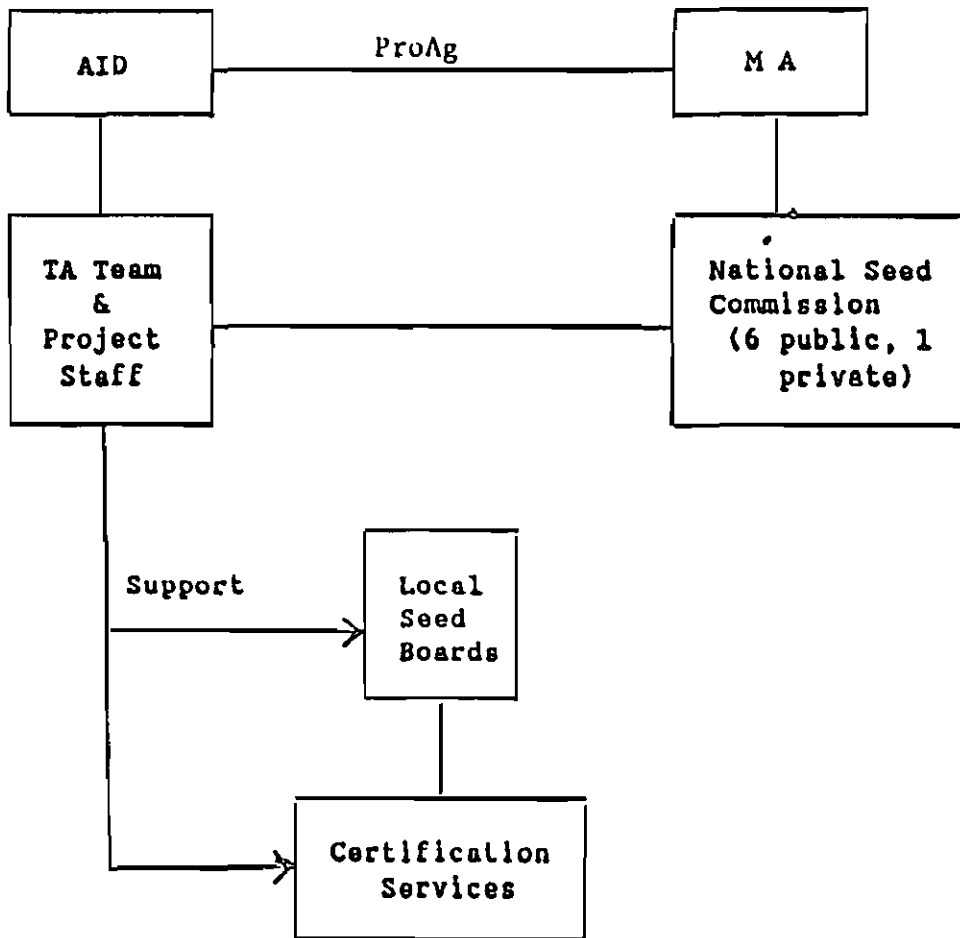
One weakness of this system is that the National Seed Commission currently has no executive functions, no staff nor offices. It is an advisory board to the MA. Therefore, the Project would depend to large degree on the MA. However, the clients and beneficiaries at the local level are not directly part of the MA, instead they are mixed, autonomous institutions which have to be established and developed over time. In this form, the Project team could end up with little support at the central level, and yet be subject to changes in internal policies of the Ministry.

