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9. ABSTRACT

This program determined that improvements in seed production and supply were needed, especially for the small farmer. Therefore a three-year project was developed to bring the quality and quantity of seed produced up to those levels needed to support adequate agricultural development. The project would concentrate on improvements in existing operations and emphasize rice, bean, and maize seed, and yucca and plantain propagules. Increasing total production and productivity with associated employment and income benefits would require substantial assistance to develop an effective and responsive production support system for the small-farm farmer, as well as assistance for a small farm service system for distribution and marketing to ensure that these benefits are not lost in marketing inefficiencies or inequities.

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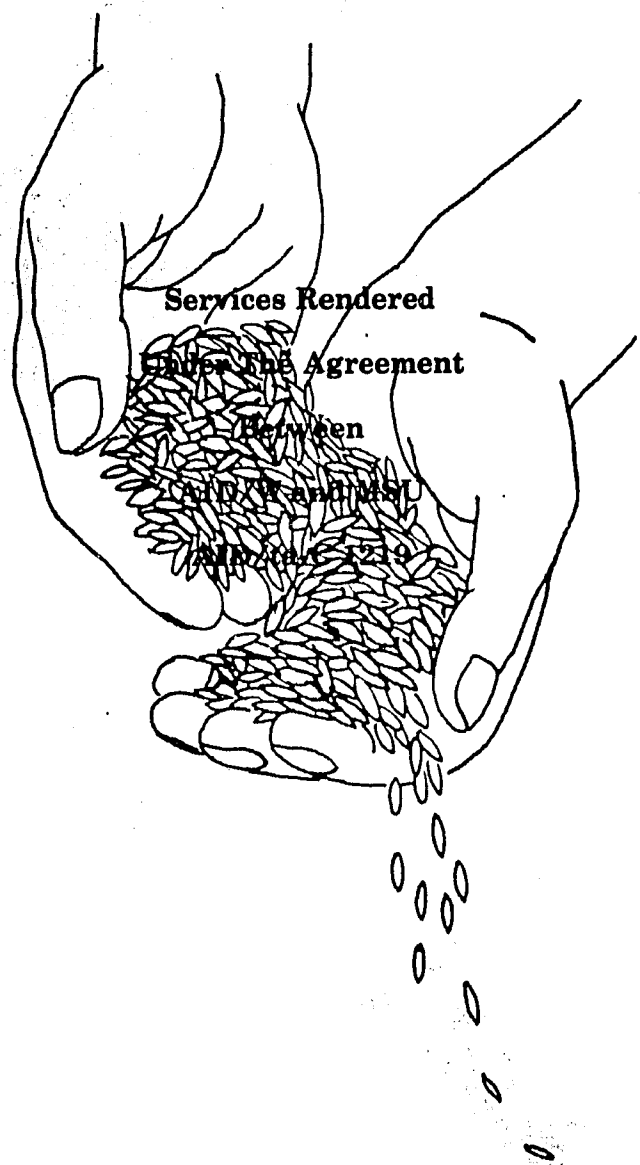
IMPROVED SEED AND PLANT MATERIALS PROGRAM FOR THE DOMINICAN REPUBLIC



Services Rendered
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SEED TECHNOLOGY LABORATORY
MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI

REPORT SUMMARY

TITLE:	IMPROVED SEED AND PLANT MATERIALS PROGRAM FOR THE DOMINICAN REPUBLIC
CONTRACT NO.:	Mississippi State University - AID-ta-C-1219
CONSULTANT:	James C. Delouche
PERIOD OF TRAVEL:	29 February - March 13, 1976

SUMMARY

1. Services available under AID-ta-C-1219 were requested to assist the GODR and USAID/DR with preparation of an improved seed and plant materials component for proposed Agricultural Loan II.
2. It was determined that improvements in seed production and supply were needed to support development of agriculture in the D.R., especially small farmer agriculture.
3. A project was developed for a three-year time frame to bring the quality and quantity of seed produced up to level needed to adequately support agricultural development. The project concentrates on improvements in existing operations, and emphasizes rice, bean and maize seed, and yuca and plantain propagules.
4. The estimated total financial requirement for implementation of the project over a three year period is RD$2,890,543. Revenues from the project over the same period are projected at RD$3,282,089. Details of financial requirements are given in Annex H.

ACKNOWLEDGEMENTS

I wish to acknowledge the exceptionally fine support of the USAID/DR Mission during the period of my consultation. Briefings by Bill Janssen and his staff were concise and to the point. Background materials and office space were provided on first day of consultation. The secretarial services were superb.

I appreciate the assistance of John Warren and Tom Ivers on several field trips, and Harry Wing's help in locating needed data.

Finally, I wish to acknowledge the invaluable assistance of Domingo Marte in formulating the program proposed in this report. The ideas and concepts, and many of the other details were mostly supplied by him.

J. C. D.
Mississippi State
April 25, 1976

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IMPROVED SEED AND PLANT MATERIALS PROGRAM

FOR THE

DOMINICAN REPUBLIC

I. INTRODUCTION

The goals of the agricultural sector in the Dominican Republic as formulated and articulated by the SEA are: 1/

1. To achieve a more equitable distribution of income among those who earn their living from the agricultural sector, so as to improve the quality of rural life.
2. To provide food and fiber to consumers at reasonable costs.
3. To provide agricultural products for industrial uses, exportation, and import substitution.
4. To obtain the kind of agricultural production which will improve national nutritional levels.
5. To achieve optimum utilization of renewable resources.

The USAID/DR Mission, accepting the broad sector goals of the GODR, has formulated a strategy designed to assist the GODR in development and employment of the means necessary to achieve its goals. More specifically, the Mission strategy includes encouragement of the SEA in its efforts to obtain better financing for the public institutions involved in agricultural development, improvements in sectoral planning and coordination, enhancement of institutional capacities for training, research, and outreach programs, increasing farm production, and improvements in the rural infrastructure, employment, and income. In summary, therefore, Mission strategy is to assist the GODR in achieving its

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1/ USAID/DR Interim Report and Agricultural Sector Assessment Update, 1976.

goals for the agricultural sector through extension of those essential services needed by the small farmers and rural poor to improve the quality of their lives.

The Mission proposes to implement its assistance strategy within a framework of three interrelated, but mutually supportive, efforts: (1) development of a sectoral policy planning and coordination capability in agriculture, which can serve both as a mechanism for dynamic agricultural development and as a tool for better utilization of resoures; (2) promotion of a greater allocation of public and private resources to agriculture; and (3) encouragment of institutional changes needed to facilitate the growth of the agricultural sector, and greater participation by the target group in the benefits of that growth.

The major instrument under development by the Mission to implement its assistance strategy is a loan program (Agricultural Sector Loan II). In developing this instrument (i.e., loan project paper), the Mission had need of assistance to help in the formulation of some components of the program.

Mississippi State University (MSU), under terms of its technical assistance contract with TAB/AID (AID/ta-C-1219), was requested to provide assistance for the formulation of a program for the multiplication and distribution of improved seed and plant materials of selected crops. The program presented here was developed by the MSU consultant in collaboration with Mission and SEA personnel.

II. BACKGROUND

In his report, "Programa Nacional para Semillas", submitted on February 9, 1967, Bell reviewed the "seed situation" in the Dominican Republic. 2/

2/ Bell, T. N., "Programa Nacional par Semillas", AGR/D, 1967.

He pointed out that production and distribution of quality seed and vegetative propagules were virtually unknown (up to 1967). Small quantities of seed of vegetable and field crops were being imported by the Government and the private sector, but these mainly went to the larger scale farmers. With the exception of the small quantities of imported seed, the seeds used by the farmers were characterized as follows:

1. The seed used for planting was generally "saved" by the farmer from his own grain production.
2. The seed was largely of unknown germination potential and purity, and of uncertain varietal identity.
3. The better "grain" was sold by the farmer, thus leaving the poorer quality "grain" for use as planting seed.
4. Poor storage conditions and practices further reduced the quality of seed saved for planting by varietal admixtures, rodent and insect damage.
5. A significant number of farmers periodically bought or bartered for their seed supplies in the local grain markets.

The situation described by Bell in 1967 is not surprising considering that "formalized" agricultural research in the Dominican Republic dates back only to 1965.3/ Seed multiplication and distribution become important only when improved, adapted crop varieties are developed.

Organized seed production in the Dominican Republic dates back to 1967. Indeed, Bell's report was directed toward implementation of a seed program within an organizational framework that had just been established by the SEA.

3/ Kennard, W. C., Crops Research and Its Administration in the Dominican Republic. Report to USAID/DR, 1975.

The Departamento de Investigacion y Produccion de Semillas had been established within the Centro Nacional de Investigaciones Agropecuarias (CNIA) under the direction of the Sub-Secretario de Investigacion y Extension Agropecuaria. (CNIA became CNIECA, Centro Nacional de Investigacion, Extension y Capacitacion Agropecuarias, in 1973). The Departamento de Semillas was to be responsible for foundation seed production, seed testing, and seed certification. Recommendations on organization, staffing and financing were included in Bell's proposal. A building was constructed and some seed equipment were purchased and installed in late 1967 and in 1968.

In cooperation with the Agricultural Bank of the Dominican Republic (AgBank), 13,000 qq. of rice seed are recorded to have been produced and distributed in 1968 along with substantial quantities of other kinds of seed. Considerable quantities of seed of superior varieties were also produced in 1969. In the case of rice, at least, the seed program in 1969, "Entró en un proceso de decadencia que lo llevó a un punto casi inoperante. Las razones de este colapso fueron múltiples ... la pérdida de coordinación entre el Banco Agrícola y el Departamento de Semillas ... ya que esta desyuntiva desmanteló un mecanismo de distribución y financiamiento de las semillas producidas; la falta de distribución oportuna trajo consigo un deterioro de las semillas, una pobre calidad en el producto ofrecido, pérdida de la confianza por parte del agricultor a la semilla producida y además pérdida cuantiosa a la Secretaria por deterioro irreversible de las semillas almacenadas. El resultado do lo ante espuesto sitúa al Departamento de Producción de Semillas ... a un punto que lo hacía casi incapaz para la continuación de tan importante programa". 4/

4/ Memoria Anual, Estacion Experimental Arrocera Juma, 1975, pp. 168-169.

The problems discussed above relate directly to rice seed. However, observations and discussions suggest that a similar situation prevailed in the case of other kinds of seed in the program although this cannot be documented. In any event, the program for production of improved rice seed was reorganized in 1973 with major responsibility given to the Estacion Experimental Arrocera de Juma. The Departamento de Semillas retained coordination responsibility for rice seed, and production responsibility for seed of habichuelas (red beans), maize, pidgeon peas, etc.

III. PRESENT SITUATION

A. Seed Production

The Departamento de Semillas supplied the information on distribution of seed by the department for 1969-1975 given in Table 1. Perusal of the data in this table suggests that there is a well established, entirely adequate seed production and distribution system in the Dominican Republic. The 42,662 qq. of bean seed distributed in 1975, for example, could have planted about 60% of the total hectarage devoted to beans in the country. The 12,088 qq. of maize seed distributed in 1975 would have been sufficient to plant the entire maize crop (estimated 30,000 ha. at planting rate of 18 kg./ha.). Observations, however, indicate that the seed situation is much, much less developed than indicated by the statistics in Table 1.

