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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

THAILAND - SEED DEVELOPMENT LOAN

AID-DLC/P-2115

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DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

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June 19, 1975

MEMORANDUM TO THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: Thailand - Seed Development Loan

Attached for your review are the recommendations for authorization of a loan to the Government of Thailand in an amount not to exceed $3,700,000 (three million seven hundred thousand U. S. dollars) to finance the foreign exchange and certain local currency costs of goods and services necessary to assist the Borrower in developing facilities and programs to cause the use of improved seeds on Thai farms.

No meeting is scheduled for this proposal. However, please advise us of your concurrence or objection as early as possible, but in no event later than close of business on Wednesday, June 25, 1975. If you are a voting member a poll sheet has been enclosed for your response.

Development Loan Committee
Office of Development
Program Review

Attachments:
Summary and Recommendations
Project Analysis
Annex A-H

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PART I. Summary and Recommendation

A. Face Sheet Data

Agency for International Development
Project Paper

Transaction Code
Add ☐ Delete ☐ Change ☐

1. Country
Thailand

2. Document #3 PP
Status New [x] Revision# ___

3. Project Number
493-21-130-270

4. Bureau Code
EA 2

5. Short Project Title
Thailand Seed Development Project

6. Estimated Initial/Final Obl.
FY 75 FY 80

7. Est. Date of Initial Obl.
June '75

8. Est. FY of project completion: FY 81

9. Estimated Total Cost ($000)

	First Year FY 75/76			All Years		
	FX	L/C	Total	FX	L/C	Total
AID Approp. Total	739.2	179.6	918.8	1920.2	2025.0	3945.2
Grant	(90.2)	-	(90.2)	(320)	-	(320)
Loan	(649.0)	(179.6)	(828.6)	(1600.2)	(2025.0)	(3625.2)
Other US	-	-	-	-	-	-
Total US	739.2	179.6	918.8	1920.2	2025.0	3945.2
Host Govt.	95.9	1124.1	1220.0	265.7	3715.6	3981.3
Other Donors	-	-	-	-	-	-
TOTAL	835.1	1303.7	2138.8	2185.9	5740.6	7926.5

10. AID Appropriated Funds ($000)

Funding Source	Tech Code	FY 75/76		FY 77		FY 78		Fut. Yrs.	
		Grant	Loan	Grant	Loan	Grant	Loan	Grant	Loan
FAA		90.2	3625.2	93.4		29.2		107.2	
TOTAL		90.2	3625.2	93.4		29.2		107.2	
11. Estimated Expenditures		75.0	120.0	85.0	650.0	30.0	750.0	130.0	2105.2

12. Project Purpose(s)

To cause the use of improved seed on Thai farms.

The expected result will be an increase in productivity and income of Thai farmers.

13. Were changes made in PID Facesheet data not included above: Yes ☐ No ☐ NA

14. Originating Office Clearance
Signature [signature]
Title & Date Acting Director 6/1/75

15. Date received in AID/W, or for AID/W documents, date of distribution: ___

Summary Cost Estimate and Financial Plan
($000)

Use	Source				Total
	AID		Host Country		
	FX	LC	FX	LC	
Fixed Assets					
Buildings & Facilities	-	-	-	918.4	918.4
Equipment	431.9	-	52.8	60.1	544.8
Vehicles	-	-	137.0	127.8	264.8
Working Capital Fund	-	1,500.0	-	748.9	2,248.9
Other					
Extension Services	-	-	-	270.2	270.2
Technical Assistance	454.5	-	-	85.5	540.0
Inoculant Program	216.0	-	7.0	441.2	664.2
Training	* 245.0	-	-	75.2	320.2
Evaluation	* 75.0	-	-	25.0	100.0
Sub-Total	1,422.4	1,500.0	196.8	2,752.3	5,871.5
25% Inflation Factor	355.6	375.0	49.2	688.1	1,467.9
10% Contingency	142.2	150.0	19.7	275.2	587.1
Grand Total	1,920.2	2,025.0	265.7	3,715.6	7,926.5

* Grant Funds

B. Recommendations

It is recommended that funds be approved for the Thailand Seed Development Project as follows:

Grant	$ 320,000
Loan*	$3,625,200
Total new AID obligation	$3,945,200

*Terms of the loan will be 40 years, 10 year grace period with interest 2% during the grace period and 3% thereafter.

C. Description of the Project

The purpose of this $7.9 million project is to cause the use of improved seed on Thai farms with the expected result being an increase in the productivity and income of Thai farmers. The United States will provide, through a loan, foreign exchange costs and local currency requirements up to 50% of the total project cost. The Royal Thai Government will provide the other 50% of the project costs.

Three agencies of the Royal Thai Government will be directly involved in the project; the Department of Agriculture (DA), the Department of Agricultural Extension (DOAE), and the Marketing Organization for Farmers. During the project some of the activities initially carried out by the DOAE will be turned over to the Marketing Organization for Farmers (MOF). Part IV A, Administrative Arrangements, explains the phasing of project responsibilities in detail. A Thai Project Manager and Seed Project Implementation Committee will organize and coordinate the various project activities that will be carried out by the DA, DOAE, and MOF.

The project will focus on soybeans, corn, rice, mungbean, peanuts, and sorghum. During the last year of the project 8,650 tons of high quality improved seed will be produced and distributed. The distinct project activities that will lead to improved seed availability are production of foundation seed from selected improved crop varieties, multiplication of this improved seed by contract seed growers, processing of multiplied seed, distribution of processed seed to farmers, and a program to supply farmers with legume inoculant.

1. Foundation Seed Program

The research base for the Project crops is well developed and improving rapidly. Improved seed varieties developed, through this research, will be selected for release for commercial production. The project will enhance the Department of Agriculture's capability to take these small amounts of breeders seed and multiply it under controlled conditions, usually on a research station, dry and process it, and turn it over initially to the Department of Agricultural Extension (DOAE) and as the project evolves to the Marketing Organization for Farmers. Through the project, personnel and facilities will be expanded to produce adequate foundation seed to meet project needs.

2. Seed Multiplication Program

Foundation seed, still in relatively small quantities, will be provided initially by the DOAE and later by the Marketing Organization for Farmers (MOF) to contract seed growers for multiplication. These agencies will select farmers, give them training in seed production, and contract with them to produce seed at a premium over regular grain prices. The seed will be collected by the DOAE/MOF and transported to one of its seed processing plants. The project will provide funds for hiring and training personnel to supervise contract growers and vehicles for personnel and transport of seed.

3. Seed Processing

After the seed has been multiplied by the contract growers into quantities large enough for commercial distribution it must be tested, dried, cleaned, treated, bagged, stored, and re-tested; it is then ready for sale to farmers for commercial production. At the end of the six year project, four seed processing plants will have been constructed and be in operation. One plant presently in operation will be expanded and three additional plants will be constructed and equipped. The project will include construction of processing and storage facilities, provision of equipment and its installation, training of personnel, and provision for working capital necessary for purchasing seed from contract growers.

4. Seed Distribution

Processed high quality seed of known germination, purity and free of weed seed and other foreign material will be distributed to farmers through the Marketing Organization for Farmers. The Marketing Organization will sell seed to individual farmers, farmers associations, cooperatives, and other RTG agencies. The distribution program will be coupled with an extensive farmer education and seed appreciation program carried out by the DOAE. Special emphasis will be given to providing seeds to small poor farmers. One of the methods used to reach the poorest farmer will be distribution through RTG agencies that deal almost exclusively with the rural poor; i.e. Public Welfare Department, Accelerated Rural Development Office, Communit Development Department, etc. The other method is to insure that smaller farmers in the target areas can and do participate in the Project. The project will provide for farmer and extension agent training in the use of project seeds--including extensive demonstration

programs that also involve the use of associated inputs with seed.

5. Inoculum Availability

Leguminous crops, particularly soybeans, require rhizobium inoculation to bring about root nodulation or a nitrogen fixation capability. Inoculation of legume seeds before planting is desirable and usually has significant effects on the crop yield, particularly in areas where leguminous crops have not been previously grown. The Project will provide for sufficient inoculant available in Thailand to meet the needs of leguminous seeds produced under the Project.

* * * * *

The RTG and USOM are confident that a well designed foundation seed production program linked with a program of seed multiplication through contract growers and an efficient seed processing program following stringent quality control standards will make available large quantities of improved seed. This improved seed will be distributed to farmers associations, cooperatives, and individual farmers. An effective education and seed promotion program coupled with extensive training of the RTG officials involved as well as farmer users will assure the use of this improved seed on Thai farms.

To assist the RTG with implementation of the various project activities seven man years of technical assistance is planned, four man years for a Senior Seed Specialist with marketing experience, and two man years for a Processing and Production Specialist. In addition, twelve man months of short term assistance is planned in various fields; i.e. seed plant engineering, seed regulations and certification, seed marketing, and seed quality control.

Extensive training of Thai personnel both in country and abroad is also planned. Twenty-six in-country short courses as well as eighteen study tours outside Thailand are planned for RTG personnel. In-country management training will also be provided to assist the MOF in establishing and maintaining a modern accounting system. Six M.S. programs in required disciplines are also planned. Over 25,000 farmer users will receive a 1-2 day training program on improved seed and its accompanying technology. Finally over 2,000 contract farmer seed growers will receive seed production training.

At the end of the project the following national requirements[1] for improved seed will be met: soybeans 31%, corn 6%, rice 2%, peanuts 6%, mungbeans 5%, and sorghum 7%. Over 75% of the farmers in the target areas selected, including poor farmers, will be using seed of improved varieties provided as a result of the Project. At least 10% of the Project seed will be made available to RTG agencies with programs designed to improve the welfare of the very poor. (Refer to discussion of beneficiaries on pages 11-12).

1/Mississippi State University experience in seed technology indicates that the average farmer will purchase new non-hybrid seed every four to five years or the annual national demand for seed will in general be 20-25% of the total national requirement. The demand for seed with poor keeping quality, soybeans for example, will be substantially higher, particularly in tropical climates.

D. Summary Findings

1. All analyses are complete and the results indicate the Project is well planned and will be ready for implementation when the covenants discussed in Part IV D are satisfied. Discussions on these covenants are well advanced and it is expected they will be satisfied within three months.

a. Technical Analysis

The Project is basically designed to establish a mechanism for extracting benefits from substantial investments of resources in crop improvement research through the systematic multiplication and distribution of seed of improved varieties. The crop improvement research programs--requisite for a viable seed program/industry--are excellent in the case of rice and corn/sorghum, and adequate for soybeans, peanut, and mungbean. A substantial pool of improved varieties is available for multiplication and distribution, and even more improved varieties are in advanced testing stages.

The technology adopted for accomplishment of the project objective is essentially standard with, of course, appropriate modifications to fit cropping and climatic patterns in the country. The three regional seed centers to be established and organizationally linked to the one already operational center at Phitsanulok will be very similar. Thus, the replicability of the technology is of a high order. The technology adopted is also relatively unsophisticated, and easily within the capability of Thai specialists and workers with a modest amount of technical assistance and suitable specialized and in-service training, all of which have been provided for. The phasing of the project by location and within location by crop and target, was purposel adopted to facilitate technical assistance, in-service training and learning experiences.

The crops selected for inclusion in the Project are the most important seed propagated crops from the standpoints of both internal consumption and export. The targets are adequate and achievable. The distribution and marketing function is assigned to a recently established organization (Marketing Organization for Farmers) which also has responsibility for supply of other inputs and the selective purchase of grains to help in stabilization of grain prices. Since the

quantities of seed for distribution are relatively small in comparison to other commodities and supplies handled by the Marketing Organization for Farmers, distribution and marketing should not impede progress of the Project. The working capital of the Project will serve in the form of accounts receivable as another source of production cycle credit to farmers associations, cooperatives and individuals for the purchase of seed.

The Project was analyzed on the basis of existing use levels of other inputs. Thus, the expected benefits are not dependent on an increase in the use of other inputs. They will, however, be increased, to a moderate degree by any increase in the use of other inputs.

The overall costing of the Project is realistic and adequate, but modest in comparison to the benefits expected. (See Part III. A. for details).

b. Social Analysis

The social analysis concludes that Thai society and culture present no obstacles to the use of improved Project seeds nor to the overall success of the Project. The Project design provides for preferential attention to the poor majority. The quantitative analysis indicates a high social rate of return and positive social benefits of a large magnitude, and shows substantial direct and indirect benefits to Thai female farm workers.

c. Economic and Financial Analysis

In terms of direct benefits as measured by the added net income to Thai farmers who will be the seed users, the total seed project is very attractive. The direct rate of return (DRR) to total capital investment in the project is 136.7 percent per year. Starting with the third 6-month period used in the cash flow analysis, direct benefits exceed the sum of all capital outlays plus direct and associated operating costs by substantial margins. At an annual discount rate of 15 percent, the net present value of the total project over the 15-year planning period is $25,447,000 (see Table E-15).

The primary impact of the project on the economy of Thailand comes through the direct benefits to farmers. Associated or social benefits through direct linkages in the economy, through employment benefits, etc. are partially offset by associated costs to insure that these benefits can be realized. At the annual discount rate of 15 percent, the net present value of the project in terms of total benefits is $33,000,000 -- greater than the corresponding figure for direct benefits by 30 percent. The curve relating the NPV to the discount rate for total benefits is steeper than the one for the direct benefits, so at the very high rates, the social rate of return (SRR) is 111.5 percent, or 35 points under the DRR.

In a strict commercial sense as measured by the internal rate of return, the project is not sufficiently viable to attract private investment. At prices for quality seeds which can be charged to compete with ordinary seeds, the internal rate of return for the total project is only 6.375 percent per year. Operating expenses exceed operating incomes for the first three 6-month periods. On an annual basis starting with period 1, operating revenues do not exceed operating costs until the 6th year (see Table E-110). Operating losses for these periods as well as the capital costs must be financed by sources outside the cash flow generated by project. By the end of 6-month period 10 in Table E-110, the cumulative total requirements for facilities and working capital are $3,200,000 and the operating losses have cumulated to $590,000, making a total financial requirement of $3,790,000. Starting period 10 the project will be able to cover total operating costs from operating revenue and contribute a modest return (roughly 6 percent per year) to total capital investme

As typical of operating agribusiness projects, the total working capital requirements to finance current assets loom large relative to the capital requirements to finance land, buildings and equipment. At the end of 6-month period 10 in Table E-110, the cumulative total facility requirements are $1.95 million compared to the cumulative total working capital requirements of $1.7 million. Thus, working capital requirements represent 46.6 percent of the total project assets to be financed by period 10.

d. Statutory Criteria

The project meets all applicable statutory criteria. See Statutory Checklist, Annex F.

E. Project Issues

The following is a summary of issues raised and resolved/ pending in the design and preparation of the Project. Reference to specific sections of the PP are provided when appropriate.

1. Beneficiaries

In response to the Congressional Mandate and to the interest of the RTG in the welfare of its poorer farmers, a number of features have been designed into the Project to impact on the poorest majority.

a. More than half of the Project seed output is scheduled for use in the Northeast and the North, the lowest income regions of Thailand.

b. Preferential consideration is given to poor farmers by allocating a portion of Project seed output to RTG agencies dealing directly with small poor farmers. The Project will be capable of supplying the bulk of these agencies requirements by the end of the Project (See Part III C for description of agency programs).

c. Project seed distribution will be primarily through Farmers Associations and Cooperatives. These local organizations include a high proportion of small, low income farmers but they probably have somewhat higher average size and income than the average for the region in which they are located. An extensive education, demonstration, and publicity program (See Part II B) is incorporated in the Project to acquaint farmers with the benefits of using improved seeds. A special effort will be made to extend this whole package of information to the farthest reaches of the hinterland where poor farmers are the rule. Special efforts will also be made to broaden the participation base in the Farmers Associations to include a larger number of the communities small farmers.

d. Traditional practice in Thailand, particularly by smaller/poorer farmers, is the exchange of grain for "seeds" with his neighbors (See PRP, page 5). The widespread and continuous introduction of improved seeds through the use of a large number of Farmers Associations, Cooperatives, and RTG "poor farmer" agencies will provide access by a much higher proportion of Thai farmers on first and second round exchange than would be possible if seed

distribution were concentrated in smaller, highly selected areas. The education/demonstration/publicity program will make all farmers aware of the availability and value of the improved seeds.

e. The Marketing Organization for Farmers plans to make credit preferentially available to small farmers by supplying seed through the RTG agencies working with poor, small farmers on a no interest production cycle credit basis. The Project working capital account will be used to fund this effort.

2. Economic Return

In the economic analysis presented in detail in Part III B, the direct rate of return to farmers is based on the differences in yields of currently used varieties compared to those varieties to be incorporated into the Project initially (See Part III B and accompanying annexes) and allowing for additional improvement in crop yields (due to varietal change) during the life of the Project.

3. Crop Research

The Thai agronomic research establishment is judged fully adequate to provide yield/income increasing varieties of the crops included in the project (See Annex B-1). No Project inputs will go into agricultural research, per se. (See Part III A, Technical Analysis). However, strong participatory links between the proven research results and seed multiplication/distribution are an integral part of the whole Project and are described in detail in the PP in Parts II, III, and IV.

4. Related Agricultural Inputs

The effect of other input requirements on the yield of crop varieties to be distributed under the Project are analyzed in Part III B. However, the economic, financial, and technical soundness of the Project do not depend on the expanded use of related inputs, but only on increased yields due to varietal improvement. Emphasis of the current varietal development programs is upon yield stabilization; i.e. disease, insect and drought tolerance, and improved nutritional and processing quality; i.e. higher percent protein, high lysine corn and sorghum and improved palatability, rather than increasing yield per se. Recent worldwide escalation in the price of fertilizers and pesticides, all of which are imported, directed this change in emphasis.

The education/demonstration program included in the Project will make farmers aware of the additional benefits to be gained from the use of related inputs. Only in the case of small farmers will a deliberate effort be made as a part of the Project to make fertilizer, pesticides, and other inputs available. This will be handled as a part of the overall input supply program of the MOF. (See Part II-B and Part III-A).

5. Enforcement of the Seeds Act

The Project is independent of the Seed Act. Government agencies are excluded from its provisions. The Seed Act will not become fully operational for several years and will initially concentrate on imported seeds. The Project will assist, however, through provision of training and technical assistance to the DA staff responsible for implementing the Act. This situation is discussed in detail in Annex II-B-21.

6. Multiple Crop Effort

Crops to be included in the Project were selected by the RTG. These crops fit the RTG Third Five Year Plan objectives which focus on oil seeds, and corn and sorghum. Rice, of course, is the basic food supply and the premier export. However, rice is not emphasized more in the Project because the RTG has not opted to go for a major expansion of rice for export (See DAP page 32). In addition, the proportion (2%) of national rice seed needs supplied by the Project is low because the biological nature of the rice plants and farmers traditional practices of exchange make large amounts unnecessary. Thus, this combination of crops fits both Thai objectives and those of the world community in seeing more food grain available in world markets.

RTG capacity to handle this multiple crop Project is judged to be adequate. A major factor in arriving at this judgment is that the Thais will have an opportunity to "grow into" the Project over its six-year life. Only two crops are started during the first year with the other four added the second year. (See Part III-A and Annex B-4).

7. Private Sector Involvement

The RTG has made a deliberate policy choice not to include private merchants as distributors of Project seed. They point to

limited availability of seed supplies and a preference for not allowing the private sector to profit on public investment to the economic disadvantage of small farmers. This general position toward the private sector is consistently and strongly held by the MOAC, and most other RTG agencies.

The rationale for not turning the plants over to the private sector is that with an IRR of around 6 per cent it would not be as profitable an investment as other alternatives. This assumes, of course, RTG preferencial pricing of the seed to farmers. If the plants were sold to the private sector, and with their own pricing policies, the plants could be very profitable.

8. Bureaucratic Constraints

The Project implementation structure on the Thai side is described in Part IV A. This structure has been successfully used in other projects, such as the Irrigated Agriculture Projects under IBRD funding. It includes a bureaucratic coordination mechanism that will result in adequate coordination of the three principal agencies involved--DA, DOAE, and MOF. In addition, this Project is receiving high priority attention from other key RTG agencies involved--the NESDB, DTEC, and BOB.

9. Associated Grant-Financing

The RTG/USOM Project Design Team has reassessed the overseas training requirement and modified it somewhat from the PRP proposal. The training program now proposed (Annex B-21) is considered the minimum necessary for successful Project operations as described in this PP. Lower levels of trained manpower would reduce overall efficiency, increase costs, and delay the maturation of the Project.

The RTG strongly prefers, obviously, grant financing of the training element. If not grant financed by the USG, their first course of action would be to attempt to obtain grant financing from other donors. Were this financing not available they probably would accept a lower performance in the overall Project, with some, but less training. However, the RTG has indicated that they consider the training element critical to project success.

The RTG has agreed to fund the local currency costs of the evaluation program. USOM considers it inappropriate to finance dollar costs of evaluation from loan funds. The critical importance of the evaluation process to successful project implementation and the joint RTG/USG nature of these evaluations call for grant funding by the USG necessitates the USG providing from its own resources the necessary funds to carry its end of the joint evaluation program.

10. Local Cost Financing

Approximately $1,500,000 of loan funds will be used to finance local currency contributions to a Project working capital account. Direct dollar purchase of Thai baht will be used to generate this local currency. The justification for direct purchase and the method of disbursement are explained on page 96.

11. Vehicle Procurement

There is a long-standing USOM policy against importing left hand drive vehicles because of the safety hazard involved. Only left-hand drive vehicles are available from the US. The RTG has accepted the AID/W suggestion that they provide financing for vehicles required for this project.

USOM is proposing to the RTG to finance the revolving fund for purchasing multiplied seed and financing credit to seed purchasers through the MOF.

12. Environmental Impact

USOM has prepared an analysis, presented in detail in Annex C, which concludes that there are no detrimental environmental impacts of the Project.

13. Analyses for PP Preparation

All analyses proposed on page 17 of PRP were completed and the results incorporated in the PP.

14. Disbursement Period

The disbursement period will be five years. A project life of six years was determined to be necessary by the RTG in order to have sufficient time for the MOF to evolve the necessary capability to assume its assigned functions.

PD 57 sets a maximum disbursement period of 36 months for AID financed projects. AIDTO Circular A-241, "Revised Project Development, Review and Approval System" indicates that this maximum period will be extended to 5 years. Section 4.05 of the loan agreement for this project and the implementation plan (see Part IV) follows the guidance of AIDTO Circular A-241 in establishing a 5 year implementation period for AID's commitments to this project.

To achieve the purpose of this project, and thus the sector goal, six essential operations must be performed: foundation seed production, seed multiplication, seed processing, seed marketing and distribution, seed education and training. The RTG has made the decision that the Marketing Organization for Farmers, a new government organization, will be ultimately responsible for all elements of the project except the education and training. The RTG time schedule, with which we concur, for the Marketing Organization for Farmers to take over all these responsibilities requires a full six years. This means developing the capabilities of the Department of Agricultural Extension and the Marketing Organization for Farmers concurrently and then insuring the transfer of responsibilities to the Marketing Organization for Farmers as its capabilities are demonstrated. Although the RTG views this as a seven year project USOM's disbursements will be completed by year five.

Five years is the minimum period to build up the institutional capabilities required to insure a successful project. Three years is totally inadequate, given the strategy the Government has adopted for increasing agricultural productivity and farmer incomes through the planned introduction of high yielding improved seed.

PART II Project Background and Detailed Description

A. Background

Thailand is basically an agricultural country and has a long history of agricultural exports--particularly food-grains. A continuing population growth rate of near 3 percent, coupled with heavy inroads on available new land for crop production have caused RTG policy makers to focus on increasing per unit--labor and land--productivity. The policy, strategy and factual background are elaborated in the Development Assistance Paper for Thailand, particularly Annex B, Agricultural Sector Assessment.

RTG Third Five Year Plan goals of increased foreign exchange earnings, higher farm incomes, and more equitable distribution of the benefits of development are to be accomplished, in part, through higher agricultural production. RTG planning has been focussed on selected commodities--particularly oil seed crops and maize; and more recently a recognition of Thailand's comparative advantage in rice production. Fourth Five Year Plan targets also recognize Thailand's potential for contributions to filling the world food gap. The current government has stated as its major policy goals reducing the rural urban income disparity and increasing agricultural productivity.

The concentration on increasing unit productivity in Thai agriculture has brought about a number of action programs and facilitating legislation which are amplified in the DAP. There has been particular emphasis on increasing and improving farm inputs--particularly the development and distribution of improved seed. This is recognized by the RTG as one of the quickest and cheapest ways of obtaining increased agricultural output.

1. Seed Project Development

In 1972 the RTG initiated the Seed Multiplication and Improvement Project under the leadership of the Department of Agricultural Extension, to provide high quality seed to farmers. The initial project emphasis was on soybean seed. Under this activity a modern Seed Center, including a seed processing plant, laboratory, and training facilities were established in North Central Thailand at Phitsanulok. The Phitsanulok Seed Center is now operational and will be incorporated as a part of the Seed Development

Project. This facility and the experience gained by the RTG in its development will be major assets in the design, planning, and operational implementation of the Project.

There is a long but varied (by commodity) history in both the quantity and quality of research on new varieties of various crops. However, available varieties at the foundation stage for the crops to be included in the Project are considered sufficiently better than those presently in use by farmers. Therefore a seed multiplication/distribution project can be successfully implemented to the benefit of the farmers using these varieties. There is also a more than reasonable expectation that additional new improved varieties will continue to be forthcoming from the Thai research network. The Rice Division and the Crop Division of the Department of Agriculture are well staffed with qualified personnel; five personnel have Ph. D's, 23 are MS degree holders, and 103 have Bachelor degrees. They work on 34 research stations located throughout Thailand. The IBRD, and other donors, provide five technical research advisors on a full time basis. (See Annex B-1. Crop Research in Support of the Seeds Project. Additional details are contained in a series of reports prepared under FAO auspices analyzing the research status of individual commodities.)

2. AID Experience

USOM/Thailand has assisted the DOAE in various projects over the last 25 years. Most of the assistance in the field of seed technology has been concentrated since 1970, including that for the Seed Multiplication and Improvement Project, the predecessor of this Project. USOM assistance in the field has been in training, technical assistance, and commodities.

Seventeen advanced academic degrees (seven before 1970) and 20 On-the-Job training experiences (13 before 1970) in seed technology have been funded by USOM. (See Annex B-2. Participants Trained in Seed Technology). This trained manpower pool has been and is being utilized in the design and development of the Project. To the extent feasible this pool will also be utilized in Project implementation.

In 1973 USOM provided two seed specialists from Mississippi State University for approximately one month to assist in setting up the Seed Multiplication and Distribution Project (See Report to USAID

Thailand and AID/W, TA-73-1 D "Seed Program/Industry Development in Thailand"). In 1974 two Mississippi State specialists returned for about one month, to supervise equipment installation at the Phitsanulok Seed Center, and to provide general project assistance (See Report to USOM/Thailand and AID/W TA-74-16 "Seed Center Facilities in Phitsanulok, Thailand"). Selected seed processing equipment was furnished by USOM through Technical Assistance grants.

The AID memory bank indicated that no loan has been executed to assist host countries in development of a seed program. However, AID assistance in seed technology has been provided to several LDCs through a centrally funded contract with Mississippi State University.

Technical services have been provided to 33 countries in one, several, or all of the following: (1) seed multiplication, processing, drying, storage, certification, distribution; (2) planning, designing and constructing facilities; (3) establishing and operating seed testing program; and (4) training of LDCs' staff in seed technology. Most requests for services at the beginning of the program were for training local seed technicians and to assist in setting up seed testing laboratories. In more recent years assistance in establishing seed production programs has also been requested. Thailand is one of the more fortunate countries in that it has some well-trained staff and some facilities for seed technology upon which needed expansion can be built.

3. Studies and Other Donor Projects Related to Seed Development

Following an earlier FAO/IBRD Cooperative Program Seeds Identification Mission in November 1969, a mission visited Thailand between 19 October and 2 November 1972 to discuss with Government authorities the possibility of preparing a seed project for funding consideration by the World Bank Group.

The RTG had indicated a strong interest in the key role which a seed project could play in the attainment of its development objectives for the agricultural sector. The need for such a project was endorsed by all agencies and organizations contacted. Consequently the discussions centered mainly on the desirable scope and likely components of the project and the nature of the follow-up action required to finalize a submission to the IBRD for financing. The FAO/IBRD Mission

prepared a two volume report that developed a seed improvement project for Thailand (See FAO/IBRD Cooperative Program Reports No. THA-5-3/73 dated 30 January 1973 and THA-6-21/73 dated 16 July 1973). These detailed reports have been used in the development of this Project. The project as originally presented by the IBRD was a small element of the Phitsanulok Development Project ($200,000,000) that is now programmed for later development. The RTG/IBRD/USOM felt that the seed development portion of the Phitsanulok Project was extremely important and should not be delayed. For this reason the RTG informally requested and the IBRD supported the presentation of the program to USOM for consideration.

Several proposals by other donors that could provide assistance in the seed improvement area are now being considered by the RTG. The first is an FAO/UNDP proposal to supplement IBRD, ADB, and proposed USOM activities in the field of irrigated agriculture in Northeast Thailand. The FAO/UNDP is proposing to apply the research results on irrigated crops obtained at the Kalasin Irrigated Agriculture Station to the IBRD, ADB, and USOM on-farm water utilization activities now under way and/or proposed for the Northeast. One element, involving about $200,000 of the FAO/UNDP project, is for making improved seed available to project farmers. USOM has had discussions with FAO/UNDP personnel to assure coordination of both efforts. Coordination should not be a serious problem since the Department of Agricultural Extension will be the primary action agency in both activities.

The Government of New Zealand has proposed assistance to Chiang Mai University in establishing a Seed Technology Program at the University. If this project is carried out as proposed, it will complement the Thailand Seed Development Project, particularly the seed processing plant and accompanying programs that will be located in the Chiang Mai area.

The IBRD Rainfed Rice Improvement Pioneer Project will enhance the Department of Agriculture's capability to produce, and make available to the Seed Development Project, high quality rice foundation seed. Six rice experiment stations in the Northeast will be improved to expand rice breeding, experimentation, foundation seed production, and on-station training and demonstrations. Supervised out-grower schemes will be established for on-farm testing and demonstration of improved seeds, cultivation techniques

and fertilizer use. The stations will be provided with research and farm equipment, seed processing and storage facilities, vehicles, housing,training facilities, and related equipment and materials to carry out the objectives indicated above.

The Japanese Government has supported soybean research and development in the Department of Agriculture for the past five years. An RTG request has been made to continue assistance for soybean breeding, varietal testing, extension, and marketing. The nature of assistance for the latter two has not been clearly defined.

A Seed Production, Processing, and Storage Project has been approved by DTEC for implementation by the Department of Agriculture. It's objectives are:

- to establish a pilot seed processing and storage center and to equip ten selected rice stations with the seed processing and storage facilities for cleaning, drying, grading, treating, bagging and storing various classes and varieties of upland crop and low-land rice seeds.

- to establish a system for certification of the seed produced.

- to establish a sound basic organization for multiplication, production and procurement of quality seeds of designated crops.

- to work out a system for production of the basic and foundation seed generations at the field crop experiment station with maximum control.

Technicians and equipment have been requested from Japan. Fellowships for training will be requested from Australia and/or New Zealand. This project will further strengthen the Department of Agriculture capability to provide sufficient quantities of high quality foundation seed to the Seed Development Project.

4. Borrowers' Application for Assistance

The RTG documentation required to formalize a request to the USG for assistance has been developed parallel with preparation of this PP. There are large areas of overlap where the analyses reported in Part III serve both Thai and U.S. documentation requirements.

The RTG document has been presented by the MOAC to the National Economic Social Development Board, DTEC, the Ministry of Finance and the Bureau of the Budget. Formal action by these agencies and subsequent approval by the Cabinet is expected by June 12, 1975. Notification of the formal request from the RTG is expected to be submitted by cable to AID/W not later than June 14, 1975.

B. Detailed Description

For the readers convenience two sections of this paper provide a detailed description of the project. The Project Logical Framework Matrix (Annex D) provides a quick, but detailed, description of the project. In addition the project description, part 2 of this section, describes each project activity in more detail than the Logical Framework.

1. The Logical Framework Matrix

The project design Logical Framework Matrix, Annex D, provides a quick but detailed description of the project, including where possible, a delineation of outputs and inputs by project year.

A number of critical assumptions have been made in developing the project design. These assumptions will be followed closely throughout project implementation and problems encountered will be addressed quickly by the Project Implementation Committee. In addition the evaluations scheduled (See Part IV, C.) will address the assumptions and their progress. It is fully recognized by the project designers that many of the assumptions are just as critical to project success as achievement of outputs.

The project goal of increasing the farm income of the people who live in the rural areas is consistent with the Royal Thai Government (RTG) Third and Fourth Five Year Plans. Although this project can make a significant contribution toward achievement of the goal other RTG projects are underway or planned that will contribute to the same goal and complement this project, i.e. provision of credit, on farm development for water utilization, fertilizer and insecticide availability etc.