Alternative B Mixed

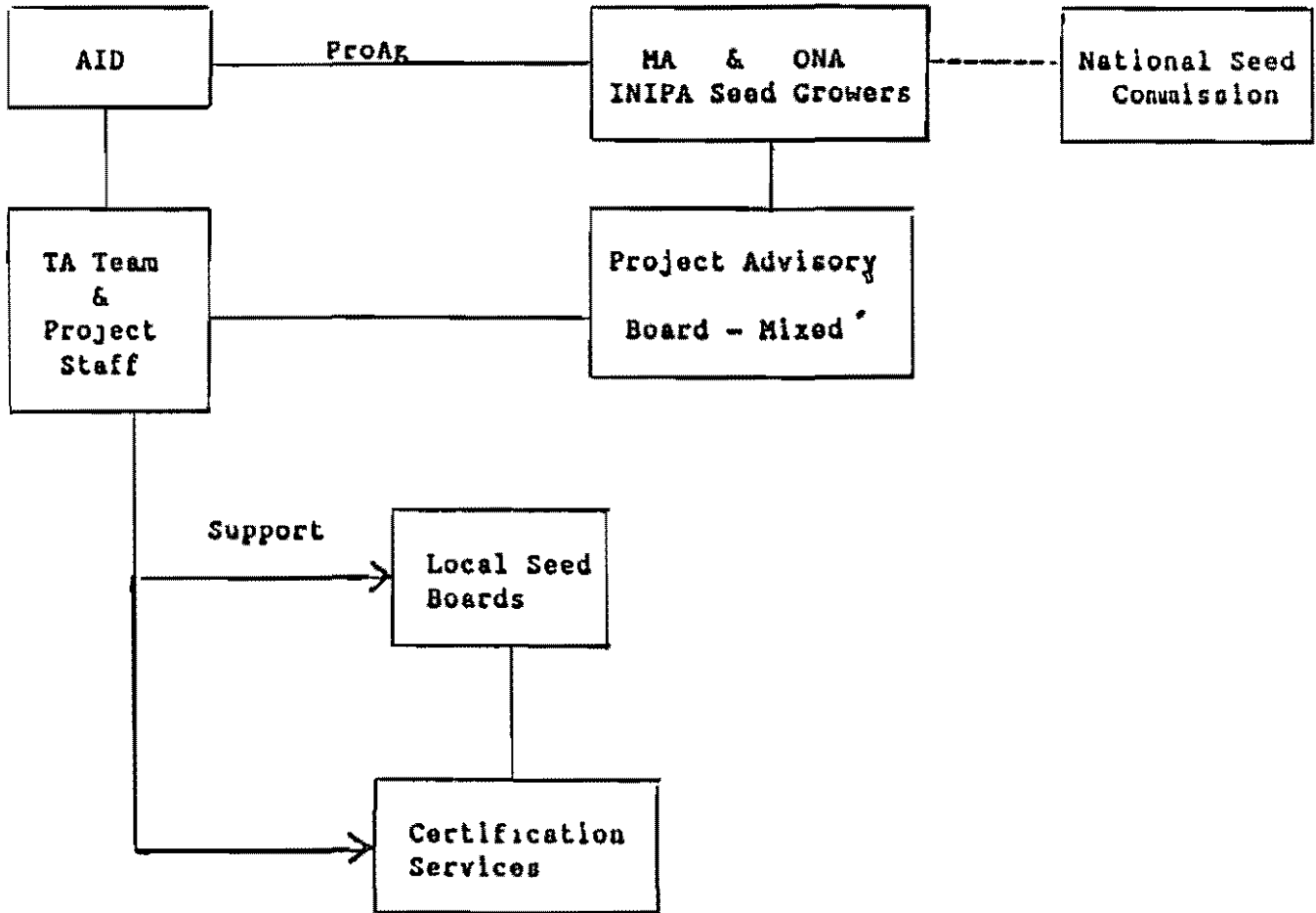
MA and ONA sign the ProAg with AID to develop a seed program. The former institutions establish an Advisory Board at the national level with representatives of MA, INIPA, ONA, Seed Growers, AID and Project staff. This board coordinates with the Project to support seed activities of Local Seed Boards, which are formed in a similar way as in Alternative A. The local boards will implement certification services and collect the respective fees under delegation of MA. Additionally, the National Seed Commission acts as an advisor to the MA and ONA, but again its representation shall be changed.

The Project Advisory Board, or a Coordinator hired by the Board would be recognized by the COP as the official executing agency for the Project.

Alternative A Public



Alternative B Mixed



Thus, the Board could have more or less control over project resources, depending on the style desired

This alternative attempts to draw the public and private sectors into project implementing with equal representation. It also gives the Project team considerable autonomy from established institutions at the national level. However, local boards still have to be formed and developed starting from zero, without clear definition as either public or private organizations. They also have no clear connection at the central level. Also, the Project Advisory Board has no clear relationship to the National Seed Commission. The future of both would be left to evolve during Project implementation.

Alternative C Private

This model implements certification services through private collective action by the National Agrarian Organization (ONA). Coordination between the various participants, including those in the public sector, comes through two advisory/coordinating groups: the National Seed Commission and Local Seed Councils.