The data in Table 1 apparently includes some seed produced and distributed, seed purchased in the market and distributed, seed imported and distributed, and a lot of "seed" acquired in various ways that ended up in grain channels.

The rice seed production and distribution data from the Juma station are perhaps more indicative of the real situation -- as regards rice seed. In 1975, the following quantities of rice seed were produced at or under the supervision

of the Juma station:

Kind	No. of Varieties	Quintales of Seed
Genetic (breeders) Seed	9	123
Foundation Seed	7	1,786
Improved and Selected Seed	9	62,443

The 62,000 qq. of rice seed distributed in 1975 represented about 50% of the total seed requirement for planting. Approximately 45% of the seed distributed were improved seed. In the terminology of the Juma station, "improved seed" (semilla mejorada) refers to seed of the so-called high yielding varieties of rice which are produced by selected growers from Foundation Seed, while "selected seed" (Semilla seleccionada) refers to seed of traditional, but improved, varieties, purchased from farmers on the basis of a field inspection.

It is important to note that of the 62,000 qq. of rice seed distributed in 1975, 55,000 qq. were for the Instituto Agrario Dominicano (IAD) which "controls" about 50% of the area devoted to rice production in the Dominican Republic. Further, that the greatest portion (66%) of the rice seed distributed were of "traditional" varieties, such as Ingles, Tono Brea, and Mingolo.

The rice seed production statistics from the Juma station also include production by the private company, Productora de Semillas Dominicanas (PROSEDOCA).

B. Facilities and Equipment

The Juma station is poorly equipped for rice seed production. There are no drying facilities other than a slab for sundrying. Processing/cleaning equipment consists of one small, low capacity cleaner with elevator. Storage space is limited. Only genetic and foundation seed are cleaned.

The Departamento de Semillas at CNIECA, San Cristobal, is somewhat better equipped, but not nearly to the extent of being able to properly handle the quantities of seed listed in Table 1. The Departmento has:

1. A small poorly equipped and totally inadequate seed testing laboratory.
2. A large 2-3 ton/hr. modern seed cleaner, small maize sheller, several holding bins, elevators, and a packaging system. These are arranged very inefficiently in a building not at all suitable (insufficient height) for seed operations.
3. An air conditioned seed storage room with capacity for about 3,000 qq. of seed, but which lacks humidity measuring or control equipment.
4. Unconditioned (ordinary) storage for an additional 2,500-3,000 qq. of packaged seed.
5. Access to two large open-sided warehouses for storage of incoming, unprocessed seed and for some open-air "drying".

There are no drying facilities for beans, maize, or other kinds of seed.

Overall the facilities available might be adequate for 3,000 - 4,000 qq. of seed, but certainly not for the 75,000 qq. plus of seed recorded as handled and distributed in 1975.

c. Seed Multiplication/Production System

The seed multiplication/production system that SEA seed workers are trying to use is essentially the same as the one used in all progressive seed production and supply programs. Genetic or breeders seed produced by the research departments (plant breeders) are used for the production of foundation seed. Foundation seed are then allocated to selected farmer seed producers for the production of seed which will be marketed to farmers. Inspection procedures are used to ensure that a high degree of varietal purity is maintained

through each of the multiplication stages.

Unfortunately, personnel, facility, and financial contraints, and inadequacies in planning limit application of the seed multiplication/production system to a relatively small portion of the seed handled and marketed. The "short-circuiting" of the multiplication system in the acquisition of a major part of the rice seed available for distribution to farmers has already been mentioned. Because of late orders, i.e., orders after planting time, the rice seed program is forced to by-pass systematic, controlled seed multiplication/production and arrange for seed purchases from farmers as the basis of inspection of fields planted for grain production.

The major portion of bean, maize, and pidgeon pea seed supplies are also acquired by direct purchases from grain producers or in the grain market. The results of these "field expedient" procedures for acquiring needed seed supplies are variable and uncertain seed quality, and frequent farmer dissatisfaction with performance of the seed.

D. Private Sector Operations

PROSEDOCA is the only private sector seed producer of field crop seed in the Dominican Republic. Some seed, especially of hybrid maize, sorghum, and the vegetables, are imported by other private companies.

In 1974-1975 PROSEDOCA produced about 16,000 qq. of rice seed, 5 tons of hybrid maize seed, and 15 tons of hybrid sorghum seed. The two hybrids are produced under an agreement with the Pioneer International Hi-Bred, Co., a major producer of hybrid seed in the U.S.A.

In 1975-1976 PROSEDOCA is scheduling production of about 23,000 qq. of rice seed, 9 tons of hybrid maize seed, and 15 tons of hybrid sorghum seed.

PROSEDOCA'S facilities are located near Santiago. They are modest but well designed. The company plans a major expansion of facilities in 1976-1977. This

will include substantial additional storage, and a very modern, high-capacity seed cleaning, grading, and packaging plant. The latter will require an investment in equipment of more than US$125,000.

PROSEDOCA appears to be well managed and has had little difficulty in marketing the seed it produces.

E. Seed Control

A seed law was enacted in 1971 (Ley No. 231). This law is basically an enabling act which grants authority to the Secretaria de Estado de Agricultura to appoint or create a Departamento de Semillas for the purpose of: (1) controlling the production, processing, and commercialization of seed; (2) preparation and maintenance of a national register of varieties; (3) establishing the standards for certification of seed; (4) coordination of producers and production, distribution and marketing of seed; and (5) adoption and promulgation of all other measures needed to promote the use of good seed in the country. The law also establishes a Committee for Classification and Registration of Varieties, outlines a seed certification program and its control mechanisms, and establishes sanctions for violations of the law.

Insofar, as can be determined, the law has not been implemented. The regulations required for implementation have not even have formulated.

F. Personnel

In the public sector, personnel assigned to the seed production program are very limited. Those at Juma also have other duties. The Departamento de Semillas at CNIECA has five professionals and laborers. In addition, regional officers assist with field inspections. Personnel engaged in seed operations have had little formal training in seed technology. Such expertise as they have has been developed by "trial or error" experiences in the DR seed program.

G. Constraints

There are numerous constraints to development of a more effective, efficient, responsible, and responsive seed production and supply program in the Dominican Republic, within the existing organizational-financial frame. Major constraints or deficiencies are:

1. The present organizational structure within SEA for seed production and supply is rather loose and usually by-passed. Further, there is no independent check on the quality of seed acquired and distributed, although, obstenibly, the Departamento de Semillas has this function.
2. Planning and coordination of seed production and supply is extremely poor. The agencies that purchase seed such as IAD, and those that finance seed purchases such as the Ag Bank, often do not make their intentions known in time to plan for necessary production. Apparently, there is little recognition of the fact that seed production has to be planned at least one crop season in advance of projected marketing so that the seed required can be purchased. Foundation seed supplies, which are needed to produce the seed intended for distribution, have to be planned two seasons in advance.
3. The present program lacks the equipment, facilities, and trained personnel to produce, process, and distribute a consistent supply of quality seed. Because the quality of the seed "produced" and distributed has been of uncertain and variable quality, farmers have lost confidence in the seed supplied by the Departamento.
4. Financing for working capital requirements (needed for purchase of seed from contract growers) and maintenance of equipment and facilities is inadequate and often not ava[illegible]e at the time needed.

5. The program is not adequately linked to other associated programs or to private sector operations.

6. Quality control is generally extremely poor or non-existent, except possibly for rice seed.

H. Plant Materials

This discussion has thus far focussed entirely on improved seed. Yuca and plantains are major food crops in the Dominican Republic. Improved, higher yielding clones of both yuca and plantains have been identified and are available for multiplication. Presently, there is no organized multiplication and distribution system for these plant materials. An important consideration in multiplication of vegetative propagating materials is maintenance of a phytosanitary condition so as to prevent the spread of insects and diseases along with the propagules.

IV. JUSTIFICATION AND RECOMMENDATIONS

The purpose of the project under preparation by the Mission to assist the GODR to attain its basic goal for the agricultural sector is:

> "To increase food production, agricultural productivity, employment, and income among the least advantaged groups of the rural population."[5/]

Increasing total production and productivity with associated employment and income benefits will require substantial assistance to develop an effective and responsive production support system geared to the needs of the small farmer, and a small farm service system in the distribution and marketing area to insure that the benefits of increased production and productivity are not lost in marketing inefficiencies or inequities.

5/ USAID/DR Interim Report and Agricultural Sector Assessment Update, 1976.

Increasing production and productivity -- the latter being the central issue in a country such as the D.R. with limited land resources -- will require the introduction into the small farmer arena of a package of production improving inputs, and its adoption and proper use by them.

It has been amply demonstrated that production can be increased through use of adapted high-yielding crop varieties which are responsive to higher levels of fertilization, improved cultural methods, and better management. Use of these means to improve production and productivity requires, first of all, the development, introduction, and/or identification of superior crop varieties adapted to the soil and climatic conditions of the country. Then, seed of these superior varieties have to be made available to farmers along with information on how they can best be used. Other essential inputs such as fertilizer, pesticides, and credit must be available and accessible to the small farmers. Finally, provisions must be made in the marketing system to reap the benefits of increased production.

Agricultural research in the Dominican Republic has resulted in the identification, introduction, and development of superior, higher yielding varieties of most of the important food and feed crops, and a number of even more improved varieties are in the pipeline of advanced testing. Additionally, increased support for adaptive research with special emphasis on improvement of crop varieties and the establishment of linkeages to the International Research Centers are being proposed in the Mission's assistance package. Other elements of the assistance package are designed to assist in the extraction of maximum benefits from the inherent production potential of modern, high yielding varieties: i.e., more efficient extension of production packages into the small farmer arena; improved capacity for the transfer and utilization of production technology; a farm service system with emphasis on both inputs and out-

puts; and a rural socioeconomic development program that will provide better financing to small farmers and improve the rural infrastructure.

In view of the specific tactics proposed to implement the Mission's assistance strategy, and considering the crucial role improved seed and plant materials must play in achievement of stated objectives, the recommendations given below and the program proposed in the next section are fully justified.

I. Recommendations

The proposed agricultural loan (Agriculture Loan II) should include provisions for the establishment of an effective, efficient, responsible, and responsive improved seed and plant materials program in the Dominican Republic. This program should focus on seed and vegetative propagation materials of those crops which have the greatest potential for improvements in production, and of which increased production would be most beneficial to the small farmer and consumers in the Dominican Republic.

Specifically, it is recommended that:

1. Organizational changes be made in the present seed program to facilitate better planning of seed supplies, improve management of operations, and provide for a more effective allocation of responsibilities among involved entities of the SEA and private sector.

2. Sufficient funds be made available to the seed program to support an adequate staff of professionals, technicians, and laborers, to develop essential facilities and acquire equipment needed for quality seed operations, to finance seed production under contract grower arrangements and on the lands of SEA, to finance other operational costs such as for sacks, chemicals, power, fuel, tags, etc., and to provide for proper maintenance and repair of facilities and equipment.

3. Assistance be provided the GODR and SEA to help with the development of appropriate regulations to the existing seed law so as to permit a modest implementation of quality control measures in the area of seed production and marketing.

4. Initial efforts and assistance (next 3-4 years) be focussed on improving seed production and supply for rice, maize, and beans; and on initiating a maintenance and multiplication program for propagative materials of superior varieties of yuca and plantains.