The project purpose of causing the use of improved seed on Thai farms has a narrow focus but is a critical element in improving the productivity and income of the Thai farmer. We are confident that the project is designed in a way to achieve this purpose. The project will concentrate on but not be limited to target areas identified in the project description. Project implementation methodology will be tested in these areas and as the volume of improved seed increases the areas covered will increase. Base line data surveys will be conducted in each of the target areas and comparable surveys will be conducted during the project in concert with scheduled evaluations to determine if the purpose is being achieved.

The outputs are those that are deemed necessary to bring about achievement of purpose. Outputs 1 through 6 in the Logical Framework are direct actions that must occur to achieve the project purpose. Outputs 7 and 8 are associated outputs and are not critical for achievement of purpose, however they could make the project more effective. Since all seed produced and processed during the project will be under RTG control it will not be subject to the regulatory program. The regulatory program will be developed, based on law already enacted, during the project and will be fully operational by the end of the project.

The inputs identified in the Logical Framework are the basic ones and details regarding staffing, funding, etc., can be found as referenced in other parts of the Project Paper.

2. The Project Description

The Project encompasses three distinct activities and is closely interrelated with two supporting MOAC programs. The activities are: (1) seed operations, which includes the production, processing and marketing of 8,650 MT of seed of improved varieties of Thailand's six basic crops, (2) inoculant program to provide sufficient inoculum to inoculate 500 MT of soybean seed each year; and, (3) technical and extension education training program, which provides for development of the technical skills necessary for the seed operations and a farmer demonstration--education, training--program to promote utilization of Project seed inoculants and other production inputs.

The two interrelated supporting programs are: (1) the DA foundation seed programs which will supply the Project with

foundation seed of the varieties to be multiplied by seed operations and promoted by the educational program, and (2) the seed marketing regulatory and certification program, also administered by the DA, which will be responsible for development and implementation of this program parallel with but not an integral part of this Project.

The project description which follows is organized on the basis of organizational responsibility. The integration of the various activities on a time sequence basis is given in the implementation plan Section IV. B.

a. Foundation Seed Program

(1) General Scheme

The Rice Division and the Oil Crops and Maize and Sorghum Sections of the Crops Division of the DA each have personnel, facilities and land to conduct programs in basic and adaptive research, varietal development and foundation seed multiplication. Each foundation seed section has been producing, processing and distributing from two to five hundred tons of foundation seed each year. These sections also produce a second generation, "extension", seed because until now there has been no organized program for further multiplication of the foundation seed. A description of the research staff and programs involved in varietal development of the crops included under the Project appears in Annex B-1 (Crops Research in Support of the Seed Project).

The general program followed and to be followed by the three Foundation Seed Sections concerned with the Seed Project is as follows:

(a) Breeders seed of each variety are supplied each year by the responsible Breeding Section of the DA.

(b) The Foundation Seed Section will make one or more increases at the research stations and sub-stations under control of the Division (Annex B-1)

(c) One or more field inspections are made by foundation seed personnel from the principal breeding station and at least one inspection by the breeder responsible.

(d) Seed are harvested, dried, processed and packaged using the personnel and facilities from each crop section.

(e) Seed are evaluated for quality by the divisional seed testing laboratories.

(f) The head of each Foundation Seed Section will inform the Project Manager when the seed are ready for delivery.

Both the Rice and Crops Divisions have sufficient personnel, land and facilities to supply foundation seed to the Project and other organizations or individuals who may desire to produce seed of known pedigree independent of the Seed Project. The Foundation Seed Section of the Rice Division has recently assumed responsibility for supplying foundation seed and training seed producers as part of the IBRD/RTG Rainfed Rice Improvement Project in the Northeast region. This project was discussed in Part II, A. Background.

(2) Manpower Requirements

No additional personnel will be necessary for the three Foundation Seed sections to fulfill their commitments to the Seed Project.

(3) Training Requirements

The leaders of the Foundation Seed Sections involved have each received specialized training in seed production and technology in the U.S., two having Masters degrees in this specialized descipline. Each section provides continuous on-the-job training to new personnel.

(4) Equipment and Facilities Required

The Rice and Crops Divisions, with support from various bilateral and multilateral donors since the mid-1950's, have acquired all the equipment and constructed the facilities necessary to

thresh and process the foundation seed required by the Seed Project and other programs.

(5) Estimated Output

The estimated Seed Project requirements for foundation seed by year are given in the table below. Foundation seed production of rice, maize and sorghum presently exceed the estimated requirements for the sixth project year. Currently the Oil Crops Section is producing sufficient foundation seed of soybeans, and peanuts to meet estimated Seed Development Project needs for the third project year and sufficient mungbean seed for the fifth project year. Adequate quantities of foundation seed of the three leguminous crops can be produced as the need arises. A listing of the currently recommended and anticipated new varieties appears in Annex B.

II. B. 1. Projected Requirements for Foundation Seed (M. T.)[1/]

Project Year	Crops					
	Soybeans	Maize	Rice	Peanuts	Mungbeans	Sorghum
1	16.7	2.5	0	0	0	0
2	27.9	6.3	8.7	29.2	1.1	0.8
3	53.0	10.0	32.2	58.5	3.2	1.5
4	69.0	15.2	40.9	30.0[2/]	6.3	2.2
5	83.6	18.9	67.2	35.0[2/]	10.5	2.9
6	92.0	20.1	87.6	50.0[2/]	12.6	2.9

1/ Provides sufficient seed to plant 20% greater area than that indicated in Annex B-4 to assure stocks for replanting or similar emergencies.

2/ Starting in year three peanuts will be produced under a two step multiplication system to provide adequate seed stocks.

b. Seed Production Component

(1) General Scheme

Multiplication of the foundation seed will be accomplished through farmer-seed-growers who will sign contracts with the DOAE Seed Division. The Project operations manager will have the overall responsibility for contract production, however, personnel at each center, working with the Changwat and District extension officers, will actually contact the seed growers.

The general scheme to be followed is outlined below:

(a) The number of rai needed to produce the necessary seed of each crop and variety will be established by the Project Manager following consultations with the technical staff and the Project Implementation Committee.

(b) The Project Operations Manager and the production supervisor at each Seed Center, working cooperatively with the Changwat Officers, Cooperatives, Farmer's Associations, etc., will contact village leaders in the area of the Seed Centers to ascertain farmer interest in producing seed.

(c) Meetings will be scheduled for those villages or groups in which a sufficient number of farmers express interest in producing seed to explain the program and the contracts. Interested farmers meeting basic requirements of land control, technical capability, experience in production of the crop(s) under consideration, etc., will sign a written contract, (See Annex B-11)

(d) The production officer, assigned to each seed center, will be responsible for supervising seed stock distribution, proper production practices, providing needed technical assistance and scheduling the production within limitations imposed by the growing season and production input availability.

(e) Each field will be subjected to one or more inspections as necessary to assure good seed production practices and isolation.

(f) Seed from those fields meeting the field inspection requirements, as stated in the contract, will be harvested and threshed by the seed growers.

(g) As rapidly as possible after threshing the seed will be picked up and transported to the Seed Center for drying, if necessary, and processing.

(h) Payment to each farmer will be made after it is determined that the seed meet the quality requirements as stated in the contract.

Existing RTG regulations governing all purchases require regula government agencies to form two teams of three persons each to inspec and purchase products--the first team inspects the product to determin if it meets the contract specifications, the second team authorizes payment. The composition of the teams changes from one political district to another. This regulation precludes timely pick-up of the seed, however, to maintain seed viability, it is very important to move the seed to the center where drying facilities are available as soon as possible after they are threshed. Operating under the above regulation necessitates waiting until all seed growers in a village have completed threshing, usually a six to eight weeks period, before the seed can be purchased. To circumvent this regulation concerning payment the Production Officer at each center will be authorized to act as the purchasing agent for the MOF, whose purchase operations are not restricted by this regulation.

A secondary advantage of transfering the seed purchase function to the MOF is the by-passing of bureaucratic delays in obtaining funds needed to adjust to changes in market price which is the basis for the price seed growers receive for their seed.[1/] In support of the seed production activity a seed purchase revolving fund for the purchase of seed from farmer-seed growers, will be established as a part of the

1/ Detailed explanation is given in "Seed Program/Industry Development in Thailand" pp 36-38 op. cit.

project. Funds paid from the revolving fund, to be administered by the MOF will be replaced as the clean seed are sold. It is anticipated that by the third operation year of each center the MOF will station their own purchasing agent at the Center leaving the DOAE employees responsible only for production supervision.

Selection of farmer-seed growers on the basis of technical capability and location is vital to the success of the Project. The selected seed growers should possess the following characteristics: Near or above the regional average in farm size and income; cooperative with their neighbors and receptive to new technology.1/

Operationally, the seed growers will be grouped into production units with each unit controlling sufficient land to produce at least 20 to 25 tons of seed. Further, the central collection point for each production unit must be adjacent to a road capable of supporting a 5-ton truck.

It will be necessary to sign contracts covering the production area shown in projected requirement tables (Annex B-6) to attain the indicated goals for clean seed distribution. Attrition of seed volume between the number of rai contracted and seed for distribution will result from rejection of fields, failures to meet contract quality standards and drying-processing loss.

(2) Manpower Requirements

In addition to the Project's Production Manager, the Center Chief, Production Officer and two assistant production officers will be responsible for training and coordination of the seed growers; maintaining necessary records of contracts, field inspections, grower performance; providing estimates of production, harvest dates, etc., supervision of threshing equipment, and purchase and movement of seed to the Seed Centers.

1/Experience from developing seed programs in Thailand and other countries, where farmers have the freedom to choose the crops they produce, has shown farmers having these characteristics are the best seed producers. Thus, the seed production component is not the appropriate place to implement mandates to "help the poorest farmers", Provision is made to assure the poorest farmers benefit from the Project's output through the preferential distribution of seed which is discussed in the Social Analysis Part III C.

An estimated 3,100 farmer seed growers will be needed to produce project seed by the sixth year. Experience indicates that minimum difficulty will be encountered in obtaining seed growers. However the turn over rate during the past three years has averaged nearly 20%. As the seed growers become more proficient and technical assistance more readily available this turnover rate should decrease to 10% or less.

(3) Training Requirements

The officers involved with contract production will need intensive technical training to include the following subjects:

(a) Basic requirements for producing high quality project required seed including cultural practices; insect, rodent, and disease control; field isolation and inspection techniques; and advanced procedures for harvesting, threshing, and conservation of threshed seed.

(b) Farmer relations and implementing contract requirements.

(c) A general knowledge of seed drying, processing, storage, quality control and marketing techniques.

(d) Sources and contacts for assisting seed growers to obtain production credit, fertilizers, pesticides and related inputs.

The trained production officers with support from Changwat and Amphor Extension Officers and local DA research personnel will be responsible for training the seed growers. Initial training of seed growers will be through village or production unit level meetings with follow-up by personal contact.

The meetings will be used to:

(a) explain the Seed Project and the grower's role in its success as well at the returns he and the country as a whole can expect.

(b) discuss the latest cultural practices; special techniques for seed production, harvesting and threshing; and providing detailed information concerning the characteristics and requirements of each new variety.

(c) explain seed contract specifications and requirements and accept applications.

(d) clarify questions concerning sources of production credit, other production inputs, etc.

The frequency and location of this training will of necessity depend upon the work pattern of the farmers, the turnover rate of seed growers, the numbers of farmers, villages or production units involved and the availability of cooperating personnel to participate. Every seed grower will have the opportunity to attend at least one such meeting each year.

(4) Facilities, Equipment and Supplies

Office space and supplies will be required for the Project Production Manager in Bangkok and the seed production supervisors at each seed center. The production officer will require field transportation, capable of carrying loads of up to 3 MT, for general travel and distribution of foundation seed.

Two, 5 MT capacity, trucks will be assigned to each seed center for the purpose of transporting seed from the production area to the Center and for distributing seed to the retail outlets. When additional trucks are needed they will be leased. A detailed listing of the equipment is given in Annex B-10.

(5) Time Phasing of Activities

With the exception of the Seed Center at Phitsanulok, phasing of personnel, facilities, equipment and seed production goals is based upon the anticipated completion of the other Seed Centers. Contract seed production should not be undertaken until it is certain that the essential facilities for processing, storage and distribution will be available by crop harvest.

As indicated in Annex B-4 only soybean and maize seed will be produced the first project year. With completion of the Processing Center at Khon Kaen the second project year, and expansion of the production capability at Phitsanulok modest quantities of seed of all six target crops will be produced. Regardless of the location , the contract acreage of each crop will start at modest levels with increases each year until the desired output levels are attained. As the project develops and experience is gained the production goals will be reviewed and reassigned among the different Seed Centers as necessary.

c. Seed Processing Component

(1) General Scheme

Those seed purchased from the seed growers will be transported to the appropriate processing center. These centers, to be located at Phitsanulok, Khon Kaen, Chiang Mai and Chai Nat (Annex B-13), will each have personnel and facilities to dry, clean, package and provide storage for approximately 2,500 MT of seed per year under nominal operational conditions of 24-8 hour work days per month during the processing season. The projected processing season for each center is given in Annex B-7.

The general plan for operation of each processing unit is as follows:

(a) Seed will be transported from the seed growers collection points to the nearest center.

(b) Moisture tests will be used to determine the need for drying and, when necessary, the seed will be dried to a safe moisture content.1/

(c) Seed will be cleaned to remove foreign materials; diseased, immature and insect damaged seed; improve general appearance and quality; and, as needed, treated with a fungicide and/or insecticide.

1/ Safe moisture content depends upon species, type of packaging materials, length of the storage period, and the environment of the storage area.

(d) Clean seed will be packaged in a distinctive bag each containing 25 or 30 kgs. depending upon the crop.

(e) Each seed lot will be sampled and the purity, germination and related quality factors determined. Bags containing seed which meet the quality standards established for each crop will be labeled in accordance with the provisions of the Seed Act.

(f) Seed to be sold the next planting season will be stored in flat-storage warehouses. Seed to be held longer than three months, particularly the soybeans, peanuts and mungbeans produced at Phitsanulok and Chiang Mai will be placed in conditioned storage warehouses.

(g) Seed will be delivered from the warehouses upon receipt of an order from the MOF and charged to the MOF on a 90 day account basis.

(2) Manpower Requirements

The personnel required to operate each of the four processing units are listed in Annex B-12a. At the end of the project DOAE personnel will continue to operate the Phitsanulok Center, processing seed on a custom basis for the MOF. Those personnel working at the other three centers will be transferred from the DOAE to the MOF after year six of the project.

(3) Location of Processing Units and Facilities Required

The sites selected and construction phasing of the processing units considered geographic and crop distribution; communications networks, present and planned irrigation projects, suitability of soils of the region for seed production, etc. A description of the locations selected follows (Ref Annex B-13):

(a) Phitsanulok - located approximately 500 km. North of Bangkok, is on the Northern edge of the Central Plain. Located on the site of a

DOAE regional training center, construction of this facility was started in late 1972 by the DOAE. In 1973, the RTG received assistance from USOM in the form of technical assistance and equipment to increase the capacity and operational efficiency of this processing unit. At present this Center includes the following facilities: Administration building, classroom building, seed testing laboratory, bulk seed drying-processing unit, 500 MT capacity flat storage warehouse, 90 MT capacity conditioned storage, workshop, vehicle shed and a concrete drying floor, see Annex B-14 for Phitsanulok Seed Center Layout. Under the Project, facilities to dry and shell ear corn, an additional 500 MT conditioned flat storage warehouse and necessary vehicles, supplies, and training aids will be provided to permit processing of soybeans, corn, rice and mungbeans as well as technical training of personnel involved in all phases of the Seed Project and associated programs. Output goals of clean seed are given in Annex B-4.

(b) Khon Kaen - located 500 kms Northeast of Bangkok, Khon Kaen is the agricultural center of the 16 Northeast provinces. This will be the first center to be built from project funds. Crops to be processed include peanuts, rice, corn and sorghum. (Annex B-4). Rice is the principal crop of the region. However, because of the planned production of 1,600 MT of seed rice under the IBRD/RTG Rainfed Rice Program, peanuts, and corn as well as rice will be the major crops processed at this location. The sorghum production, scheduled to begin the second project year, will be processed at this location for the entire Project.

(c) Chiang Mai - located 780 kms. North of Bangkok and 400 kms. Northwest of Phitsanulok. This Seed Center will be the second constructed under the Project. Seeds of soybeans, rice and peanuts will be processed. As of 1974, there were over 400,000 rai having water management facilities permitting supplementary and second crop irrigation in the four changwats adjacent to this site. The best quality soybean seed produced under the DOAE's existing program have come from this area. Further, an initial corps of about 200 farmer-seed growers, some having three years experience, has been developed. This facility should be operational within 30 months of project initiation permitting the processing of a limited quantity of seed of each crop assigned during the third project year. (Annex B-4)

(d) Chai Nat - located 200 kms. North of Bangkok near the eastern edge of the Central Plain. Construction of this unit is scheduled to start the second project year with processing operations to begin the second half of the third project year.

Rice will be the principal crop processed with lesser volumes of corn and mungbeans. An irrigation project serving seed growers is scheduled to be at least partially operable by the time this unit is ready for operation. (Annex B-4)

The equipment and facilities needed to complete each of the Seed Centers is listed in Annex B-9 and B-10. The equipment and buildings are of adequate capacity to dry, process and store the seed effectively at the volumes indicated and at moderate levels of management. Each of the four processing units will be capable of drying and processing seed of all target crops, except drying ear corn at Chiang Mai, as well as seed of most other crops presently produced in Thailand. Thus, should it be deemed necessary to shift crop allocations the processing operations will not be affected. Most of the equipment needed for drying and processing will have to be imported, however, the operational supplies required are available in Thailand.

(4) Training Requirements

Except for the limited experience of the DOAE personnel at Phitsanulok, the operation and maintenance of modern seed drying, processing and storage facilities is not well known to the available Thai personnel. Fortunately, the Phitsanulok facilities are available for both classroom and in-service training of all personnel required for operation of the processing units. The cadre system of training will be utilized, those personnel assigned to operate the Khon Kaen unit will be trained the first project year at Phitsanulok. During the second project year those technicians to be assigned to Chiang Mai and Chai Nat will be trained at both Phitsanulok and Khon Kaen. After the four units become operational, replacement personnel for all locations will be trained at Phitsanulok. Because of the limited number of personnel having knowledge of drying and processing, training these personnel will be a major responsibility of the technical assistance team during the first year of operations. The operational officers will each participate in one or more of the appropriate in-country

short courses discussed in the section on Technical Training and Extension Education Component.

(5) Transfer of Processing Units from DOAE to MOF

All of the processing units will be constructed under the auspices of the MOAC and operated by the DOAE's Seed Division throughout the life of the Project. This course of action will facilitate equipment and supply import, avoid import taxes and facilitate use of expertise available in the various departments of the MOAC. The MOAC will grant the facilities and equipment, except those at Phitsanulok, and transfer the operational personnel to the MOF. The Phitsanulok Center will continue to operate its processing unit as a custom processing operation for the MOF. This unit will also be used for on-the-job training of replacement personnel and interested individuals from the private sector.

d. Seed Marketing Component

(1) General Marketing Structure

The marketing of seed produced and processed within this proposed Project will be provided by the Marketing Organization for Farmers (MOF). The MOF is a State Enterprise created by the government in late 1974. The purpose of this agency is to supply farmers with the necessary inputs for increasing production (fertilizer, pesticides, seeds, machinery, etc.) at a modest price markup to recover operating expenses. This will result in lower input costs due to by-passing the current higher cost agricultural input supply system.[1/]

(2) Channels of Distribution

The MOF will sell seed to farmer associations, government agencies, and general small farmers. These groups are enumerated and described as follows:

1/ The essentially non-competitive input marketing system in Thailand is described in "The Agricultural Economy of Thailand", USDA/ERS Foreign Report #321, 1972.

(a) Farmers Associations. At the present time there are 1,214 farmer associations throughout the country and all are permanent customers of MOF.

(b) Agricultural Cooperatives. All of the 498 agricultural cooperatives are customers of MOF. It is estimated that these cooperatives have 300,000 members.

(c) Government Agencies. Agencies which will be purchasers of seed are the Department of Public Welfare, Accelerated Rural Development Office, Department of Cooperative Promotion, etc. These agencies deal directly with poorest of the poor so provide a good vehicle to reach this population segment with improved seed.

(d) General Plant Sales. Other farmers who are living in the vicinity of a processing plant will be able to buy up to 10 percent of the Project seed production at the plant.

Note: See Part III C for further description of the beneficiaries (channels of distribution).

(3) Market Demand

The estimated demand for seed of superior crop varieties and high germination is estimated in Annex B-3. These estimates are, with the exception of soybeans, extremely conservative. The higher demand for soybean seed is due to weather factors within the country that cause germination distinction in soybeans, therefore preventing farmers from saving grain for seed from past crop seasons as in other grain crops.

As improved seed varieties are released, as farmers gain confidence in the stability of seed supply, and as crop demonstration programs and other promotion activities are implemented, it is estimated that the market demand for seed produced by this Project will be twice the goal of the projected seed production capability.

(4) Operating Structure

At the present time an operational structure for seed marketing is being designed by the MOF. The manpower requirements are detailed in Annex B-12b to coincide with projected seed processing schedules in Annex B-4. Preliminary seed sales procedures, buyer qualifications, credit policies, credit guarantee requirements, transportation policy, and organizational structure have been completed. It is forecasted by the MOF that 60 per cent of available seed will be sold to farmer associations, while 20 per cent, 10 per cent, and 10 per cent will be sold to agricultural cooperatives, government agencies, and general farmers respectively.

While a sound start has been made in this area much more needs to be accomplished. The following section is directed toward the technical assistance required to assist the MOF in completing the operational structure plans and the implementation of seed marketing.

(5) Technical Assistance Requirements

It is estimated that technical assistance support to the marketing segment will be substantial during the first four years of the proposed project. This assistance will be provided by the Senior Seed Specialist augmented by short term consultants.

The basis of the need for technical assistance is that marketing of seed as proposed herein is composed of three primary functions, i.e., inventory control, logistics, and merchandising. These functions in seed marketing are highly interrelated. Since the MOF is a new organization and lacking in expertise, technical assistance is required to assist the MOF in development of sound operational procedures and the implementation of the seed marketing process. Since this proposed project envelops a six year time span to reach projected capacity, the technical assistance supplied to the MOF will be able to correct any deficiencies early in its operation. Therefore, a strong marketing structure will exist at the time the project reaches proposed capacity in the sixth year.

(6) Training Requirements

Among the requirements, established by the MOF, for officers of the agricultural supply marketing division is a B.S. degree in marketing or business. In addition to in-service training to teach MOF operational procedures, those assigned to work in seed marketing will participate in one of the 3-week Seed Technology Courses at Phitsanulok.

Provision is made for the manager of the seed marketing section to receive short term (7 months) training in seed marketing, inventory control, and distribution during the first year of the Project. Additionally, two-third country study tours (2 months) to other Asian countries having established seed programs are provided to permit in-depth study of specific marketing and distribution problems related to seeds.

Provision also is made for in-country training of MOF staff in appropriate accounting and other procedures for the management and control of the working capital fund for the Project.

(7) Equipment and Facilities Required

The MOF will provide the equipment and facilities needed for seed marketing as part of their overall operations. However, vehicles for use in the marketing segment of this project have been provided for and are detailed in the equipment list in Annex B-10.

e. Legume Inoculant Production Program

Leguminous plants have the capacity to convert elemental nitrogen of the air into forms usable by the plant provided the proper species of Rhizobium bacteria are present in the soil, to attack the plant's roots and establish a symbiotic relationship with the plant. Most of the soils of Thailand do not contain sufficient Rhizobium japonicum bacteria of the proper strains to effectively inoculate soybeans or mungbeans.

Results of field studies conducted by personnel of the Bacteriology and Soil Microbiology Branch of the DA have effectively proven that yield increases in the range of 1% to 40% can be expected following inoculation of soybean seed with locally cultured strains of Rhizobium japonicum. The results of other field studies have shown that proper inoculation effectively substitutes for nitrogenous chemical fertilizers applied at the rate of 24 kgs/rai. The results of this research have been effectively demonstrated in the farmers fields. The need for inoculants is real.

At present inoculants containing locally selected strains of Rhizobium are not generally available except for the small quantities, enough inoculant to apply to 25 MT of soybean seed per year, produced by the Bacteriology and Soil Microbiology Branch of the DA and the Soil Microbiology Section of the MOAC Land Development Department. Imported inoculants from the U.S. and Japan reportedly are only 40% as effective as the inoculants containing locally isolated strains of Rhizobium. On the other hand, it is possible to ship the small quantities (200-300 grams) of the Rhizobium anywhere in the world for further multiplication and subsequent production of the inoculant material. Thus an apparently viable alternative to local production of inoculants by a government agency is export of small quantities of the selected local strains to a country which already has the facilities for preparing the inoculants and then importing the prepared inoculant ready for distribution.

Efforts to retain the consultant services of an inoculant production expert to assist in the design of the Project were unsuccessful. However, because of the long term direct and indirect advantages of widespread use of inoculants by Thailand's farmers, the following plans providing for local production and the alternative importation of inoculants are included. Cost estimates are based on the known and estimated costs of buildings, equipment,

supplies, and personnel. Neither the actual equipment or supply costs nor the costs of importation of prepared inoculants from the U.S. have been confirmed. Because of the uncertainties a covenant concerning the inoculant production program is included (See Part IV. D). The balance of the proposed Project will not be affected by the outcome of the Inoculant Production Program.

Project Implementation - Local Production

(1) General Scheme

The project will provide the necessary staff, facilities and technical assistance to increase inoculant production to a level sufficient to inoculate 500 MT of soybean seed per year. Should the demand for soybean inoculant not require full utilization of the facilities, excess capacity will be used for production of inoculants for mungbeans, peanuts and snap beans.

(a) Isolation and culture of the most effective strains of *Rhizobium japonicum* for soybeans.

(b) Combine the *Rhizobium* with the carrier medium and incubate.

(c) Package the inoculant and printed instructions in moisture vapor-proof packages of a size sufficient to inoculate 25 kgs. of soybeans.

(d) Store in coldroom until required for distribution.

(e) Supply the inoculant at cost to MOF which will distribute it through seed marketing channels.

Using the locally available base media, coconut husks or refuse, the prepared inoculant will remain effective following three months cold storage for only eight to ten weeks. Research to find a locally available base media equivalent to the Michigan peat moss, which makes the inoculant effective for six months, is continuing. Because of the limitations of the locally available base media actual inoculant production has to be completed during a three month period just prior to the bi-annual soybean planting season. The periods between actual inoculant production

will be used for preparation of the base media and for culture of the bacteria.

(2) Manpower Requirements

The present staff of eight professionals, all women, devote the equivalent of 2.9 man years to rhizobium culture, quality control and inoculant production. Increasing output capacity to the desired levels will require the addition of 4.0 man years of professional staff and several laborers (Annex B-12c).

(3) Training Requirements

Because the techniques and procedures required are already in use most of the training will be of an in-service nature provided by the present staff. Funds are provided to permit 2-3 month study tours for the Inoculum Production Project leader and her assistants to study commercial scale inoculant production and quality control procedures in the U.S.

Two short term inoculant production experts will be provided through the Project. The first, early in the Project, to prepare equipment specifications and review present operations. A second expert is scheduled during the second year of the project, to verify proper installation and operation of the equipment and train personnel in its operation and maintenance.

(4) Facilities and Equipment Requirements

The equipment believed to be needed to supplement that presently available is listed in Annex B-19b. It will be necessary to construct a single story building ($1000m^2$) to provide space for media storage and preparation, culture preparation, mixing and packaging, cold storage of the prepared inoculant and offices. One pickup truck for general purpose hauling of base media and up to one-half ton of inoculant is provided. Estimates of the total capital investments and yearly operational costs other than labor are given in Annex B-19a. Costs for Personnel, Technical Assistance and Training are included in Annex B-12c, B-20, and B-21.

Importation of Inoculant - An Alternative

Importation of inoculant for soybean and possibly other leguminous crops such as mungbean and peanut must be considered as a possible alternative to in-country production. On the basis of cost information from the Nitragin Co., a leading U.S. supplier of legume inoculants, and technical recommendations of Dr. George Ham, University of Minnesota, the cost of importing a quantity of soybean inoculant sufficient to inoculate 500 MT of seed (enough to plant 83,300 rai) would be about $10,000 for the inoculant and $16,500 for air freight of inoculant to Thailand to prevent in-transit loss of viability of inoculant as might occur during surface shipment. The inoculant would have to be stored in a refrigerated storeroom in Thailand from time of arrival until distribution. A suitable refrigerated storeroom would cost about $15,000. On a strict import basis, therefore, the six-year cash outlay would be $159,000 for the inoculant including air freight plus $15,000 for a storeroom, or a total of $174,000 for soybean alone.

Several technical questions must be answered before a choice between the in-country production and importation alternatives can be fully rationalized: (1) Is the reported 60% less nitrogen-fixing efficiency of imported inoculum a result of inherently low efficiency of imported strains under Thai conditions, or a reflection of unfavorable storage (low viability), improper application procedures, inadequate dosage, etc.? (2) How often should a Thai farmer apply inoculant to the soybean seed he plants given his complex of "tropical soils" generally, on the acid site, distinctively dry and wet seasons, and essentially annual flooding for rice production when multiple cropping is practiced?; and (3) would other leguminous crops in project, i.e., mungbean and peanut (and other legumes outside project) be improved by inoculants and thus benefit from an in-country capability for inoculant production.

Regardless of the plan used, the direct benefits to the farmers, estimated at $425,000 per year after the third year, would be equal. Clearly there are other economic and social benefits that would accrue from the local production plan.

f. Technical Training and Extension Education Component

(1) General Scheme

The success of the Project, and of greater importance, Thailand's emerging seed program, will be determined by the expertise of the seed growers, skilled and semi-skilled laborers, managers, and sales personnel to produce, harvest, dry, process, test, market and distribute seeds of a significantly higher quality than the average farmer can save for himself. To achieve this goal, extensive training and educational programs are required.

Fortunately, Thailand has a nucleus of professionals who have received training in the technical skills necessary for initiation of the Seed Development Project (Annex B-2). These persons will be utilized for training others to the extent their services are available. Assisting this group of professionals in both the development and presentation of the technical training and educational programs is a major responsibility of the technical assistance personnel.

Two types of educational program will be provided. A technical training program for those persons directly involved in the production, processing and marketing seed, and extension educational programs directed to the farmers who utilize the seed and inoculant.

(2) Technical Training Program

Four levels of training are needed to permit the orderly development of Thailand's seed program: in-depth professional training; operational technical training; on-the-job training and seed awareness training.

In-Depth Professional Training

(a) Degree level training is needed to develop an in-depth understanding of both the theories and practical application of various aspects of seed technology. Persons having B.S. level training in agronomy, botany, agricultural engineering marketing etc. must be trained to apply their knowledge to resolution of problems and effective implementation of the seed programs. Masters degree training in seed processing and handling, quality control and evaluation, and seed production is provided. (Annex B-21).

(b) Short term technical training, two to three months duration, is required for those trained professionals directly responsible for the immediate implementation of the seed marketing, inoculant production and seed drying-processing components. The purpose of these study tours is to permit a review and up-dating of the current techniques and practices used by developed commercial companies. (Annex B-21).

Operational Technical Training

(a) General seed technology training will be given to all professional and skilled workers responsible for the day to day operations of the Seed Project. A series of 3-week short courses, presented at the Phitsanulok Seed Center, will be used to give theoretical and practical training in seed production, drying, processing, storage and quality evaluation. One seed technology short course is scheduled for each year of the Project. Participation in these courses should be limited to 25 persons per class with preference being given to those working directly with the Seed Project initially.

A minimum of 150 persons should receive training during the life of the Project.

(b) Skills development training courses will be given in (1) seed processing and handling, (2) seed analysis and quality control, and (3) seed inspection. These two week courses for training the skilled operational personnel will emphasize the learning and refinement of the techniques and skills required for top level performance.

The seed processing and handling course will teach operation, adjustment and maintenance of the equipment used in drying, processing, handling and storage of seed. The seed analysis and quality control course will develop the trainees skills in purity analysis, quality evaluation techniques, identification and solution of problems in maintenance of seed quality. Participants in the seed inspection short course will be instructed in proper sampling techniques, field inspection, records keeping and similar techniques required for implementation of the regulatory and certification programs.

These courses will be taught in alternate years starting with the processing and handling and seed inspection courses. To be most effective, class size should be limited to 15 trainees.

(c) On-the-job training is necessary for those persons who have participated in a skills development course, semi-skilled laborers at each Seed Center and the farmer--seed growers. Responsibility for this training will rest primarily with the field production supervisors for farmers, processing superintendents and quality control officers for those at the seed centers, the marketing manager for the marketing agents, and the section leaders for foundation seed, inoculant production, seed certification and seed regulatory programs.

(d) Seed awareness training will be primarily directed to those persons whose normal activities place them in contact with the general farmer in contexts other than the production, processing and marketing of seed. Further description of the guidance, subject matter and training goals of the seed awareness training is indicated under the Extension Education Program.

(3) Extension Education Program

It is essential to the success of the Project that farmers be made aware of the benefits and have access to the improved varieties and higher quality seed to be made available through the Seed Development Project. To insure that this information reaches the most remote farmer a carefully planned and continuir extension program will be implemented.