The AID Mission signs the ProAg with MA and ONA. ONA will add to their Committees a National Seed Growers Committee. Since ONA is organized by crops, the commodity of this Committee is seed. The MA transfers seed certification activities and fees to the Local Seed Growers Committees. They return part of the collected fees to the National Committee to develop seed service in other regions of less relative development.

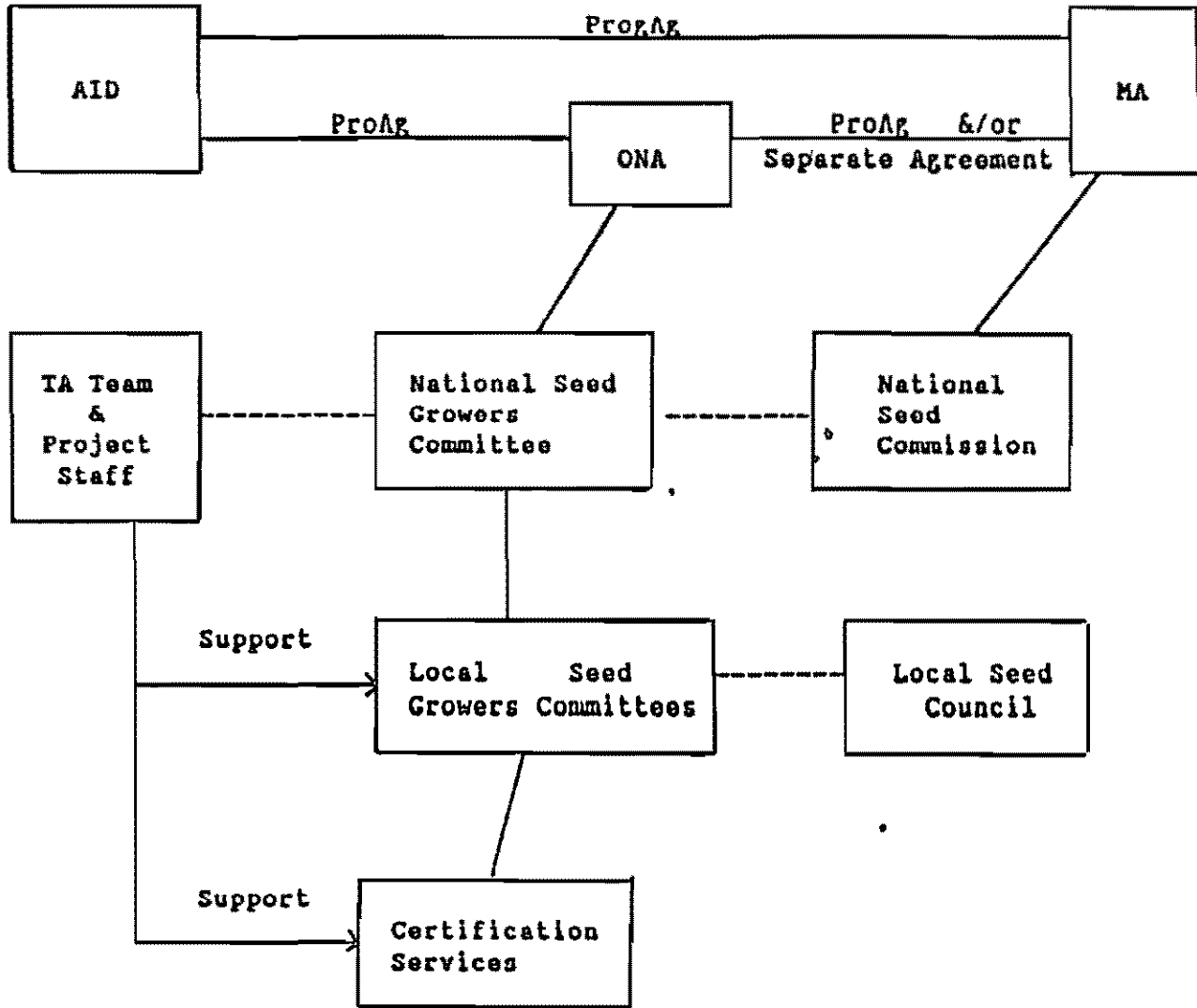
A TA and Project staff team contracted by AID advise the National Seed Committee and support the local committees to perform the seed services to all seed growers. Parallel the National Seed Commission with different composition is to advise the ONA's Committees and the MA in their seed policies. Local Seed Councils would be established with participation of public and private sectors to advise the local seed growers committees.