5. The improved seed and plant materials production component be closely linked to other components of the assistance program to insure its maximum impact; i.e., adaptive research - to insure supply of breeder and foundation seed; specific production packages - to insure that seed production is geared to deliver seed of the varieties needed for the different production packages; transfer and utilization of production technology - to insure that farmers are aware of advantages of improved seed, and their proper use; and the farm service system - to provide for distribution and marketing of the improved seed produced, to insure that other inputs essential for realization of their potential are available and accessible to the small farmer (fertilizer, pesticides, credit), and to provide for assistance in marketing of the increased production realized.

6. The public sector seed program be designed, managed, and operated so as to encourage the development and participation of the private sector in the production and supply of improved seed and plant materials.

V. DESCRIPTION OF PROPOSED PROGRAM AND RATIONALE

The program proposed encompasses several distinct but interrelated acti-

vities, and the establishment of essential operational linkages to other programs -- on-going and proposed. The activities are: (1) production of genetic (breeder) and foundation seed of rice, maize, and beans; (2) further multiplication/production of improved seed of these crops up to the quantities needed by farmers; (3) establishment of foundation plantings and a multiplication program for yuca and plantain (vegetatively propagated); and (4) establishment of a modest seed control program. Linkages which need to be established and/or maintained include those with: IAD - for purchase and distribution of improved seed in programs it administers; CNIECA, CENDA, the Estacion Experimental Arrocera (Juma), and other research organizations of the SEA - for varietal maintenance and supply of breeder seed; Programa de Centros de Venta de Materiales Agropecuarios, presently in pilot operation with expansion proposed -- for distribution and marketing of seed to small farmers.

A. Organization

Obstensibly the current seed program in the Dominican Republic is organized within the Departamento de Semillas, under the Sub-secretario de Estado de Investigacion y Extension Agropecuaria. Operationally the Departamento de Semillas appears to have responsibility for production of bean, maize, and pidgeon pea seed, and some coordinating function over rice seed production. Rice seed production, however, is essentially the responsibility of the Estacion Experimental Arrocera Juma. The seed law enacted in 1971 also designates the Departamento de Semillas as the action agency within the SEA for implementation of its provisions.

The following changes in and additions to the present organization and division of responsibilities in the SEA seed program should be effected.

(1) A National Seed and Plant Materials Committee should be established to advise the SEA on policy and programs relating to seed production

and supply: crops that should be emphasized in the seed program; the role of the private sector; seed importations; implementation of the seed law; price structure for seed; varietal releases; seed reserve stocks; seed production targets by crop and variety; marketing arrangements. This committee should be chaired by the SEA or his designated deputy and include in its membership representatives from CNIECA, Estacion Experimental Arrocera, CENDA, IAD, Ag. Bank, the Programa de Centros de Venta de Materiales Agropecuarios, and the private sector. The committee should meet at least twice a year and provide the necessary guidance to the seed program.

(2) Departamento de Semillas -- This Departamento should be re-organized into a quality control and service unit with specific responsibilities for providing inspection and quality control services for the production units and contract seed producers to include field inspections, processing plant inspections, sampling and testing. In this way, a modest degree of implementation of the seed law can be achieved. The Departamento should not directly engage in seed production operations.

(3) A new seed production unit should be organized at CNIECA to take over responsibility (from the Departamento de Semillas) for production of foundation seed of beans, maize, and possibly other crops (e.g., pidgeon pea), and subsequent multiplication/production of the foundation seed up to quantities needed to meet established seed requirements for these crops.

NOTE: The changes proposed in (2) and (3) will require transfers of facilities, equipment and possibly personnel from the Departamento de Semillas to the new seed production unit at CNIECA.

(4) The Estacion Experimental Arrocera should improve its seed production

unit, which should then assume responsibility for production of foundation rice seed and contract production of the quantities of rice seed needed for farmers.

(5) The CENDA should initiate and assume responsibility for establishment and maintenance of foundation clonal plantings of improved strains of yuca and plantain and their subsequent multiplication and distribution.

(6) Responsibilities for varietal maintenance and supply of genetic or breeders seed should be assigned to the pertinent research sections: Estacion Experimental Arrocera for rice; CNIECA for maize, beans, and other crops such as pidgeon pea, CENDA for yuca and plantain.

(7) The SEA should appoint a coordinator for the seed program component of the Agricultural Loan, possibly the same person who is designated as chairman of the National Seed and Plant Materials Committee. The coordinator should have sufficient authority to establish the proposed organization for the seed program and to ensure that the several units operate in a harmonious manner.

B. Breeders Seed Production

Research agencies involved in research to improve, introduce, and evaluate crop varieties have an obligation to maintain crop varieties once they are released for as long as they are in use, and to supply breeders seed to the seed production and supply system as needed for the production of foundation seed.

The research agencies involved in crop improvement research in the Dominican Republic have the capacity and capability to produce the quantities of breeders seed needed.* No specific assistance for this element of the seed program is proposed. Some assistance, however, will be indirectly provided through development of facilities and acquisition of equipment for larger scale operations,

which can also be used for drying and processing of breeders seed. The quantities of breeders seed needed are quite small (Table 5 in Annex A).

C. Foundation Seed Production

The new seed production unit at CNIECA should appoint one agronomist with responsibility for production of foundation seed of beans, maize, and possibly pidgeon pea. Similarly, one professional at the Estacion Experimental Arrocera should be put in charge of foundation rice seed production and one professional at CENDA should be placed in charge of the foundation clonal plantings of yuca and plantains proposed for CENDA.

The quanitities of foundation seed that need to be produced each year within a four-year time frame and the land requirements are given in Table 5, Annex A. It is important to recognize that breeders seed production has to be one season (or year) in advance of foundation seed production, and foundation seed production has to be one season or year in advance of the seed production intended for distribution to farmers.

Personnel and labor requirements for foundation seed production are included within the overall recommendations for each of the three locations in Annexes B (CNIECA and Juma) and C (CENDA).

Facilities and equipment for foundation seed operations are not specifically provided for. These are already available or will become available with proposed development of facilities for handling the larger volumes of seed produced by planting foundation seed.

Insofar as possible, foundation seed should be produced on lands owned and managed by the stations at each location. In cases where this is not possible because of the large land area required (beans, for example), arrangements should be made to produce the foundation seed under contract with private growers, or on a government farm at another location. In either case, it is imperative that the closest, most rigorous supervision be given to foundation seed production.

Foundation seed are the base for production of seed to be distributed to farmers; and, therefore, should be of the highest quality. If the quality of foundation seed is poor, the quality of subsequent multiplications will be as poor, or probably worst.

D. General Seed Production

The seed programmed for distribution to farmers will be produced under this component by the seed production units at Juma (rice) and CNIECA (beans and maize). In considering the quantities of each kind of seed and plant material needed to adequately support efforts to increase production and productivity in the DR, four factors were taken into consideration: (1) the mode of pollination of the crop or "kind" of variety, which influences the maintenance of varietal characteristics, hence, the effectiveness of traditional farmer "seed saving" practices; (2) the relative ease of distributing seed in the D.R.; (3) estimated farmer acceptance and demand; and (4) experience derived from the current seed program.

Rice and beans are self-pollinated crops; therefore, out-crossing is not a problem and maintenance of varietal purity becomes primarily a matter of preventing mechanical admixtures. Maize is cross pollinated but of the "open pollinated" type. Ample evidence is available that sufficient varietal purity in maize can be maintained for 3-5 years in most situations, provided, of course, that mechanical admixing of varieties is prevented. Yuca and plantains are vegetatively propagated and, hence will maintain their "varietal purity" indefinitely. However, diseases and nematodes can and are transmitted through vegetative propagules.

Farmer acceptance and demand of improved seed appears to be quite favorable in the D.R., and this is enhanced by several built-in mechanisms. For example, the IAD controls and essentially "manages" 50% of the rice area in the country, and is already the biggest market for rice seed.

Compared to countries in Central America and the Caribbean area, the infrastructure needed for distribution of inputs is relatively advanced, and will be further improved with implementation of other components of the assistance package.

Finally, levels of seed distribution are already high, despite the marginal or uncertain quality of the seed.

Considering the factors enumerated above, projections were made of the requirement for improved seed (Table 2, Annex A). These are based on replacement factors of 50% for rice and maize, and 33% for beans, which means that 50% of the total rice and maize seed needs should be supplied each year or planting season, and 33% of total seed needs for beans. Viewed from the perspective of the farmer, enough seed production is programmed for him to "replace" his rice and maize seed every other planting, and his bean seed every third planting.

Achievement of these replacement levels would be entirely adequate to support a modern, progressive agriculture insofar as seed usage is conceived. In most countries, including the highly developed countries, the replacement factor for self-pollinated crops and open pollinated maize is on the order of 30% or less. Only in exceptional cases -- and the case in the D.R. is exceptional -- are higher replacement factors recommended.

Based on estimated areas planted to beans, rice, and maize, planting rates, and replacement factors of 50% for rice and maize, and 33% for beans, the quantities of good quality, clean seed needed by the end of the project are: rice - 2,880 mt; beans - 1,069 mt; maize - 270 mt.

The phasing-up of seed production over the three year period of the project is given in Table 4, Annex A. Quantities of vegetative propagules of yuca and plantains needed by project year are given in Annex C.

It will be noted that the projected seed production schedules over the project period (Table 4, Annex A) do not agree in the final year with the projected

seed needs (Table 2, Annex A). The former has reference to seed production schedules in the public sector; i.e., by entities within SEA, while the latter has reference to projected total seed needs regardless of who supplies them.

One private seed company producing seed in the D.R. has been established (PROSEDOCA). This company is already producing and supplying over 20,000 qq. of rice seed (900 mt), 220 qq. of maize seed (10 mt), and 300 qq. of sorghum seed (15 mt). The rice seed being produced are those improved or developed at the Juma Station. The maize and sorghum seed, however, are Pioneer International hybrids which are well adapted to and high yielding in the D.R., and which PROSEDOCA is producing under special arrangement

As mentioned earlier in this report, PROSEDOCA is undertaking a substantial expansion in facilities, equipment, and capacity. It is also under sound technical management and is doing an excellent job of seed production and distribution.

Programming the entire projected seed needs for production within the public sector would seriously jeopardize the continued viability of PROSEDOCA, and essentially preclude participation of any other private sector entities in seed production and supply in the D.R. The only way in which PROSEDOCA could survive in such a situation would be to restrict its operations entirely to hybrid seed, or to produce seed of substantially superior quality than that produced by the SEA units.

Since it should not be the effect of this project to preclude private sector participation in input supply operations as long as they are competitive and serving needs in the country, a proportion of the projected seed needs is allocated for production in the private sector. Recommended proportions and quantities are given in Table 3, Annex A. The proportions amount to 50% of the rice and maize seed production in the private sector, and 25% of the bean seed

production. Bean seed production is not as commercially "viable" an enterprise as rice and maize seed.

The production schedules shown in Table 4, Annex A, therefore, refer to the quantities of seed recommended for production by the public sector. In the event that the private sector does not produce the quantities of seed projected for it, the public sector will have to increase its production schedules accordingly.

Seed production should be in general accord with the scheme outlined below.