Major responsibility for preparing and disseminating educational information of improved seed will rest with the Crops Promotion Division, DOAE until such time the Seed Division DOAE is officially approved. Assistance and cooperation of all DOAE facilities and personnel will be required at all levels in:

(a) preparation and distribution of seed literature (Crops Specialists)

(b) participating in training exercises (Amphor and Changwat Officers)

(c) planning and supervising demonstration plots (Demonstrations Officers)

(d) forwarding of pertinent information to Project headquarters (Changwat Officers)

(e) pinpointing and advising on seed problems in outlying areas (Amphor and Demonstrations Officers

(f) distributing improved seed (Amphoe Officers)

Cooperation with other government agencies, particularl DA, will be necessary in preparing information for distribution, assistance in training programs, and participation in farmer meetings.

Two methods will be used to inform and educate farmers of the benefits of using improved varieties and higher quality seed. The first will be a broad approach in the target areas in the form of general education and demonstration. The second method will be a narrow, concentrated effort in specific areas (ref paragraph 2 b). Due to the limited quantity and kinds of seed available during the early years of the Project, a concentrated program will provide a better

measure of the Project's impact at the farm level. This impact will be measured against base line data collected prior to project initiation.

(4) Specific Educational Programs

General Education and Demonstration Program

(a) During regional and national meetings of Extension and Research personnel the DOAE project personnel will present information concerning the plans and progress of the Project such as:

- crop seeds and quantities planned,
- timing of Seed Center construction and locations,
- areas of concentrated large volume production efforts, and
- plans for the demonstration plot program.

(b) Extension personnel who have attended regional meeting will hold a series of district and sub-district meetings with farmers to present the same information as above.

(c) Seed awareness short courses. The purpose of these short courses is to instill a knowledge and appreciation of good seed and superior varieties and the benefits that can be derived from their use. These 3-5 day courses will be especially designed to establish in the minds of the participants the differences between good seed of improved varieties and grain; the basic concepts of seed production, drying, processing, storage and marketing; and a detailed explanation of the Project. Sufficient RTG personnel in direct contact with farmers, cooperative managers, BAAC credit supervisors, seed and grain dealers, and salesmen for other production inputs should be trained until a "good seed mentality permeates the agricultural sector".

At least one such short course per year will be held at each seed center after it becomes operational, or at a nearby location. Twenty such courses will be presented by DOAE Seed Division personnel during the Project's life with average attendence of 30 persons per course expected.

(d) Demonstration Plots

As Project seed becomes available two types of demonstration plot programs will be organized and implemented through Changwat Extension personnel with a goal of one plot per district depending on local conditions.

--In potential production areas a crop introduction plot using improved seeds and best cultural practices and other production inputs will be set up. The purpose is to introduce the crop to a new area by producing the best possible yield and showing the farmers how they might do the same.

- In existing production areas improved practice demonstration plots will be established. This will be a side-by-side demonstration with half the plot planted using local methods and non-processed, non-improved seed, and the adjacent half of the plot using the latest cultural and fertilizer technology with well processed, improved variety seeds. The purpose of this type of plot is to demonstrate the benefits of improved Project seeds and modern cultural techniques.

(e) Farmer Field Days will be organized to gain maximum benefit from those demonstration plots. Farmers will be transported to plot sites for an agricultural education program given by Extension personnel and the participating demonstration farmer.

Concentrated Improved Production Program

One district in the area served by each of the Seed Centers has been selected for an intensified educational and demonstration program to maximize impact of the Seed Project (Annex B-22). The types of demonstration plots previously described will be used, but the number of plots will be increased to more thoroughly concentrate on specific locations.

Farmer's Associations are the smallest of the farmer organizations; are confined to a small area usually one village, and maintain closer contact with the individual, small farmer. The Concentrated Improved Production (CIP) program effort will be made through selected Farmer's Associations. In addition to the demonstration plots, a base line data survey of the seed use habits and economic

level of the association members will be made by changwat and district personnel under supervision of DOAE Seed and MOAC Projects Division personnel. Surveys will be conducted on completion of each regional Seed Center. Subsequent followup surveys are scheduled in the Evaluation Plan, Part IV C. The Farmers Associations selected are shown in Annex B-22. Project benefits will be available to all members of each selected Farmers Association.

The first area to be identified for this effort is in the vicinity of the Phitsanulok Seed Center, the CIP program will commence the first project year, and will be continued through the sixth project year. The second area will be near the Khon Kaen Seed Center, to begin the second year, and continue through the sixth project year. The third and fourth areas will be near Chai Nat and Chiang Mai. The educational and demonstration programs will begin during the third year, and continue through the sixth project year.

Amphor officers working with the Project Demonstration Officer will organize and conduct more farmer meetings, maintain better contact, and assist Association officers in providing for the necessary seeds, credit, fertilizer and pesticides for members than is possible at present. To develop and maintain close contact with the individual farmer, the Extension officer, working through the officers of the Association will divide the area covered by the members into smaller area units and designate a progressive farmer as the Farmer Foreman. The Farmer Foreman will be in close contact with the farmer to insure the best possible dissemination and collection of information vital to the success of the Project. Experience gained the first year will be the basis for refining and improving on the system during succeeding year of the Project.

(5) Additional Means of Disseminating Information

The Information and Training Section of the DOAE Seed Division will be responsible for preparing and disseminating other forms of information to educate and create interest in good seed of improved varieties.

(a) Publications

- Newsletters and production pamphlets will be prepared and distributed to both seed and commercial production farmers.

- The Agricultural Extension Journal, a bio monthly publication of the DOAE, will be used to educate Extension personnel in seed technology.

- The Agricultural Extension News, a monthly publication of the DOAE, will similarly be used to inform Extension personnel in the field.

- A Seed Technology Handbook will be prepared and distributed as an aid to Extension personnel.

(b) Radio

- Over 44 government radio stations are operating in Thailand, all carry news of agriculture and will be utilized.

- Kasetsart University operates 4 stations which cover Thailand broadcasting mostly news of agriculture.

- The DOAE conducts courses in preparing radio scripts and broadcasts a daily program of questions and answers for farmers. These services will be made available for use by the above radio stations.

- Since a majority of farmers have access to radio the Project will rely heavily on radio to popularize improved seed in the most remote areas.

(c) Exhibitions

Exhibits of improved, processed seeds will be shown at the National Agriculture Exhibition complete with attendents and hand-out literature describing the benefits of using improved seed and improved varieties.

(6) Manpower Requirements

Those DOAE personnel directly responsible for the educational effort of the Seed Project are listed in Section III of the

Staffing and Costs table (Annex B-12d). Additionally, the Chief and the professional staff of the Phitsanulok Seed Center will be used as instructors for the various short courses conducted at this location. At present there is a corps of five first or second grade officers who have received Masters degree training in either Extension Education or Seed Technology. The Demonstrations officer located at each center will be primarily responsible for the general and the concentrated improved production program.

(7) Facilities and Equipment

No new facilities are required to implement the Technical Training or Extension Education Programs. The additional vehicles, information preparation equipment and training aid equipment required to effectively implement this component are listed in the equipment list (Annex B-10).

(8) Training Requirements

Because the DOAE is a training organization the officers to be utilized in the Project will be selected on the basis of their already proven performance. The Demonstration officers, Crops specialists and similar officials will be required to participate in one of the Seed Technology short courses. To further strengthen the Extension capability in seed, two short term (7 months) study tours will be provided to officers selected to serve at the national level as Extension Seed specialists.

g. Supporting Programs to the Seed Project

The "Seed Act B. E. 2518" was passed in February 1975 by the Parliament. This Act authorizes the MOAC to establish both a seed marketing regulatory control program and a seed certification program. The Minister has designated the DA as the implementing agency for both programs. Neither of the above programs is directly connected to the Seed Project though as they develop there will be considerable interchange of information among the operational level personnel.

Seed Marketing Regulatory Control Program

The purpose of this program is to regulate the quality of the seeds offered for sale to farmers and other seed dealers. The Act is written using the "truth-in-labeling" philosophy i.e. seed containers must be labeled with specified information which will be checked for accuracy based on samples drawn in a specified manner, however, all seed produced by an agency of the RTG are exempt from this Act.

The Agricultural Regulatory Division, DA will be responsible for implementation of the specific regulations as they are developed. This Division is also responsible for implementation of the recently passed fertilizer and pesticide regulatory programs.

Though Project seed are not subject to the Seed Act they will be labeled to comply with the regulations promulgated to demonstrate to farmers that good seed are tested and the seller is responsible for their quality. It is anticipated that the Project will be in its third or fourth year of operations before regulations are applied to the Project crops. The initial efforts of the seed regulatory section will be directed toward imported seeds, principally vegetable seed, where the more serious offenses reportedly occur at present.

(1) General Scheme

The Controls Section which will have primary responsibility for the regulatory program will be an integral part of the Agricultural Regulatory Division, DA. Seed Technology Laboratory, Crops Division, DA and the Seed Testing Laboratory, Rice Division, DA will be responsible for making the official laboratory analyses for all regulated seed.

(2) Manpower Requirements

Staffing to implement the regulatory provisions of Seed Act will be within the normal pattern for RTG organizations. It is anticipated that a total of 31 positions (15 professionals) will be created by the time the program becomes fully implemented, however, the phasing will be dependent upon the need as dictated by development and needs of the program. Both laboratories to be used are presently fully operational, in terms of trained staff, facilities and equipment, having previously received technical and training assistance through an FAO grant program. The Director of the Crops Division laboratory is a former USAID participant.

(3) Training Requirements

The major interface with the Seed Project will be in providing training for the supervisory personnel and the inspectors and in assuring coordination of activities. The techniques required for implementing inspections will be new to the personnel assigned, though already in use by other Divisions of the DA and DOAE. Provision has been made to include these persons in the appropriate skills development short courses to be presented at the Phitsanulok Seed Center. In addition to the trained personnel of the DOAE, those DA professionals having experience in seed testing and field production will be used as instructors for these courses.

To assist in the orderly development and implementation of the Regulatory Program the Project will provide one short term consultant, short-term training for the Chief Seed Regulatory officer and in-depth professional training for a quality control officer (Annex B-21).

(4) Facilities and Equipment

All facilities and equipment required for implementation will be provided through the DA Seed Production, Processing and Storage Project, although the Seed Project may provide some miscellaneous supplies required during the initial training and implementation phases. No specific items are included in the Project budgets for facilities or equipment.

Seed Certification Program

The Seed Certification Program will be organized in the Crops and Rice Divisions of the DA. Participation in the Certification program will be voluntary and it will be available to any seed grower who agrees to abide by the rules and regulations established. The Seed Project's success is not dependent upon the development or implementation of this program though it is anticipated that a portion of seed produced during the Project's later years will be certified.

(1) General Scheme

(a) Seed Classes

A maximum of four generations of any variety will be supervised, usually referred to as:

- Breeder's Seed - as developed by the plant breeders.

- Foundation Seed - the progeny of Breeder's Seed

- Registered Seed - the progeny of Foundation Seed

- Certified Seed - the progeny of Registered Seed.

Any additional generations or multiplication will be identified as non-certified, or commercial seed.

(b) Field & Seed Standards

Internationally accepted standards will be used as a guide in establishing Thailand's standards in the Seed Certification program. Regulations issued by the DA will prescribe:

- Field requirements for each crop

  - isolation distances from like crops
  - contamination by other crops or noxious weeds.

- Harvesting and processing protection requirements

- Seed requirements--purity, germination, weed seed content, etc.

- Packaging and identification requirements.

(c) Certification Procedures

Each stage in the production of the different classes of certified seed is supervised by the inspector from the Certifying Agency to make sure that contamination is minimal and varietal purity is maintained. The various inspections and tests will include:

Field history. DA regulations will stipulate requirements of a field to be used in production of certified seed, i.e. previous crops grown, presence of undesirable weeds, etc.

Isolation. Cross-pollinated crops will require specified distances from like crops.

Seed used for planting. The farmer will be required to prove the certified class and variety of seed being planted to produce a certified seed crop.

Crop Inspection. Inspections of the growing crop are made to confirm the crop is true to variety, and that off types and undesirable weeds are removed within prescribed tolerances.

Identification of harvested seed. Inspectors are responsible for ensuring that the total amount of seed harvested from a particular field was, in fact, harvested from that seed crop. Inspectors will brand and seal all containers as they are filled from harvesting.

Supervision of seed processing. To guard against contamination by mixing or careless handling in the processing mill, inspectors will determine proper care is taken during the seed cleaning process.

Seed Testing. Upon completion of seed processing a composite sample will be drawn by the inspector and submitted to the National Seed Laboratory for analysis. Based on seed standards prescribed by regulations issued by the DA, seed to be certified must meet or exceed these standards.

Sealing and tagging. The final act of seed certification is sealing the containers of the seed, and attaching a tag prescribed by the Certifying Authority. Information included on the tag will be the species and variety of seed, certification class, purity, germination, and date of the test.

Rejection. Fields inspections, or seed inspections which identify seed which fail to meet prescribed standards in any of the previous steps will be the basis for rejection from certification.

(d) Certification Fees

Certification programs are usually not self supporting, however, minimal fees will be established for field inspections, sampling and testing, and sealing and tagging.

(e) Manpower Requirements

Preliminary plans indicate that a staff of 12 professionals will be needed to conduct the Certification program. At this time the specific staff phasing plan has not been fully developed. The personnel and facilities used for determining the quality of clean seed for the regulatory program will perform the same function for the Certification program. The certification field inspectors will be added as the need arises with only two inspectors needed during the initial years of the program.

(f) Facilities and Equipment

No additional facilities or equipment were requested from the Project. The major equipment item not presently available to this program will be vehicles for the field inspectors. The vehicles and operational supplies required will be supplied through the DA Seed Production, Processing and Storage Project.

(g) Training Requirements

The Seed Act essentially made official the certification program that had been in effect for the Rice and Crops Divisions for several years and will extend this service to all seed growers on a time phased basis. Because of this "unofficial" certification program trained field inspectors are already available in the foundation seed production sections of each crop group. However, the Seed Act's official establishment of the Certification program will require a refinement of techniques and procedures if the program is to reach internationally recognized levels of excellence. To assist the DA in its effort to upgrade the certification program two short term (3 months) third country training tours are provided through the Project. One will be used for a study of the National Seeds Corporation certification program in India and the other to study the certification program of the Bureau of Plant Industry in the Philippines. Additionally, the services of one short term seed certification consultant will be utilized after the program has had an opportunity to operate for one or two year.

PART III Project Analyses

A. Technical Analysis

In its Third National and Social Development Plan (1972-76), the RTG recognized that achievement of planned crop production targets would require very substantial improvements in the availability of production inputs and their use by Thai farmers. Major emphasis was given to improving the production and supply of improved seed, and the DOAE was assigned responsibility for this task. The critical importance of an adequate and timely supply of improved seed for increased crop production in Thailand was reaffirmed by independent analyses of the seed production and supply situation in 1973.1/ Some progress has been made in seed production and supply since 1973 but it has been slow and inadequate in scope (see Background).

This project is addressed to the task of developing an effective and responsive seed production and supply program in Thailand during a six year period.

1. Crop Improvement Research

On-going, productive and resourceful crop improvement research is the requisite foundation for establishment and growth of a seed program/industry. Conversely, an effective seed production and supply system is essential for extraction of maximum benefits from an investment of resources in crop improvement research, especially crop introduction and varietal improvement.

Thailand has excellent to adequate crop improvement programs for the crops covered in this project, i.e., rice, corn, soybeans, peanuts, sorghum and mungbean. Major responsibility for crop improvement research resides in the Department of Agriculture (DA), where it is organized on a crop or crop group basis. Rice research is conducted by the Rice Division of DA, while research

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1/ FAO/IBRD Seed Project Reconnaissance Mission to Thailand. Report No. THA. 5 3/73. FAO/IBRD Cooperative Program. January 1973.

Seed Program/Industry Development in Thailand. Report to USAID/Thailand and AID/W. Report No. TA-73-10. Mississippi State University. August 1973.

on the other crops included in the project is conducted by the Corn and Sorghum Section and Oil Crops Section (soybean, peanut and mungbean) of the Crops Division.

The Universities also participate actively in crop varietal improvement work. Kasetsart University, the oldest and most important, is heavily involved in joint research programs with the DA on rice, corn and sorghum. A request is also in preparation for UNDP assistance to establish a soybean breeding and improvement program at Kasetsart University.

The rice and corn/sorghum programs are also supported by the Rockefeller Foundation and strong and intimate linkages have been established with IRRI, CIMMYT and other international and national research centers. In terms of cooperation, level of support, and productivity, the rice and corn/sorghum improvement programs rate among the best in the developing world.

Soybean research is centered at the Mae Jo Station in the North and is assisted by Japan. Peanut and mungbean research is only adequate; nevertheless, improved varieties have been released and other improved strains are in the advanced test stage.

Rice

There are three distinct "types" of rice varieties in Thailand: traditional native varieties, improved varieties of the native type, and the dwarf to intermediate statuvarieties of the "high-yielding" type. A substantial area is still planted to the hundreds of traditional varieties, which have excellent grain quality. Improved varieties of the native type are probably now dominant in the wet season, with the dwarf and semi- dwarf types widely grown in the dry season. Some of the newer high yielding varieties have good grain quality and the ability to do well in the wet season when water level is not too controllable.

Major emphasis in the rice breeding program is on stabilization of yield through incorporation of appropriate resistance to major diseases and insects. Advanced lines incorporating these desirable traits have been submitted to the rice varietal evaluation and release Committee. This project will concentrate on production and supply of seed of existing improved varieties and new varieties as they are released (Annex B-15 and B-16).

Corn and Sorghum

The Guatemala Yellow-Flint Corn variety CIIO was introduced in the early 1950's and provided the basis for the remarkable developments in corn production in the late 1950s and 1960s. It is still the dominant variety in the corn producing areas. Varietal deterioration of CIIO through out-crossing required the development of an improved strain in the late 1960s which was named PB 5. This variety has a yield advantage over the traditional CIIO of 15-20% even under the "no-input" normal corn production practice, and 30% with moderate amounts of fertilizer.

The downy mildew disease first appeared in Thailand in 1968 and, thereafter, spread very rapidly. A severe epiphytotic of downy mildew contributed greatly to the severe decrease in corn production in 1971. Incorporation of downy mildew resistance in advanced strains has, therefore, become a matter of urgent priority. The Tainan-10 and "Bogor" varieties which had some resistance to downy mildew were introduced, multiplied and disseminated as an intermin measure. The downy mildew resistance program is well advanced and resistance strains are in the process of release. As in the case of rice, main emphasis on maize breeding is on stabilization of yields through incorporation of disease and insect resistance, with continuous but modest improvements in yield potentials.

The dominant varieties of sorghum are early and late Hegari, white seeded varieties which are subject to considerable losses in quality from weathering and are unpopular with potential foreign buyers. They are also susceptible to Helminthosporium leaf blight and shoot fly, both serious pests. The new varieties are very high yielding but the more promising also have a high tannin content which limits their acceptibility in the export market. New disease and insect tolerant lines with low tannin content are under development.

Seed production efforts in the project will concentrate on the existing improved varieties and potential varieties as listed in Annex B-15 and B-16.

Soybean

Commercial soybean production is a relatively new enterprise in Thailand. The SJ-1 and SJ-2 varieties released a few years ago are widely grown but poor seed quality (low germination) results in poor stands which contributes to severe weed problems and low yields. Two new varieties, SJ-3 and an as yet unnamed rust resistant variety to replace SJ-1 are in the process of release (Annex B-16).

Poor nodulation is another serious problem in soybean production especially in some of the newer soybean producing areas. Use of an effective strain of inoculum for a few years until the soil is adequately populated with the desirable strains of Rhizobium would overcome this problem.

Peanut and Mungbean

The peanut and mungbean research effort is only adequate. Nevertheless, a new, higher yielding variety of peanut (Tainan #9) with better quality and shelling percentage is being released and should increase production when widely distributed. A new mungbean variety with more uniform maturity, thus facilitating harvest and greatly increasing harvestable yield, is being released. Farmers are reportedly paying a 60% premium for limited quantity of this variety already in the "grain" market. Varieties of peanut and mungbean scheduled for production in the project are given in Annex B-15.

Overall Crop Improvement Strategy

It is evident from the brief foregoing review of on-going crop improvement research directly relevant to the project that Thailand has only partially adopted the "high yielding variety" (HYV) strategy. This position should not be unexpected considering that Thailand is not confronted with mounting food deficits and has a quality export reputation to maintain, especially, in the case of the rice. Further, the "high yield" development approach is presently adaptable to only three of the six crops included in the project, viz., rice, corn, and sorghum.

In the case of rice the HYV plant type and genetic background has been and is being incorporated into the breeding program with essential modification to the realities of rice culture in the country: high cost of fertilizer with relatively low farm gate market prices; high milled rice quality standards to meet export requirements; and poor control of water level during the main wet season production season. In view of these realities the slow but steady approach to higher yield levels with built in stabilizers such as resistance factors appears to be entirely appropriate.

Corn production and yields in Thailand are already relatively well advanced compared to many other developing countries and this has been achieved with limited outlay for costly inputs. Existing improved varieties - mostly composites and synthetics - have a substantial yield advantage (15-30%) over the widely grown CHO yellow flint in on-farm culture with little or no fertilizer, thus, use of one of the improved varieties is, "probably more profitable to the grower and with much less risk than a moderate rate of fertilizer", 2/ considering that improved seed adds little to the cost of production. An additional but variable "yield kick" is obtained depending on incidence and severity of downy mildew and other diseases for which the improved varieties have resistance.

Sorghum is presently of minor importance compared to corn, but it appears to have great potential as a crop for the areas too dry for corn. The research effort on sorghum was only recently intensified and still is at a low level compared to corn. The development approach, however, is sound and modern and the newer varieties in sight have very substantially improved yield potential and resistance. The yield "kick" from existing improved varieties is 30-70% with little (or no) to moderate fertilization.

HYVs of soybeans, mungbeans and peanuts have yet to be developed in any country. Solid improvements in yield, yield stabilization and adaptability, however, are being made and the programs in Thailand are taking full advantage of developments. Presently available improved varieties out-yield commonly grown varieties by 20-40%, have greater resistance, and better specific qualities: e.g., higher oil content in soybeans, higher shelling percentage and better kernel quality in peanuts, more uniform maturity, hence, greater harvestable yield with less labor output in mungbeans.

2/ 1973 Annual Report. Thailand National Corn and Sorghum Program. Kasetsart University and the Department of Agriculture. p. 31.

This over-view of crop improvement strategy in Thailand is partly in response to one of the points raised in the PRP review, viz., that economic benefits calculations should differentiate between improved seed production for (a) crop varieties common in project area, and (b) high-yield varieties already developed but still not in widespread use due to seed supply insufficiencies.

The project is not designed to produce and supply traditional, native or "common" varieties. There would be no valid purpose of a project to produce and supply seed of varieties already widely grown and in the traditional farmer seed-saving pattern, except for soybeans for which the seed-saving practice does not work well because of rapid seed deterioration (loss of germination), and as an exercise to establish a seed production and supply base for the future. The project will focus on existing and potential new varieties which may or may not fit the general concept of an HYV derived from rice and wheat experiences. In the economic analysis, therefore, benefit calculations distinguish only between existing and new (prospective) varieties, both of the improved type.

2. Organizational Features

During the project reconnaissance and study phase, 3/ several technical, organizational and financial deficiencies were identified as major impediments to the development of a seed production and supply program adequate to support present and projected crop improvement programs in Thailand. These are:

(1) The lack of a National Seed Plan or Program with firm, consistent policies regarding seed program development, clear definition of responsibilities of the several agencies involved, and the private sector, realistic goals, and a suitable organizational structure.

(2) Dispersal of seed production and supply responsibilities among the several crop improvement divisions in DA and the DOAE without adequate mechanism for their coordination and integration.

(3) The lack (until the recent completion of the Phitsanulok facility) of specialized drying, cleaning, and storage facilities essential for the production of seed of good physical and biological quality.

3/ See foot note 1.

(4) Inadequate standards for seed quality, quality control procedures, and an incomplete and often short-circuited system for the orderly multiplication of seed of improved varieties with maintenance of varietal purity.

(5) Inadequate distribution and marketing expertise, facilities and arrangements, which are as necessary for the creation of effective demand for seed, as for any other agricultural input.

(6) Insufficient financing over a long enough period to permit the establishment of a viable seed program/industry.

The technical dimensions and organizational features of this project are designed to overcome present difficulties and deficiencies in Thailand's seed production and supply program to the extent possible, as well as to establish an organizational and technical frame that will facilitate growth and expansion of the seed program as may be needed in the future and permit - in time - the emergence of an effective, responsible, responsive seed industry.

Bases and Purposes of Organizational Structure Adopted

This project along with related developments such as the formation of a "working group" for the project, projected formation of a Project Implementation Committee, appointment of a project manager, reactivation of the National Seeds Committee, and the recent enactment of a "Seed Act" become - in effect - a national seed planning and policy group for the RTG, while the project itself becomes the framework of a national seed plan. These developments and mechanisms for additional planning, policy making and continuing direction as might be needed, should be adequate and appropriate for the needs in this area for the duration of the project, and with timely up-dating, for the years ahead (see Part IV.A.).

The problems of dispersal and duplication of efforts, overlapping functions, lack of coordination, and deficiencies in distribution/marketing are resolved to the extent possible by:

(1) Establishment of a project management/coordination committee with representation from DOAE, DA, the Marketing Organization for Farmers and other agencies which interface with the seed program.

(2) Assignment of specific operational responsibilities to the agencies most directly involved in implementation of the project:

(a) DA - breeder and foundation seed production, quality control, and regulatory services (i.e., seed certification, testing, enforcement of other provisions of the "seed act".)

(b) DOAE - seed multiplication and production, drying, processing packaging; operational and technical training of seed specialists and workers; farmer education in use and benefits of improved seed; promotions of good seed; assessments of demand. By the end of the project DOAE responsibilities for seed multiplication and production, drying, processing, and packaging operations and facilities established will have been transferred to MOF with the exception of the facilities at the Phitsanulok Seed Center. The latter will be retained by DOAE to also serve as a center for operational and technical training and development work in seed technology.

(c) MOF - seed distribution and marketing, promotional activities, seed multiplication and production, phased-in during the project, and drying, processing and packaging except for the Phitsanulok Seed Center as discussed in (b) above, at the end of the project.

The organizational structure adopted in the project and assignment of responsibilities are neither novel nor radical. They are, in fact, quite representative of the pattern followed in many other countries with established or developing seed programs, and are well within the capabilities of the Thai agencies involved.

3. Appropriateness of Technology Adopted

The technology adopted in the project is fairly standard for seed program/industries in both developed and developing countries with appropriate modification, of course, to fit conditions in Thailand. It is new to Thailand only in terms of its "completeness", integration into a coordinated program with established goals, and its scale or scope. Portions and elements of the technology have already been introduced and established, although not efficiently because they are not now integrated into a complete program; e.g., foundation seed production, seed testing, the Phitsanulok Seed Center.

The appropriateness of the technology adopted has been amply demonstrated in countries around the world including many with cropping, social and climatic patterns similar to those in Thailand. Essential features of this technology of seed are: (see also Part II.B.).

(1) Systems for maintenance of varieties and systematic, controlled multiplication of seed so that varietal identity and purity is maintained.

(2) Concentration of seed production within selected cropping areas or regions to permit and facilitate management and inspections, and the proper timing and control of critical operations.

(3) Establishment of facilities in each selected seed production area adequate to handle the volumes of seed scheduled with maintenance of varietal purity, minimal loss in germination, substantial improvements in physical purity through processing, and maintenance of seed quality during storage for the period desired.

(4) Quality control procedures which establish minimum standards of seed quality, monitor and evaluate seed quality throughout the production-processing-storage-marketing cycle, continuously lead to improvement, and ensure that the seed made available to farmers are of acceptable quality.

(5) A distribution and marketing organization system with capability of supplying quality seed of the right kinds and varieties in the needed quantities at the proper time to marketplace accessible to farmers.

(6) Provisions for in-depth, training of prospective managers and supervisors, and in-service training of workers at the operational levels; establishment of a capability for in-country training of specialists and workers who will be needed as replacements and to man the key positions and for future expansion of the seed program/industry.

The DA, which will be responsible for varietal maintenance and the production of foundation seed, already has the experience and more than adequate facilities and operational capability for its assigned tasks (see Part IV.A.). In fact, the project will benefit DA directly by general seed production responsibilities, thus, permitting greater use of time and resources for research activities. The DA Rice Division, however, will retain responsibility under the RTG/IBRD rainfed rice project for production of about 2,000 mt. rice seed by the project for use within the project area. This effort has been taken into consideration in establishing the rice seed production goal at the Khon Kaen Center.

Foundation seed produced by DA will be purchased by the seed production unit of the project for multiplication by private farmers under a contractual arrangement for a 15% premium above the price of equivalent grain. To this extent, therefore, the private sector will participate in the seed program. Private farmers will benefit in three ways: (a) they will receive the 15% premium without any marketing expense as the seed will be picked up at the farm site; (b) yields will be increased by 15-30% as a result of use of improved, high quality seed; and (c) they will receive direct extension training and information from the field inspectors and production supervisors. The average Thai farmer works 25.6 rai (10.2 acres)4/. Assuming that on the averag a seed producer will contract for 10 rai seed production, about 3,000 farmers will be involved in specialized seed production by year six of the project (Annex D).

Seed production will be supervised and inspected by personnel of the project seed production unit utilizing procedures of demonstrated effectiveness. Seed meeting contract quality specifications will be picked-up for transport to four seed centers for drying and processing. An internal quality control capability has been

4/ Annual Report - 1974. Agricultural Sector Analysis, Thailand. Iowa State University.

designed into each of the seed centers and will be used as a operational management tool (see Part II.B.).

Facilities at each of the seed centers will be similar except that provisions have been made for improvement of designs and layouts of the Chiang Mai, Chai Nat and Khon Kaen Centers over the existing one at Phitsanulok (Annex B-14). Each center will have the capability of drying 25-50 mt seed per 24 hour period - depending on extent of moisture reduction required - and processing/packaging of 25 mt seed per 8 hour working day. Processing capacity can be easily expanded by using double-shifts during especially busy seasons, and by scheduling higher levels of production during the dry season under irrigation. The drying and processing facilities are also directly adoptable for all other kinds of seed. They are simple in design and take into account the manner in which seed will be received (in sacks), the specific requirements for each seed kind, e.g., shelling of corn, and the required flow of seed from receiving through load-out from storage. For these reasons, the replicability of the technology adopted is excellent. When and if the need arises, similar seed centers could be easily established in other regions of Thailand.

Because of inherent difficulties in production and storage of soybean seed, and storage of peanut seed, features for minimization of problems have been designed into the project. Soybeans will be produced during the dry season with supplemental irrigation so that weathering will be minimal during the critical harvest period. Since relative humidity at the Phitsanulok and Chiang Mai Centers, which will be handling soybean seed, average above 70% during the storage period, air-conditioned warehouses have had to be specified. Air-conditioning will reduce temperature by 5-8°C and humidity by 10-15%, which is necessary to maintain germination for the 8-9 month storage period.

Peanut seed will be handled entirely in the shell. Shelled peanut seed have a very short storage life, and shelling is required only when mechanical planting is the practice, which is not the case in Thailand.

The facilities, equipment, vehicles, and supplies provided for are appropriate for the seed kinds handled and adequate in capacity. The costing (January 1976 basis) is as realistic as possible in these times.

4. Seed Kinds and Targets (Annex B-4)

The six crops included in the project are major seed propagated crops in Thailand from the standpoints of both internal consumption and exports. The 6th year targets represent the following percentages of the total seed needed to plant each crop each season:

Rice.....	2%
Corn	6%
Soybean	31%
Peanut	6%
Mungbean.....	5%
Sorghum.....	7%

While these targets may appear low, it should be recognized that all of the crops included in the project, except corn, are self pollinated and that none are hybrids. Even in an agriculturally advanced country such as the U.S.A., farmers renew their seed stocks of self-pollinated crops only about every 3-4 years on the average. This amounts to a market demand for seed of such crops of only 25-33% of total quantity needed for planting - the remainder comes from farmer-saved seed. Experiences in other developing countries and the "developing" stages of the developed countries, show that a seasonal demand for seed above about 10% of the total requirement can be achieved only by relatively massive extension and market promotion programs, unless the seed-saving practice cannot be relied on for various reasons. In Thailand as in the Southern U.S., and other areas with humid sub-tropical and tropical climates, soybean seed does not maintain its viability (germination) well from harvest to planting under on-farm drying and storage conditions. For this reason, a 31% of total seed requirement for soybeans was targeted.

It should also be recognized that seed are a multiplying rather than consumable input, such as fertilizer or pesticides. A kilogram of improved rice seed planted by a farmer in Thailand yields on the average about 50 kg. of grain, which has all the biological and genetic properties of the seed planted provided viability is maintained and the seed are not admixed with other varieties. Thus, the farmer has a source of improved seed for his own use next season, and if the variety is sufficiently improved to attract attention of his neighbors to supply some of their needs also through traditional farmer-to-farmer seed exchange practices. Therefore, the diffusivity of improved seed is of a very high order.