Alternative C solves many of the ambiguities of the previous models. It places responsibility for certification with the groups that have the most at stake: seed growers and users. By delegating the responsibility for certification to local seed growers committees, it assures that development within ONA will occur from the bottom-up.

The definition of the certifying agency is clear in this case, however, the Project still needs to place a great deal of emphasis on development of the local seed growers committees and also the national committee. For instance, formation of a national seed growers committee currently would result in a poorly-balance organization with a few medium-sized firms on the coast and potato growers from Junin. Smaller growers and growers from the selva and other sierra regions would be poorly represented.

The Alternative C Private seems to have better opportunities to a self sustaining development. ONA is already organized as products-crops committees, they exist and some are doing good work at the national and departmental levels. In the other alternatives most institutions have to be

Alternative C Private



established Advantage in implementing a project with the addition of a Seed Committee in ONA and taking advantage of service already underway will facilitate the Contractor's role and help in the success of the Project

b Management of Local Counterpart Funds

Each local seed growers committee will collect funds through their certification services. This is usually done in conditioning plants at the time of tagging, although fees can be charged in different stages during production, such as at time of registration of fields, inspections of fields or lab tests. Each local committee will manage its own funds independently. The active participation of growers in the committee is essential to assure that the use of funds is carried out according to approved plans.

One of the first activities needed at the national level is to identify resources and help channel funding to areas where most needed. The fees collected for certification services should not all be used in the same departments and subregions where they are generated. A certain portion should be made available in order to assist other areas which are not a highly advanced.

The GOP and ONA should establish the following procedures in connection to the Project:

* Local seed growers committees established for the purpose of providing services in support of seed programs at the departmental or subregional level shall have the responsibility and authority to act as official certifying agencies.

* Of the total fees collected for certification services, two thirds shall be retained in each departmental or subregional program for strengthening local service, and one-third shall be transferred to a central, national seed program fund.

* The national seed program fund will be considered local counterpart funds for the ATT Project.

* The National Seed Growers Committee will appoint a Coordinator to manage the fund and carry out other activities in support of the program. ONA and USAID must concur on the appointment of the Coordinator.

* The Coordinator will be recognized by ONA as its representative for purposes of implementation of the seed program at the ATT Project.

* Disbursement from national seed fund will be authorized by the program Coordinator and a representative of the National Seed Growers Committee.

c Specific Roles of Institutions to Carry Out the Program

The three charts on following pages correspond to the three charts on pages 25, 29 and 32 in the "Program Description" section. Responsibilities to carry out project activities are shown according to the kind of resource inputs required from the Project. This would not vary under any of the

Responsibilities for Carrying Out Activities
and Direct Beneficiaries -- San Martin

<u>ACTIVITIES</u>	<u>REQUIRED FROM PROJECT</u>	<u>RESPONSIBILITY</u>	<u>BENEFICIARY</u>
Basic Seed Production	Minor Installations for pos-harvest handling	Project Staff	INIPA
Commercial Seed Production	Technical Advise	TA Team	Individual Seed Growers
Drying Seed Growers	Seed drying units & portable equip	AID, Project staff,	Committee
Conditioning	Processing plant for corn, rice beans, etc Equip. for lease	AID, Project staff AID, Project staff	Seed Growers Committee Seed enterprises
Storage	400 Tons cold storage	AID, Project staff	Seed Growers Committee
Distribution and Marketing	Guidance to improve marketing based on quality seed.	TA Team	Seed Enterprises Distributors
Quality Assurance, Certification Technical Assist to Seed Growers	2 vehicles Operating expenses Seed laboratory furniture	AID, Project staff	Local Seed Growers Committee for Corfication Service
Seed Council Formation	Advice Travel expenses for members	TA Team Project staff	ONA
Organization of Seed Growers Committee	Organization of meetings Funds for travel & others	TA Team	ONA, Seed Growers
Training and Education	Program for seed specialists, seed growers, distributors and others	TA Team	INIPA, Seed Growers, Seed Enterprises, Distributors