(1) Prior to each seed production season, the projected seed production targets will be reviewed to determine if any adjustments are necessary. This review should be carried out by the National Seed Committee. The National Seed Committee will also breakdown the targeted production for each crop into production goals by variety. This will have to be done on the basis of demand estimates, projected "extension" efforts, Ag. Bank and IAD forecasts, etc. In short, it is essential that production goals be as closely attuned as possible to intentions of major markets (IAD, Ag. Bank, agricultural service centers).

(2) Foundation seed supplies, which must also be planned in the manner outlined above, will be allocated to the production units <u>including private sector producers</u>.

(3 The production units will generally contract for the programmed production with carefully selected private farmers. Insofar as possible, the selected contract seed producers should be larger farmers.[6/] Seed production on large units is much more manageable and easier to

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[6/] This may appear to be at odds with the thrust of the project which is aimed at helping small farmers. The seed production component, however, is an "input component" and not the appropriate place to implement mandates to help the poor small farmer. He will be benefitted through <u>use</u> of the input.

supervise and control than when scattered over numerous small units. Larger farmers are also usually more advanced in terms of technology applied and equipment available, both of which facilitate seed production.

(4) The contract drawn with the selected farmer producers will specify that foundation seed be purchased in the quantities needed and that the producer agree to a planting time -- so that deliveries, drying, processing can be scheduled -- and a regime of supervision and field inspections. The maximum quantity of seed that will be purchased, the place and general time of delivery, method of delivery, standards that must be met (field standards, seed moisture content, impurities, etc.), and the purchase price will also be mutually agreed to by the contracting parties.

(5) The production unit (CNIECA, Juma, CENDA) will carry out such supervision of the seed producers as necessary to ensure that quality seed are produced. Particular emphasis will be given to supervision of harvseting operations.

(6) The Departamento de Semillas field inspectors will inspect each production field at or just before flowering to check on isolation, varietal purity, and diseases, and again after the crop is mature but before harvest to make a final inspection of varietal purity, disease condition, and cleanliness of harvesting equipment.

(7) Production fields that pass final inspection will then be harvested and seed delivered (or picked up at set differential in price) to the drying, processing, and storage facilities at Juma and CNIECA. Samples will be drawn and placed in test to determine if the seed meet contract specifications. If the seed meet contract specifications, the

grower will be paid the agreed to price from a working capital or revolving fund.

E. Seed Drying, Processing, and Storage

The present facilities for drying, processing, and storage of seed at CNIECA and Juma are totally inadequate to properly handle the quantities of seed projected. These will be renovated, added-to, equipped or re-equipped, and repaired as needed. Estimated costs of renovations of and additions to facilities at Juma and CNIECA and needed equipment and equipment repairs are given in Annex D.

The seed delivered at the processing centers at Juma and CNIECA will be dried as needed to reduce moisture content to a favorable level, cleaned, treated as required, and stored until distribution time.

The Departamento de Semillas inspectors will inspect the drying and cleaning equipment for cleanliness before each processing season, and between each variety processed within a season. Samples will be drawn at the time of packaging and/or after seed are packaged for quality control tests and to obtain information for labeling.

F. Seed Inspection and Control

The Departamento de Semillas will be responsible for seed inspection and control. A seed law was enacted in 1971, but regulations needed for implementation have not been developed and adopted. Under the Technical Assistance, section that follows, technical assistance is recommended to help D.R. specialists with formulation of seed regulations that are in concert with the needs in the D.R. at this stage in its development of the Agricultural Sector.

The regulations developed will, in general, provide for implementation of standardized production procedures and quality standards, and an inspection system to determine compliance. It should be patterned after well established "seed certification" procedures and regulations, although not so rigorous

during the first few years. It is envisaged that these regulations will be "tightened-up" and made more comprehensive after a few years experience so that they will evolve into a full-fledged certification system by 1980.

Two types of control mechanisms will be used. First, the Departamento field inspectors will inspect production fields (including foundation seed fields) to determine if the fields meet established standards for varietal purity, weeds, and diseases. Secondly, seed will be sampled by Departamento inspectors to determine if they meet established standards for purity and germination.

As a means of identification of seed lots that meet all quality standards, labels giving minimum quality standards and indicating that the seed were inspected and approved will be affixed to all packages of seed. After the control procedures evolve into a real certification program around 1980, the labels should be changed to conform to international usage in terms of color, format, etc.

At present, there are essentially no facilities for seed testing and other quality control procedures. Funds needed to renovate and expand present quarters, provide for adequate equipment, and to provide transportation for inspectors are given in Annex D.

The inspection services outlined above should be provided free to both the public and private sectors until such time as a full-fledged certification system is established. Thereafter, a certification fee sufficient to cover inspection expenses should be charged.

G. Distributing and Marketing

Improved seed regardless of how carefully they are produced, have no impact on agricultural productivity unless they are distributed and planted by farmers. Distribution and marketing, therefore, are a major key to success of the program proposed.

Distribution and marketing of improved seed will not be easy. The small farmer will first have to be persuaded that use of improved seed will be beneficial to him in terms of on-farm production of food for his family, and income derived from commodity sales. Secondly, the means for acquiring improved seed and other inputs will have to be made available to him, namely, a line of production cycle credit, which may be in kind, on reasonable terms. Thirdly, the improved seed he wants has to be available in the quantities needed, at the right time, and at market places accessible to him.

Rural credit in the D.R. is already reasonably good and is programmed for additional capitalization under an IDB loan. Considering these and other advances in the rural credit area, accessibility of the small farmer to credit for inputs should not be a major constraint.

IAD presently controls about 50% of the rice acreage in the D.R., and is a major purchaser of rice seed (about 60% of rice seed currently produced). This constitutes an excellent built-in market which should be exploited to the extent possible. A review of previous IAD purchases of seed indicates that a major portion of the seed bought is of improved but traditional varieties which do not have the potential of the high yielding Juma varieties or imported varieties such as IR-6, CICA-4, CICA-6, etc. Every effort must be made to persuade IAD that use of seed of high yielding varieties would improve production on lands under their control and hence, benefit the farmers settled thereon. In like manner, IAD should be cultivated as a market for improved seed of maize, beans, and improved vegetable propagules of yuca and plantains.

The input distribution centers already established and those scheduled to become operational constitute an excellent means of distribution and marketing. These input centers should handle and agressively market the improved seed produced by the seed program and private sector.

In the probable event that IAD can be persuaded to act more in the capacity of a "change agency", and the input distribution centers are reasonably successful, distribution and marketing of the improved seed produced should not be an impediment to realization of full expected benefits.

H. Improved Plant Materials

Under the supervision and control of CENDA, "foundation" plantings of high yielding clones of yuca and plantains will be established to provide a continuing source of vegetative propagating materials for use by farmers.

In the case of yuca, several especially high yielding varieties (50-100% better than local types) have been identified and tested for adaptability. The best adapted of these varieties or clones will be established in foundation plantings on about 250 tareas. The cuttings from these plantings will be sufficient to plant about 6,500 tareas. By proper cycling, cuttings in this quantity could be made available each year. Close attention will be given to the phytosanitary condition of the cuttings produced so that clean, healthy stocks are available for distribution. It is also anticipated that there will be a slow but continuous "diffusion" of the improved varieties through farmer-to-farmer sales or barter.

SEA is presently distributing seed pieces (cepas) of plantains. These are often diseased, infected with nematodes and borers. The result is that many of the seed pieces do not develop, or develop poorly with low productivity, and diseases and pests are being spread throughout the country. Studies also indicate that selected clones are 25-50% higher in yield than non-selected "local" clones.

Foundation clone plantings will be established on 500 tareas after the soil has been treated with a nematicide. These plantings should produce about 1.5 million seed pieces per year, which are sufficient to plant about 15,500 tareas. There will also be considerable "diffusion" of the selected

clonal materials through farmer-to-farmer sales and exchange. These procedures will lose somewhat the advantages of "phytosanitaryness", but inherent productive potentials will be retained.

The cost of establishment of the foundation seed plantings of yuca and plantains, personnel needed, and operational costs are given in Annex C.

The improved plant materials should be marketed through the various GODR rural improvement programs.

The price of the plant materials should be established on the basis of the costs of production excluding investments in land, facilities, and equipment; i.e., on basis of operational costs.

I. Pricing Poli

Two pricing policies will have to be established: the premium above grain price paid to contract seed producers as an essential incentive to use procedures for producing seed rather than grain; and, the price of packaged seed to farmers or other purchasers.

The present price structure used by the Juma station for rice seed is fairly reasonable and workable. Contract rice seed producers are paid RD$30/100 kg. of raw seed, which is about 20% above the equivalent grain price; i.e., a 20% premium. This price is further discounted for moisture above 20% and impurities above 6%. Assuming that the average moisture content of the rice seed on delivery is 18% and that it is dried to 13%, then the loss of weight due to drying amounts to a loss of 5.75 kg. per every 100 kg. raw seed received. An additional 14% or so will be lost in cleaning, or through rejection because of low quality, etc. Thus, for every 100 kg. raw seed, about 80 kg. will end up packaged for sale. Currently, rice seed is being sold for RD$0.48/kg. (RD$22/quintale). The present price structure for rice seed as outlined above can be summarized as follows:

	RD$	Premium Over Grain
1. Purchase price of 100 kg. of raw seed from grower	$30.00	20%
2. Selling price of 80 kg. clean, packaged seed at 0.48 kg. (RD$22/quintale)	38.40	Approximately 95%
3. Sale of 7 kg. screenings per 100 kg. of raw seed cleaned at 50% grain price or 0.12/kg.	0.84	
	$ 9.24	gross return on each 100 kg. raw seed taken in.

The RD$9.24 gross return per 100 kg. raw seed handled must cover transport, processing costs, cost of bags, etc. These costs are currently estimated at about RD$3.25 per 100 kg. of raw seed. Thus, there is a net of about RD$6.00/100 kg. raw seed taken-in to cover return on investment, interest on working capital, repairs and maintenance, losses from seed not marketed as seed (and sold as grain) etc.

Overall the price structure for rice seed appears to be working. It should be recognized, however, that the present rice seed price is about 200% of the price of rice for grain. Experiences in many countries indicate that this is about maximum that farmers can be expected to pay for seed of self-pollinated crops. Hopefully, efficiencies resulting from the better equipment and facilities proposed will permit reduction in rice seed price to 180-185% of grain price.

The price structure for the bean and maize seed produced by the Departamento de Semillas is apparently quite variable and not too rational. Bean seed are being purchased from growers for RD$77/100 kg. (35/qq). After drying (with weight loss), cleaning (additional weight losses), packaging (cost of bags), the cleaned, packaged seed are being sold at RD$55/100 kg. (25/qq). This is below grain price!

It represents a net loss of at least RD$12/qq. excluding costs of processing, handling, transportation, sacks, etc. The screening, and/or clean-out can probably be sold for RD$25/qq., or as much as the seed.

Maize seed are being purchased from growers at about RD$22/100 kg. (10/qq). Considering losses in weight from dry-down, costs of handling, cleaning, packaging, etc., the maize seed are being sold at a net loss.

A rational pricing policy must be established for bean and maize seed. A premium over grain price of 15% is recommended for purchase of bean and maize seed from contract growers. Considering losses in weight from drying, cleaning losses, and sale of same as low grade grain, a sales price for maize seed of 200% of grain price would be reasonable (See Annex E for more details on pricing).