5. Bases for Projected Benefits

The projected benefits (Part III. B) were determined on the basis of a no increase in the use of other material inputs such as fertilizer, pesticides, etc., which appears realistic in light of high and rising fertilizer and other agri-chemical prices. The projected benefits, therefore, will derive from inherent yield advantages of the improved varieties over common and traditional varieties under limited input conditions, and better seed quality, hence, better stands, fewer weeds, and greater yield. The expected yield increases used in the benefits analyses were calculated on the basis of results from farm-demonstration plots, fertilizer experiments in which a 0 fertilization level served as a check, discussions with plant breeders and crop scientists, and experiences in other countries - developed and developing. The projected yield increases over traditional varieties used are:

Crop	Yield Increases Expected from Improved Varieties (%)	
	Existing	Prospective (New)
Corn	20	25
Sorghum	20	30
Soybeans	20	20
Mungbeans	15	20
Peanuts	20	20
Rice		
Phitsanulok	15	20
Khon Kaen	20	30
Chiang Mai	15	20
Chai Nat	15	20

6. Effect of Project on Employment

The project will have a beneficial effect on employment: at year six, about 3,000-3,500 farmers will be engaged in specialized seed production, and the number of persons shown in the manning tables will be gainfully employed in production supervision, management, processing, and marketing. Labor in the various operations is used to the extent possible. Operations are "mechanized" only as essential to technology involved, and when labor cannot be substituted, or is so inefficient as to impede the rate and necessary sequencing of operations.

7. Inoculum Production/Use

It is very evident - strikingly so - in some cases that soybean production could be enhanced by 40-60% in some areas just by use of suitable Rhizobium inoculum for nitrogen fixation. It is equally evident that soybean production has extended out of the traditional zones, and it is these extensions which are most deficient in inoculum potential.

There are two alternatives for improving the soybean inoculum problem: (a) increase production of inoculant in Thailand from the present 5,000 rai/year production level twenty to fifty-fold; or (b) import inoculant in the same quantity. Specialized expertise is needed to assess these alternatives, and is provided for in a condition precedent to this loan.

8. Environment Impact Statement

(1) The project is designed to improve income in the rural sector through production and distribution of seed of improved varieties with marked increases in yield, which will increase production per unit area, and, thus, income per farm. The projected benefits of the project are not dependent on any increase in the prevailing use level of fertilizers and crop applied agri-chemicals. Pesticide usage should, in fact, be decreased as a result of use of disease and insect resistant improved varieties. About 3,000 - 3,500 farmers will be engaged in specialized seed production operations by the end of year six of the project, and about 130 specialists and laborers in supervision of seed production operations, and in processing marketing and promotion of use of improved seed. The use of inoculants for soybean as envisioned in the project will gradually eliminate the need for nitrogenous fertilizer.

The only potential sources of adverse environmental effect are dust pollution in the processing-cleaning plants and seed treatment chemicals used for fumigation to control storage insects, and to protect the seed from deleterious micro-organisms in the seed bed micro-environment.

The potential dust problem will be prevented by use of dust collection systems with cyclone type collectors over all dust sources. This type of system is in common use in seed operations in the U.S.

In the case of fumigants, the phostoxin fumigant will be used. Fumigation will be accomplished in seed storage warehouses provided with locks on all openings and warning signs. After fumigation for the proper time, ventilation fans will be activated from the outside and allowed to run for a minimum of 12 hours to clear interior of remaining fumigant vapors. Further, all doors and other openings will be opened before entry into the warehouse. This type of fumigation is in present use in Thailand in grain collection and storage points.

Slurry type seed treatment chemicals will be used to prevent any dust problem, and treated seed will be packaged in 3-ply kraft paper bags. Chemicals used will be thiram, captan, sevin and malathion, all in common use for similar purposes in the U.S. and

already in use in Thailand. Dust masks and other standard worker safety items and measures are provided for in the project funding. Seed treatments will be colored with high visibility dyes and all treated seed packages will bear appropriate treated seed warnings and symbols on the tag as well as on the package. Seed treatment will be used for only about one-third of the targeted seed production.

(2) The project does not have any adverse environmental effects which cannot be avoided.

(3) The only viable alternative to proposed project and activity is to continue with present ineffective and insufficient system for seed production and distribution, which has become a serious impediment to agricultural development in Thailand.

(4) Improved seed, the end product of the project, are a multiplying resource.

This statement was prepared by James C. Delouche and Howard C. Potts, Professors of Agronomy and Seed Technology, Mississippi State University.

B. Financial and Economic Analysis

1. Method of Analysis and Order of Presentation of Findings

The economic analysis of the proposed total seed project and its various components utilized the IRR Feasibility Analysis Program which is a part of the Kansas State University computerized system for feasible agribusiness development. Supporting analyses for input to the cash flows were made with the Master Projection program in the same computerized system. All of the computer runs were made at the U.S. Embassy computer center in Bangkok.

Three types of analysis have been made:

a. Internal rate of return (IRR) analyses to test the ability of the project to generate cash flow internally and earn a return to total capital investment at the proposed margins and selling prices for the agricultural seeds to be produced.

b. Direct rate of return (DRR) analyses to test the economic viability of the project as a public venture for generating measureable benefits to the intended direct beneficiaries.

c. Social rate of return (SRR) analyses to evaluate the projected over-all impact on the economy of Thailand.

The data were prepared and the analyses made by component of the project as well as for the project as a whole. The components include the three major functions,

(1) Contract seed production,

(2) Seed processing, packaging and storage,

(3) Seed marketing and distribution, and the four production areas:

- Phitsanulok
- Khon Kaen
- Chiang Mai
- Chai Nat

Tables of data and results are presented in sets ranging from A. Phitsanulok Seed Processing Plant to E. Phisanulok Contract Seed Production to L. Marketing from the Chai Nat Plant.

A combination number and letter code is used to designate the tables in each set. The projected summary cash flow tables for the economic analysis are designated as E-, starting with Table E-1 showing the IRR analysis for the seed processing plant at Phitsanulok. The sets of supporting appendix tables for the Table E series are designated as follows:

OP - series showing projected operating volumes by period

Table OP-1	Projected Volume of Seed Sales
Table OP-2	Projected Volume of By-Product (Grain) Sales
Table OP-3	Projected Volume of Seed Stock Purchases

OR - series showing projected revenues by period

Table OR-1	Projected Revenue for Seed Sales
Table OR-2	Projected Revenue from By-Product Sales

VC - series showing projected variable costs by period

Table VC-1	Projected unit costs in 1976 values
Table VC-2	Projected Total Variable Operating Costs
Table VC-3	Projected Cost of Seed Stock Purchases
Table VC-4	Projected Net Cost of Seed Stock Purchases

Tables FC-1 Projected Total Fixed Costs

L - series showing projected labor requirements and costs by period

Table L-1	Projected Labor Requirements
Table L-2	Projected Labor Cost

WC - series showing projected working capital requirements by period

Table WC - 1	Projected Average Monthly Inventories of Seed
Table WC - 2	Projected Average Monthly Inventory Values
Table WC - 3	Projected Average Monthly Accounts Receivable
Table WC - 4	Projected Total Working Capital Requirments

A standard format is used for all summary tables of investment feasibility analysis in the E series, and is illustrated by Table E - 1. The IRR (DRR, SRR) is shown at the top of the table as an annual percentage return on total capital investment in present value terms. The periods are shown by number from O to 30 in the first column, and by designation in the second column. Each period represents six months, as indicated by 76-1, 76-2, etc. The next three columns are the projected investment requirements for facilities (fixed assets), working capital (current assets) and total investment (total assets). As indicated in the table these figures are given in terms of U.S. Dollar equivalents. The facility figures represent the estimated original capital cost by period as the outlay will be required, and costs for replacement of depreciated equipment when needed. The negative figure show for period 30 represents the remaining depreciated value of the total fixed assets at the end of the planning horizon. It is shown as a negative investment to properly credit for the remaining "unused" investment at that time. The figures in the working capital column represent the incremental additions (or subtractions) to working capital needed period by period. The alternate plus and minus figures after reaching full production (periods 14 and 15) reflect the seasonal patterns in operations and seed sales. The negative figure in period 30 represents the accumulated total working capital balance from level-off onward, and is entered to zero this column at the end of the planning period. The figures in the total column are the summations of those in the two previous columns.

The columns in the center Section of Table E-1 contain the projected operating flows period by period--total revenue, total expenses and net revenue. As indicated by the footnote, the operating expenses exclude depreciation, interest and income tax in order to

avert double counting and provide a proper measure of the return to total capital investment.

The remaining columns in the main body of the E tables are calculated by the computer program. The present value factors are those discount factors for bi-annual compound discount rate indicated by the earning rate at the top of the table. The present value columns are obtained by applying these factors to the figures in the total investment and net revenue column, period by period. By definition for a time solution for the IRR (DRR, SRR), the total net present values of these two columns are equal.

The lower section of the E - table shows the fully-discounted benefit/cost ratio and present values of the net revenue schedule, the total capital investment schedule and the balance schedule over the 31 six-month periods at alternative annual discount rates. The figures shown in the last column represent the net present values of the projected cash flows at these alternative annual discount rates.

Each of the E tables is preceeded by a summary of all nine columns of input data used to solve the IRR (DRR, SRR). The code number shown just below "a listing of the data" indicates how these columns are combined in the corresponding E table. The number 21241 for Table E-1, for example, the first two columns are facility investment, the next one colum is working capital, the next two columns are operating revenue (benefits), and the last four columns are operating costs. The fifth digit in the code indicates that the type of analysis to be made is to determine the internal rate of return (IRR).

With the exception of the building and equipment cost estimates, the figures in the input columns for the E tables are border totals from the supporting tables in the appendix. The supporting tables for the estimated capital outlay figures for buildings and equipment are included in the technical section. The working capital figures in the E tables represent the total column from Tables WC-4. The sales revenue figures in the columns for existing varieties and new varieties of seed are taken from Tables OR-1. The fixed cost figures are the totals from Tables FC-1. The labor cost figures are the totals from Tables L-2. The other variable cost figures are the totals from Tables VC-2. The figures in the last input column to the E - tables, cost of seed stock purchases come from the total column of Tables VC-3 (or in the case of the seed processing function, from

the total column of Table VC-4). The volumes and unit prices for the supporting tables are shown by separate appendix tables, and by the footnotes to these tables.

2. Basis for Prices and Unit Costs

The prices for all outputs from the project and the unit costs for all capital outlays and operating expenditures were based on projected levels for January, 1976--the approximate starting line for the project. The price indexes for adjusting past and current levels were derived from the April 1975 "Economic Situation and Trends in Thailand" published by the American Embassy, Bangkok and comparable reports by the RTG. The 1976 projections are based on current indicators rather than direct extrapolation of past trends. The capital outlay and annual expenditure items are based on the wholesale price series for Thailand, and are converted from baht to dollars at the rate of 20 to 1. The 1976 projections and index levels since 1972 for the commodities to be used in project are shown in Table UP-1.

TABLE UP-1. WHOLESALE PRICE INDICES FOR THAILAND
(1968 = 100)

		+23%	+29%	+14.5%	+14.5%
	1972	1973	1974	1975	1976
All products[a]	111.2	136.6	176.1	191.6	219.4
All products[b]	109.8	137.2	177.6	179.6	185.4
Const. Materials[b]	106.2	138.7	197.9	202.3	226.6
Pet. Products[b]	104.9	104.9	219.1	219.5	220.8
Transp. Equipment[b]	134.0	158.2	179.6	204.2	205.6
Mach. & Equipment[b]	109.1	132.2	159.6	159.7	160.0
Agr. Products[b]	109.1	136.4	169.4	181.3	190.9

[a]Annual average

[b]June levels, except 1976 at the projected January level

[c]At 50% of the rate of inflation during 1974 = 14.5%

The projected buying prices for seed stock and selling prices for packaged processed seed are related to the projected prices for the corresponding grain for the areas served by the four plants. They are based on the reported January 1975 prices received by farmers in each agro-economic zone as reported in Agricultural Economic News, MOAC, Bangkok, February 1975 (see Table UP-2). These prices were projected to January 1976 levels in dollars per metric ton (see Table UP-3). The projected values of seed were factored from these figures.

The factors applied to the projected base prices by grain in each area are as follows for foundation seed and raw seed:

Level	Existing Varieties	New Varieties
Foundation seed	200%	250%
Price to growers	115%	115%
Price to processing	120%	125%

The factors for processed and bagged seed are

Level	Existing Varieties		New Varieties	
	Treated	Untreated	Treated	Untreated
Price to M. O. F.	165%	160%	170%	165%
Price to M. O. F. Outlets	172%	167%	182%	177%

The net delivered price t farmers at the retail level is expected to average 12 to 13 percent more (on the grain price base), or from about 180 percent of the market price to 195 percent of the market prices for the corresponding grain according to the above classifications.

3. Internal Viability of the Project

The projected seed prices derived by applying these factors to the projected base prices from Table UP-3 were used to establish operating margins to test the internal economic viability of the project for covering operating costs and earning a return to the required total capital to finance current and fixed assets. As explained in subsection 1, computerized internal rate of return analysis was used for

TABLE UP-2. PRICES RECEIVED BY FARMERS BY ECONOMIC REGION

JANUARY 1975

Baht/MT

Crop	PHITSANULOK (Zone 8)	KHON KAEN (Zone 3)	CHIANG MAI (Zone 10)	CHAI NAT (Zone 6,7,11)
Paddy Rice #1	2,227.05	2,115.83	2,036.45	2,356.27
G. Paddy Rice #1	1,875.00	1,950.00	1,907.29	2,220.83
Corn	1,760.00	2,250.00	2,020.00	2,316.67
Sorghum	1,960.00	1,960.00	NA	1,970.00
Mungbean #1 large	3,880.00	4,000.00	4,000.00	4,840.00
Soybeans #1	4,030.00	NA	4,560.00	4,865.00
Peanuts, dry in shell	4,840.00	3,460.00	3,640.00	4,040.00

Source: Agricultural Economic News, MOAC, Bangkok, February 1975.

TABLE UP-3. PROJECTED BASE PRICES - JANUARY 1976 ($/MT)

	PHITSANULOK	KHON KAEN	CHIANG MAI	CHAI NAT
Paddy Rice	125.32	119.06	114.60	132.60
G. Paddy Rice	105.51	109.73	107.33	124.98
Corn	99.04	126.61	113.68	130.38
Sorghum	110.30	110.30	NA	110.86
Mungbeans	218.35	225.10	225.10	272.37
Soybeans	226.79	NA	256.61	273.78
Peanuts in shell	272.37	194.71	194.71	227.35

Inflation rate at 12.55%: Conversion at Baht 20 = $1.

this purpose. Total capital investment is defined as the sum of fixed assets for land, buildings and equipment plus current assets for the working capital accounts, including cash, inventories, accounts receivable. Net income is defined as total operating revenue minus operating costs before subtraction of depreciation, interest payments and income tax payments.

The analysis indicates that the project is not an attractive venture in a commercial sense. The aggregate IRR for the total project is only 6.375 percent (Table E-110), well below both the market rate of interest in Thailand and the opportunity cost of private capital in the country. The IRR could be increased by raising the total margin for production, processing, storage, marketing and distribution; however, this would result in pricing the seed higher than farmers are willing to pay for non-hybrid seeds. They have opportunities of getting seed from neighbors, local grain merchants and other sources at prices which establish limits on the price of high quality seed.

The different segments and project areas yield similar results in the IRR analysis. The combined area IRRs by function are

Function	IRR (%)	Source Table
Contract Production	5.429	E-102
Processing and Storage	8.067	E-101
Marketing	12.509	E-9

By area within function, the internal rates of return vary somewhat, but all are relatively low, as indicated below:

(1) Processing and Storage

Area	IRR (%)	Source Table
Phitsanulok	11.406	E-1
Khon Kaen	6.729	E-2
Chiarg Mai	11.089	E-3
Chai Nat	8.357	E-4

(2) Contract Production

Phitsanulok	7.545	E-5
Khon Kaen	-1.522	E-6
Chiang Mai	12.379	E-7
Chai Nat	2.062	E-8

No separate analysis by processing plant location was made for the marketing function.

4. Analysis of Sensitivity to Changes in Assumptions

The scaling option for the input data schedules to computer program was used to test the sensitivity of the IRR to a series of alternative variations in factors affecting the commercial viability of the project. The results are summarized in Table E-17. Clear patterns are evident from these results. Among the functions, processing is much less sensitive to any of the factors than either production or marketing. The total project also is relatively insensitive. This phenomenon reflects the relative total value added in the different functions. Among the factors, price (margin) changes cause the greatest change in the IRR. A 10-percent change in either the price schedule for seed sales or that for the seed material purchased causes a drastic shift in the opposite direction in the IRR. In particular, a cut in margins would seriously jeopardize the economic viability of the project in the narrow commercial sense.

The project is not sensitive to changes in the cost of buildings, equipment, labor, variable operating expense items nor fixed operating expense items. A 10-percent increase in the cost of any of these items over the entire 30-period planning horizon of the project affects adversely the IRR by a small fraction of one percent.

The project is relatively insensitive to changes in the volume of seed put through the project each year. A 10-percent increase or decrease in total annual volume over the total planning horizon causes an opposite change in the IRR of about one percent, or slightly less.

The IRR is affected significantly by a change in the product mix of seed handled. A 10-percent shift toward the new varieties of seed not now available for distribution (replacing existing improved varieties) raises the internal rate of return for the project as a whole by nearly 3 percent. Such a relative increase in the new varieties compared to the mix projected in the base case is not believed practical and realistic. However, the results of this analysis support the policy of encouraging the continued emphasis on development of new varieties.

The supporting printouts for the sensitivity analysis is illustrated by the scaler option runs for the total project, Table E-110. This set of tablesis presented in the final section of the appendix.

5. Direct Economic Feasibility Analysis

It is believed that the most crucial test of the economic feasibility of public and semi-public projects such as the proposed crop seed project is the direct rate of return. In this analysis, the schedule of total capital investment for fixed and current assets is related to the schedule of net benefits to the direct beneficiaries of the project. The net benefits are measured by subtracting from the schedule of added net income to the beneficiaries, the schedule of total operating costs required to obtain these benefits. For the seed project, the direct beneficiaries are the small farmers of Thailand who will use the quality seed produced by the project plus the farmers who will grow the seed under contract to the project. The gross direct benefit of the project is measured by the added net income of these beneficiaries.

The total operating costs of the project include the total internal operating costs used in the IRR analysis plus the directly associated costs to insure the direct benefits.

The directly associated costs include (1) the costs of the agricultural extension program on the use of improved seeds, (2) the costs of development of new varieties for seed multiplication, processing and distribution, (3) the cost of administering the improved seed law in Thailand, and (4) the costs of technical assistance and training to support the program.

The direct rate of return on total capital investment in the Seed Project is highly favorable--136.676 percent per year, as shown in Table E-15, Investment Feasibility Analysis of the Projected Direct Impact of the Total Seed Project. As indicated in the listing of data input for this table, the major source of benefit is the added net income to the farmers who will use the improved seed to produce higher yielding and much more profitable food crops. These added farm income benefits are projected to reach $10,344,000 per year by 1983 (in terms of 1976 price levels). The benefits in added net income to the contract growers of the seed reach $32,000 per year by 1983 (Table E-15).

The sources of added net income to the seed users by type of crop over the total area are summarized in Table E-14. The more detailed tables by project area are numbered Table E-13, I through L. The footnotes to this latter set of tables indicate the decimal factors applied to the projected gross added income to determine the added net farm income. The factors are relatively large--for example in the Phitsanulok area .8731 for corn, .8902 for rice, .7195 for soybeans and .7278 for mungbeans. (Table E-13I). These factors were developed from the results of detailed farm production cost and income studies. These results are shown in Table E-18.

The impact to the seed users in terms of total direct income from which the added net income figures are derived are shown in Tables E-11 I through L. These tables were derived by applying the projected market prices to farmers for each crop as indicated in the footnotes to the tables (see also Table UP-3) to the projected added production resulting from the use of the quality seed. The added production projections are shown in Tables OR-11 I through L. These were computed by applying the factors shown in footnotes to the tables in units of 100 kilograms of increased production per metric ton of quality seed planted to the projected volume of seed sales (Table OR-1 I Appendix). See Part III, A., Technical Analysis, for the development of these factors.

The source of data for the added net income to the contract growers shown in Table E-15 is the set of Tables E-19E through H, Projected Direct Benefits to Contract Seed Growers. These tables were computed by applying the projected prices shown in the table footnotes to the projected volume of contract seed production (Tables OP-3, E-H, Appendix) and the added net income factor of 0.24. The factor reflects the added price of 115 percent of the farm price for the crop plus the added volume of production minus the added costs to the farmer.

The associated costs shown in the input table to Table E-15 were developed from figures presented elsewhere in the report. The costs for agricultural extension are shown in the extension requirements tables, Annex B-2, B-10 and B-12d. The costs for variety development are computed as a 10 percent royalty on total seed sales (Table OR-1(I). The costs for administration of the quality seed law were developed from information provided by the Chief, Agricultural Regulatory Division, DA. The costs of technical assistance and training are detailed in Annex B-20.

The direct project cost schedule shown in the last column of input Table-15 are taken directly from the "Operating Expenses" column of Table E-110, Combined IRR Cash Flow for the Complete Seed Project.

The DRR for the project as a whole was tested for sensitivity to variations in benefits and costs. The results are as follows:

Factor and Change	Change in the DRR
5% increase in benefits	+ 9.396
10% increase in benefits	+18.811
5% decrease in benefits	- 9.374
10% decrease in benefits	-18.723
5% increase in costs	- 3.784
10% increase in costs	- 7.497
5% decrease in costs	+ 3.856
10% decrease in costs	+ 7.786

The absolute changes in the DRR to these changes indicate sensitivity in the direct rate of return to changes in the schedules of direct project benefits and direct and associated costs. However, at the unusually high DRR for this project, these changes are small in relative terms. A simultaneous decrease in project benefits schedules and increase in the project cost schedules still would leave a highly attractive direct return to the total capital investment required for the project.

The computer runs to measure the sensitivity of the DRR for the total project as summarized above are shown in the set of scaler option Tables E-15, Annex K.

6. Total Economic Impact Analysis

The total economic impact analysis of the proposed seed project in Thailand relates the total capital investment schedule to the schedule of projected total net benefits for the project. The total net benefits represent the value of increased grain production, valued at the farm gate plus that portion of the value added through the marketing system which is greater than the added costs to marketing system. These benefits also include other measurable impacts such as employment benefits and training benefits. The total costs of the project for purposes of the total impact analysis include

all of those costs used in the DRR analysis plus additional associated costs to insure the impact benefits attributed to the project.

The results of aggregate impact analysis is summarized in Table E-16. Projected Total Economic Impact of the Seed Project. The discounted rate of return measure used for this purpose in the Kansas State University computer system is the Social Rate of Return, SRR. The SRR for the total seed project of 111.742 percent per year indicates a very favorable ratio of total economic impact relative to the capital investment required.

The source of the added crop production benefits shown in the input data to Table E-16 is the set of E-11 tables discussed in sub-section 5. In the absence of concrete data upon which to develop more accurate estimates, the net added income resulting from the value added to the grain in the Thai marketing system is estimated at 10 percent of the value of the added production, priced at the farm gate. The employment benefits credited to the project are zero over the total planning horizon. The latest official estimate for Thailand indicates a total unemployment rate of 3 to 4 percent, and much of this is in Bangkok and other areas outside the direct impact areas of the seed project. In view of these conditions, little justification can be made for using positive employment benefits to help justify the project. On the other hand, there is no evidence to indicate that the project will replace existing employment. The training benefits represent the added earning power of those persons who will be trained to fill positions of greater responsibility in the project. Supporting information for these figures is given in Part II B.

The direct costs shown in the input for Table E-16 are taken from the operating expenses column of Table E-15. The other costs, ranging up to $100,000 per year include miscellaneous other types of expenses, mostly in the public sector, to insure the project benefits.

Sensitivity analysis of the SRR for the project indicates somewhat less sensitivity than the direct rate of return. The changes in the SRR associated with changes in project benefits and costs are:

Factor and Change	Change in the SRR (%)
5% increase in benefits	+5.845
10% increase in benefits	+11.624
10% decrease in benefits	-11.905
5% increase in costs	- 2.691
10% increase in costs	- 5.320
5% decrease in costs	+ 2.753
10% decrease in costs	+ 5.570

The computer runs for the sensitivity analysis of the SRR are shown in the set of scaler option printouts for Table E-16 (Annex K).

7. Working Capital Requirements for the Project

The requirements for working capital in all three functions and all four locations were calculated for the seed project by 6-month period over the planning horizon. The computations were made using standard procedures to determine pro forma average monthly balances in the current asset accounts: (1) cash to meet current operating expenses, (2) accounts receivable for seed sales, (3) accounts receivable for foundation seed, (4) inventories of raw seed, (5) inventories of processed seed, and (6) inventories of bags, tags and other production supplies.

The average monthly inventories were calculated from budgeted monthly flows of the product into and out of storage. These month-end balances were averaged to determine the figures entered to the worksheets for the final working capital requirements shown in Table E-110. The average monthly physical inventories of raw and processed seed over each 6-month period for each seed product are entered to the WC-1 tables, Annex K. These tables were multiplied by the cost prices to value the inventories at 1976 price levels to determine the inventory values shown in the WC-2 tables. The border totals from the WC-2 tables are transferred to the WC-4 tables of total working capital requirements.

The average monthly inventories of bags, tags and supplies were calculated in comparable fashion from the projected month by month purchase and estimation schedules of these items and their projected purchase costs. The results are entered directly to the WC-4 tables.

The average monthly accounts receivable were computed for seed product sales and for foundation seed, reflecting planned credit policies. The foundation seed is to be procured ahead of planting time, supplied on credit to the contract seed growers through the growing period, and the cost deducted when settling with the grower at the time he delivers seed for processing. A turnover factor reflecting an average age of these accounts of 90 days was applied to the total sales value of the foundation seed to the grower. The accounts receivable for this item were calculated from Tables VC-3 for foundation seed by type of seed by period at each location and entered to TablesWC-3 (M through P). The prices used for the foundation seed sales of each seed at each production center are shown in the footnotes to Tables WC-3 (M)-(P). The border totals from these Tables WC-3 are entered directly to the "other" column of the Tables WC-4 for each of the seed production centers.

For the accounts receivable for the sales of seed from the production centers to the processing plants and from the processing plants to the marketing organization, only "pipe line" credit is used. The average age of these pipe-line accounts was considered to be 12 days. The corresponding factor was applied to total sales by function, location and product in Tables OR-1 (A) through (H), to generate the accounts receivable shown in Tables WC-1 (A) to (D) and Tables WC-2 (A) to (D). The border totals from these WC tables are transferred directly to the accounts receivable column of Tables WC-4 (A) to (H).

The accounts receivable for the sales of seed by marketing reflect the planned credit policies of MOF to member associations of farmers. The average ages of these accounts was taken as 90 days. The corresponding factor was applied to total sales by product by period from Tables OR-1 (I) to (L) and the results entered to Tables WC-3 (I) to (L). Again the border totals are entered t Table WC-4 (I).

The average monthly cash balance asset account by period for each function and location from the projected flow of cash income and expenses shown in the center section of the E-tables of Investment Feasibility Analysis. During the start up periods when revenue is insufficient to cover operating expenses, the cash balance was set at the average monthly cash deficit. Beyond this point during periods of surplus sales over expense, the cash balance asset account was set at a minimal level, e.g., $1,000 for each of the processing plants. The resulting figures were entered to the cash balance column of the corresponding Table WC-4.

The next step was to sum the different working capital accounts and print the complete WC-4 tables. From the border totals of the resulting tables the period-by-period incremental changes in the required working capital were computed by hand and entered to the input tables to the E-tables for the feasibility analysis. The final results can be seen by reference to the working capital column of Table E-101 for the four plants. The estimated working capital requirement for period 1 is $65,931, for period 2 is $65,931 + $39,227, for period 3 is $65,931 + $39,227 + $99,230, and so on.

Using the level-off project year consisting of both 6-month periods, the average make-up of the total working capital required is as follows:

Cash asset account	11.4%
Accounts receivable (seed)	39.8%
Accounts receivable (foundation seed)	2.8%
Seed inventories	42.8%
Supply inventories	3.2%

Questions may be raised regarding the relative contribution of various categories of operating cost in the projected cash flow to the required cash account and the value of products in the other working capital accounts. The answer to such questions can be approximated closely by comparing the relative magnitude of the individual categories of operating expense from the columnar input to Table E-110. Over two 6-month periods at level-off the relative importance of the categories of expenditure are:

Fixed cost	1.4%
Labor cost	2.1%
Other variable cost	8.0%
Seed purchases	88.5%

This procedure can be pursued further by reference to the supporting expense tables, FC-1, VC-2, L-2 and VC-3. For example, the 2.1 percent in total labor cost can be sub-portioned by classification from the data in Tables L-2.

Table E-17. Changes in the Base Case IRR with Specified Changes in Related Factors (percent)

Factor and Change	Function			
	Production	Processing	Marketing	Total
A. Price Changes				
5% Increase in Sales Price	+ 13.241	+ 2.919	+ 31.351	+ 2.311
10% Increase in Sales Price	+ 24.854	+ 5.666	+ 66.138	+ 4.489
5% Decrease in Sales Price	*	- 2.955	*	- 2.310
10% Decrease in Sales Price	*	- 5.992	*	- 4.661
B. Volume Changes				
10% Increase in Total Operating Vol.	+ 1.363	+ 0.811	+ 1.161	+ 0.801
10% Decrease in Total Operating Vol.	- 1.277	- 0.807	- 1.071	- 0.773
C. Capital Outlay Changes				
10% Increase in Building Cost	- 0.057	- 0.289	0.0	- 0.191
10% Increase in Equipment Cost	- 0.563	- 0.272	- 0.183	- 0.178
D. Operating Cost Changes				
10% Increase in Fixed Cost	- 0.224	- 0.088	- 0.257	- 0.114
10% Increase in Labor Cost	- 0.421	- 0.128	- 0.713	- 0.206
10% Increase in Other Variable Cost	- 0.452	- 0.413	- 0.585	- 0.779
10% Increase in The Purchase Cost of Seed Stock	*	- 4.443	*	- 3.154
10% Decrease in the Purchase Cost of Seed Stock	+ 23.581	+ 4.432	+ 61.136	+ 3.181
E. Product Mix Change				
10% Increase in Sales of New Seed with Offsetting Decrease in Exist Seed	+ 14.060	+ 3.392	+ 22.564	+ 2.810

* Indicates on indeterminate negative change; overflow in the exponential algorithm prevents unique solution for this case.

Table E-18. Summary of Farm Cost and Income Studies for Selected Crops in Thailand

Crop	Fixed Costs ฿/rai	Fixed Costs % Sales Income		Preharvest Variable ฿/rai	Preharvest Variable % Sales Income	Harvest & Marketing Variable ฿/rai	Harvest & Marketing Variable % Sales Income	Net Income ฿/rai	Net Income % Sales Income	Sales Income 100%	Added Net Income (%) 1/
1. Corn	64.03	30.35	Seed	7.10	3.36	23.23	11.01	48.55	23.01	211.00	87.31
			Total	75.19	35.62						
2. Rice	64.00	19.05	Seed	7.90	2.35	32.89	9.80	157.16	46.78	336.00	89.02
			Total	81.95	24.39						
3. Soybeans	43.25	15.18	Seed	32.04	11.24	63.94	22.43	15.68	5.50	285.00	71.95
			Total	162.13	56.89						
4. Peanuts	64.39	14.24	Seed	69.64	15.40	70.00	15.50	122.47	27.09	452.00	76.80
			Total	195.14	43.17						
5. Mungbeans	58.48	29.27	Seed	17.13	8.57	47.81	23.93	40.89	20.46	199.80	71.78
			Total	52.62	26.34						
6. Sorghum	51.45	42.24	Seed	1.21	1.00	17.89	14.69	17.45	14.33	121.80	84.63
			Total	35.01	28.74						

1/ Assuming total seed costs per rai for the quality seed will be 150% of existing seed costs.

Source: Division of Agricultural Economics Farm Development Project.

C. Social Analysis

The analysis of the Project as it is affected by social and cultural aspects of Thai rural society focuses particularly on the beneficiaries of the Project, probable project success, and project impacts on-farm women.

1. Intended Beneficiaries

The Project has identified three major categories of farmer beneficiaries: (a) farmers, in general, as represented by the membership of Agricultural Cooperatives and Farmers Associations; (b) farmers in close proximity to the four plants who can buy seeds directly; and (c) farmer participants in programs of selected RTG agencies dealing directly with groups of poor, small farmers.

a. Farmer Members of Agricultural Cooperatives and Farmer Associations.

This is the largest group of beneficiaries accumulating to nearly 200,000 farmers by year six of the Project. There will be up to 500 Cooperatives and 1,200 Farmers Associations involved, and nearly four million rai will have been planted to Project need. This initial group of beneficiaries will be the nucleus for spreading improved seeds widely throughout their communities.

A portion of this group will be concentrated around each of the four plants and base line data for monitoring and evaluation will be obtained from a representative sample of these farmers. The remainder of this group will be more widely distributed in the North, Northeast, and Central Regions of Thailand.