Responsibilities for Carrying Out Activities
and Direct Beneficiaries -- Junin

<u>ACTIVITIES</u>	<u>REQUIRELD FROM PROJECT</u>	<u>RESPONSIBILITY</u>	<u>BENEFICIARY</u>
Basic Seed Production			
Commercial Seed Production	Technical advice	TA Team	Individual Seed Growers
Storage	Technical advice	TA Team	Individual Seed Growers
Distribution and Marketing	Advice on marketing	TA Team	Seed Growers, Distributors, Seed Enterprises, Farmers on the Coast
Quality Assurance, Certification, Technical Assist to Seed Growers	3 vehicles Office space and furniture	AID Project Staff	Local Seed Growers Committee for Certification
Seed Council Formation	Advice Travel expenses for members	TA Team Project staff	ONA
Organization of Seed Growers Cominittee	Advice	TA Team	ONA, Seed Growers
Training and Lducation	Program for seed specialists, seed growers and leaders	TA Team	INIPA, Seed Growers, Seed Lnterprises, Distributors

Responsibilities for Carrying Out Activities
and Direct Beneficiaries -- Lambayeque

ACTIVITIES	REQUIREMENTS FROM PROJECT	RESPONSIBILITY	BENEFICIARY
Basic Seed Production			
Commercial Seed Production	Technical advice	TA Team	Individual Seed Growers
Conditioning	Minor repairs	Project staff	INIPA, ECASA
	Plant design	TA Team	INIPA, Seed Enterprises
	Equip for lease	AID, Project Staff	Seed Enterprises
Storage			
Distribution and Marketing	Guidance and coordination	TA Team	Seed Enterprises Distributors,
Quality Assurance, Certification, Technical Assist to Seed Growers	3 vehicles	AID Project Staff	Local Seed Growers Committee for Certification Service
	Office space and furniture		
Seed Council Formation	Advice Travel expenses for members.	TA Team Project staff	ONA
Organization of Seed Growers Committee	Organization and meeting	TA Team	ONA, Seed Growers
Training and Education	Program for seed specialists, seed growers enterprises & distributors	TA Team	INIPA, Seed Growers, Seed Enterprises, Distributors

Estimated Local Funds Collected by the Seed
Growers Committees and the Fifth Year of the Project

		Value	Total Value	3% fees for Certification
	(MT)	(US\$/MT)	(000 US\$)	(000 US\$)
Junin				
Potato	20,000	330	6,600	198
San Martin				
Corn	1,500	1,000	1,500	45
Rice	1,538	825	1,269	38
Lambayegue				
Rice	2,100	630	1,323	39 7
Beans	126	1,250	1,575	4 7
Corn	500	1,100	550	16 5
				<u>341 9</u>

management alternatives A, B or C To fill in the final column "beneficiaries", alternative C, the private collective action model for certification services was assumed This model is highly recommended by the design team

7 Issues Remaining

Several institutions are currently involved in providing technical assistance to seed growers and in certifying SENASE and SCCS are main two, PM is another, and CONAPAPA will have its own program soon Some Committees and universities also involved in specific areas. It will be a challenge to incorporate these into a single program to promote seed production and quality

Definition of the actions to take in the Cusco area is one of the first issues for the advisory team to solve The design team is convinced that the southern sierra offers potential for a good seed program, and within this subregion, Cusco is the most likely area to achieve success The expatriate advisor for sierra should probably reside in Cusco, and the local advisor in Huancayo, because the program in the former will be starting from close to zero, perhaps on several crops.