A sales price of 150% of the grain price for bean seed, which would be about as much as farmers could be willing to pay considering high seeding rate and low yield, would be reasonable (See Annex E).

J. Training

Training will be essential for successful implementation of program proposed. Training is especially needed in seed inspection and control, drying, processing, storage, and seed testing. Three levels of training are proposed:

1. In-depth Training: One or two Ing. Agron. should be scheduled for graduate training in U.S.A., preferably at Mississippi State Universi hich has the most comprehensive and relevant training program in see echnology for international students. Training for two years (M.S. ree) would be best, but in the event that this is not possible traini should be programmed for one year (June-May).
2. Short-term Training: At least four Ing. Agron. should be enrolled in the Special Course on Seed Improvement offered at Mississippi State University annually (June-August) in cooperation with AID and USDA. This is a 10-week, intensive course (English language), with 6-weeks

at MSU and 4-weeks on observational tour of carefully selected seed operations

3. In-service Training: Two to three weeks of intensive in-service, operational training is recommended in areas of seed inspection and control, and processing operations. Technical assistance in form of 1-2 instructors for each area would be required. MSU can provide instructors under terms of its TA contract with TAB/AGR/AID on seed program development.

Training requirements are summarized in Annex F.

K. Financial Requirements

The several proposals advanced have been costed by reference to the several Annexes. The one major item not previously considered is the operational or working capital needed to purchase seed from contract growers. Failure to pay contract growers at the time of delivery (or at most within 1-2 weeks), is one of the easiest ways to wreck a good seed program.

Experiences in many countries have demonstrated that the working capital required for purchase of seed from contract growers cannot be effectively programmed within the regular budgetary process of governmental agencies. Therefore, some type of revolving or operational capital fund is needed from which funds can be drawn to pay contract growers and into which receipts are deposited up to projected fund level needed to capitalize the next season's seed purchases. Any excess can be used for expansion of the seed program, maintenance, replacement of equipment, etc. or to finance other line items in regular budget. If well managed, the revolving fund should increase or remain stable and not be continually drained-off requiring continuous inputs of funds into it.

The working capital or revolving fund should be deposited in a sound national bank or other financial institution and subjected to rigorous audit. Provisions should be made for the production agency (i.e., Juma, CNIECA, CENDA) to issue

vouchers to contract growers payable in cash on presentation at depository. The vouchers issued should show name of grower, quantity of seed delivered, time of delivery, price of seed per unit, and total payment, and be properly signed by person with issuing authority in production agency.

Turn-over of working capital will vary depending on length of period between delivery of raw seed by contract grower and sale of seed to purchaser.

The estimated total financial requirements for the seed program proposed including working capital are summarized in Annex H.

Technical Assistance: Technical assistance will be required: (1) to help SEA personnel with drafting of appropriate regulations to the 1971 seed law (2 weeks); (2) to help in designs for renovations of existing facilities and for additional facilities, and to develop final equipment list (which will be greatly influenced by designs), and write technical specifications for same (2 weeks in D.R., 2-3 weeks after-actions at home station); (3) to assist in in-service and operational training (2 instructors for each of two 3-week training courses, total 12 weeks, 4 round trips to D.R.); and (4) at least one 2-3 week consultation (one person) to help with resolution of problems that surface during first year or two of operation. The first two consultations recommended (for regulation and designs) should be pre-project. The consultation on regulations should be timed to coincide with the visit of IICA consultant on seed regulations. The consultation on design and equipment specifications should be scheduled as much in advance of initiation of program as possible so that contracts for renovations and other construction, and equipment orders can be executed at earliest date. This will minimize delay in getting geared up after program becomes operational (i.e., loan is signed).

The pre-loan technical assistance can best be provided by Mississippi State University under terms of its seed program development contract with TAB/AID. The other technical assistance recommended could also be provided under the same

contract, at no cost to Mission or program. If decision is made to draw on technical assistance from another source, funds will have to provided in loan program.

VI. PROJECTED BENEFITS AND REVENUES

The seed produced by the project will be sold. Thus, revenues will be returned to the project. These revenues, first of all, will be used to replenish the revolving fund, and to increase its capital up to projected requirement for the next seed production season. Any excess can be directed back into regular SEA budgetary channels for budgeting line items in the seed program.

Revenues projected on the basis of 85% sale of clean seed targets, and sales prices of 195%, 150 and 200% grain price for rice, beans and maize, respectively, and RD$0.05/seed pieces of plantain and RD$3/per cuttings of yuca for one tarea are as follows: (see Annex I for details).

Item	3 Years
Seed	2,649,405
Seed By-products	--386,684
Plant Materials	246,000
Totals	3,282,089

The benefits of the project in terms of increases in production from planting the improved seed and plant materials are:

Item	Increase in Production-3 yrs
Rice	17,680 mt
Beans	3,217 mt
Maize	4,580 mt
Plantain	4,312 mt
Yuca	3,578 mt

To these increases in production should be added increases resulting from farmers "saving" seed for replanting the following season and the diffusion of seed of improved varieties through farmer-to-farmer barter and sale.

ANNEX A

TABLE 1. Quantities (qq.) of seed distributed by the Departamento de Semillas since 1969.

Year	Rice	Red Beans	Maize	Pidgeon Pea	Alfalfa	Sorghum
1969	14,624	4,988	2,450	64		513
1970	18,378	547	7,666	70	25	264
1971	17,372	1,595	5,323	9	2	42
1972	12,185	128	3,618	43	2	----
1973	27,684	29,298	4,577	77	1	----
1974	638	38,859	10,627	301	-----	----
1975	-------	42,662	12,088	316	-----	----
Total	90,881	118,077	45,349	880	40	819

Source: Departamento de Semillas

TABLE 2. Total seed requirements and projected requirements for seed production by end of project.

Crop	Total[1] Area Planted (ha/yr)	Pltg. Rate (kg/ha)	Total Seed Req'd. (mt/yr)	Replacement[2] Factor (%)	Fdn. Seed[3] Req'd. (mt)	Seed Prod.[4] Req'd. mt	Seed Prod.[4] Req'd. ha	Est. Seed Yield (mt/ha)	Projected[5] Seed For Distribution (mt)
Rice	80,000	72.0	5760	50	101.0	3600	1125	3.2	2880
Beans	45,000	72.0	3240	33	120.0	1336	1336	1.0	1069
Maize	30,000	18.0	540	50	3.5	386	154	2.5	270

[1] Estimated on basis of all available information.

[2] Refers to frequency farmers replace seed, e.g., replacement (purchase of) of seed every 3rd planting gives a replacement (or renewal) factor of 33% which in turn means that 33% of total seed needs have to be supplied for each planting season. 50% replacement of seed for rice and open pollinated or composite maize varieties would be considered as good in any developing country; likewise for 33% bean seed replacement.

[3] Includes a 20% loss factor to allow for rejection of field and seed which do not meet specifications for quality, moisture loss, cleaning loss, etc.

[4] Includes a 20% loss factor for rice and beans, and 30% for maize.

[5] Quantities of seed needed for distribution by public and private sectors.

TABLE 3. Recommended proportions of projected seed market of three major crops for public and private sectors.

Percentage and Quantity of Production by Sector	Rice	Beans	Maize
Public Sector			
%	50	75	50
Mt	1440	802	135
Private Sector			
%	50	25	50
Mt	1440	267	135

TABLE 4. Projected seed production schedules by project years for SEA production units.

Crop	Year 1 [1] Raw Seed (Mt)	Year 1 [1] Clean Seed [2] (Mt)	Year 1 [1] Area (ha)	Year 2 Raw Seed (Mt)	Year 2 Clean Seed (Mt)	Year 2 Area (ha)	Year 3 Raw Seed (Mt)	Year 3 Clean Seed (Mt)	Year 3 Area (ha)	Year 4 Raw Seed (Mt)	Year 4 Clean Seed (Mt)	Year 4 Area (ha)
Rice	600	480	188	1200	960	375	1800	1440	563	1800	1440	563
Beans	334	267	334	668	534	668	1002	802	1002	1002	802	1002
Maize	64	45	24	128	90	51	193	135	77	193	135	77
Totals	998	792	546	1996	1584	1094	2995	2377	1642	2995	2377	1642

[1] Because of lead time required for breeder and foundation seed production, quality standards on Year 1 production may have to be relaxed somewhat.

[1] Clean seed is projected as 80% of "raw" seed of rice and beans, and 70% for maize to allow for moisture loss, field and seed rejections, cleaning losses, etc.

TABLE 5. Projected needs for breeder and foundation seed production by crop and year.

Crop	Year 0 [1] Raw Seed [3] (mt)	Year 0 [1] Clean Seed [2] (mt)	Year 0 [1] Area (ha)	Year 1 Raw Seed (mt)	Year 1 Clean Seed (mt)	Year 1 Area (ha)	Year 2 Raw Seed (mt)	Year 2 Clean Seed (mt)	Year 2 Area (ha)	Year 3 Raw Seed (mt)	Year 3 Clean Seed (mt)	Year 3 Area (ha)
					Genetic (Breeders) Seed							
Rice	1.0	0.8	0.3	1.9	1.5	0.6	2.9	2.3	0.9	2.9	2.3	0.9
Beans	3.6	2.9	3.6	7.2	5.8	7.2	10.8	8.6	10.8	10.8	8.6	10.8
Maize	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Totals	4.7	3.8	4.0	8.8	7.4	7.9	13.8	11.0	11.8	13.8	11.0	11.8
					Foundation Seed							
Rice	34.0	27.0	11.0	67.5	54.0	21.1	101.0	81.0	32.0	101.0	81.0	32.0
Beans	40.0	32.0	40.0	80.0	64.0	80.0	120.0	96.0	120.0	120.0	96.0	120.0
Maize	2.0	1.0	1.0	3.0	2.0	1.5	4.0	3.0	1.5	4.0	3.0	1.5
Totals	76.0	60.0	52.0	150.5	120.0	102.6	225.0	180.0	153.5	225.0	180.0	153.5

[1] Foundation seed have to be produced one season or year in advance of large scale seed production; breeders seed have to be produced one year or season in advance of foundation seed production, hence, year 0 for breeders seed should be Year 0-1. Year 0 is taken as 1976.

[2] Clean seed schedule is sufficient for both public and private sector seed production.

[3] Raw seed is 125% of clean seed needed to allow for losses.

ANNEX B

ANNEX B

Estimated Personnel and Operating Costs for Juma and CNIECA Seed Production Units, and the Departamento de Semillas Seed Inspection and Control Activities.