The ultimate group impacted by Project seed will be many-fold larger due to the traditional practice of farmers saving their own seed and exchanging with their neighbors. The extent of this spread, while known to be large, cannot be estimated with accuracy at this time but will be identified and measured through analysis of baseline data.

b. General Plant Sales

Farmers living in close proximity to the processing plants or regional offices of the MOF may buy seeds directly. The nature and

characteristics of this group can be monitored as the Project evolves. However, it is not expected to be large enough to consume more than 10 per cent of Project output.

c. Poor, Small Farmers

In order to focus on the Congressional Mandate to reach the poor majority, and as a reflection of RTG policy - also to concentrate attention on the poorer elements of the farm population, Project seed will be made preferentially available for the programs of RTG agencies dealing directly with poor, small farmers. At least 10 per cent of Project seeds production will be reserved as needed for these farmers.

The agencies whose programs have been identified as falling in this category are:

(1) Accelerated Rural Development (ARD)

(2) Department of Public Welfare (DPW)

(3) Department of Cooperative Promotion (DCP)

(4) Royal Forestry Department (RFD)

It is the resettlement programs of DPW, DCP, and RFD and the crop production acceleration program of ARD that have a requirement for seed. Use of available Project seed will increase the production and income of participating farmers.

Available data shows that per capita cash incomes of these groups of farmers ranges from $18 to $33 per year, family size is around six members, and farm sizes vary from 4 to 12 acres (usually allocated on the basis of land quality). As a group, these farmers do not appear statistically different from the average of all Thai farmers: per capita cash income of $30, family size of six, and farm size of 10 acres. However, the programs of these agencies do focus more directly on the poor farmers and insure a high ratio of extension workers to farm families in their project areas.

The Land Settlement Cooperatives programs of the DCP have nearly 200 cooperative associations serving 12,000 farm families in

33 settlement areas in 21 provinces distributed in all major regions of Thailand. Farmers are provided 4 to 12 acres of land, credit, technical and marketing assistance, and access to agricultural inputs - including seeds.

The Self-Help Settlement Program of the DPW includes 55 settlement areas having a total cultivated area of nearly 700,000 acres, and occupied by over 23,000 farm families who have from six to 12 acres each. Services provided to farmers are similar to those in cooperative settlements discussed above. Crop production programs include all crops for which the Project is producing seed.

The ARD field crop promotion program is organized by districts (Amphurs). These are selected on the basis of internal security problems, are usually remote from rural infrastructure, and represent the lowest income strata. The Program for 1976 includes work in 45 districts and with over 6,000 farm families. The districts are concentrated in Northern and Northeastern Thailand.

The RFD reforestation program is implemented by the Forest Industry Organization. The program involves settlement of farm families for some payment but also engage in crop production as appropriate. The program is concentrated in 18 locations, mostly in the North, which include about 1,800 families.

Other RTG programs can be added, as appropriate, in later years when seed requirements of the above programs will have been satisfied.

2. <u>How and when benefits accrue</u>

The beneficiaries described above will benefit from increased production and income. The aggregate net direct benefits to seed users is estimated at $94 million for the 15-year project analysis period. Part III. B. details the build-up of these benefits by year. There are other beneficiaries. The 3,100 contract seed producers will receive increased incomes. Their aggregate net direct benefits are included in the figure above.

The country as a whole benefits from maintaining food supplies in country, reducing foreign exchange drain, creating additional employment, and so forth.

A major addition to Project benefits results from the spread effects to seeds as discussed elsewhere in this PP. See Part III. B. for time phasing of benefits through the Project life.

3. Social Rate of Return

The social or economy-wide, benefits of the Project are measured by the Social Rate of Return (SRR). The analysis presented in Part III. B. shows an SRR of 112 %. The aggregate benefits to Thai society from use of the Project output for the 15 year analysis period are $122 million.

New employment will be created. The increased intensity of agricultural production will reduce seasonal unemployment in rural areas and reduce underemployment generally. It is estimated that 3000 new jobs will be created which will help some in providing the 650,000 new jobs needed annually in the Thai economy.

A major social and economic benefit that has not been quantified in the PP is the "spread effect." New seeds spread rapidly from initial users to neighbors and friends through exchange or sale of seed. It is conservatively estimated that through this process the new seeds would be passed to three times as many farmers as receive the original seeds, within a two year period. The full benefit would not be received from second and third round exchange of seeds but substantial improvement in yields and in incomes could be expected. As indicated elsewhere, we expect to quantify this difusion process in the Project evaluation.

4. Probable Success of the Project

Besides the excellent economic prospects for the Project that are detailed elsewhere, the social aspects of Thai culture do not impose any significant constraints to the success of the Project. New seeds that substantially improve crop yields, as do those included in the Project, are readily acceptable to farmers if they know about them and the improvement potential has been demonstrated to them.

The design of this Project is consistent with existing farmer practices in Thailand - low input, low risk technology. The benefits to farmers can be derived solely from using improved seed. Ancillary inputs are not required for the Project to be successful. The better

off farmers know how and when to use improved seed. A large scale educational program has been incorporated as part of this project to insure that smaller farmers also learn the how and when of using improved seed.

Eighty-five per cent of Thai farmers cultivate their own land. They have proven to be responsive to profitable, low risk innovations, regardless of their educational or income level. The major beneficiaries of the Project will thus be individual Thai farmers, most of them small farmers, not large landlords or middlemen. There are no religions or cultural beliefs that would impede the acceptance by farmers of a more profitable technology such as improved seeds.

There is significant underemployment in rural Thailand (See DAP Annex A and USOM "The Employment Situation in Thailand", 1972). Although improved seeds will require some additional labor inputs, neither time nor motivation will be a constraint to using improved seed once the profitability is clearly demonstrated to the small farmers. Since seed distribution to farmers will be primarily through Cooperative's and Farmer Associations, traditional leadership role and communication links have been incorporated into the project design.

The nature of the Project is such that no one is likely to be harmed very much and if so, only for a short period.

For example, the private merchant community may object to incursion of MOF into their market areas. However the private sector currently deals only in grain sold for seed. This project developes a new product, improved seed, for wide dissemination. The IRR does not support selling of improved seed as a highly profitable undertaking. Except in the immediate area of the seed plants, where distribution of improved seed will be intensive, it is not contemplated that the private sector will incur any significant loss of seed business. The farmers will likely continue to sell their final products to the private sector.

In addition, new demands and depth of market are being built by the Project. Because of limited physical seed output of the Project, the private sector will get increased business by gaining access to better seeds (first round exchange and even second round).

5. Project Impact on Women

In addition to the discussion in the PID regarding women, we can estimate one particular quantitative impact of the Project on women. It is characteristic of Asian agriculture, and Thailand is no exception, for women to be the predominant labor force in the harvest and post-harvest operations.

From the analysis in Part III B, we can estimate the total harvest/post-harvest marketing bill. The total value of increased production resulting from the use of Project seeds over the 15 year analysis period is $130,000,000. Harvest/post-harvest labor costs are estimated at 16% of this total : $21,000,000 in additional wages, mostly imputed but some in cash and going primarily to women.

PART IV Implementation Planning

A. Analysis of the Recipients and AID's Administrative Arrangements

1. Recipient

The Royal Thai Government has three agencies that will be directly involved with implementation of the project. These are: (a) the Department of Agriculture, (b) the Department of Agricultural Extension, and (c) the Marketing Organization for Farmers.

a. The Department of Agriculture

(1) Foundation Seed Production

The Department of Agriculture (DA) will be responsible for the foundation seed production element of the project. Specifically the DA's Rice Division will be responsible for production of rice foundation seed; the Oil Crops Section of the Crops Division for production of soybean, peanut, and mungbean foundation seed; and the Corn and Sorghum Section of the Crops Division for corn and sorghum production. Each of these sections have been effectively producing, processing, and distributing from five to a few hundred tons of foundation seed annually for the last several years. No organizational changes within DA are planned or deemed necessary under the project.

Orders for the selected varieties of foundation seed will be given by the Project Manager to the DA and they will inform the Department of Agricultural Extension (DOAE) when the seed is ready for pickup. The DOAE and DA have established a good working relationship that can be expected to be maintained during the project.

(2) Inoculum Production

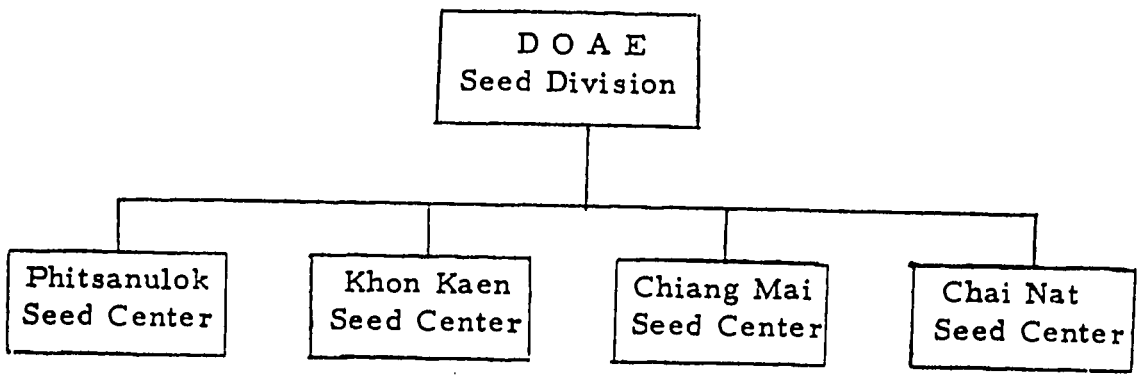
The Bacteriology and Soil Microbiology Branch of the DA will be responsible for the inoculum production element of the Project. They have a staff of eight professionals that are producing about .5% of inoculant necessary for Thailand's present soybean acreage. This organization will produce or otherwise make available through imports the project inoculant requirements.

(3) Seed Certification and Regulatory Program

The Agricultural Regulatory Division of DA will be responsible for implementation of this program. The Division is established and is staffed to effectively handle the regulatory and certification program. They will also be responsible for fertilizer and insecticide control activities.

b. The Department of Agricultural Extension (DOAE)

Initially the DOAE will be responsible for the following project outputs - (1) seed multiplication; (2) construction, staffing and operating the seed processing plants; (3) seed education and demonstration programs; and (4) training of seed producers, processors, and farmer recipients. At the end of the project they will be responsible for the latter two only. To carry out these functions the DOAE is establishing a Seed Division which will have primary responsibility for this project as well as other DOAE activities in seed. For project implementation purposes the DOAE Seed Division will be organized as follows:



Personnel directly supporting the project within this organizational unit are:

Bangkok Headquarters

Position	Number	Grade
Division Chief	1	1
Deputy Division Chief	1	2
Training Officer	1	2
Accountant	1	4
Secretary	1	3
Clerks & Typist	3	4
Miscellaneous	4	E-2

Each Seed Center

Director	1	2nd
Production/Quality Control Officer	1	3rd
Asst. Prod. /Quality Control Off:.	1	4th
Processing Officer	1	3rd
Asst. Processing Officer	1	3rd
Secretary/Bookeeper	1	3rd
Mechanic	1	4th
Clerk/typist	1	4th
Miscellaneous (laborers, janitors, drivers, etc)	7	E-1 to E-2

Temporary laborers (will be seasonal)

c. The Marketing Organization for Farmers (MOF)

Initially the MOF will be responsible only for seed marketing and distribution under this project. As the project responsibilities change, as indicated the tables in this section, they will also take over responsibility for the seed multiplication and seed processing activities. The Agricultural Inputs Division of the Department of Marketing will have specific responsibility within the MOF for the project (See the MOF Organization Chart).

d. The Implementation Organization

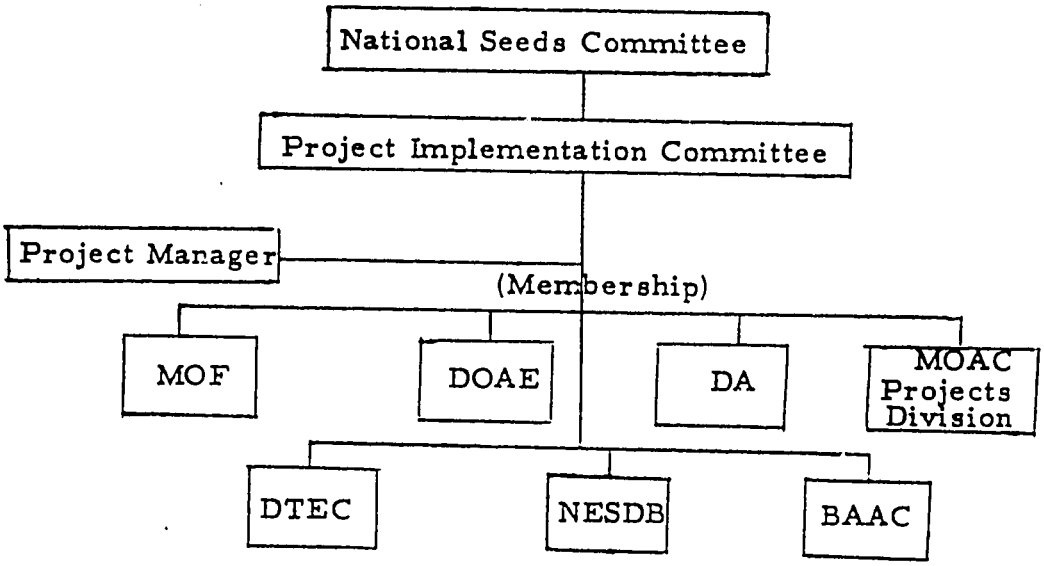
To provide for effective project implementation and coordination a Project Implementation Committee will be established as a sub-committee of the existing National Seeds Committee. The Chairman of the committee will be the Director-General of the DOAE with two Deputy Chairman: The Director for the MOF and the Deputy Director-General of the DOAE. The following agencies will be represented on the committee.

Marketing Organization for Farmers
Department of Agricultural Extension/MOAC
Department of Agriculture/MOAC
Projects Division/MOAC
Department of Technical and Economic Cooperation
National Economic and Social Development Board
Bank for Agriculture & Agricultural Cooperatives

The MOAC will appoint a Project Manager to carry out day to day project implementation with assistance and guidance as necessary from the Project Implementation Committee. The Project Manager will also be secretary of the committee.

The National Seeds Committee, to be reactivated, will provide high level policy guidance and direction to the project as necessary. Any policy issues and responsibilities that cannot be settled by the Project Implementation Committee regarding seed in Thailand will be settled by this committee.

Project Implementation Organization[1/]



Effective implementation of this project requires both a vertical and horizontal exchange of cooperation and services among the agencies involved in project implementation.

Individuals in the DOAE and DA have established lines of communication and developed areas of cooperation. Both the DOAE and DA have worked closely in development of the project and have an administrative system in operation to cope with day to day project activities. The DOAE is in the process of establishing a Seed Division to better administer the project and seed activities in Thailand. Through the Project Implementation Committee, the Project Manager, and a long standing cooperative environment we foresee no problems regarding DA and DOAE coordination of activities.

The Marketing Organization for Farmers, although a relatively new organization (established in November 1974), has developed rapidly during the past few months. The Agricultural Inputs Division, of the MOF, the Division responsible for the seed project, is establishing a marketing system to reach Farmers Associations, Cooperatives, and individual small farmers and are already distributing fertilizer and insecticide. This will not only provide a vehicle for

1/This implementation and coordination mechanism fits well with the Thai decision making methodology and should adequately and effectively coordinate the various project functions.

marketing processed seed to the rural population but will also closely tie the sale of improved seed with other agricultural inputs to further increase the yield expected fromimproved seed.

Since the MOF will be taking over the seed multiplication and seed processing activities from the DOAE a close interrelationship between these agencies will be maintained through the Project Implementation Committee. Although not as vital the DA effort will have to be well coordinated to maintain a regular and timely supply of foundation seed.

The MOF has worked closely with the DOAE, DA, and other RTG agencies that have been involved with design of this project. A realistic plan of phasing the MOF and phase out of the DOAE has been developed (See the Project Responsibilities Charts). A core group of young, well trained, and motivated people will be responsible for MOF elements of the project. Top MOF leadership is very interested in the project. The MOF will be on the Project Implementation Committee and given progress in their development thus far the MOF can be expected to fullfil their very important role in the project.

The DA will maintain the foundation seed element of the project throughout. During years one and two the MOF will only be responsible for seed marketing and distribution with the DOAE responsible for the rest of the program. In years three and four of the project the MOF will begin purchasing the multiplied seed from the contract growers. During years five and six they will take over the entire seed multiplication program including contract grower supervision. After year six the processing plants will also be turned over to the MOF and at this point the DOAE will only be responsible for the training, seed promotion and education program.

2. AID

The Seed Development Project has been assigned to one of the Mission's six new project management teams. The team consists of one U.S. direct hire Project Officer, a USOM local hire Assistant Project Officer and a secretary/administrative assistant. This team will be responsible for monitoring project progress and will work with the Project Manager and the Project Implementation Committee to assist with project implementation and evaluation.

The Mission has opted to provide agreed local currency financing through the partial funding of the Project working capital fund. Arrangements for the operation and management of this fund are required as a condition precedent for disbursement for local currency costs.

The operation and management of the working capital fund so that appropriate records, and other information are maintained is critical for monitoring and controlling USG local currency inputs into the Project. To see that appropriate accounting and other procedures are set up, the Mission proposes to grant-finance an in-country training program that would assist the MOF in organizing to discharge its responsibilities and would develop and install a complete set of appropriate records for the working capital fund. Required funds are included in the Project budget.

Loan-financed local currency will be generated through direct dollar purchase of Thai baht. The justification for this approach is that Thailand has neither a U.S. Commodity import program nor suitable internal procedures for employing special letter of credit (SLC) arrangements. The Thai Mission has endeavored to work out acceptable SLC procedures with the RTG, but has not been successful for the following reasons:

1) Since the RTG does not license imports and has minimal bureaucratic machinery for import control, it would have to create a special administrative system at considerable expense to produce the documentation required under SLC procedures.

2) SLC procedures would not generate local currency according to the Project's timing of need. The Thai banking system does not recognize an SLC as a reserve asset and will not permit the advance of local currency against it.

Loan contributions to the Project working capital fund will be made on the basis of two dollars of loan funds to every dollar equivalent of baht deposited by the RTG. Loan funds for this purpose will be advanced upon the Borrower's request and upon evidence of Borrower's deposit of the corresponding amount.

PART IV B. Implementation Plan

PROJECT IMPLEMENTATION PLAN

Chart based on "beginning Year 1 on April 1.

PREPARATORY PERIOD | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | YEAR 6

ACTIVITY

I. Project Management & Evaluation

- Project loan negotiated & signed
- Implementation committee organized
  - Project manager appointed
  - DOAE Seed Div. authorized

RTG/USOM In-house Eval.

RTG/USOM Evaluation w/ Ext. Assistance

RTG/USOM In-house Eval.

RTG/USOM Evaluation w/ Ext. Assistance

RTG/USOM Final Eval. w/ Ext. Assistance

II. Training Program

Third Country (3 for 3 mos. each)

- 4 Participants selected
  - 4 Participants 3 months, India (1 - Testing, 1 - Production, 1 - Certification, 1 - Processing)
  - 2 Participants selected
    - 2 Participants 3 mos., Indonesia (1 - Production, 1-- Processing)
- 1 Part. selected
  - 1 Part., 3 mos. Philippines (Testing)
- Part. selected
  - 1 Part., 3 mos. Philippines (Certification)

U. S. (Short term, 7 mos. each)

- 5 Part. selected
  - 5 Part. lv, (1 - Proc., MSU, 7 m, 1 - Ext., MSU, 7 m, 1 - Mkt., MSU & KSU 7 m, 2 - Inoc. prod, 3 mos)
- 3 Part. selected
  - 3 Part. lv., 7 m (2 - Proc., MSU 1 - Mkt., KSU)
- 1 Part. selected
  - 1 Part. lv., 7 mo., (Ext., MSU & MSU)

U.S. (M.S. degree, 24 mos)

0-- 2 Part. selected

- 2 Part. lv, 1 - Prod. & Cert., 1-- Proc., MSU, 24 m X Ret.
- Part. sel.
  - Part. lv, Qual. Control, MSU, 24 m X Ret.
  - Part sel. (2)
    - 2 Part. lv, Prod. & Proc., MSU, 24 m X Ret.
    - Part. sel.
      - Part lv., Qu. Ct., MSU, 24 m Rt. Aug, Year 7

PREPARATORY PERION | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | YEAR 6

ACTIVITY

III. Technical Assistance

Long Term (2)
- Contractor recruited
- Contract signed

Short Term (10)
- Sr. seed specialist arrives (4 years)
- Processing specialist arrives (2 yrs.) X Lvs. — X Lvs.
- Plant eng., designs & specs. (1.5 m)
- Plant eng. consul. (1.5 m)
- Seed law and cert. consul. (1.5 m)
- Seed law and cert. consul. (1.5 m)
- Qual. control consul. (1 m)
- Mkt. consul (1 m)
- Mkt. consul. (1 m)
- Inoculant consul. (1.5 m)
- Inoculant consul. (1.5 m)
- Inoculant consul. (1.5 m) per loan agreement covenant

IV. Foundation Seed Supply

- Foundation seed supplied by DA; cyclic activity beginning year 1, 2 mos in advance of beginning of production, each season.

V. Seed Production

Phitsanulok
- Begin corn seed prod.
- add soybeans
- add rice
- Equip.-staff
- Production cyclic activity each year from beginning.

Khon Koen
- Begin corn/rice seed prod.
- add mungbean
- Equip.-staff
- add peanut and sorghum

Chiang Mai
- Begin soybean seed prod.
- Equip.-staff
- add rice & peanut

Chia nat
- Begin corn & rice seed prod.
- Equip.-staff
- add mungbean

VI. Seed Processing

Phitsanulok
- Equip. specs
- Order equip.
- Continue soybeans
- add corn
- add mungbean
- add rice
- Processing cyclic each year after beginning.

Khon Koen
- Design & specs
- Order equip.
- Begin construct.
- Begin corn & rice
- add peanut and sorghum

Chiang Mai
- Design & specs
- Order equip.
- Begin construct.
- Begin soybean
- add rice and peanut

Chai Nat
- Design & specs
- Order equip.
- Begin construct.
- Begin corn and rice
- add peanut

PREPARATORY PERIOD | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | YEAR 6

ACTIVITY

VII. Seed Marketing

- Bangkok: organize, staff and equip.

Phitsanulok
- Begin mkt soybeans, add
- add corn
- add rice and mungbean

Khon Koen
- Staff and equip.
- Begin mkt corn and rice
- add peanut and sorghum

Chiang Mai
- Staff and equip
- Begin mkt soybeans
- add rice and peanut

Chai Nat
- Staff and equip.
- Begin mkt rice and corn
- add mungbean

VIII. Seed Education/Demonstrations

Bangkok
- Complete education/demonstration plan; begin staffing and equipping.

SA AP AP AP SA

Phitsanulok
- Staff and equip.

ST FSI PR PR ST AP ST AP

Khon Koen
- Staff and equip.

AP FSI ST PR AP FSI

Chiang Mai
- Staff and equip.

AP SA AP ST AP

Chai Nat
- Staff and equip.

AP AP

Code: ST - seed tech. short course, 3 wks., 25 per course; PR - processing short course, 2 wks., 15 per course; SA - seed testing and quality control short course, 2 wks., 15 per course; FSI - field and seed inspection short course, 2 wks., 15 per course; AP - seed awareness and appreciation short course; 4 days, 30 per course.

IX. Certification/Control

Activities mainly supportive, i.e., training and consultations. See III. Technical Assistance for consultations scheduled; see VIII. Seed Education/Demonstrations, codes SA, ST, FSI, for scheduling of relevant training and practical work.

C. Evaluation Plan

1. Evaluation Schedule

Year 1. RTG/USOM In-house evaluation

Year 2. RTG/USOM/evaluation with external assistance

Year 3. RTG/USOM in-house evaluation

Year 4. RTG/USOM evaluation with external assistance

Year 5. None

Year 6 or 7 RTG/USOM evaluation with external assistance--final evaluation

2. Evaluation Focus

Each evaluation will be a comprehensive assessment of the accomplishments of the project against purpose/output and input schedules delineated in the Project Logical Framework (See Annex D).

In addition, in years two, four, and six/seven special features would be highlighted in the evaluation. A brief list of specialized subject matter to be evaluated and proposed external assistance are described below for each of these evaluations.

a. Year Two

(1) Subject Matter

(a) Seed Marketing and Distribution Program

- Capability and performance of MOF.

(b) Impact on poor/small farmers.

- Based on a second survey as follow-up to original base line data survey. The second survey will have been completed and analyzed prior to the evaluation.

(2) External Assistance

(a) Seed Marketing Manager

(b) Agricultural Economist (with information from second survey).

(c) AID/W representative (TAB, EA/TD/RD, or others involved with implementation of the Congressional Mandate re the poor majority).

b. Year Four

(1) Subject Matter

(a) Technical assistance performance and requirements, if any, for future project operations.

(b) Impact on Poor/Small Farmers

- Follow-up on prior base line data

(c) Pipeline of new varieties

(d) MOF progress

(e) DOAE education/demonstration/publicity program.

(f) External Assistance

(a) Senior AID Agricultural Development Officer

(b) Agronomist

(c) Agricultural Economist

(d) Marketing Manager

(e) Technical Seed Specialist

c. Year Six or Seven

(1) Subject Matter

(a) Impact on Poor Small Farmers

- follow-up on prior base line date

(b) Overall Projected Operations--Assess Project Officer concept of implementation from AID point of view.

(c) Assess impact of Seed Improvement Project on rural development for AID history.

(2) External Assistance

(a) Three to five AID/W staff concerned with implementing programs for the poor majority.

(b) Three to five AID/W staff concerned with overall project implementation and management.

(c) Other specialists as needed.

NOTE: Evaluation Strategy and Plan

The proposed evaluation strategy and plan for this project follows closely AID's "Guidelines for the Evaluation of Capital Projects". It focuses on assessing change in the Project setting, particularly validity of price assumptions in the feasibility study, clarifying the design of the Project, particularly impact on small farmers and managerial capability of the MOF, and finally evaluating the progress of the Project in reaching its purpose and contribution to the sector goal, particularly progress towards achieving output indicators, support of the RTG to the Project, and behavior of the private sector.

I. Conditions, Covenants, and Negotiating Status

1. Conditions Precedent to Disbursement

1.1 Conditions Precedent to Initial Disbursement. Except as A.I.D. may otherwise agree in writing, prior to the first disbursement or to the issuance of the first Letter of Commitment or other commitment document under the Loan, the Borrower shall furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) A legal opinion by the Minister of Justice of Borrower, or other counsel acceptable to A.I.D., that this Loan Agreement has been duly authorized or ratified by, and executed on behalf of, the Borrower and is a valid and legally binding obligation of the Borrower in accordance with its terms;

(b) The name of the person or persons who will act as the representative or representatives of the Borrower pursuant to Section 9.01 together with evidence of his or their authority and a specimen signature of each such person, certified as to its authenticity by either the person rendering the legal opinion pursuant to Section 3.01 (a) or the person executing this Loan Agreement;

(c) Evidence of:

i) The reactivation of the National Seeds Committee to provide Project policy guidance;

ii) Creation of a Project Implementation Committee, composed of representatives of the agencies having substantive concern for the Project, to be responsible for overall guidance of the Project;

iii) Appointment of a Project Manager with adequate authority to permit effective responsibility for day-to-day Project operations;

iv) Establishment of an appropriate organizational structure within the Marketing Organization for Farmers (MOF) to implement those Project activities for which the MOF is to be responsible;

(d) A detailed implementation plan for the Project which sets forth in chronological order the actions required and the party having responsibility therefor.

(e) A financial plan for the Project including a schedule of expenditures by category and a schedule of funding by source which demonstrates that funds required by the Project will be made available on a timely basis;

(f) A plan agreed to by the DOAE and the MOF for extending Project benefits to farmers at the lowest end of the income scale;

(g) A plan for procurement of commodities to be financed under the loan, including any contract proposed to be entered into with a firm to perform procurement services for such commodities;

1.2 Conditions Precedent to Disbursement for Local Currency Costs
Except as A.I.D. may otherwise agree in writing, prior to any disbursements for financing the working capital account, the Borrower shall furnish to A.I.D., in form and substance satisfactory to A.I.D., evidence of:

(a) Arrangements for the creation, operation and management of the working capital account for the Project;

(b) Borrower's deposit to the account equivalent to one-half of the loan disbursement requested;

(c) A detailed marketing plan for handling Project seed production.

1.3 Conditions Precedent to Disbursement for the Inoculant Program
Prior to any disbursements for inoculant facilities and equipment, or import of inoculants, the Borrower shall furnish to A.I.D., in form and substance satisfactory to A.I.D.:

(a) An adequate technical, financial, and economic analysis of inoculant production within Thailand.

2. Covenants

2.1 Execution of the Project

(a) The Borrower shall carry out the Project through the MOAC and the Marketing Organization for Farmers (MOF) with due diligence and efficiency, in conformity with the Project Description attached as Annex A to this agreement, and in conformity with sound financial, administrative and planning practices.

(b) The Borrower shall cause the Project to be carried out in conformity with all of the terms, rules, regulations, policies, procedures, agreements, statements, schedules, and the other arrangements, including any modifications thereof, as may be approved by A.I.D. pursuant to this Loan Agreement.

2.2 Funds and Resources to be Provided by Borrower. In addition to the amounts specified in Section 5, the Borrower shall provide promptly as needed all funds, in addition to the Loan, and all other resources required for the punctual and effective carrying out of the Project.

2.3 Annual Planning and Review of Progress. The Borrower, MOAC, the MOF and A.I.D. shall cooperate fully to assure that the purposes of the Loan will be accomplished. To this end, unless A.I.D. otherwise agrees in writing, representatives of A.I.D. and the Borrower shall meet at least once each year to review the progress of the Project, its operations, and other matters relating to this Loan Agreement and the Project.

2.4 Management. The Borrower shall provide qualified and experienced management for the Project and it shall train such staff as may be appropriate to augment personnel presently available.

3.0 Negotiating Status. The conditions and covenants have been discussed with the RTG as has the assistance AID might provide toward their satisfaction. There are no substantive areas of disagreement between the Mission and the RTG regarding the Project. Documentation going forward through the RTG for Project approval and request for loan assistance has been jointly developed with the Project Paper. It is anticipated that many of the C.P.'s and covenants will be satisfied prior to execution of the agreement.

For example, reactivation of the National Seeds Committee, creating a Project Implementation Committee, and appointing a Project Manager are actions the RTG will take on approval of the Seeds Project by the Cabinet and can be expected to be accomplished prior to execution of the agreement. This is true also of the organizational structure of the Marketing Organization for Farmers.

The analysis of the inoculant production facilities could also be accomplished prior to execution of the agreement. The more detailed analysis desired will be done as was for other elements of the Project including drawing on AID/W resources for the technical talent required. Sufficient investigation into costs and probable benefits has been done to indicate economic viability of an inoculant manufacturing facility in Thailand. (See Annex B-19). Treatment of the technical/economic issue of importation versus local production is required, as well as an analysis comparable in detail to that performed on seed production, processing and marketing as reported in Part III.B.

The Mission is proposing that local currency contributions by AID under the Loan will be used for funding a portion of the working capital requirements. RTG law provides for the setting up of revolving funds by various operating departments. This would be the

mechanism through which AID contributions would be made to the Project working capital account. The law is administered by the Ministry of Finance and is in the nature of enabling legislation. A detailed operational and management plan must be developed to handle the working capital account of the Project (See Part IV, A).

The Marketing Organization for Farmers has developed a nucleus marketing plan for handling Project output. However, this plan i insufficient in detail for effective project implementation. It is the Mission's intent to assist the MOF in developing the marketing plan through the centrally funded worldwide contract on food grain production, processing and storage with Kansas State University.

ANNEX A

TELEGRAM

Foreign Service of the United States of America

INCOMING USOM/Thailand

AGR. 4

EMB 406
PP RUMJQB
DE RUEHC #5330/1 0591559
ZNR UUUUU ZZH
P 281553Z FEB 75
FM SECSTATE WASHDC
TO AMEMBASSY BANGKOK PRIORITY 9056
BT

UNCLASSIFIED
Classification

Control: 006
Rec'd: MARCH 1, 1975
1020

ACTION USOM

INFO: AMB DCM EA ECON FSI FILES

UNCLAS SECTION 1 OF 2 STATE 045330/1

AIDAC

E.O. 11652: N/A
TAGS:
SUBJECT: SEED DEVELOPMENT - PRP

ACTION O/AG

INFO D DD LA AD/M O/FIN O/PROG M/CR

1. BASED ON REVIEW SUBJECT PRP BY EAST ASIA PROJECT ADVISORY COMMITTEE (EAPAC) ON FEBRUARY 13, AID/W APPROVES USOM PREPARATION PP UNDERSTAND USOM PLANS SUBMIT PP FOR AUTHORIZATION FY 75, IF FUNDS AVAILABLE; OTHERWISE PP WILL BE CONSIDERED FOR FY 76 AUTHORIZATION.