Project Title & Number: Agricultural Technology Transformation

Organizational Component	Specific Activities and Objectives	Means of Verification	Assumptive Operational
<ul style="list-style-type: none"> o Increase the productivity of resources used for crop production in the agriculture sector of Peru 	<ul style="list-style-type: none"> o Increase in yields of potato, corn, rice and beans in three regions over area planted with certified seeds o Potato in central & southern areas 1000 kilos/ha o Increase over 1000 hectares (100% of area planted) o Corn in San Martin 200 kilos/ha increase over 15 000 ha (64% of area planted) o Rice in San Martin 300 kilos/ha increase over 15 200 ha (24% of area planted) o Rice in Lambayeque 300 kilos/ha increase over 35 000 ha (100% of area planted) o Rice in Lambayeque 200 kilos/ha increase over 2100 ha (24% of area planted) 	<ul style="list-style-type: none"> o Fact that farmers voluntarily pay full cost of high quality seed in central district o Indication in short run o Over longer period can use official FA data to see increase in average yield over entire area planted o Potato in central and southern coast 1000 kilos/ha o Corn in San Martin 172 kilos/ha o Rice in San Martin 113 kilos/ha o Rice in Lambayeque 302 kilos/ha o Corn in Lambayeque 42 kilos/ha 	<ul style="list-style-type: none"> o The value of these increases should be measured in opportunity costs of products (e.g. later seasonal prices plus transport as opposed to local prices) o Private sector costs can be subtracted to get a net return to public investments
<ul style="list-style-type: none"> o Increase the amount of high quality seed used by Peruvian farmers 	<ul style="list-style-type: none"> o Conditions that will indicate purpose has been achieved: o Volume of certified seed (commercial seed under certification programs) increases in following levels: o Corn in San Martin 1200 metric tons o Rice in San Martin 1328 metric tons o Corn in Lambayeque 176 metric tons o Demand ability improves as reflected by the percentages in different categories which reflect quality of premium certified seed emerge in rice. This should be applied to all crops. Only one study to potato seed in Lambayeque 	<ul style="list-style-type: none"> o Records of local certification offices will have this as a normal part of their operation. It is the amount of commercial seed on which fees are collected and which is tagged o Specific goals in quality of seed cannot be set in the project design stage because initial levels of seed in commercial categories are not known o The FA team needs to help define useful categories which reflect seed quality o These goals can be set in Certification Records with sufficient results 	<ul style="list-style-type: none"> o Assumptions for achieving purpose: o Credit is available to the farmer to purchase high quality seed o A state for agricultural products do not become overly restrictive
<ul style="list-style-type: none"> o Formation of local organizations o Formation of local leadership o Establishment of Certification Services o Formation of local seed enterprises o Private investment in the seed sector 	<ul style="list-style-type: none"> o National seed growers and four local seed growers committees formed o Four local seed boards formed o Four local or departmental certification services established o Seed enterprises formed as follows: o Lambayeque: at least 6 new firms o San Martin: at least 6 new firms o Nearly all (90%) of rice seed in Lambayeque produced by private enterprises o Val in estimates reach \$1 000 000/year over several accounts as follows: o Potato in Junin 600 000 o Corn in San Martin 1 175 000 	<ul style="list-style-type: none"> o Reports of FA team and GSA to verify formation of Committees and Boards o Certification records will show if volume of seed paying fees and receiving tags reaches threshold level of about 1000 metric tons o This implies certifi- cation services are self financing and therefore established o Volume of seed times its value in market at end of Proj 411 versus current situation shows increased level of private investment o Very low-inflated values 	<ul style="list-style-type: none"> o GSA accepts the seed's ability to certify o Credit is available for seed producers o COP adapts policies in support of private sector o Seed prices provide incentives to private sector

ANNEX No. 1

EXCHANGE RATE - PERU
(March 1987)

\$EE UU.1,00 = 1/20 00 Approximately on parallel market

ABBREVIATIONS

APROSEM	Asociación de Productores de Semilla de Maíz
BAP	Banco Agrario del Perú
CIAT	Centro Internacional de Agricultura Tropical
CIPA	Centro de Investigación y Promoción Agropecuaria
COTESU	Cooperación Técnica Suiza
CONAPAPA	Comité Nacional de Productores de Papa
ECASA	Empresa Comercializadora de Arroz S A.
FUNDEAL	Fundación para el Desarrollo del Algodonero
GENTEC	Grobman Genotécnica
HOPETA	Hoja Peruana de Tabaco S.A.
INIPA	Instituto Nacional de Investigación y Promoción Agropecuaria
MA	Ministerio de Agricultura
ONA	Organización Nacional Agraria
PM or PCIM	Programa Cooperativo de Investigación en Maíz
SCCS	Subdirección de Certificación y Control de Semillas
SENASA	Servicio Nacional de Semillas
UNA	Universidad Nacional Agraria "La Molina"
UNPRG	Universidad Nacional "Pedro Ruiz Gallo", Lambayeque
UNSAA	Universidad Nacional San Antonio Abad, Cusco
USAID or AID	Agency for International Development