Item/Unit	Estimated Cost (U.S. $) Year 1	Year 2	Year 3	Total
I. Personnel[1]				
A. Juma Station				
(1) Agronomist In Charge	6,000(1)[2]	6,000(1)	6,000(1)	18,000
(2) Agronomists	9,600(2)	14,400(3)	14,400(3)	38,400
(3) Field/Plant Foreman	3,600(2)	5,400(3)	5,400(3)	14,400
(4) Book-Keeper-Clerk	3,600(1)	3,600(1)	3,600(1)	10,800
(5) Secretary	3,000(1)	3,000(1)	3,000(1)	9,000
Sub-totals	25,800	32,400	32,400	90,600
B. CNIECA Seed Production Unit Proposed[3]				
(1) Agronomist In Charge	6,000(1)	6,000(1)	6,000(1)	18,000
(2) Agronomists	9,600(2)	14,400(3)	14,400(3)	38,400
(3) Field/Plant Foreman	3,600(2)	5,400(3)	5,400(3)	14,400
(4) Book-Keeper-Clerk	3,600(1)	3,600(1)	3,600(1)	10,800
(5) Secretary	3,000(1)	3,000(1)	3,000(1)	9,000
Sub-totals	25,800	32,400	32,400	90,600
C. Departamento de Semillas (at CNIECA)[4]				
(1) Director	8,000(1)	8,000(1)	8,000(1)	24,000
(2) Chief Inspector	6,000(1)	6,000(1)	6,000(1)	18,000
(3) Chief Seed Analyst	5,000(1)	5,000(1)	5,000(1)	15,000
(4) Inspectors	9,600(2)	14,400(3)	19,200(4)	43,200
(5) Seed Analysts	4,800(1)	4,800(1)	9,600(2)	19,200
(6) Lab Assistants	1,800(1)	1,800(1)	3,600(2)	7,200
(7) Book-Keeper-Clerk	3,600(1)	3,600(1)	3,600(1)	10,800
(8) Secretary	3,000(1)	3,000(1)	3,000(1)	9,000
Sub-totals	41,800	46,600	58,000	146,400
Personnel TOTALS	93,400	111,400	122,800	327,600

II. Operational Costs (excluding working capital for seed purchases)

Item/Unit	Estimated Cost (U.S.$) Year 1	Year 2	Year 3	Total
A. Juma Station				
(1) Utilities & Communications	400	600	600	1,600
(2) Office Supplies	400	500	600	1,500
(3) Vehicle Operation	800	1,000	1,200	3,000
(4) Insecticides and Fumigants	200	350	450	1,000
(5) Foundation Seed Production Costs ($250/ha)	5,275	8,000	8,000	21,275
(6) Costs of Seed Drying, Processing, Handling, Storage, Packaging and Transport ($44/mt of clean seed) 5/	23,496	45,804	66,924	136,224
Sub-totals	30,571	56,254	77,774	164,599
B. CNIECA Seed Production Unit				
(1) Utilities & Communications	600	700	800	2,100
(2) Office Supplies	400	500	600	1,500
(3) Vehicle Operation	1,000	1,200	1,400	3,600
(4) Insecticides and Fumigants	300	500	600	1,400
(5) Foundation Seed Production Costs ($250/ha)	10,250	20,500	30,500	61,250
(6) Costs of Seed Drying, Processing, Handling, Storage, Packaging and Transport ($44/mt of clean seed) 5/	16,632	31,812	45,584	94,028
Sub-totals	29,182	55,212	79,484	163,878
C. Departamento de Semillas				
(1) Utilities & Communications	600	700	800	2,100
(2) Testing & Inspection Supplies	800	1,200	1,400	3,400
(3) Office Supplies including: forms & labels for bags of seed	1,800	3,600	5,500	10,900
(4) Vehicle Operation	1,500	2,500	3,000	7,000
(5) Travel Expenses for Inspectors	600	1,200	1,400	3,200
Sub-totals	5,300	9,200	12,100	26,600
Operating TOTALS	65,053	120.666	169,358	355,077

1/ Includes total personnel needed but not labor which is costed to operations.

2/ Numbers in parentheses refer to numbers of people.

3/ New seed production unit proposed at CNIECA.

4/ Based on proposed reorganization of the Departamento de Semillas.

5/ Includes labor, fuel, power, packaging materials, seed treatment chemicals and minor repairs and maintenance.

ANNEX C

ANNEX C

Estimated Costs of Establishing and Operating Plantain and Yuca Multiplication Plantings

Plantain

Item	Estimated Cost (U.S.$) Year 1	Year 2	Year 3	Totals
I. Investment Costs				
A. 500 ta land @50/ta	25,000	-	-	25,000
B. Tractor and implements	25,000	-	-	25,000
C. Rototillers (4 @1200)	4,800	-	-	4,800
D. Sprayer (tractor drawn)	2,500	-	-	2,500
E. Sprayers, hand (5 @300)	1,500	-	-	1,500
F. Shed with disinfection tank	10,000	-	-	10,000
G. 300,000 seed pieces @0.05 (put in 150,000 each of first two years)	7,500	7,500	-	15,000
H. Pick-up truck	5,000	-	-	5,000
I. Miscellaneous hand tools	1,200	-	-	1,200
Investment Subtotals	82,500	7,500		90,000
II. Operating Costs				
A. Expendable Supplies and Operations				
(1) Fertilizer (15/ta/yr)	3,750	7,500	7,500	18,750
(2) Nematicide for disinfecting soil (15/ta)	3,750	7,500	7,500	18,750
(3) Chemicals for disinfecting seed pieces (13/ha of cuttings)	3,250	6,500	6,500	16,250
(4) Pesticides (3/ta)	750	1,500	1,500	3,750
(5) Fuel for equipment	800	1,400	1,400	3,600
(6) Packaging materials	2,000	4,000	4,000	10,000
(7) Repair and maintenance	1,000	1,500	1,500	4,000
(8) Utilities & communications	300	300	300	900
(9) Miscellaneous	500	750	750	2,000
	16,100	30,950	30,950	78,000
B. Personnel and Labor				
(1) Agronomist, In Charge (1)	6,000	6,000	6,000	18,000
(2) Agronomists (2)	9,600	9,600	9,600	28,800
(3) Field Foreman (1)	1,800	1,800	1,800	5,400
(4) Laborers (8)	7,680	7,680	7,680	23,040
(5) Secretary-Bookkeeper (1)	2,400	2,400	2,400	7,200
Personnel	27,480	27,480	27,480	82,440
Operations Subtotals	43,580	58,430	58,430	160,440

Item	Estimated Cost US$ Year 1	Year 2	Year 3	Totals
III. Capability - When established the plantain multiplication unit will have capability of producing 1.5 million seed pieces per year, which is sufficient to plant 15,000 ta.				
IV. Projected Revenues -1st yr. .75 million seed pieces at 0.05	37,500	-	-	37,500
-2nd & 3rd years, 1.5 million seed pieces @ 0.05	-	75,000	75,000	150,000
Totals	37,500	75,000	75,000	187,500

Yuma

Item	Estimated Cost (U.S.$) Year 1	Year 2	Year 3	Totals
I. Investment Costs				
A. 250 ta. land @50/ta.	12,500	-	-	12,500
B. Tractor with implements	25,000	-	-	25,000
C. Rototillers (3 @1200)	3,600	-	-	3,600
D. Sprayer, tractor drawn	2,000	-	-	2,000
E. Sprayers, hand (3 @300)	900	-	-	900
F. Pick-up truck	5,000	-	-	5,000
G. Work shed	5,000	-	-	5,000
Investment Subtotals	54,000	-	-	54,000
II. Operational Costs				
A. Expendable Supplies & Operations				
(1) Fertilizer (15/ta/yr)	3,750	3,750	3,750	11,250
(2) Pesticides (4/yr)	1,000	1,000	1,000	3,000
(3) Fuel for equipment	800	1,200	1,200	3,200
(4) Packaging materials	1,000	1,500	1,500	4,000
(5) Repair and maintenance	1,000	1,500	1,500	4,000
(6) Utilities & Communications	300	300	300	900
(7) Miscellaneous	500	750	750	2,000
Supplies & Oper.	8,350	10,000	10,000	28,350
B. Personnel & Labor				
(1) Agronomist, In Charge (same as for Plantain)				
(2) Agronomist (1)	4,800	4,800	4,800	14,400
(3) Field Foreman (1)	1,800	1,800	1,800	5,400
(4) Laborers (5)	4,800	4,800	4,800	14,400
(5) Secretary	2,400	2,400	2,400	7,200
Personnel	13,800	13,800	13,800	41,400
Operations Subtotals	22,150	23,800	23,800	69,750
III. Capability - When established the Yuca multiplication unit will have a capability of producing enough cuttings for planting 6500 ta. annually.				
IV. Projected Revenue - (Sale at 3/cuttingsfor Tarea.)	19,500	19,500	19,500	58,500

ANNEX D

ANNEX D

I, Recommended Facility Development

	Estimated Cost US$
A. Seed Production Unit, CNIECA	
1. Addition to present facilities to provide proper housing for efficient arrangement of seed drying/processing operations. Addition to be approximately 12m X 12m X 10m high at ridge; regular warehouse, clear span construction with concrete slab floor (20) 1/	
$144m^2$ at US$150/$m^2$	$ 21,600
2. Concrete pad for drying/storage bins and maize sheller; 14m X 16m X 10cm. thick (20)	
$224m^2$ at US$12/$m^2$ (20)	2,688
3. Shelter over maize sheller (20)	500
4. Modification of existing open-sided flat storage room into sack dryer; 168 sack capacity (about 200 qq.); drying platform approximately 18m X 6m X 1m high (20)	3,500
5. Renovation of area for quality control laboratory. Need approximately $30m^2$ (20)	1,500
6. Renovation of office space	1,500
7. Repair of conditioned cold seed storage room, and refrigeration units and purchase of dehumidification equipment (10)	5,000
8. Renovation of present seed processing area into combination air conditioned and unconditioned storage and small shop (20)	5,000
9. Air conditioning for 8. (10)	5,000
CNIECA Seed Unit Sub-total	$ 46,288

ANNEX D (cont.)

B. Estacion Experimental Arrocera, Juma

1.	Modification and expansion of processing area to permit use of higher capacity equipment and more efficient arrangement (20)	$ 10,000
2.	Concrete pad for drying bins (224m^2 @ U.S. $12/$m^2$) (20)	2,688
3.	Seed storehouse (partially conditioned) (20) 700m^2 @ 100	70,000
4.	Air conditioning for 3. (5)	10,000
5.	Renovation and equipping of existing cold storage room for seed (10)	6,000
	Juma Sub-total	$ 98,688

C. Departamento de Semillas (seed inspection and control)

1.	Seed inspection and analysis laboratory and offices 140m^2 @ 150/m^2 (20)	$ 21,000
2.	Air conditioners for (1)	4,000
	Departamento de Semillas Sub-total	$ 25,000

1/ Numbers in parentheses refer to expected life (yrs.) of facility or item of equipment.