2. LIST OF ANALYSES REQUIRED FOR PREPARATION OF PP SHOWN ON PAGE 17 SUBJECT PRP WELL-CHOSEN. IN ADDITION TO THESE, EAPAC MEETING IDENTIFIED OTHER ISSUES WHICH SHOULD RECEIVE SPECIAL ATTENTION IN PP.

3. ECONOMIC RETURN: RATE-OF-RETURN CALCULATIONS SHOULD DIFFERENTIATE BETWEEN IMPROVED SEED PRODUCTION.

(A) FOR CROP VARIETIES COMMON TO PROJECT AREAS AND

(B) FOR NEW HIGHER-YIELD VARIETIES ALREADY DEVELOPED BUT NOT YET IN WIDESPREAD USE DUE TO MULTIPLICATION AND DISTRIBUTION PROBLEMS;

4. AG RESEARCH: SINCE HIGHEST PROJECT PAY-OFF DEPENDS ON DEVELOPMENT AND PROPAGATION IMPROVED VARIETIES, ANALYSE THAI CAPABILITIES AND SUCCESSES IN AGRICULTURAL RESEARCH. IF AG RESEARCH PROGRAM INADEQUATE FOR PURPOSES THIS PROJECT, HOW DOES RTG PROPOSE TO REINFORCE RESEARCH EFFORT AND STRENGTHEN LINKS BETWEEN RESEARCH AND MULTIPLICATION/DISTRIBUTION FUNCTIONS OF SEED INDUSTRY.

.....2

This is a PRIORITY telegram.

Action is required within 2 working days.

UNCLASSIFIED
Classification

FORM 1-64 FS-501
MFG. 11-64

5. RELATED AGRICULTURAL INPUTS: ANALYZE OTHER INPUT REQUIRMENTS OF NEW VARIETIES READY FOR MULTIPLICATION THROUGH PROJECT, FOR ATHFCTMENT DESIRED YIELD LEVELS. IN EACH OF FOUR PROJECT AREAS, DEMONSTRATE THAT NECESSARY INPUTS ARE AVAILABLE AT ECONOMIC PRICES, OR ALTERNATIVELY, DESCRIBE HOW SHORTAGES AND COST PROBLEMS WILL BE OVERCOME.

6. ENFORCEMENT OF SEEDS LAWS: ASSESS CAPABILITY OF RTG ORGANIZATIONS TO ENFORCE SEED CERTIFICATION AND SEED MARKETING LAWS. DISCUSS IMPLICATIONS OF INADEQUATE ENFORCEMENT FOR PROJECT SUCCESS. IF DEFICIENCIES EXIST, WHAT IS RTG STRATEGY FOR IMPROVING STAFF, FACILITIES, AND PROCEDURES OF REGULATORY ORGANIZATIONS, AND HOW WILL PROJECT ASSIST THIS STRATEGY?

7. MULTIPLE CROP EFFORT: ACCORDING TO PRP, PROJECT WILL PRODUCE AND DISTRIBUTE IMPROVED SEEDS FOR SIX BASIC CROPS. DISCUSS WHY MULTIPLE CROP EFFORT CONSIDERED PREFERABLE ALTERNATIVE TO INITIAL CONCENTRATION ON ONE OR TWO MOST IMPORTANT CROPS AND ANALYZE THAI CAPABILITY TO EFFECTIVELY MANAGE MORE COMPLICATED EFFORT PROPOSED.

8. BENEFICIARIES: PROJECT EMPHASIS ON RURAL SECTORS AND PLANT LOCATIONS IN NORTH AND NORTHEAST RESPONSIVE TO CONGRESSIONAL MANDATE TO FOCUS ON POOR MAJORITY, PROPOSAL TO SATISFY SEED REQUIREMENTS OF OTHER RTG PROGRAMS CONCERNED WITH LOW INCOME GROUPS ALSO SOUND. HOWEVER, EAPAC STILL CONCERNED THAT WITHIN PROJECT AREAS, CHARACTERISTICS OF PROJECT MIGHT PRECLUDE PARTICIPATION BY POOREST FARMERS. ANALYZE EXTENT TO WHICH CROPS SELECTED FOR SEED MULTIPLICATION AND SEED PRODUCTION PRIORITIES AMONG THEM WILL BENEFIT POOR FARMER PREFERENTIALLY, GIVING CONSIDERATION TO TRADITIONAL CULTIVATION PATTERNS AND ECONOMIC FACTORS THAT DETERMINED CROP CHOICES BY POOR FARMERS. ON BASIS OF ANALYSIS, REAPPRAISE CROP PRIORITIES SHOWN IN LOGFRAME ON PAGE 11 PRP. ALSO DISCUSS HOW REQUIREMENTS FOR OTHER INPUTS MAY SERVE AS IMPEDIMENT TO PARTICIPATION BY FARMER WITH LIMITED CASH AND DIFFICULT ACCESS TO CREDIT AND DESCRIBE WAYS IN WHICH PROJECT CAN ASSURE BROADEST POSSIBLE PARTICIPATION.

9. PRIVATE SECTOR: DESCRIBE REASONS FOR LIMITED INITIAL PARTICIPATION IN PROJECT BY PRIVATE SECTOR, RATIONALE BEHIND STRATEGY FOR TRANSFER OPERATION OF FOUR SEED PLANTS TO FARMERS' MARKETING ORGANIZATION RATHER THAN PRIVATE FIRMS, AND MEANS OF PROMOTING PRIVATE SECTOR INTEREST AND INVESTMENT IN SEEDS INDUSTRY AS DEMAND FOR IMPROVED SEEDS EXPANDS.

10. BUREAUCRATIC CONSTRAINTS: DISCUSS HOW PROBLEMS OF INTER-AGENCY COORDINATION AND BUREAUCRATIC DELAYS WILL AFFECT PROJECT IMPLEMENTATION WHAT WILL BE DONE BY THE RTG TO MINIMIZE SUCH CONSTRAINTS.

11. ASSOCIATED GRANT-FINANCING: EAPAC AGREES WITH RATIONALE FOR GRANT FINANCING OF OVERSEAS TRAINING AND EVALUATION. HOWEVER, DUE TO BUDGET LIMITATIONS, MISSION SHOULD REAPPRAISE THESE ELEMENTS TO DETERMINE MINIMUM ESSENTIAL FUNDING AT SAME TIME AID/W REASSESSES FUND AVAILABILITIES. DEFINITE ANSWER ON LATTER POSSIBLE ONLY LATE IN FISCAL YEAR. AS CONTINGENCY, MISSION SHOULD ALSO DISCUSS WITH DTEC AND OTHER CENTRAL RTG AGENCIES FEASIBILITY OF LOAN-FUNDING THESE ELEMENTS AND ASSESS IMPACT ON ON PROJECT SUCCESS OF LEVELS OF TRAINING AND EVALUATION RTG LIKELY TO APPROVE IF LOAN FUNDS.

.....2

108

12. LOCAL COST FINANCING: IN LIGHT OF PAST DIFFICULTIES SAME ISSUE IN THAILAND, EAPAC UNDERSTANDS MISSION PREFERENCE FOR DIRECT DOLLAR-BAHT CONVERSION. HOWEVER, DEFINITIVE RESPONSE THIS ISSUE DEPENDS ON PPC ANALYSIS STILL IN PROGRESS, EA BUREAU WILL DISCUSS FURTHER WITH PPC AND ADVISE.

75
#5330
UNCLAS FINAL SECTION OF 2 STATE 045330/2

13. VEHICLE PROCUREMENT: REQUEST USOM APPRAISE SUITABILITY U.S. MANUFACTURED VEHICLES FOR PROJECT NEEDS. IF U.S. VEHICLES DETERMINED UNSUITABLE AND PROCUREMENT NECESSARY FROM NON-CODE 941 COUNTRIES, SUGGEST USOM SEEK RTG FINANCING OF VEHICLES WITH COMPENSATING AID FINANCING OF ADDITIONAL LOCAL COST ELEMENTS.

14. DISBURSEMENT PERIOD: FIVE-YEAR PERIOD ACCEPTABLE CONSIDERING PROJECT COMPLEXITY AND INSTITUTIONAL DEVELOPMENT REQUIRED. PP SHOULD INCLUDE FULL JUSTIFICATION FOR DISBURSEMENT PERIOD LONGER THAN PD-57 STANDARD.

15. LOGICAL FRAMEWORK: GENERALLY WELL-DONE LOG-FRAME MATRIX REQUIRES DELINEATION OF INTERMEDIATE OUTPUTS UNDER COLUMN FOR OBJECTIVELY VERIFIABLE INDICATORS. PP SHOULD INCORPORATE NARRATIVE PRESENTATION OF PROJECT DESIGN USING LOGICAL FRAMEWORK METHODOLOGY WITH SUMMARY MATRIX AS ANNEX.

16. ENVIRONMENTAL IMPACT: PP REQUIRES ANNEXED STATEMENT DISCUSSING POTENTIAL EFFECTS OF PROJECT ON ENVIRONMENT: AID/W WILL CONDUCT PRELIMINARY ANALYSIS AND PROVIDE GUIDANCE ON FORM AND CONTENT THIS STATEMENT.

17. ROLE OF WOMEN: IN RESPONSE TO PERCY AMENDMENT AND PD-60, DISCUSS HOW PROJECT WILL INVOLVE WOMEN MORE ACTIVELY IN ECONOMIC DEVELOPMENT PROCESS, EFFECTIVELY UTILIZE THEIR CAPACITIES, AND BENEFIT THEM.

18. DEVELOPMENT OF PP: ASSESS NEEDS, IF ANY, FOR TDY ASSISTANCE IN PREPARING PP AND ADVISE ASAP, SPECIFYING TASKS TO BE PERFORMED AND EXPERTISE REQUIRED: ALSO INDICATE FUNDING SYMBOLS AND AMOUNT FOR ANY TDY REQUIREMENTS OVER 30 DAYS: TO BE CONSIDERED FOR FY 75 AUTHORIZATION, FUNDS PERMITTING, PP SHOULD BE SUBMITTED NLT MAY 31. PP SHOULD INCORPORATE DRAFT LOAN AGREEMENT. KISSINGER

BT
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Pensri

Crop Research in Support of the Seed Development Project

Crops research is conducted by personnel working in the Rice or Crops Divisions of the Department of Agriculture (DA). These Divisions, and Sections thereof, conduct research programs in basic research, adaptive research, and varietal development, as well as produce foundation seed of the crops for which they are responsible. The fact that each Section responsible for varietal development has or will shortly release improved varieties for every target crop is evidence of their capability, see attached tables. The RTG and several donor agencies have long recognized and supported the work of the Rice and Crops Divisions.

A. Rice Division

Rice is by far the most important crop in Thailand. The Rice Division is well staffed with qualified personnel, 4 with Ph. D. degrees, 19 with Masters degrees, and 88 holding Bachelor's degrees. Operations are performed on 21 stations located throughout Thailand (attached table). Through hybridization techniques some 200 crosses are made each year with the major goals being higher yields, improved quality, and insect and disease resistance. Radiation breeding has been successful in developing several glutinous varieties. Since climatic conditions vary throughout the country, there is an extensive effort on adaptive research to identify varieties suitable to specific areas.

In addition to the local staff, shown on the attached chart, there are five foreign advisors attached to the Rice Section:

1. One advisor from IRRI working on an extensive floating rice project.

2. One advisor from the Rockefeller Foundation working on rice breeding.

3. One rice geneticist from the Japanese Tropical Research Organization.

4. One FAO advisor on rice soil fertility.

5. One advisor from the World Bank working on rice improvement for rainfed areas.

The Rice Section produces from 400-500 metric tons annually of foundation seed of some 21 varieties of lowland rice and 4 varieties of floating rice.

B. Oil Crops Section, Crops Division

This Section is involved in varietal improvement of soybeans, peanuts, and mungbeans on 13 stations in Thailand. Twenty scientists are assigned to this Section with: 1 Ph.D, 4 M.S, and 15 B.S. degrees.

Approximately 75% of the effort is on soybean research on the main Maejo station located in Chiang Mai Province. Three sub-stations are located in Sukhothai, Kalasin and Phra Phuthabath. There are 5 additional stations of some 500 rai used for seed multiplication located in Tak Fa, Mukdahan, Sakon Nakhon, and Loei. There are two soybean varieties currently recommended, with a third variety scheduled for release in 1976. At the present time there are twn promising lines plus several crosses under test. Research emphasis is toward higher yields, resistance to rust, and non-shattering types. There is one Japanese advisor cooperating in soybean research. Approximately 50-60 metric tons of foundation seed is produced in an average year.

Research on peanut improvement is done primarily in the Northeast provinces of Thailand on some 300 rai. Two varieties are presently recommended with a third variety, Tainan #9 scheduled for early release. Research efforts are toward hybridization, variety trials, and selections. Ten metric tons of foundation seed was produced in 1975 for the first time. Present plans are to increase this production to from 30-50 metric tons.

Mungbean research now consists of three year's data on ten promising lines. No outstanding variety has as yet been identified, but one variety, M-7-A is being considered for release. No problem is expected in producing the foundation seed required because they can be produced after crops having a longer growing season.

C. Maize and Sorghum Section, Crops Division

Research on maize and sorghum is conducted on 20 stations under supervision of 20 trained scientists from the DA. The DA scientists are only a part of the National Corn and Sorghum Program conducted through the cooperative efforts of the DA, Kasetsart University and the Rockefeller Foundation. The National Program which conducts

research and demonstrations on every aspect of maize and sorghum production involves over 100 trained scientists.

Major emphasis of the varietal development program has been directed toward development of composite varieties having greater yield potential, better grain quality and resistance to downy mildew. Since the 1960's three improved varieties have been released. The latest, Thai synthetic No. 1, was released in 1973. Some work is being done on hybrids but the release of hybrid varieties is not anticipated in the near future.

Breeding research in grain sorghum is directed primarily at developing varieties of white, yellow or cream color desired by the export market. Thus far, only limited success has been achieved because of the susceptability of the desired grain types to field weathering and bird damage. Bird and weather resistant lines are included in the testing program and several outstanding lines of this type are ready for release when market conditions, foreign or domestic for livestock feeding, warrant.

Department of Agricultural Technology Research Stations(Excluding Rubber

Northern Region

Chiang Rai (R)[1/]
San Patong (R)
Phrae
Nan (C)[1/]
Chiang Mai (C)
Maejo (C)

Northeast Region

Chumpae (R)
Khon Kaen (R, C)
Phimai (R)
Surin (R)
Sakon Nakhon (R)
Ubon (R)
Kalasin (C)
Sakon Nakhon (C)
Nong Khai (C)
Loei (C)
Udorn (C)
Nakhon Phanom (C)
Roi Et (C)
Buri Ram (C)
Chaiyaphum (C)
Nakhon Ratchasima (C)
Surin (C)
Ubon (C)
Maha Sarakham (C)

Central Plain Region

Phitsanulok (R)
Chai Nat (R, C)
Koksomrong (R)
Suphan Buri (R)
Huntra (R)
Ratchaburi (R)
Bangkhen (R, C)
Klong Luang (R)
Rangsit (R)
Tak Fa (C)
Nakhon Sawan (C)
Tak (C)
Sukhothai (C)
Suphan Buri (C)
Saraburi (C)
Thon Buri (C)
Rayong (C)
Chanthaburi (C)
Phra Phutthabat (C)
Uthong (C)

Southern Region

Nakhon Si Thammarat (R)
Kuan Gut (R)
Pattani (R)
Chumphon (C)

1/R--Principal emphasis on rice
C--Principal emphasis on crops other than rice

Source: Department of Agriculture, MOAC

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ANNEX B-2

Personnel Trained in Seed Technology

Primarily as a result of the AID participant training program there is a reservoir of Thai personnel who have had training in seed technology. Most of this training has been at Mississippi State University, and there is excellent cooperation among those working on the Project. In spite of this trained manpower pool, additional staff training will be required and is programmed as a grant activity under the Project.

The following individuals have completed or are presently receiving the training indicated in seed technology.

Name	Current Status	Training or Degree/year
Dr. Prasoot Sittisroung	In Research at Khon Kaen	PhD/70
Mr. Pranom Saisawat	DOAE - Chiang Mai	MS/73
Mr. Panoo Satayavibul	DOAE - Khon Kaen	MS/72
Mr. Silpachai Sojaiya	DOAE - Khon Kaen	MS/74
Mr. Rasamee Kirithavip	DA - Research at Khon Kaen	MS/69
Miss Wanbhen Amaritsut	DA - Research at Khon Kaen	MS/72
Mr. Ponchai Pookaman	DA - Rice Improvement	MA/62
Mr. Pricha Khambononda	DA - Rice Improvement	MA/62
Mr. Sermsak Awakul	DA - Rice Improvement	MA/62
Mr. Ampol Senanarong	DA - Corn & Sorghum	MS/59
Mr. Sanit Kittikorn	DA - Seed Tech. Lab	MA/63
Mr. Kasem Tunstul	DOAE - Krabi Province	MS/74
Mr. Tawee Pluemsub	Manager Phitsanulok Seed Center	MS/72
Mr. Somchai Thammonragsa	DA - Khon Kaen	MA/66
Mr. Visanu Boonying	PhD - Student (DA)	77
Mrs. Jungjan Duangpatra	PhD - Student (Kasetsart U)	75
Mr. Suppavat	MS - Student (DA)	75

AID Seed Improvement Training Course
(3 months general training in Seed Technology)

Name	Year
Dr. Sala Dasananda	56
Mr. Prasit Yengkayan	56
Mr. Sommart Dhammanuvong	57
Mr. Suvit Pushpavesa	57
Dr. Arwoot Na Lampang	59
Mr. Kasem Sukhaband	59
Mr. Sanan Intratat	59
Mr. Prasert Suwanasuk	59
Mr. K. Devahastin	62
Mr. D. Sinthavalaya	62
Mr. P Suvanajata	62
Mr. Suthep Thongmung	63
Mr. Bonnlert Klyprayong	65
Mr. Vorasak Pugdee	70
Mr. Kamolsak Kasevayuth	71
Mr. Pramote Suttaroj	71
Mr. Vithya Khunakasem	72
Mr. Suchart Saiprasert	74
Mr. Charuspong Arunsit	74
Mr. Petcharat Wannapee, DOAE 6 months On-the-Job training	73

Total Seed Requirements for Six Crops (1974), Estimated Demand for Improved Seed, and Projected Seed Production by 6th Year of Seed Project.

Crop	Total a/ National Acreage (000 rai)	Pltg. b/ Rate (kg/rai)	Total Seed Required (mt/yr)	Estimated Farmer Demand (%)	Foundation c/ Seed Needed (mt)	Seed Multiplied		Estimated d/ Seed Yield (kg/rai)	Project Seed for Distribution (mt)
						mt.	rai		
Rice	47,570	6	285,420	2	87.6	3,300	13,071	280	3,000
Corn	7,550	3.6	27,180	6	20.1	1,760	5,577	350	1,600
Soybean	1,170	6	7,020	31	92.0	2,420	15,337	175	2,200
Peanut	814	24	19,536	6	175.7	1,320	7,320	200	1,200
Mungbean	1,450	6	8,700	5	12.6	495	2,092	175	450
Sorghum	750	3.6	2,700	7	2.9	220	813	300	200
TOTAL			350,556		390.9	9,515	44,210		8,650

a/ Source: DOAE Crop Promotion Division estimates for 1974.

b/ Approximately 20% above DA recommendations to allow for some replanting. Actual farm level planting rates are presently another 20-25% higher to compensate for poor quality of seed.

c/ Includes a 22% loss factor to allow for rejection of multiplication fields, bulked seed and processed seed which do not meet specifications for quality.

d/ Clean seed (after processing) yields/rai are estimated to be about level of national average yield/rai for each crop.

Project Seed Production Schedules by Location and Crop for the Six Years of the Seed Project. Production Targets are in Metric Tons (mt) Clean, Bagged Seed.

Location/Crop	YEAR AND PERIOD											
	1976-77		1977-78		1978-79		1979-80		1980-81		1981-82	
	A-O*	O-A**	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A
Period:	1	2	3	4	5	6	7	8	9	10	11	12
PHITSANULOK												
Soybean	200	200	400	267	533	333	667	333	667	333	667	333
Corn	-	200	-	300	-	400	-	500	-	500	-	500
Rice	-	-	-	100	-	300	-	400	-	500	-	600
Mungbean	-	-	-	25	-	50	-	100	-	150	-	225
Sub-totals	200	400	400	692	533	1,083	667	1,333	667	1,483	667	1,658
KHON KAEN												
Corn	-	-	-	200	-	200	-	300	-	400	-	500
Rice	-	-	-	200	-	300	-	400	-	500	-	600
Peanut	-	-	-	200	-	300	-	400	-	600	-	700
Sorghum	-	-	-	50	-	100	-	150	-	200	-	200
Sub-totals				650		900		1,250		1,700		2,000
CHIANG MAI												
Soybean	-	-	-	-	150	250	250	400	400	600	600	600
Rice	-	-	-	-	-	200	-	200	-	300	-	300
Peanut	-	-	-	-	-	100	-	200	-	300	-	500
Sub-totals					150	550	250	800	400	1,200	600	1,400
CHAI NAT												
Rice	-	-	-	-	-	300	-	500	-	1,000	-	1,500
Corn	-	-	-	-	-	200	-	400	-	600	-	600
Mungbean	-	-	-	-	-	25	-	50	-	100	-	225
Sub-totals						525		950		1,700		2,325
TOTAL/PERIOD	200	400	400	1,342	683	3,058	917	4,333	1,067	6,083	1267	7,383
TOTAL/YEAR	600		1,742		3,741		5,250		7,150		8,650	

*A-O denotes April to October
**O-A denotes October to April

Projected "Project" Seed Available by Crop and Year, and Farmland Area (rai) that can be Planted with Seed Available.

YEAR	CROP						TOTAL
	SOYBEAN	CORN	RICE	MUNGBEAN	PEANUT	SORGHUM	
1st Year							
Commercial seed available (mt)	400	200	-	-	-	-	600
Area that can be planted (rai)*	66,667	55,555					122,220
2nd Year							
Commercial seed available (mt)	667	500	300	25	200	50	1,742
Area that can be planted (rai)	111,167	138,888	50,000	8,333	8,333	13,888	330,609
3rd Year							
Commercial seed available (mt)	1,267	800	1,100	75	400	100	3,742
Area that can be planted (rai)	211,167	222,222	183,333	12,500	16,667	27,777	673,666
4th Year							
Commercial seed available (mt)	1,650	1,200	1,500	150	600	150	5,250
Area that can be planted (rai)	275,000	333,333	250,000	25,000	25,000	41,667	950,000
5th Year							
Commercial seed available (mt)	2,000	1,500	2,300	250	900	200	7,250
Area that can be planted (rai)	333,333	416,667	383,333	41,667	37,500	55,555	1,268,055
6th Year							
Commercial seed available (mt)	2,200	1,600	3,000	450	1,200	200	8,650
Area that can be planted (rai)	366,667	444,444	500,000	75,000	50,000	55,555	1,491,660

*Calculated on basis of following planting rates (kg/rai): soybean, mungbean and rice, 6 kg; corn and sorghum, 3.6 kg; peanut, 24 kg (unshelled).

Estimated Land Area (rai) Required for Contract Production

Location/Crop	YEAR AND PERIOD											
	1976-77		1977-78		1978-79		1979-80		1980-81		1981-82	
	A-O*	O-A**	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A
Period:	1	2	3	4	5	6	7	8	9	10	11	12
PHITSANULOK												
Soybean	1/	4,182	-	5,777	-	6,971	-	6,971	-	6,971	-	6,971
Corn	697	-	1,046	-	1,394	-	1,742	-	1,742	-	1,742	-
Rice	-	-	436	-	1,306	-	1,742	-	2,179	-	2,614	-
Mungbean	-	-	174	-	349	-	697	-	1,046	-	1,568	-
Sub-total	697	4,182	1,656	5,777	3,049	6,971	4,181	6,971	4,967	6,971	5,924	6,971
CHIANG MAI												
Soybean	-	-	-	1,045	-	3,486	-	5,577	-	8,366	-	8,666
Rice	-	-	-	-	871	-	871	-	1,307	-	1,307	-
Peanut	-	-	-	-	610	-	1,220	-	1,830	-	3,050	-
Sub-total	0	0	0	1,045	1,481	3,486	2,091	5,577	3,137	8,366	4,357	8,666
CHAI NAT												
Rice	-	-	-	-	1,307	-	2,179	-	4,357	-	6,536	-
Corn	-	-	-	-	697	-	1,394	-	2,091	-	2,091	-
Mungbean	-	-	-	-	174	-	349	-	697	-	1,568	-
Sub-total	0	0	0	0	2,178	0	3,922	0	7,145	0	10,195	0
KHON KAEN												
Corn	-	-	697	-	697	-	1,046	-	1,394	-	1,742	-
Rice	-	-	871	-	1,307	-	1,742	-	2,179	-	2,614	-
Peanut	-	-	1,220	-	1,803	-	2,440	-	3,660	-	4,270	-
Sorghum	-	-	204	-	406	-	610	-	813	-	813	-
Sub-total	0	0	2,992	0	4,213	0	5,838	0	8,046	0	9,439	-
TOTAL/PERIOD	697	4,182	4,648	6,822	10,921	10,457	16,032	12,548	23,295	15,337	29,915	15,637
TOTAL/YEAR	4,879		11,470		21,378		28,580		38,632		45,552	

1/ During the Project preparatory period 1,393 rai of soybeans should be contracted.
*A-O denotes April to October.
**O-A denotes October to April.

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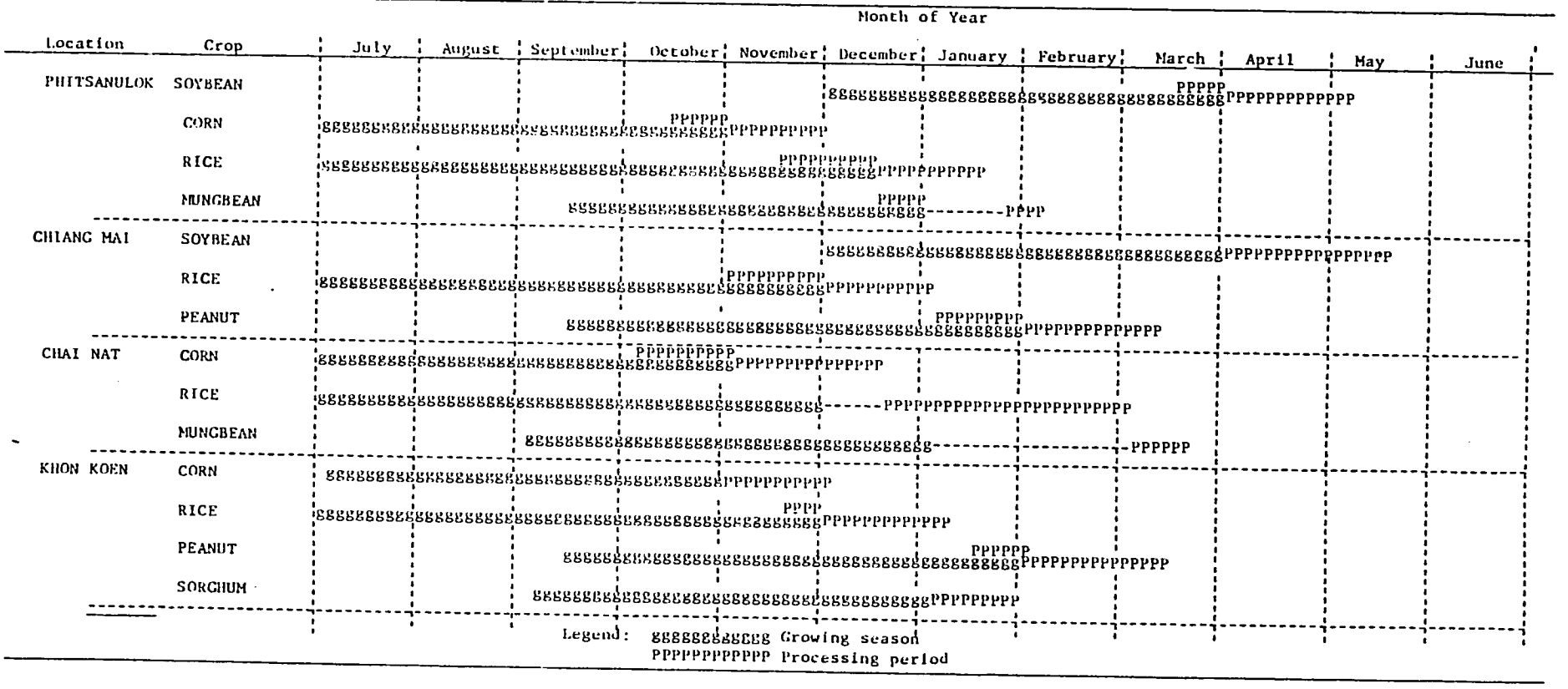
Projected receiving and processing schedule for project produced seed by crop and location during the year. Projections based on 25 mt/day processing capacity or 600 mt/month.



Production of Foundation Seed Needed by Crop and Year
for Each of the Four Seed Production Locations

Location/Crop	1975	YEAR OF PROJECT											
		1976-77 *		1977-78		1978-79		1979-80		1980-81		1981-82	
	0	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A	A-O	O-A
PHITSANULOK													
Soybean		--	27.9	--	36.3	--	41.8	--	41.8	--	41.8	--	41.8
Corn		2.5	--	3.8	--	5.1	--	6.3	--	6.3	--	6.3	--
Rice		--	--	2.9	--	8.8	--	11.7	--	14.6	--	17.5	--
Mungbean		--	--	1.1	--	2.1	--	4.1	--	6.3	--	6.3	--
CHIANG MAI													
Soybean		--	--	--	16.7	--	27.2	--	41.8	--	50.2	--	50.2
Rice		--	--	--	--	5.8	--	5.8	--	8.8	--	8.8	--
Peanut		--	--	--	--	14.6	--	29.3	--	43.9	--	73.2	--
CHAI NAT													
Rice		--	--	--	--	8.8	--	11.7	--	29.2	--	43.8	--
Corn		--	--	--	--	2.5	--	5.1	--	7.5	--	7.5	--
Mungbean		--	--	--	--	1.1	--	2.1	--	4.2	--	6.3	--
KHON KAEN													
Corn		--	--	2.5	--	2.5	--	3.8	--	5.1	--	6.3	--
Rice		--	--	5.8	--	8.8	--	11.7	--	14.6	--	17.5	--
Peanut		--	--	29.2	--	43.9	--	58.6	--	87.8	--	102.5	--
Sorghum		--	--	0.8	--	1.5	--	2.2	--	2.9	--	2.9	--
TOTALS		2.5	27.9	46.1	53.0	105.5	69.0	152.4	83.6	231.2	92.0	298.9	92.0

* A-O = April 1 to September 30; O-A = October 1 to March 31.

NOTE: Actual production schedules are 22% greater to allow for rigorous adherence to field and seed quality standards.

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Estimated Value of Existing Facilities, and Cost of Facilities Needed by Project Year

Location/Use/Item	Size M^2	Unit Cost M^2	Pre-Project 0	Cost By Project Year* 1	2	3	4	5	6	Location Total
PHITSANULOK										
1. Offices and quality control laboratory			13,692							
2. Seed processing building			57,510							
3. Storehouse, ventilated			22,820							
4. Storehouse, ventilated	600	70					42,000			
5. Storehouse, air-conditioned w/insulation			27,119							
6. Storehouse, air-conditioned, w/insulated ceiling	400	130		52,000						
7. Workshop			4,564							
8. Drying Floor, Concrete			5,751							
Estimated site preparation for pre-project construction			32,216	5,200			4,200			
Sub-Total			163,672	57,200			46,200			267,072

*Costs are based on January 1, 1976 project prices.

Cost of Facilities Needed by Project Year

Location/Use/Item	Size M^2	Unit Cost M^2	Pre-Project 0	Cost By Project Year* 1	2	3	4	5	6	Location Total
KHON KAEN										
1. Offices and quality control laboratory	120	110			13,200					
2. Seed processing building	400	130			52,000					
3. Storehouse, ventilated	1,000	70			70,000					
	600	70						42,000		
4. Storehouse, air-conditioned, w/insulated ceiling	100	130			13,000					
5. Sacked seed dryer, open sides, w/roof	300	45			13,500					
6. Drying floor, concrete	600	10.65			6,390					
7. Equipment shed	100	48.9			4,890					
Site, Site Preparation and Utilities Hook-up					38,547			4,200		
Sub-Total					211,527			46,200		257,727

*Costs are based on January 1, 1976 project prices.

Cost of Facilities Needed by Project Year

Location/Use/Item	Size M^2	Unit cost M^2	Pre-Project 0	Cost by Project Year* 1	2	3	4	5	6	Location Total
CHIANG MAI										
1. Offices and quality control laboratory	120	110			13,200					
2. Seed processing building	400	130			52,000					
3. Storehouse, ventilated	600 600	70 70			42,000			42,000		
4. Storehouse, air-conditioned, w/insulation			24,000							
5. Storehouse, air-conditioned, w/insulated ceiling	400	130			52,000					
6. Sacked seed dryer, open sides, w/roof	600	45			27,000					
7. Drying floor, concrete	600	10.65			6,390					
8. Equipment shed	100	48.9			4,890					
Site, site preparation and Utilities hood-up					41,172			4,200		
Sub-total			24,000		238,652			46,200		308,852

*Costs are based on January 1, 1976 project prices.