ANNEX No. 2

PERSONS CONSULTED WITH DURING THE FIELD WORK PHASE
OF PROJECT DEVELOPMENT

NAME	POSITION AND INSTITUTION	LOCATION
Dale Bandy	Chief of Party, NC-INIPA	LIMA
Manuel Castillo	Manager, CONAPAPA	LIMA
Charles Crissman	Economist, CIP	LIMA
Antonio Chavez	Coordinator, INIPA	LIMA
Jorge Chavez	HORTUS	LIMA
Luis Escalante	Manager, ECASA	LIMA
Fernando Ezeta	CIP-INIPA-COTESU, Potato Program	LIMA
Luis Guzmán	Manager, Comité Nacional Productores Maíz-Sorgo	LIMA
Carlos Herrera	Manager, HORTUS	LIMA
Nelson Larrea	Manager, Comité Nacional Arroz	LIMA
Antonio Manrique	Director of Maize Program, UNA	LIMA
Lander Pacora	Chief, INIPA	LIMA
Martha Pizarro	ECASA	LIMA
Guillermo Ramírez	Chief, Seed Department, ECASA	LIMA
Marino Romero	Cereals Program, UNA	LIMA
Guillermo Torres	Comité Productores de Papa Huasahuasi	LIMA
Rafael Villanueva	Comité Nacional Productores de Cereales	LIMA
Cesar Vitorelli	CIP-INIPA-COTESU, Potato Program	LIMA
Julio García	Comité Arroceros de Tarapoto	TARAPOTO
Roberto García	President, Comité Arroceros de Tarapoto	TARAPOTO
Javier Gómez	Extension Agent, INIPA	TARAPOTO
Manuel Juarez	Regional Manager, ECASA	TARAPOTO
Julio Mondragón	Maize Program, INIPA	TARAPOTO
Enrique Solórzano	Semillas y Tecnología Agrícola Tropical (SEISA)	TARAPOTO
Gerardo Villalba	Seeds, ECASA	TARAPOTO
César Apolitano	National Bean Program, CIPA VII	CHINCHA
Miguel Quijandria	National Bean Program, CIPA VII	CHINCHA
Guillermo Reyes	National Bean Program, CIPA VII	CHINCHA
	Asociación Agricultores de Ica	ICA
	Servicios Agrícolas Villanueva - Empresa Productora de Semillas de Maíz	ICA

Carlos Balarezo	Director, CIPA III, E E. Vista Florida	CHICLAYO
Juan Bazantapia	FOPEX - Centro Civico	CHICLAYO
Luis Beingolea	Seed Department, UNA	CHICLAYO
Napoleón Cueva	Seed Certification, Ministerio de Agricultura	CHICLAYO
Pedro Garay	Banco Agrario	CHICLAYO
Hugo González	Semillas Peruanas S.R.L.	CHICLAYO
Julio Gutiérrez	Manager, Servicio Guadalupe	CHICLAYO
Federico Minguillo	Director, INIPA, E.E. Vista Florida	CHICLAYO
César Moyano	Manager, Semillas Peruanas S R L.	CHICLAYO
Marco Neciosup	Seed Unit, CIPA, Vista Florida	CHICLAYO
Luis Orbegoso	CIPA III, E.E. Vista Florida	CHICLAYO
Carlos Panizo	Dean, Faculty of Agronomy, UNPRG	CHICLAYO
Jorge Paz	E E Vista Florida	CHICLAYO
Raul Sánchez	Professor, Seed Department, UNPRG	CHICLAYO
Alexander Grobman	Gentec	LIMA
Alfonso López	SENASE, INIPA	LIMA
Raúl Sobrevilla	SENASE, INIPA	LIMA
Ricardo Bentín	SCCS, MA	LIMA

ANNEX No 3

US Dollar and Local Currency Cost Breakdown

ACTIVITY	US DOLLAR BUDGET	LOCAL CURRENCY BUDGET
----- (000 dollars)		
Long-term IA		
Expatriate	1950	
Local		480
Short-term IA		
Expatriate	337 5	
Local		90

Seminars, Workshops, Conferences		
In Peru		15 0 ⁰
Outside	18	
Intensive Seed Technology Courses		
In Peru	40	340
Outside	350	
Travel Study outside Peru	90	
Travel for Meetings and organizational development in Peru		56
Masters degree training	200	

Organizational Support		65
Equipment	683	325

TOTALS	3668 5	1571 0