I. FACILITIES TOTAL	$169,976

II Recommended List of Equipment for Drying-Processing of Seed

A. ESTACION EXPERIMENTAL ARROCERA JUMA

No.	Description	Estimated Cost US$[1] Unit	Total
1	Dump pit, for efficient intake of raw seed (15)[2]	$ 2,000	$ 2,000
1	Belt-bucket elevator, high capacity, for feeding raw seed from dump pit to scalper for rough cleaning (10)[2]	2,500	2,500
1	Scalper, high capacity, rough cleaner, to remove foreign material from seed prior to drying and cleaning (15)	8,000	8,000
1	Belt-bucket elevator, high capacity, for elevating seed to permit discharge into drying bins, and to elevate dried seed to hopper above main seed cleaner (10)	4,200	4,200
3	Drying/storage bins, corrugated metal construction, with perforated metal drying floor and standard accessories; 14 ft. diameter, 10 ft. eave hight; drying capacity of 250 qq. rice seed at 4 ft. depth (15)	4,000	12,000
3	Heater-fan units for drying system or drying bins; oil burner type heater (10)	3,800	11,400
1	Belt-conveyor for conveying dried seed from drying/storage bins to main receiving elevator for elevation to discharge into basic cleaner (10)	3,600	3,600
2	Bins, corrugated metal, hopper bottom, with center discharge, to hold excess of drying capacity over cleaning capacity, 150 qq. capacity each (15)	1,800	3,600
1	Air-screen cleaner, 4 screens, 2 air systems, with standard accessories and screens, for basic cleaning operation (15)	10,000	10,000
2	Belt-bucket elevators, about 30 ft. discharge height; 100 qq./hr. capacity, with standard accessories; to feed seed from holding bins into basic cleaner and to handle cleaned seed (10)	2.400	4,800
1	Dust collector, cyclone type, for air-screen clean aspiration systems (15)	1,200	1,200

ANNEX (continuation)

No.	Description		
1	Surge-holding bin, for mounting above feed hopper of air-screen cleaner (local fabrication, metal) (15)	$ 400	$ 400
2	Indented cylinder seed separator for removing cross broken grains of rice and other shorter materials from rice seed, with selected indent shells (15)	4,00	
.2	Surge-holding bin for mounting above indented cylinder separators, all metal, local fabrication (15)	40	800
1	Belt-bucket elevator, for handling and elevating cleaned seed from indented cylinder separator (10)	1,80	1,800
1	Seed treater, slurry type, stainless steel, for applying treatment materials to seed (10)	3,00	3,000
1	Surge-holding bin for mounting above treater, all metal, local fabrication (15)	40	400
1	Seed weigher-bagger-sewing system; for packaging of seed (10)	4,20	4,200
1	Surge-holding bin for mounting above packaging system, all metal, local fabrication (15)	40	400
1	Vacuum cleaner, heavy duty, for cleaning up facility to prevent varietal mixtures(5)	70	700
1	Air-compressor, with slip-on base connections, 120 psi, for supplying air blast to help in cleaning machines between varieties (10)	1,000	1,000
3	"Bagtrucks", 2 wheel for moving packaged seed (5)	100	300
3	"Bagtrucks", 4 wheel platform type, 1 ton capacity (10)	400	1,200
-	Local fabrication of machine stands, other integral framework and supports for equipment from steel (angle iron, channels, etc.) (15)	2,500	2,500
-	Moisture tester, seed samplers and other quality control equipment (8)	2,000	2,000
-	Office equipment and furnishings (local) (10)	2,000	2,000

ANNEX (continuation)

No.	Description	Estimated Cost US$ Unit	Total
3	Vehicles, pick-ups (5)	$ 5,000	$ 15,000
	Contingencies	5,000	5,000
			$112,000
	Shipping & Crating 20%[3/]		17,180
	Installation (10%)[4/]		9,750
	Juma Sub-total		$138,930

1/ These are estimated costs only. Prices of equipment are constantly increasing. Some revision of list will probably be required when layout of drying-processing plant is designed.

2/ Numbers in parentheses are life expectancy of item.

3/ Calculated for those items that will be purchased in

4/ Calculated for those items that need to be installed.

B. SEED PRODUCTION UNIT, CNIECA

No.	Description	Estimated Cost US$ Unit	Total
1	Dump pit, for efficient receiving of raw seed (10) 2/	$ 2,000	$ 2,000
3	Drying/storage bins, corrugated metal, with perforated metal floor for drying seed; 14 ft. diameter, 10 ft. eave height; drying capacity of 250 qq. maize grain at 8 ft. depth (ear corn), or 150 qq. bean seed at 2.5 ft. depth (15)	4,000	12,000
3	Heater-fan drying units for drying bins, oil burner type (10)	3,800	11,400
1	Aeration fan for storage bin	600	600
1	Maize sheller, suitable for maize seed, 150 qq./hr. capacity, with cob blower (10)	5,000	5,000
2	Belt conveyor with flights, inclined, for conveying ear corn; capacity of 200 qq. ear corn/hr. (10)	1,500	3,000
1	Belt-bucket elevator, high capacity, receiving type (10)	4,200	4,200
-	Air screen cleaner, 4 screens and 2 air systems (Crippen H-564 cleaner is on hand)		(on hand)
-	Components for repair of above air-screen cleaner to put it in first class condition	1,000	1,000
-	Holding bin for mounting above air-screen cleaner (on hand)		(on hand)
2	Precision graders, for size grading maize seed as needed	2,700	5,400
2	Belt-bucket elevator, for elevating clean seed up to holding bin above precision grader, or above treater (10)	2,000	4,000
-	Repair kits for elevators on hand	1,000	1,000
1	Seed treater, slurry type, stainless steel, with accessories (10)	900	2,900
-	Surge-holding bin for mounting above treater (on hand)		(on hand)
1	Seed weighing, packaging, sewing system (10)	4,200	4,200

ANNEX (continuation)

No.	Description	Estimated Cost US$ Unit	Total
1	Vacuum cleaner, industrial type (5)	$ 700	$ 700
1	Air compressor with slip-on hose connections, 120 psi. (10)	1,000	1,000
3	"Bagtrucks", 2 wheel (5)	100	300
4	"Bagtrucks", 4 wheel with platform, 2 ton capacity (10)	300	1,200
3	Vehicles, pick-up type	5,000	15,000
-	Local fabrication of machine stands, bin supports, essential framing from steel (angle iron, channels, etc.) (15)	2,500	2,500
-	Office furnishings and equipment	2,000	2,000
-	Miscellaneous and contingencies	5,000	5,000
			$ 84,400
	Add 20% shipping and crating[3/]		11,980
	Add 10% installation[4/]		5,990
	CNIECA Seed Unit Sub-total		$102,370

1/ See footnote under A

2/ See footnote under A

3/ See footnote under A

4/ See footnote under A

C. DEPARTMENT DE SEMILLAS INSPECTION AND CONTROL

No.	Description	Estimated Cost US$ Unit	Total
-	Sampling equipment	$ -	$ 700
-	Moisture testers	-	1,300
-	Dividing and purity analysis equipment	-	3,500
-	Germination equipment	-	9,000
-	Miscellaneous Laboratory equipment	-	2,000
3	Vehicles (incremental)	5,000	15,000
-	Office equipment	-	1,200
-	Contingencies	-	2,500
			35,200
	Shipping and Crating 20%[3/]		3,300
	Departamento de Semillas Sub-total		$ 38,500

1/ See footnote under A

2/ See footnote under A

3/ See footnote under A

II. EQUIPMENT TOTAL $279,800

ANNEX E

ANNEX E

PRICING POLICIES

A rationale pricing policy needs to be established for the seed produced in the project. At least three, possibly four prices need to be considered: (1) price charged for breeder and foundation seed; (2) price paid to contract seed producers; (3) price of clean seed to "dealers"; (4) price of seed to farmer.

A rigorous analysis of seed prices in the D.R. with recommendations for same would require several weeks and TDY assistance of an economist. Based on experience in many countries, however, guidelines for a seed pricing policy can be given and should be helpful in financial analysis of the seed component of the project.

First, there is no justification for selling seed below grain price such as is the current case for bean seed in the D.R. Indeed, there is no real justification for selling seed at grain price. Such practices only divert seed into grain channels.

Secondly, experiences in many countries (some less developed than D.R., with "smaller" farmers) have shown that farmers will purchase seed at a substantial premium over the equivalent grain price provided that the seed are of higher yielding varieties, clean, and of good germination. These same experiences have shown that farmers won't ever pay grain price for poor quality, low germinating seed of traditional, unknown, or mixed varieties. In other words, the seed have to be improved.

Thirdly, prices (to farmers) of seed of self-pollinated crops or composites such as maize, which are relatively easy to "save" on farm, must be kept below 200% of equivalent grain price. Since the farmer traditionally "saves" seed of these types of crops, he will use his own seed whenever the price goes above what he thinks is reasonable.

Fourthly, a 10-15% premium over grain price is generally necessary to interest

the type of contract seed grower desired for seed production. He must put in extra effort to produce seed rather than grain, and should be fully compensated for it.

Fifth, foundation seed should be priced at least 125% of price of commercial (or certified) seed.

Considering these guidelines, tentative suggestions for seed prices in the D.R. follow.

Rice

The grain price of rice (paddy) in the D.R. is about RD$11.35. Contract seed growers are paid a 20% premium, which is too much, or RD$13.63/qq. The seed can be as high as 20% moisture and have 6% foreign material (mostly inert material). Assuming that the average moisture content of seed on receipt is 18% and that it is dried to 13%, 5.75 lbs. of water will be loss. Further, assuming that other losses average an additional 14.25 lbs. on each 100 lbs. (qq) of raw seed, then the clean seed out-take would be 80 lbs. for each 100 lbs. of raw seed (this is quite reasonable). If the cleaned seed is sold at RD$22/qq (as in the case at present) then for each 100 lbs. raw seed, receipts would be RD$0.22 x 80 = RD$17.60. About half of the 14 lbs. cleanout will be satisfactory for sale as low quality grain and should bring in 7 lbs. x RD 0.06 = RD$0.42. Thus, total receipts per RD$13.63 invested in 100 lbs. raw seed would be $18.02. The costs of drying-processing-packaging, etc., do not exceed about RD$2.00/qq. of clean seed, or RD$1.60 for the 80 lbs. out-take from 100 lbs. raw seed. Thus, net returns per 100 lbs. raw seed would be RD$18.02 less 13.63 paid to grower less 1.60 cost of processing or RD$2.79. If only 85% of 1440mt (31,680 qq) programmed for year 3 are sold as seed with the rest as grain, then returns over variable costs from seed sales would be about RD$75,130 less about 12,000 loss on the sale of 4,752 qq. of unprocessed seed as grain or RD$63,130. This RD$63,130 would represent return to investment in professional and administrative inputs, facilities and equipment.

Over-all the pricing policy for rice seed of a 20% premium over grain price to the contract grower, and about 195% of grain price to farmers appears to be reasonable. Efficiencies introduced with new facilities and equipment should bring processing costs down to about RD$1-1.25/qq. This combined with a reduction in premium to growers from 20 to 15% (RD$13.05 rather than 13.63 per qq. of raw seed delivered) should permit a good discount to market intermediaries such as the ag. service centers.

Beans

Bean seed are presently being sold at below grain price. This is not rationale. Assuming a grain price of RD$31.00/qq. for beans and a premium to contract growers of 15%, then cost of seed produced by the contract growers (i.e., price to them) should be about RD$35.65. Bean seed ought to be delivered by growers at moisture content not greater than 16%. If dried to 12%, the moisture loss per 100 lbs. of raw seed would be 4.55 lbs. Cleaning losses will average another 10 lbs. per 100 lbs. raw seed for clean seed out-take of about 85 lbs. per 100 lbs. raw seed. If bean seed were sold at 150% grain price, the selling price would be 46.50/qq. or 39.52 per 85 lbs. of clean seed. The CNIECA production unit should be able to sell at least 7 of the 10 lbs. clean-out/100 lbs. raw seed for 75% of grain price. This would bring in another RD$1.61 for total returns per 100 lbs. raw seed handled of RD$41.13. Net returns would be 41.13 less 35.65 less about 1.70 costs of processing, or RD$3.78 per quintale of raw seed handled. Considering the professional personnel, administrative, and other miscellaneous costs, there will not be much return on investment. Bean seed supply, however, is known to be a poor commercial venture. Therefore, benefits in terms of increased quantity and quality of production from planting the seed have to be considered to justify the activity. Pricing bean seed to farmers higher than 150% grain price is not a good means of increasing the internal rate of return. Considering the high seeding rate and low yields of beans in the developing countries, a farmer

cannot be expected to pay more than 150% of grain price for bean seed.