Cost of Facilities Needed by Project Year

Location/Use/Item	Size M^2	Unit Cost M^2	Pre-Project 0	Cost by Project Year* 1	2	3	4	5	6	Location Total
CHAI NAT										
1. Offices, and quality control laboratory	120	110				13,200				
2. Seed processing building	400	130				52,000				
3. Storehouse, ventilated	1,000	70				70,000				
	800	70						56,000		
4. Storehouse, air-conditioned, w/insulated ceiling	100	130				13,000				
5. Sacked seed dryer, open sides, w/roof	300	45				13,500				
6. Drying floor, concrete	600	10.65				6,390				
7. Equipment shed	100	48.9				4,890				
Site, site preparation and utilities hook-up						37,490		5,600		
Sub-Total						210,470		61,600		272,070
Facilities Total			187,672	57,200	450,179	210,470	46,200	154,000		1,105,721
Less Pre-project value										187,672
										918,049

*Costs are based on January 1, 1976 project prices.

List of Equipment with Use, Location, and Estimated Cost

Use/Item	Unit Cost (US$)	Units by Location 1/ PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
A. SEED DRYING, SHELLING, BULK STORAGE											
1. Drying bin, metal, flat perforated floor, w/foundation ring and air intake, bin hopper w/unloading auger, vent and load port in roof, walkin side door, ladder, 18' D, 14' sidewall, 25 mt capacity at 10'.	3,400	2		2	2	6,800	6,800	6,800			
2. Heater-fan drying unit, direct oil-fired, safety devices, 10000 CFM/1.5", up to 300,000 btu/hr.	5,000	2	2	2	2	10,000	20,000	10,000			
3. Conveyor, inclined belt w/flights, open trough, undercarriage, drive, 8.5 m, 8-10 mt/hr capacity.	1,200	1	1	1	1	1,200	2,400	1,200			
4. Same as 3. but 5.0 m long and wo/undercarriage.	700	2	1	2	2	1,400	2,100	1,400			
5. Corn sheller, w/aspirator and cob blower, 7 mt/hr, w/starter and drive.	1,700	1		1	1	1,700	1,700	1,700			
6. Perforated metal flooring, panel-lock type.	15/m^2	50	50	50	50	750	1,500	750			
		------	m^2	------							

1/ PS refers to Phitsanulok; CM to Chiang Mai; CN to Chai Nat; KK to Khon Kaen.

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
7. Tubular belt conveyor, up to 45° incline, all-weather housing, w/undercarriage, load hopper, discharge spout, 40 mt/hr.	3,000	1	1	1	1	3,000	6,000	3,000			
8. Aeration fan, centrifigal type, 4000 cfm/3", w/starter.	1,000	1	1	1	1	1,000	2,000	1,000			
						25,850	42,500	25,850			
	plus, Shipping (40%)					10,340	17,000	10,340			
	Spare parts (5%)					1,292	2,125	1,292			
	Installation (10%)					2,585	4,250	2,585			
	Sub-total A					40,067	65,895	40,067			
B. SEED PROCESSING, TREATING, PACKAGING											
1. Air-screen cleaner, 4 screens, 2 air systems, 12 screens, w/drive, drive mount and accessories.	9,000		1	1	1		18,000	9,000			
2. Screens, additional, for 1.	60		12	12	12		1,440	720			
3. Elevator, belt-bucket type, receiving, all-weather housing, w/drive, starter, hopper, 3-way spout, 10-12 mt/hr.	4,200		1	1	1		8,400	4,200			
4. Elevator, belt-bucket type, indoor use, w/drive and hopper, 4-5 mt/hr.	1,400		4	4	4		11,200	5,600			

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location				Cost by Project Year (US$)					
		PS	CM	CN	KK	1	2	3	4	5	6
5. Dust collector, cyclone type, sized for air-screen cleaner in B.1, w/mount.	1,800		1	1	1		3,600	1,800			
6. Ducting, metal, round, for dust collector in B.5.	20/m		20	20	20		800	400			
7. Gravity table seed separator, w/drive and 3 different decks, 3 mt/hr.	4,000		1	1	1		8,000	4,000			
8. Width-thickness seed separator, precision grader type, with drive and twin shells, 8 extra shells, 3 mt/hr.	4,200			1	1		4,200	4,200			
9. Length seed separator, indent cylinder type, 3 mt/hr, with 3 extra cylinders, drive.	3,000		1	1	1		6,000	3,000			
10. Seed treater, slurry type, with drive, mixing tank and agitator, 7 mt/hr.	2,200		1	1	1		4,400	2,200			
11. Bagger-weigher, semi-automatic, with bag closer (sewing head), bag conveyor, 5 bags/min, drives.	2,800		1	1	1		5,600	2,800			

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location				Cost by Project Year (US$)					
		PS	CM	CN	KK	1	2	3	4	5	6
12. Scale, platform shallow pit type, metric, 2 mt capacity.	1,500		1	1	1		3,000	1,500			
13. Scale, platform portable type, w/casters, metric, 0.5 mt capacity.	500		2	2	2		2,000	1,000			
14. Bag conveyor, belt type, w/undercarriage, 5 m/length.	1,500		1	1	1		3,000	1,500			
15. Bag trucks, 4 wheel platform type, bearing casters, platform 3 x 6 ft.; 1.5 mt capacity.	400		4	4	4		3,200	1,600			
16. Bag truck, 2 wheel type, bearing wheels.	100		4	4	4		800	400			
17. Vacuum cleaner, heavy duty industrial type, with attachments, portable.	600		1	1	1		1,200	600			
18. Blower, electric, hand held type, heavy duty, w/nozzles.	200		2	2	2		800	400			
19. Bin, metal, holding, hopper bottom, floor supported frame, 5 mt.	1,000		1	1	1		2,000	1,000			
20. Bin, holding, metal, hopper bottom, floor supported frame, 1.5 mt.	600		4	4	4		4,800	2,400			

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
21. Angle iron frames for equipment supports.	400		4	4	4		3,200	1,600			
22. Spouting, metal, flexible, 6" diameter, w/flanges.	12/m		15	15	15		360	180			
			----m-----								
23. Spouting, metal, rigid, 6" diameter, w/flanges.	8/m		20	20	20		320	160			
			----m-----								
24. Ventilator fan, turret type, for roof mounting, w/motor.	600		4	4	4		4,800	2,400			
25. Electric motor starters, safety type, on/off.	50 each		12	12	12		1,200	600			
26. Bag holders, universal type, metal.	50		6	6	6		600	300			
27. Auger conveyor, utility type, w/hopper and electric motor, 6" diameter, 25 mt/hr.	300		1	1	1		600	300			
							103,520	53,860			
plus, Shipping (40%)							41,408	21,544			
Spare parts (5%)							5,176	2,693			
Installation (10%)							10,352	5,386			
Sub-total B							160,456	83,483			

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
C. SEED STORAGE											
1. Dehumidifier, desiccant type, 10/gal. water removal capacity/day.	2,500	2	2	2	2	2,500	5,000	2,500			
2. Hygrothermographs, drum type, 7 day clock, recording, w/500 charts.	400	2	2	2	2	800	1,600	800			
						3,300	6,600	3,300			
plus, Shipping (40%)						1,320	2,640	1,320			
Spare parts (5%)						165	330	165			
Sub-total C						4,785	9,570	4,785			
D. QUALITY CONTROL & TESTING											
1. Moisture tester, electric.	800		1	1	1		1,600	800			
2. Oven, heated air.	450		1	1	1		900	800			
3. Seed divider, electric.	300		1	1	1		600	300			
4. Balance, torsion, w/weights.	300		1	1	1		600	300			
5. Scale, gram, balance beam type, 500 g.	90		3	3	3		540	270			
6. Lamp, fluorescent, floating type, w/magnifier.	90		2	2	2		360	180			

(3)

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
7. Volume/weight tester, hand held type, metric.	100		1	1	1		200	100			
8. Refrigerator, household type, medium size.	400		1	1	1		800	400			
9. Germinator, small, heating only.	500		1	1	1		1,000	500			
10. Seed triers, probes for sampling.	75		6	6	6		900	450			
11. Screens, hand testing, 9" x 9", set of 24, selected sizes.	300		set	set	set		600	300			
12. Miscellaneous (forceps, purity boards, counting boards, pans, etc.)	1,000		set	set	set		2,000	1,000			
13. References and handbooks.	500	set	set	set	set	500	1,000	500			
						500	10,600	5,550			
	plus, Shipping (40%)						3,840	2,020			
	Spare parts (5%)						480	250			
	Sub-total D					500	14,920	7,822			

NOTE: $2,000 references not included in shipping and spare parts calculation.

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
E. GENERAL PURPOSE											
1. Mechanic tool set	600 set	1	1	1	1	625	1,250	625			
2. Calculator	500	1	1	1	1 & 2 Bangkok	1,500	1,000	500			
3. Typewriters	500	2	2	2	2 & 2 Bangkok	2,000	2,000	1,000			
4. Mimeograph machine, w/accessories	600	1	1	1	1 & 1 Bangkok	1,200	1,200	600			
5. Projector, slide, 35 mm, w/accessories	400	1	1	1	1 & 1 Bangkok	800	800	400			
6. Projection screen, portable	100	1	1	1	1 & 1 Bangkok	200	200	100			
7. PA system, portable, battery powered	100	1	1	1	1 & 1 Bangkok	200	200	100			
8. Office furnishings	1,000/ office	0	3	3	3 & 3 Bangkok	3,000	6,000	3,000			
						9,525	12,650	6,325			
	plus, 5% spare parts					476	632	316			
	Sub-total E					10,001	13,282	6,641			

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
F. SEED THRESHERS											
1. Thresher, all-purpose, plot size, portable, Thai made.	1,500		10	10	10		30,000	15,000			
							30,000	15,000			
	plus, Spare parts (5%)						1,500	750			
	Sub-total F						31,500	15,750			
G. TRANSPORT & VEHICLES											
1. Truck, 2 axle, 6 wheel, heavy duty, 5 mt.	14,000	2	2	2	2	28,000	56,000	28,000			
2. Tarpaulins for truck.	150	2	2	2	2	300	600	300			
3. Truck, pick-up, 3/4 ton,	4,000	3	3	3	3	24,000	24,000	4,000		21,000*	
		& 3 Bangkok									
4. Mini-bus	8,000	1 Bangkok				8,000				6,000*	
5. Driver's tool set	100	6	6	6	6	800	1,200	400			
	Sub-total G					61,100	81,800	32,700		27,000	

* Vehicle replacement with trade-in.

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS	CM	CN	KK	Cost by Project Year (US$) 1	2	3	4	5	6
H. SPECIAL CONDITIONED STORAGE											
1. Air conditioner, 18,000 btu, with high dehumidification capacity.	1,000	8	8	4	4	8,000	12,000	4,000			
		Sub-total H				8,000	12,000	4,000			
I. EQUIPMENT FOR MARKETING FUNCTION, MARKET ORGANIZATION FOR FARMERS											
1. Calculator	500	2 - Bangkok				1,000					
2. Typewriter	500	2 - Bangkok				1,000					
3. Mimeograph, office	600	1 - Bangkok				600					
4. Office furnishings	1,000	2 - Bangkok				2,000					
5. Car, utility	5,000	1 - Bangkok				5,000				3,750*	
6. Car, utility	4,000	1	1	1	1	4,000	4,000	8,000		3,000*	
		Sub-total I				13,600	4,000	8,000		6,750	

* Vehicle replacement with trade-in

List of Equipment (Continued)

Use/Item	Unit Cost (US$)	Units by Location PS CM CN KK	Cost by Project Year (US$) 1	2	3	4	5	6
J. EQUIPMENT FOR TECHNICAL TRAINING AND EXTENSION EDUCATION								
1. Car, utility, carryall type.	7,350	2 - Bangkok	14,700					
2. Truck, pick-up, 3/4 ton, with tool kit.	4,200	4 - Bangkok	4,200	4,200	8,400		3,000*	
3. Calculator	500	3 - Bangkok	1,500					
4. Typewriter	500	2 - Bangkok	1,000					
5. Mimeograph, office	600	1 - Bangkok	600					
6. Slide projector	500	1 - Bangkok	500					
7. Projection screen	100	1 - Bangkok	100					
8. PA system, portable	100	4 - Bangkok	400					
9. Office furnishings	1,000	3 - Bangkok	3,000					
		Sub-total J	26,000	4,200	8,400		3,000	
All Equipment Grand Total			164,053	397,623	211,648	-	36,750	-

* Vehicle replacement with trade-in.

SEED GROWERS CONTRACT
(Unofficial Translation)

Soybean Multiplication Seed Production Agreement, 1974
Department of Agricultural Extension
Ministry of Agriculture & Cooperatives

****

This agreement is signed at_____on_____19___ between (Mr. Mrs. Miss)_____whose address is_____(house No.)_____(Village No.)_____ (Tambon)_____(Amphoe)_____(Changwat) who in the agreement, shall be called the "cultivator" as one party, and (Mr. Mrs. Miss)_____(official position, title and grade) Amphoe agricultural officer, the representative of the Agricultural Extension Department, as the other party.

The provisions of the agreement are as follows:

1. The cultivator gives his statement of agreement as follows:

1.1 I will plant soybeans of_____variety on an area of _____rai at the rate of_____kilos per rai using Foundation see, which cost ฿_____per kilo, to produce Multiplication seed for the Agricultural Extension Department.

1.2 I will cultivate the soybeans in the area which the representative of the Agricultural Extension Department has concurred.

1.3 I agree to be trained or receive orientation concerning soybean cultivation for producing Multiplication seed from personnel of the Agricultural Extension Department.

1.4 I will act strictly according to the advice of said personnel in practices such as in land preparation, plant spacing, elimination of weeds, insects and diseases, harvesting, threshing, etc.

1.5 I agree to sell the Multiplication seed produced by me according to the amount and price specified in clause 2.1 of this agreement.

1.6 I will keep the seed as best as I can while awaiting their transfer to the purchasing committee by preventing damage by pests and moisture, such as rain or dew.

2. The Agricultural Extension Department gives the statement of agreement as follows:

2.1 The Department will purchase the Multiplication seed produced in the area stated above at_____Baht per kilo provided the seed meet the following quality standards:

(a) Pure seed 100% (no varietal mixture)
(b) Maximum moisture content 20%
(c) Minimum germination 85%
(d) Maximum 5% green seed (unripe seed)
(e) Maximum spoiled seeds such as broken, thin, insect damaged 10%
(f) Maximum adulterating materials, i.e. stones, gravel, soil, etc. 2%

2.2 The Department will render assistance and give technical advice in connection with the cultivation and care of soybeans grown for production of Multiplication seed and give advice for the prevention and elimination of soybean pests throughout the growing season.

2.3 The Department will pay for the Multiplication seeds not more than 15 days, after the purchasing committee has approved their purchase.

2.4 Payment for the seed will be made through the Bank. (sic- indicated on the payment draft).

3. Conditions

3.1 In the event the price of soybeans guaranteed by the Department of Agricultural Extension, according to the agreement, is lower than the local market price for grain, the Department permits the cultivator to sell the grain to the local merchants, but the cultivator must pay the Department for the Foundation seed supplied, in cash, and repay any loan and interest that was incurred for producing this crop within 15 days.

3.2 Any cultivator who wishes to sell the Multiplication seed according to clause 3.1 must inform the representative of the Department of Agricultural Extension, at leat 7 days before the sale.

3.3 In the event that the Purchasing Committee has considered and found that the quality of the seed produced by the cultivator, according to the provisions of this Agreement, is lower than that specified in Clause 2.1 and the Committee does not buy the seed, the cultivator has to pay the cost of the Foundation seeds to the Agricultural Extension Department equal to the amount that the cultivator has bought.

3.3.1. Pay back the loan together with the interest to the bank from which the cultivator has obtained the loan.

3.3.2. The cultivator cannot claim any compensation from the Department of Agricultural Extension whatsoever.

This Agreement is made in 3 copies, having the same provisions. One copy is kept by the cultivator; one by the representative of the Department of Agricultural Extension and one at the Changwat Agricultural Office.

The cultivator has read and understood all the provisions of this Agreement and has signed his signature in the presence of two witnesses.

Cultivator's Signature _____
( )

Signature of the
Representative of the
Dept. of Agri. Extension _____
( )

Witness' Signature _____

Witness' Signature _____

STAFFING AND COSTS ($)

Seed Operations

	Salary /Man Yr. 1/	PROJECT YEAR													
		Prep. Period		1		2		3		4		5		6	
		MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost
1. Seed Operations															
1. Administration															
Chief - Seed Division	3,466	0.25	867	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733
Operations Manager	1,908	0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Accountant	1,908	0.25	477	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954
Secretary	1,172	0.25	293	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Accountant	1,172	0.25	293	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Crops Specialists	1,172	-		-		-		-		0.4	469	0.6	703	0.6	703
Clerk/Typists	868	1.0	868	1.0	868	2.0	1,736	2.0	1,736	2.0	1,736	2.0	1,736	2.0	1,736
Permanent Labor	640	0.5	320	1.0	640	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280
Sub-Total Administration			4,072		8,447		9,883		9,955		10,424		10,658		10,824
2. Seed Production-Processing Centers															
a. Phitsanulok															
Center Chief	1,908	0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Production/Quality Control Officer	1,172	0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Qual. Cont. Off.	1,172	0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Processing Officer	1,172	0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Process. Officer	1,172	0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Secretary/Bookkeeper	1,172	0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Clerk/Typist	868	0.5	434	1.0	868	1.0	868	1.0	868	1.0	868	1.0	868	1.0	868
Mechanic	868	0.5	434	1.0	868	1.0	868	1.0	868	1.0	868	1.0	868	1.0	868
Skilled Labor	770	1.0	770	2.0	1,540	2.0	1,540	2.0	1,540	2.0	1,540	2.0	1,540	2.0	1,540
Unskilled Labor	640	2.0	1,280	5.0	3,200	5.0	3,200	5.0	3,200	5.0	3,200	5.0	3,200	5.0	3,200
Temporary Labor	1.25/man day	-			250		455		672		833		896		969
Sub-Total - Phitsanulok			6,802		14,494		14,699		14,916		15,077		15,140		15,213

1/ Man Year (MY) or one full time employee.

STAFFING AND COSTS ($)

Seed Operations

	Salary /Man Yr.	Prep. Period MY	Prep. Period Cost	1 MY	1 Cost	2 MY	2 Cost	3 MY	3 Cost	4 MY	4 Cost	5 MY	5 Cost	6 MY	6 Cost
		PROJECT YEAR													
b. Khon Kaen															
Center Chief	1,908	-		0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Production/Quality Control Officer	1,172	-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Qual. Cont. Off.	1,172	-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Processing Officer	1,172	-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Process. Officer	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Secretary/Bookkeeper	1,172	-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Clerk/Typist	868	-		-		1.0	868	1.0	868	1.0	868	1.0	868	1.0	868
Mechanic	868	-		-		0.5	434	1.0	868	1.0	868	1.0	868	1.0	868
Skilled Labor	770	-		-		1.0	770	2.0	1,540	2.0	1,540	2.0	1,540	2.0	1,540
Unskilled Labor	640	-		0.5	320	3.5	2,240	5.0	3,200	5.0	3,200	5.0	3,200	5.0	3,200
Temporary Labor	1.25/man day	-		-			270		375		521		708		834
Sub-Total - Khon Kaen					2,446		11,764		14,619		14,765		14,952		15,078
c. Chiang Mai															
Center Chief	1,908	-		-		1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Production/Quality Control Officer	1,172	-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Qual. Cont. Off.	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Processing Officer	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Process. Officer	1,172	-		-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Secretary/Bookkeeper	1,172	-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Clerk/Typist	868	-		-		0.5	434	1.0	868	1.0	868	1.0	868	1.0	868
Mechanic	868	-		-		-		1.0	868	1.0	868	1.0	868	1.0	868
Skilled Labor	770	-		-		-		2.0	1,540	2.0	1,540	2.0	1,540	2.0	1,540
Unskilled Labor	640	-		-		1.5	960	5.0	3,200	5.0	3,200	5.0	3,200	5.0	3,200
Temporary Labor	1.25/man day	-		-		-			292		438		666		834
Sub-Total - Chiang Mai							6,818		14,536		14,682		14,910		15,078

STAFFING AND COSTS ($)

Seed Operations

	Salary /Man Yr.	PROJECT YEAR													
		Prep. Period		1		2		3		4		5		6	
		MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost
d. Chai Nat															
Center Chief	1,908	-		-		0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Production/Quality Control Officer	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Qual. Cont. Off.	1,172	-		-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Processing Officer	1,172	-		-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Asst. Prod/Process. Officer	1,172	-		-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172
Secretary/Bookkeeper	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Clerk/Typist	868	-		-		-		1.0	868	1.0	868	1.0	868	1.0	868
Mechanic	868	-		-		-		0.5	434	1.0	868	1.0	868	1.0	868
Skilled Labor	770	-		-		-		1.0	770	2.0	1,540	2.0	1,540	2.0	1,540
Unskilled Labor	640	-		-		0.5	320	3.5	2,240	5.0	3,200	5.0	3,200	5.0	3,200
Temporary Labor	1.25/man day	-		-		-			219		395		708		969
Sub-Total - Chai Nat							2,446		11,713		14,639		14,952		15,213
Sub-Total - Seed Production-Processing			6,802		16,940		35,727		55,784		59,163		59,954		60,582

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STAFFING AND COSTS ($)

Seed Operations

	Salary /Man Yr.	Prep. Period MY	Prep. Period Cost	1 MY	1 Cost	2 MY	2 Cost	3 MY	3 Cost	4 MY	4 Cost	5 MY	5 Cost	6 MY	6 Cost
		PROJECT YEAR													
3. Marketing															
a. General Management (Bangkok)															
Sales Manager	2,310	-		1.0	2,310	1.0	2,310	1.0	2,310	1.0	2,310	1.0	2,310	1.0	2,310
Asst. Sales Manager	1,260	-		-		1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260
Accountant	1,260	-		1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260
Clerk	610	-		1.0	610	1.0	610	1.0	610	1.0	610	1.0	610	1.0	610
Driver	480	-		1.0	480	1.0	480	1.0	480	1.0	480	1.0	480	1.0	480
					4,660		5,920		5,920		5,920		5,920		5,920
b. Phitsanulok															
Traffic and Operations Manager	1,908	-		1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Salesman	1,260	-		1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260
Clerk	610	-		1.0	610	1.0	610	1.0	610	1.0	610	1.0	610	1.0	610
					3,778		3,778		3,778		3,778		3,778		3,778
c. Khon Kaen															
Traffic and Operations Manager	1,908	-		-		0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Salesman	1,260	-		-		0.5	630	1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260
Clerk	610	-		-		0.5	305	1.0	610	1.0	610	1.0	610	1.0	610
							1,889		3,778		3,778		3,778		3,778
d. Chiang Mai and Chiang Rai															
Traffic and Operations Manager	1,908	-		-		-		1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Salesman	1,260	-		-		-		1.0	1,260	1.0	1,260	1.0	1,260	1.0	1,260
Clerk	610	-		-		-		1.0	610	1.0	610	1.0	610	1.0	610
									3,778		3,778		3,778		3,778
e. Chai Nat															
Traffic and Operations Manager	1,908	-		-		-		0.5	954	1.0	1,908	1.0	1,908	1.0	1,908
Salesman	1,260	-		-		-		0.5	630	1.0	1,260	1.0	1,260	1.0	1,260
Clerk	610	-		-		-		0.5	305	1.0	610	1.0	610	1.0	610
									1,889		3,778		3,778		3,778
Sub-Total - Marketing					9,698		11,587		17,254		21,032		21,032		21,032
GRAND TOTAL - Seed Operations			10,674		35,085		57,192		82,993		90,619		91,638		92,438

STAFFING AND COSTS ($)

Inoculant Production

(Assume: Full capacity operation starting the 2nd half of 2nd year)

	Salary /Man Yr.	PROJECT YEAR													
		Prep. Period		1		2		3		4		5		6	
		MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost
II. Inoculant Production															
Chief	3,466	0.25	867	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733
Quality Control Officer	1,908	0.25	477	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954
Asst. Quality Control Officer	1,172	-		0.7	820	0.7	820	0.7	820	0.7	820	0.7	820	0.7	820
Production Officer	1,908	0.25	477	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954
Asst. Production Officer	1,172	-		0.7	820	0.7	820	0.7	820	0.7	820	0.7	820	0.7	820
Engineer	1,172	-		-		0.5	586	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Microbiologist	1,172	-		-		1.0	1,172	2.0	2,344	2.0	2,344	2.0	2,344	2.0	2,344
Mechanic	868	-		-		0.5	434	1.0	868	1.0	868	1.0	868	1.0	868
Permanent Labor	640	-		2.0	1,280	5.0	3,200	10.0	6,400	10.0	6,400	10.0	6,400	10.0	6,400
GRAND TOTAL - Inoculant			1,821		6,561		10,673		16,065		16,065		16,065		16,065

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STAFFING AND COSTS ($)

Technical Training and Extension Education

	Salary /Man Yr.	PROJECT YEAR													
		Prep. Period		1		2		3		4		5		6	
		MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost
3. Khon Kaen															
Demonstrations Officer	1,172	-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
4. Chiang Mai															
Demonstrations Officer	1,172	-		-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
5. Chai Nat															
Demonstrations Officer	1,172	-		-		-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
GRAND TOTAL - Technical Training and Extension Activities			6,854		20,771		21,943		23,115		24,990		22,944		22,944
GRAND TOTAL - Seed Project - Thai Salaries			19,549		62,417		89,808		124,062		131,674		130,647		131,477

STAFFING AND COSTS ($)

Technical Training and Extension Education

	Salary /Man Yr.	PROJECT YEAR													
		Prep. Period		1		2		3		4		5		6	
		MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost	MY	Cost
III. Technical Training and Extension Activities															
1. (a) Division Headquarters															
Chief - Seed Division	3,466	0.25	867	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733	0.5	1,733
Chief Training Officer	1,908	0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Accountant	1,908	0.25	477	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954	0.5	954
Secretary	1,172	0.25	293	0.5	586	0.5	586	0.5	586	0.5	586	0.5	586	0.5	586
Asst. Accountant	1,172	0.25	293	0.5	586	0.5	586	0.5	586	0.5	586	0.5	586	0.5	586
Crops Specialists	1,172	-		1.0	1,172	1.0	1,172	1.0	1,172	1.6	1,875	2.4	2,813	2.4	2,813
Clerk/Typists	868	1.0	868	4.0	3,472	4.0	3,472	4.0	3,472	4.0	3,472	4.0	3,472	4.0	3,472
Permanent Labor	640	1.0	640	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280
Sub-Total - Division Headquarters			4,392		11,691		11,691		11,691		12,394		13,332		13,332
(b) Technical Assistance Team Support															
Secretary	1,172	-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	-		-	
Translator	1,172	-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	-		-	
Driver	640	-		1.0	640	1.0	640	1.0	640	1.0	640	-		-	
Sub-Total - T.A. Team Support					2,984		2,984		2,984		2,984				
Sub-Total - Div. Hqts. & TA Team Support			4,392		14,675		14,675		14,675		15,378		13,332		13,332
2. Phitsanulok Training Center															
Asst. Training Officer	1,908	0.5	954	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908	1.0	1,908
Demonstrations Officer	1,172	-		1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172	1.0	1,172
Clerk/Typists	868	1.0	868	2.0	1,736	2.0	1,736	2.0	1,736	2.0	1,736	2.0	1,736	2.0	1,736
Permanent Labor	640	1.0	640	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280	2.0	1,280
Sub-Total - Phitsanulok Training Center			2,462		6,096		6,096		6,096		6,096		6,096		6,096

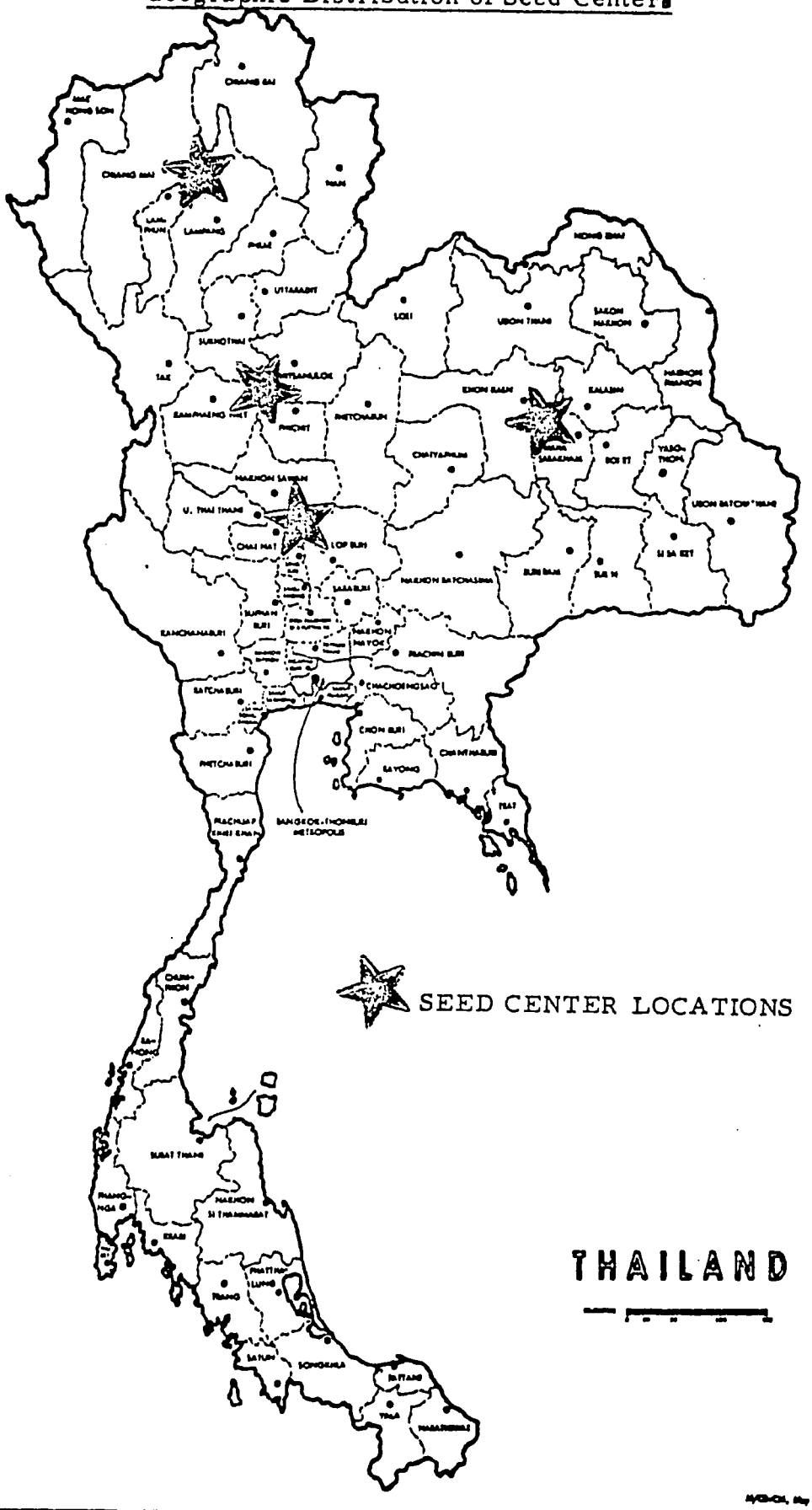
Personnel and Their Estimated Division of Responsibility

in Seed Production and Processing

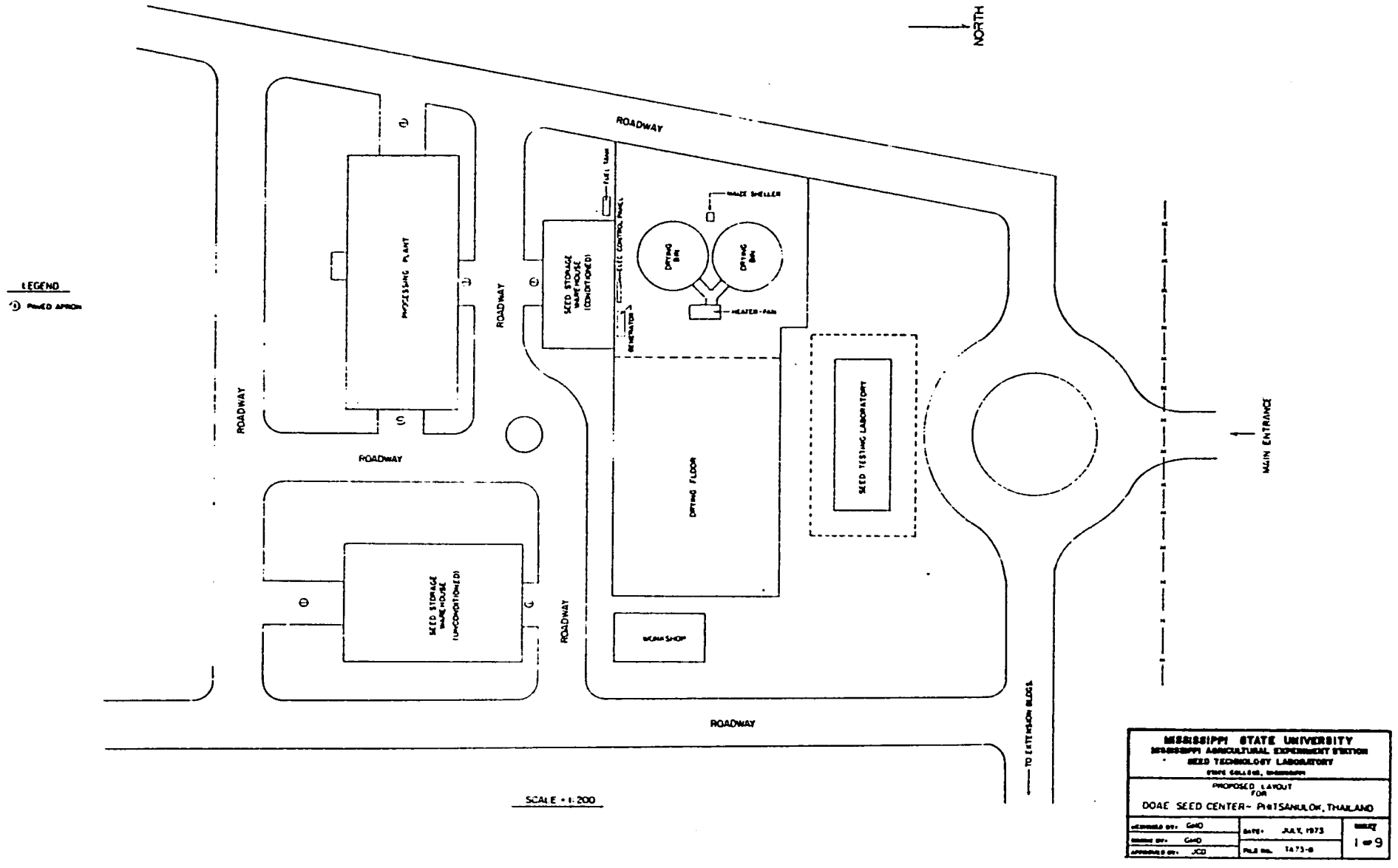
TITLE	No.	Recom-mended Grade	Function	
			Production % of time	Processing % of time
Chief of Center	1	2	50	50
Production/Quality Control Officer	1	3	70	30
Asst. Prod./Quality Cont. Officer	1	3	70	30
Processing Officer	1	3	-	100
Asst. Prod/Processing Officer	1	3	40	60
Secretary/Bookkeeper	1	3	50	50
Clerk/Typist	1	4	50	50
Mechanic	1	4	25	75
Laborer (cleaning)	1	E-1	-	100
Laborer (warehouse)	1	E-1	-	100
Watchmen	2	E-2	25	75
Drivers	2	E-2	50	50
Janitor	1	E-2	-	100

Temporary labor: 1 man/day per each 3 MT processed

Geographic Distribution of Seed Centers



Layout of the Phitsanulok Seed Center



ANNEX B-14

Varieties currently recommended to be multiplied by the Seed Project

Crop/variety 1/	Notes	Center for Multiplication			
		P	KK	CM	CN
Soybeans					
SJ-1		x		x	
SJ-2		x		x	
Rice					
Leuang Yai 148	non-glutinous			x	
Nam Sa Gui	non-glutinous		x		
RD-1	non-glutinous	x			x
RD-2	glutinous		x	x	
RD-3	non-glutinous	x			x
RD-4	glutinous		x	x	
RD-5	non-glutinous	x			x
Corn					
PB 5		x	x		
Peanuts					
SK 38			x	x	
Mungbean					
None	(see ANNEX B-16)		x		x
Sorghum					
PB Hegari			x		

1/ Source: List of Recommended Varieties, DA-1974

Anticipated new varieties to be multiplied by the Seed Project

Crop/variety 1/	Foundation Seed available	Project Seed available	Location of Production			
			P	KK	CM	CN
Soybean						
SJ-3 (replace SJ-2)	1976	1977	x		x	
Rust resistant line (replace SJ-1)	1978	1979	x		x	
Rice						
BKN 6809-74-70 (NG)	1976	1977	x		x	x
SPR 6726-134-2-6 (NG)	1978	1979		x		
RD 169-NF, U-G 1-47 (G)	1977	1978		x	x	
or RD 169-NF, U-G 2-32 (G)	1977	1978				
Corn						
Thai Composite 1 (replace 50% PB-5)	1976	1977	x		x	
Thai DMR 6 (replace 50% PB-5)	1977	1978	x		x	
Peanuts						
Tainan #9 (replace SK 38)	1976	1977		x	x	
Mungbean						
M-7-A	1976	1977				
NN 1	1977	1978				
Sorghum						
IS 8719 (replace 50% PB Hegari)	1977	1978		x		
TSS 7-5 (replace 50% PB Hegari)	1978	1979		x		

1/ Source: Conferences with the responsible breeders in the D.A.