Maize

Presently, maize seed are being sold at a price that does not even cover costs of processing. Assuming a grain price of RD$7.00/qq., seed growers should receive RD$8.05 for seed produced. With a drying loss of about 5 lbs. per 100 lbs. raw seed handled and another 15 lbs. of clean-out, then the clean seed out-take from 100 lbs. seed delivered by grower would be 80 lbs. At a price of 200% grain price, which is reasonable for maize because of low planting rate, the 80 lbs. of seed would bring in RD$11.20/100 lbs. raw seed.

At least 10 lbs. of the 15 lb. clean-out/100 lbs. raw seed could be sold as low quality grain (80% grain price), which would bring in another RD$0.56 for total of RD$11.76 return/100 lbs. raw seed. Processing costs would be about RD$2/qq. clean seed or RD$1.60/80 lbs. clean seed. Net returns, therefore would be 11.76 less 8.05 to grower, less 1.60 for processing or 2.11/100 lbs. raw seed handled. This is a reasonable price structure for maize seed (non-hybrid).

Foundation seed

Foundation seed should be sold to seed growers at about 125% of commercial or certified seed price. Under assumptions above and suggested price structures, the price of foundation seed would be as follows:

Rice----------27.50/qq.

Beans----------58.12/qq.

Maize----------17.50/qq.

ANNEX F

ANNEX F

Recommended Training Schedule

Time	Type		No. ersons	Duration
June, 1976	Special Seed Training Cours	Mississip State Uni	2	10 wks.
Sept, 1976 or Jan, 1977	Acdemic Traini in Seed Techno	MSU	2	2 yrs.
Feb-March, 1977	Short Course o Seed Inspectio Testing and Co trol.	CNIECA*	10-12	3 wks
	*Need two instr ictors and interpreter; MSU can provide instru:tors.			
June, 1977	Special Seed T ain- ing course	MSU	2	10 wks
Nov., 1977	Short course Seed Drying & Processing		10-12	3 wks
	*Need two instructors and interpreter; MSU can provide instructors. This course needs to be timed for period after facilities developed and equipment installed.			

ANNEX G

ANNEX G

Technical Assistance Recommendations and Suggested Schedule

1. Technical assistance to help in drafting of regulations to seed law. Should be timed for period when IICA consultant on seed laws is on board. Mississippi State University can provide consultant under Contract AID/ta-C-1219 (with TAB/AGR/AID). If IICA consultant does show up by June, suggest consultation be timed for July, 1976 (2 weeks).

2. Technical assistance to help in design of renovations of facilities and additions; to help in developing equipment specifications suitable for use as tenders - suggest July, 1976. Need 2 weeks in DR and 2 weeks at home station. MSU can provide consultant under AID/ta-C-1219.

3. Technical assistance to help with conducting of two on-the-job training courses in DR. (See Annex F on training). Need two instructors for 3 week training course on seed inspection, testing and control in period Feb-March, 1977. Instructors would need to be on-board one week in advance of course, or total of 4 weeks in DR. Two instructors will be needed for 3-week on-the-job training on seed drying, processing, storage, after facilities proposed are developed. This should be around Nov., 1977 - Feb., 1978. MSU can supply instructors.

4. Additional technical assistance will probably be needed at time equipment is installed in new facilities (2 weeks), and probably later as operational problems surface.

ANNEX H

ANNEX H

FINANCIAL REQUIREMENTS

A major financial requirement will be working capital to finance contract seed production. Contract growers should be paid just as soon after delivery as it can be determined that the seed delivered meet contract specifications. They should be paid by voucher which can be cashed at any branch office of the bank in which the working capital is deposited. This deposit should be in the nature of a revolving fund solely for purchase of seed from contract growers. After the seed are sold, the revenue should be deposited back into the revolving fund. Any surplus over needs for the next season can be used to finance expansion of program, repairs, personnel costs, costs of producing foundation seed, processing costs, etc.

Based on a 15% premium over grain price to seed growers and the proposed production schedule in Table 4, Annex A, working capital requirements would be as follows:

TABLE 6. Working Capital (revolving fund) Requirements

Seed Kind	Estimated Requirement US$[1/]			
	Year 1	Year 2	Year 3	Total
Rice (Juma) (15% premium over grain price or RD$13.05/qq. seed delivered)	172,500	344,500	516,800	516,800
Beans (CNIECA) (15% premium over grain price or RD$35.65/qq. of seed delivered)	262,000	523,900	785,900	785,900
Maize (CNIECA) (15% premium over grain price or RD$8.05/qq. of seed delivered)	11,400	22,700	34,200	34,200
	445,900	891,100	1,336,900	1,336,900

TABLE 6. (continued)

Seed Kind	Estimated Requirement US$ 1/			
	Year 1	Year 2	Year 3	Total
Input by year	145,900	445,200	445,800	1,336,900

1/ Since this is a revolving fund the yearly needs are incremental and not additive, i.e., for rice the additional working capital needed for Year 2 will be 344,500 - 172,500, assuming that the 172,500 used in Year 1 is re-deposited in the revolving fund.

The total financial requirements for the project are estimated in Table 7 (based on details in Annexes B,C,D,F,G and H).

TABLE 7. Estimated Total Financial Requirements For Project

Item	Estimated Cost US$ Year 1	Year 2	Year 3	Total
I. Personnel Costs				
A. Juma Station	25,800	32,400	32,400	90,600
B. CNIECA Seed Production	25,800	32,400	32,400	90,600
C. Departamento de Semillas	41,800	46,600	58,000	146,400
D. CENDA (Yuca & Plantain)	41,280	41,280	41,280	123,840
Personnel Sub-totals	134,680	152,680	164,080	451,440
II. Investment Costs				
A. Juma Station				
1. Facilities	98,688	-----	-----	98,688
2. Equipment	138,930	-----	-----	138,930
B. CNIECA Seed Production				
1. Facilities	46,288	-----	-----	46,288
2. Equipment	102,370	-----	-----	102,370
C. Departamento de Semillas				
1. Facilities	25,000	-----	-----	25,000
2. Equipment	38,500	-----	-----	38,500
D. CENDA (Yuca & Plantain)				
1. Facilities & Equipment	136,500	7,500	-----	144,000
Investment Sub-totals	586,276	7,500	-----	593,776
III. Operational Costs (excluding working capital)				
A. Juma Station	30,571	56,254	77,774	164,599
B. CNIECA Seed Production	29,182	55,212	79,484	163,878
C. Departamento de Semillas	5,300	9,200	12,100	26,600
D. CENDA	24,450	40,950	40,950	106,350
Operational Sub-totals	89,503	161,616	210,308	461,427
IV. Working Capital Requirements[1/]				
A. Juma Station	172,500	172,000	172,300	516,800
B. CNIECA Seed Production	273,400	273,200	273,500	820,100
Working Capital Sub-totals	445,900	445,200	445,800	1,336,900

TABLE 7. (continued)

Item	Estimated Costs US$ Year 1	Year 2	Year 3	Total
V. Training				
A. Short term (U.S.4 persons)	4,000[2/]	4,000	-----	8,000
B. In-Country (D.R.), on-the-job[3/]	7,000	-----	-----	7,000
C. Academic (US) (2 persons for 2 years)	16,000	16,000	-----	32,000
Training Sub-totals	27,000	20,000	-----	47,000
VI. Technical Assistance				
No cost to mission if services available and the Mississippi State University AID/ta-C-1219 contract services are used.				
GRAND TOTAL	1,283,359	786,996	820,188	2,890,543

1/ Represents input by year to increase revolving fund up to total needed by Year 3.

2/ Assumes services under MSU/AID contract will be used. Costs represent supplies, training materials, and interpreting services.

ANNEX I

ANNEX I

ESTIMATED REVENUE FROM SALES OF BEAN, RICE AND MAIZE SEED AND BY-PRODUCTS OF SAME[1/]

Item		Estimated Revenue US$			
		Year 1	Year 2	Year 3	Total
I.	Rice				
A.	85% rice seed sold as seed at RD$484/mt (22/qq)	197,472	394,944	592,416	1,184,832
B.	15% seed not sold as seed, but marketed unprocessed as grain at RD$250/mt (grain price)	20,700	41,400	62,100	124,200
C.	Marketable screenings at about 50% grain price or RD$132/mt	4,712	9,424	14,137	28,273
II.	Beans				
A.	85% bean seed sold as seed at RD$1,023/ mt, or RD$46.50/qq.	232,169	464,339	697,379	1,393,887
B.	15% seed not sold as seed, but marketed as edible beans (un-processed) at RD$600/mt.	26,000	52,014	78,114	156,128
C.	Marketable screenings at RD$500/mt	9,345	18,690	28,070	56,105
III.	Maize				
A.	85% seed sold as seed at RD$308/mt.	11,781	23,562	35,343	70,686
B.	15% seed sold unpro-cessed as grain at RD$290/mt	2,569	5,141	7,714	15,424

ANNEX I (continued)

Item	Estimated Revenue US$ Year 1	Year 2	Year 3	Total
C. Marketable screenings at RD$200/mt.	1,092	2,184	3,278	6,554
Total Revenues from Seed Operations	505,840	1,011,698	1,518,551	3,036,089
Revenues from sale of plant materials (from Annex C)	57,000	94,500	94,500	246,000
GRAND TOTAL				3,282,089

Estimated Benefits of Project in Terms of Increased Production

Rice - (3 years)

- 2,448 mt. seed marketed.
- 34,000 ha. planted with improved seed.
- 17,680 mt. increased production based on 20% increase in yield over national average of 2.6 mt/ha.

Beans - (3 years)

- 1,362 mt. seed marketed.
- 18,924 ha. planted with improved seed.
- 3,217 mt. increased production based on 20% increase in yield over national average of 0.82 mt/ha.

Maize - (3 years)

- 229 mt. seed marketed.
- 12,722 ha. planted with improved seed.
- 4,580 mt. increased production based on 20% increase in yield. over national average of 1.8 mt/ha.

Plantain - (3 years)

- 3.00 million seed pieces produced.
- 1,875 ha. planted with improved seed.
- 4,312 mt. increased production based on 50% increase in yield over national average of 4.6 mt/ha.

Yuca - (3 years)

Cuttings for 650 ha. produced annually.

3,575 mt. increased production based on 50% increase in yield over national average of 11.0 mt/ha.

The benefits listed are straight line, considering seed as a consumed input. Seed, however, are multiplied rather than consumed in the production process, or as plant propagating materials. Since the genetic potential is set, saving seed of an improved variety and planting same will yield benefits the following and succeeding years (or until the variety becomes badly mixed). In the project, it is proposed that farmers be educated to buy new seed of rice and maize every other year, and every third year for beans.

Benefits from marketing of improved seed are also derived from a diffusing effect. A farmer buys improved seed and his crop yields better than his neighbors. He saves seed for planting next year and barters or sells some seed to his neighbors. The following year they also benefit from inherent high yield potential of the variety. Although the diffusitivity factor in seed supply is difficult to quantify, it has been operative for about 10,000 years, or the time when crop husbandry began.