Area Planted, Total Production and Average Yields of Project Crops

Crop Year	Area Planted (000 rai)	Production (000 MT)	Ave. Yield (Kg/rai)
Soybeans			
1970-71	368	50.4	140
1971-72	359	54.3	161
1972-73	500	72.0	144
1973-74	1,005	188.3	187
4 yr. average	558	91.25	164
Corn			
1970-71	5,180	1,938	380
1971-72	6,368	2,300	360
1972-73	6,231	1,315	211
1973-74	6,750	2,400	350
4 yr. average	6,132	1,988	325
Rice			
1970-71	46,840	13,570	290
1971-72	47,043	13,744	292
1972-73	44,620	11,669	262
1973-74	47,568	13,904	310
4 yr. average	46,518	13,219	284

Crop Year	Area Planted (000 rai)	Production (000 MT)	Ave. Yield (Kg/rai)
Peanuts			
1970-71	562	124.9	212
1971-72	715	133.5	208
1972-73	743	152.8	216
1973-74	814	161.0	198
4 yr. average	708.5	143.1	209
Mungbeans			
1970-71	1,493	149	106
1971-72	810	126	159
1972-73	1,284	191	148
1973-74	2,137	296	138
4 yr. average	1,431	191	138
Sorghum			
1970-71	n.a.	n.a.	n.a.
1971-72	353	101	293
1972-73	530	160	300
1973-74	750	220	300
3 yr. average	544	160	298

Source: Data for crop years 1970-71, 71-72, 72-73 from Agricultural Statistics of Thailand - Crop Year 1972-73 Division of Agricultural Economics, MOAC.
Data for crop years 1973-74 from Crop Promotion Division, DOAE, MOAC (unpublished).

Temperature, Relative Humidity and Rainfall Data at Seed Centers

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Phitsanulok												
Mean Temp. (°C)	24	26	29	31	30	29	28	28	28	28	26	24
Mean R.H. (%)	69	67	64	64	73	79	81	82	83	80	75	71
Mean rainfall (mm)	7.9	13.8	37.8	55.3	205.5	169.9	192.1	226.0	264.7	140.6	21.9	6.5
Mean rainy days	1.1	1.9	3.8	5.3	13.3	16.4	18.0	20.0	19.9	12.0	3.8	1.1
Khon Kaen												
Mean Temp. (°C)	23	25	28	30	29	28	28	28	27	26	25	23
Mean R.H. (%)	64	63	61	64	72	76	78	80	82	76	71	67
Mean rainfall (mm)	10.0	19.0	39.6	68.5	168.3	188.0	169.8	179.1	278.2	92.3	11.6	1.5
Mean rainy days	1.2	3.0	4.7	6.6	16.5	16.6	15.9	17.6	18.1	9.9	1.7	0.6
Chai Nat												
Mean Temp. (°C)	23	25	28	29	29	28	27	27	27	26	25	23
Mean R.H. (%)	52	51	53	57	67	71	73	76	78	70	62	56
Mean rainfall (mm)	3.0	12.4	53.4	78.8	159.7	143.1	163.0	134.1	293.2	100.3	18.3	0.9
Mean rainy days	1.0	2.1	5.9	7.6	14.0	13.2	15.3	17.2	18.9	10.4	1.7	0.7
Chiang Mai												
Mean Temp. (°C)	21	23	26	28	28	27	27	27	26	26	24	21
Mean R.H. (%)	72	64	56	60	72	78	80	83	83	81	79	67
Mean rainfall (mm)	9.8	8.6	19.1	51.0	165.7	156.7	175.6	236.0	267.6	132.9	30.9	15.4
Mean rainy days	1.6	1.0	2.0	5.5	15.5	17.9	19.7	28.2	18.5	11.3	4.6	2.0

Estimates of Facilities, Equipment, Supplies and Operational Costs for the Local Production of Inoculants

Item	Project Year					
	1	2	3	4	5	6
1. Buildings - including site preparation and maintenance.	172,550	60	60	60	60	60
2. Equipment						
(a) Office furnishings	3,000	-	-	-	-	-
(b) Laboratory furnishings	9,000	-	-	-	-	-
(c) Production equipment	206,000	10,000	-	-	-	-
(d) Vehicles	7,350	-	-	-	-	-
Equipment Sub-total	225,350	10,000	-	-	-	-
3. Supplies	10,000	30,000	45,000	45,000	45,000	45,000
4. Operational expenses	1,400	1,600	1,800	1,800	1,800	1,800
Sub-total	409,300	41,660	46,860	46,860	46,860	46,860
5. Contingencies 5%	$ 20,465	2,083	2,343	2,343	2,343	2,343
TOTAL	$423,765	43,743	49,203	49,203	49,203	49,203

Inoculant Production Program Tentative List

of Equipment and Estimated Costs

Item	Number	Unit Cost 1/ ($)	Total Cost ($)
I. Inoculant Production			
a. Fermacell model CF250	4	20,000	80,000
b. Tissue culture propagator, 1-3 lt. cap.	1	6,000	6,000
c. Reach-in incubator, refrigerated	1	5,000	5,000
d. Harvest cart, refrigerated 200 lt. cap.	2	2,500	5,000
e. Nutrient pre-mix reservior sterilizable, 200 lt. cap.	1	3,000	3,000
f. Vacuumatic sterilizer, pre-fabricated modular wall, 30 cu. ft. cap.	1	40,000	40,000
g. Steam generator, electric	1	5,000	5,000
h. Diapham pump, 16 lt/hr cap. steam sterilizable	1	1,000	1,000
i. Automatic still 5 gal/hr cap. with storage tank 25 gal. cap.	2	5,000	10,000
j. Water purifier 50 gal/hr cap.	1	3,000	3,000
k. Hammer mill	1	6,000	6,000
l. Roller mill	1	5,000	5,000
m. Sieving machine, 100-125 mesh screens	1	2,000	2,000
n. Packaging machine/plastic bag sealer	1	8,000	8,000
o. Vertical mixer 1 ton cap.	1	4,000	4,000
p. Air-conditioners 18,000 BTU	1	1,000	1,000
II. Quality Control			
a. Fluorescent microscope w/camera	1	5,000	5,000
b. High speed centrifuge	1	1,000	1,000
c. Psycrotherm	1	7,000	7,000
d. Spectrophotometer	1	5,000	5,000
e. Low temperature incubator	1	4,000	4,000
			206,000

1/ Based on estimates prepared by the Bacteriology and Soil Microbiology Branch, DA.

Technical Assistance Requirements and Estimated Costs

Classification	No.	Totals M/Years	Totals Cost	Project Year 1	2	3	4	5	6
1. US$ Costs*									
Senior Seed Specialist	1	4	260,000	65,000	65,000	65,000	65,000		
Seed Processing Specialist	1	2	130,000		65,000	65,000			
Consulting Specialists (Short term)									
Seed Plant Engineer	2 (3m/m)		16,000	8,000		8,000			
Inoculant Expert	2 (3m/m)		16,000	8,000		8,000			
Seed Law/Certification	1 (2m/m)	1	8,000		8,000				
Seed Marketing Expert	2 (3m/m)		18,000	8,000		10,000			
Seed Quality Control	1 (1m/m)		6,500		6,500				
Sub-totals		7	454,500	89,000	144,500	156,000	65,000		

*Includes:
Salaries, international travel, shipment of personal effects, other direct costs, and contractor administrative and overhead costs.

2. Baht (฿) Costs**							
Long Term Specialists							
Housing			720,000	120,000	240,000	240,000	120,000
Children educational allowance			480,000	80,000	160,000	160,000	80,000
In-country travel & allowances			240,000	40,000	80,000	80,000	40,000
Bi-lingual secretary			192,000	48,000	48,000	48,000	48,000
Driver			46,000	11,500	11,500	11,500	11,500
Consultants (Short term)							
In-country travel			30,000	8,000	8,000	10,000	4,000
Sub-totals (฿)			1,708,000	307,500	547,500	549,500	303,500
GRAND TOTAL(US$)			539,900	104,375	171,875	183,475	80,175

**Based on married consultant with 2 school age children: housing, $500/mo; school fee, $2000/yr/child; approx. 72 days in-country travel/specialist/yr @ $21/day, plus $500/yr travel costs/man; $200 in-country travel per consultant (short term).

Time phasing and costs for Technical and Participant Training Programs

Training Activity	Duration	No. of Participants	Participant Cost (US$ each)	Project Year 1	2	3	4	5	6	Total Cost (Dollars)
A. In-country Courses										$ 75,000
1. Seed Technolocy	3 weeks	25/course	200	1	1	1	1	1	1	30,000
2. Skills Development										
a. Processing & Handling	2 weeks	15/course	150	1	1		1			6,750
b. Analysis & Testing	2 weeks	15/course	150		1	1		1		6,750
c. Seed Inspection	2 weeks	15/course	150	1		1			1	6,750
3. Seed Awareness	4 days	30/course	75	1	2	2	2	2	2	24,750
B. 3rd Country Training										$ 24,000
Production Operations	3 mo.	2	3,000	1	1					6,000
Processing Operations	3 mo.	2	3,000	1	1					6,000
Marketing Operations	3 mo.	2	3,000	1	1					6,000
Certification Operations	3 mo.	2	3,000	1		1				6,000
C. Participant Training										$172,200
1. Study Tour										
Processing Management	7 mo.	3	7,000	1	2					21,000
Marketing Management	7 mo.	2	7,000	1	1					14 000
Inoculant Production	3 mo.	2	4,000	2						8,000
Extension Seed Specialist	7 mo.	2	7,000	1		1				14,000
2. Degree Training (MS)										
Seed Production & Certification	24 mo.	2	19,200		1		1			38,400
Seed Processing & Handling	24 mo.	2	19,200		1		1			38,400
Quality Control	24 mo.	2	19,200			1		1		38,400

Total $271,200

Target Areas for Concentrated Improved Production Program

First Project Year

Phitsanulok Seed Center - Sukothai Province, Swankalok District

anticipate concentrated soybean and corn production

Farmer's Association	No. of Families	Paddy (rai)	Upland Crops (rai)	Horticultural Crops (rai)
Tatong	58	1,077	548	- 0 -
Klong Kaichung	57	- 0 -	315	508
Parknum	36	672	- 0 -	- 0 -
Naimung	77	1,870	- 0 -	- 0 -
Natung	53	522	355	- 0 -
Klong Yang	252	90	5,462	- 0 -
Nakorn Durt	222	577	5,229	- 0 -
Pakumko	121	113	3,566	- 0 -
Wang Maikom	31	- 0 -	485	- 0 -
Srinakorn	194	186	4,633	- 0 -
Totals	1,101	5,107	20,593	508

Second Project Year

Khon Kaen Seed Center - Khon Kaen Province

anticipate rice, peanuts, corn, sorghums production

District	Farmer Ass'n	No. of Families	Paddy (rai)	Upland Crops (rai)	Horticultural Crops (rai)
Nampong	Kaosuanguang	105	692	577	- 0 -
"	Wangchai	130	2,950	760	- 0 -
Muang	Laonantong	48	530	151	- 0 -
"	Nongbua	295	3,175	380	- 0 -
"	Muangkao	150	1,500	250	- 0 -
"	Tapra	69	760	430	36
Pon	Nondong	292	5,427	5,015	- 0 -
Kranuan	Nongko	127	1,964	3,039	766
Chunpae	Nongpai	120	2,040	560	- 0 -
"	Non Udom	145	3,517	- 0 -	- 0 -
	Totals	1,481	22,555	11,162	802

Third Project Year

Chiang Mai Seed Center - Chiang Mai Province

anticipate production of rice, soybeans, and peanuts

District	Farmer Ass'n	No. of Families	Paddy (rai)	Upland Crops (rai)	Horticultural Crops (rai)
Doisaket	Choeng Doi	263	3,150	- 0 -	- 0 -
Maetang	Cholae	192	795	87	123
"	Sanmohopon	160	640	223	245
Sanpatong	Sanklang	234	936	215	189
Sansai	Sansai Luong	122	890	- 0 -	292
Chontong	Kungpao	182	800	125	187
Long Dong	Bonwen	130	851	60	22
Maerim	Keelek	56	343	- 0 -	277
"	Huey Sai	60	277	- 0 -	195
	Totals	1,399	8,682	710	1,530

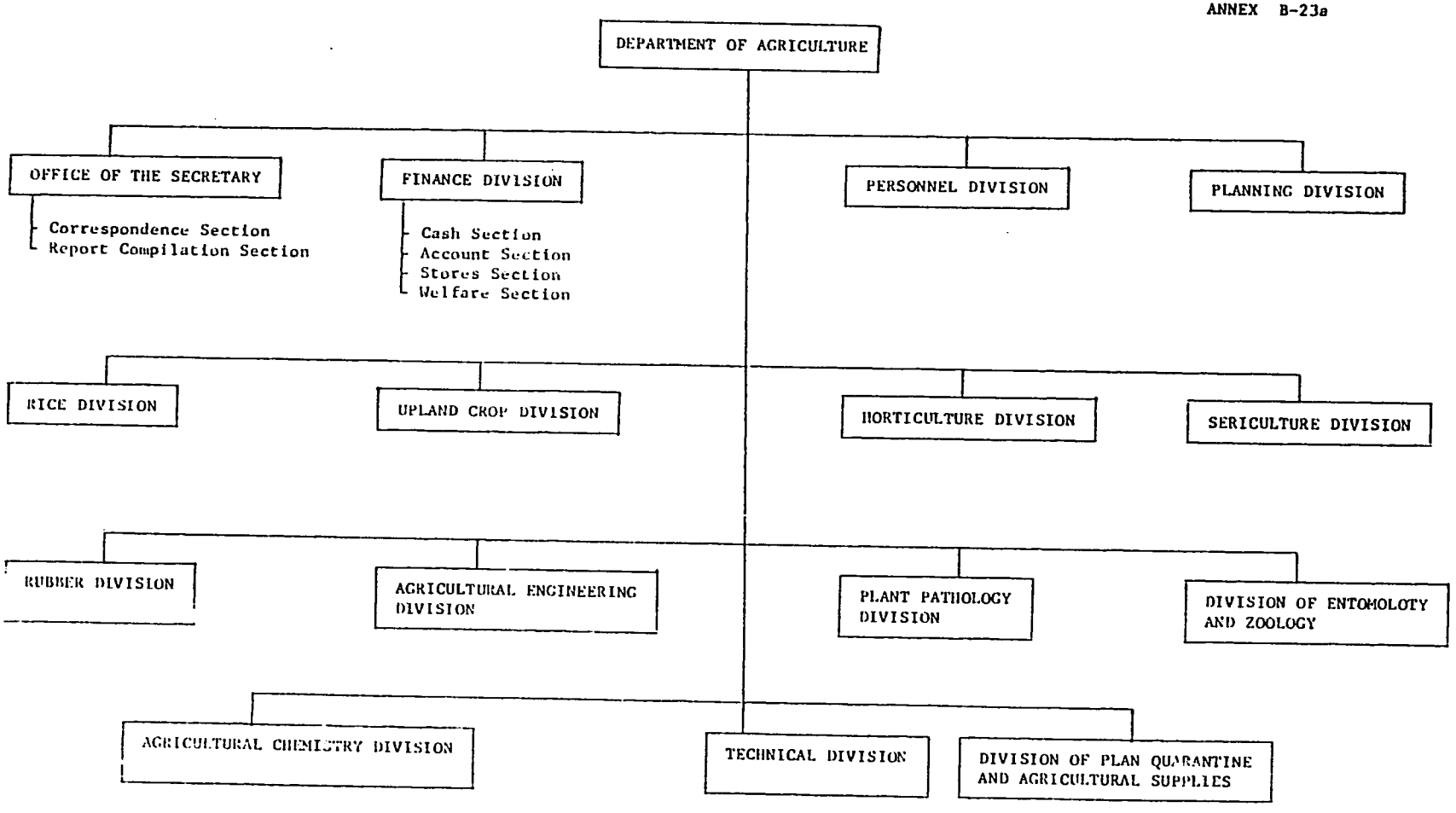
Third Project Year

Chai Nat Seed Center - Nakonsawan Province

anticipate rice, corn, mungbean production

District	Farmer Ass'n	No. of Families	Paddy (rai)	Upland Crops (rai)	Horticultural Crops (rai)
Paisaly	Samrongchai	335	14,674	9,415	2,440
"	Wangnumlad	81	3,447	- 0 -	- 0 -
Kaoleao	Kaodin	288	890	1,126	47
Kroke-Pra	Proke-Pra	94	5,176	765	- 0 -
"	Noensala	112	500	3,863	- 0 -
Takli	Chongkae	312	4,000	10,543	- 0 -
"	Nongpo	96	4,300	520	- 0 -
Tatko	Tumnobe	62	- 0 -	2,103	- 0 -
Chumsang	Tubgrit	128	8,900	2,500	- 0 -
"	Nongkrachao	218	9,913	- 0 -	- 0 -
	Totals	1,614	51,800	30,835	2,487

ANNEX B-23a



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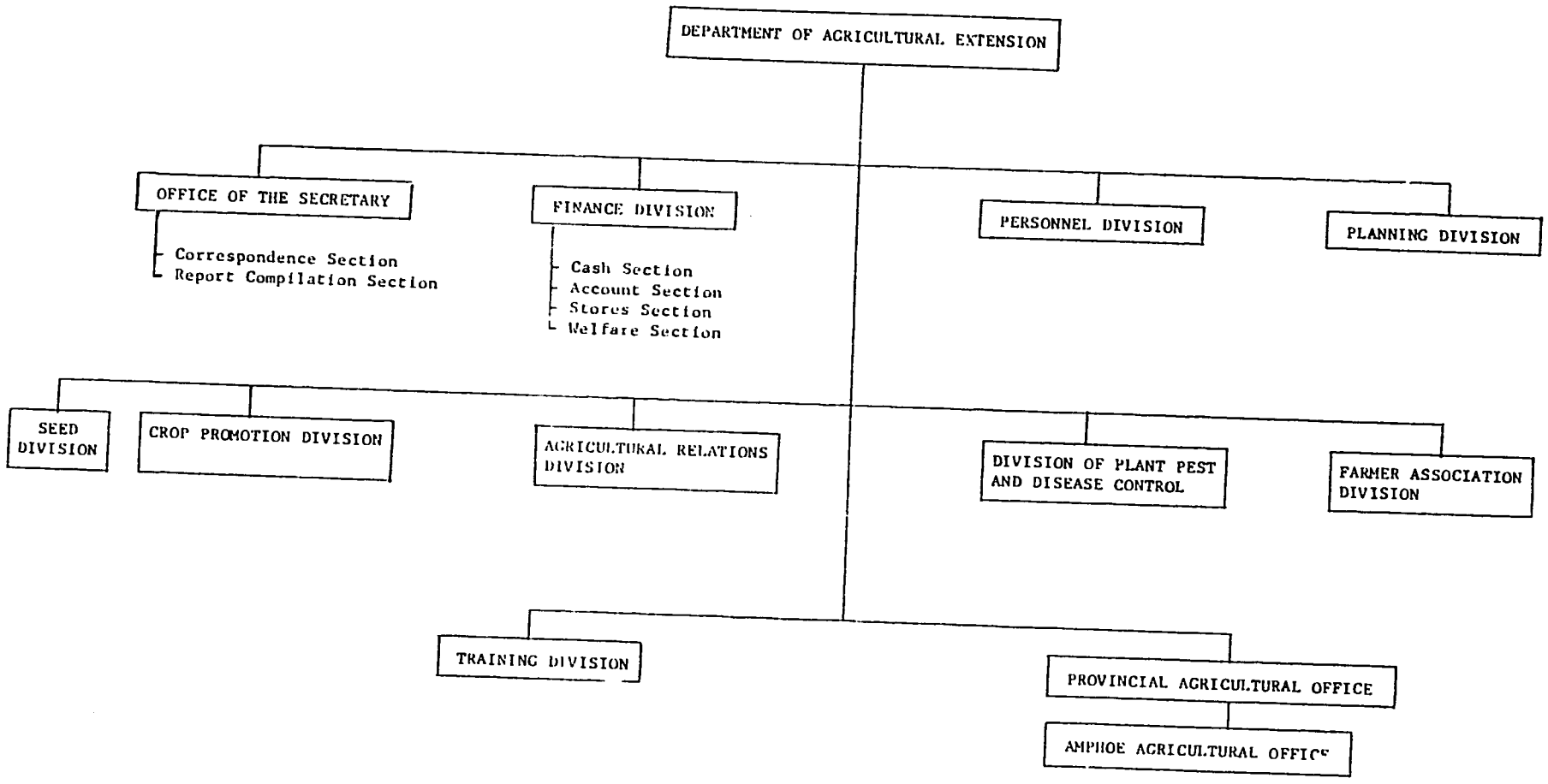
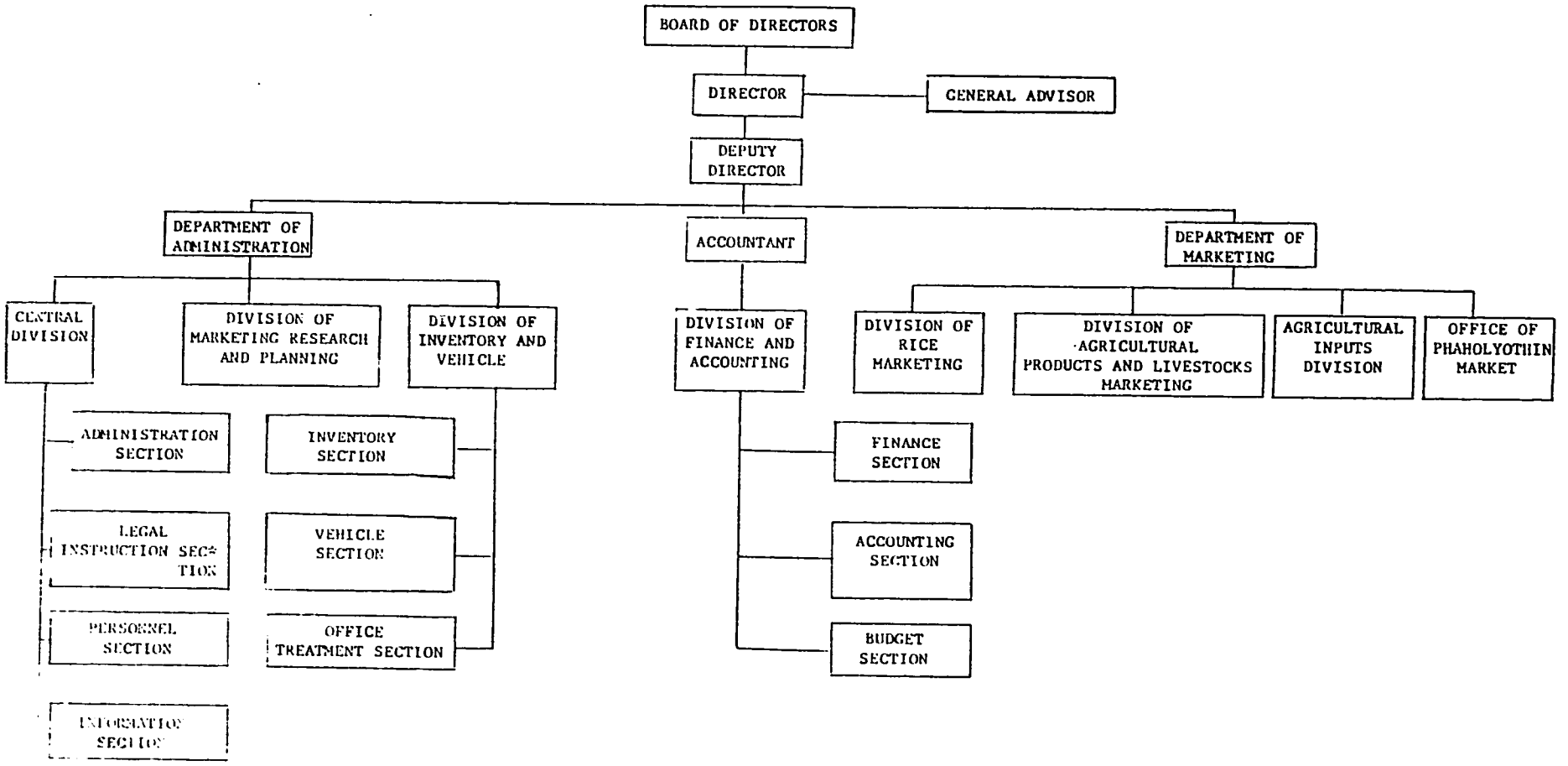

DEPARTMENT OF AGRICULTURAL EXTENSION
OFFICE OF THE SECRETARY
Correspondence Section
Report Compilation Section
FINANCE DIVISION
Cash Section
Account Section
Stores Section
Welfare Section
PERSONNEL DIVISION
PLANNING DIVISION
SEED DIVISION
CROP PROMOTION DIVISION
AGRICULTURAL RELATIONS DIVISION
DIVISION OF PLANT PEST AND DISEASE CONTROL
FARMER ASSOCIATION DIVISION
TRAINING DIVISION
PROVINCIAL AGRICULTURAL OFFICE
AMPHOE AGRICULTURAL OFFICE

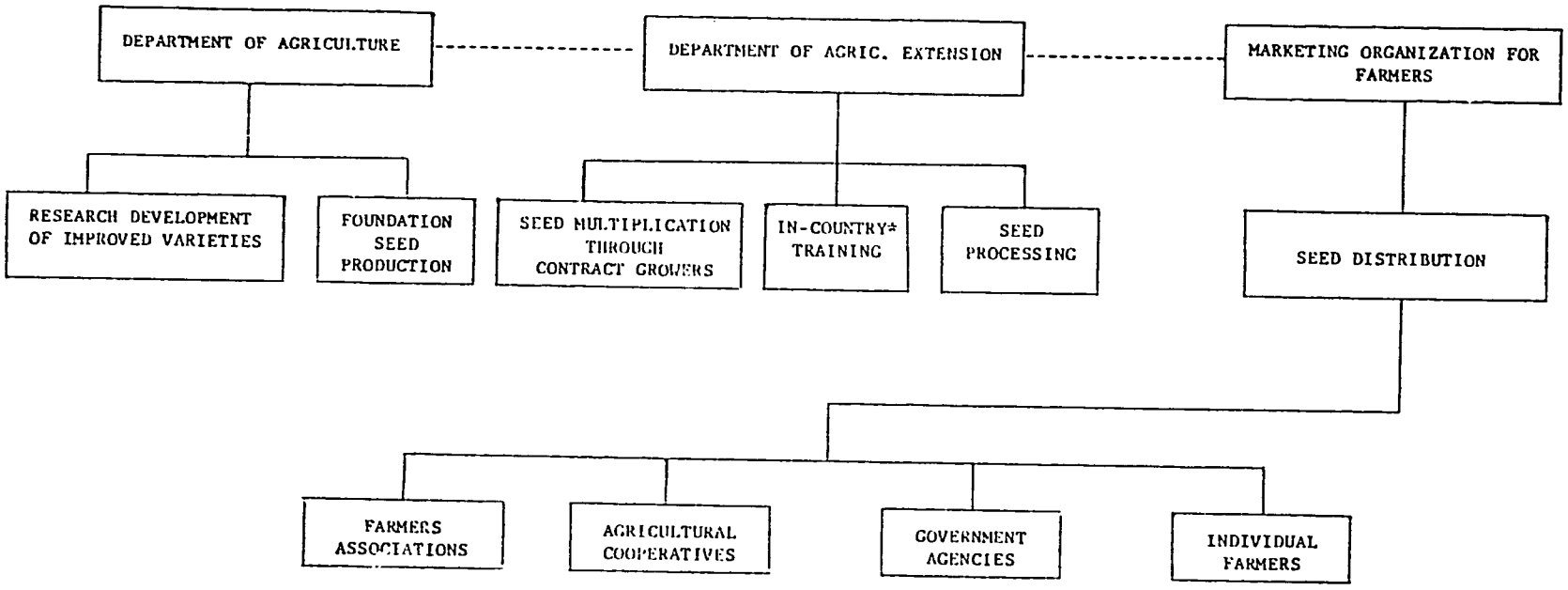
MARKETING ORGANIZATION FOR FARMERS



SEED MULTIPLICATION PROJECT

RESPONSIBILITIES BY PROJECT YEAR

YEARS/AND 2

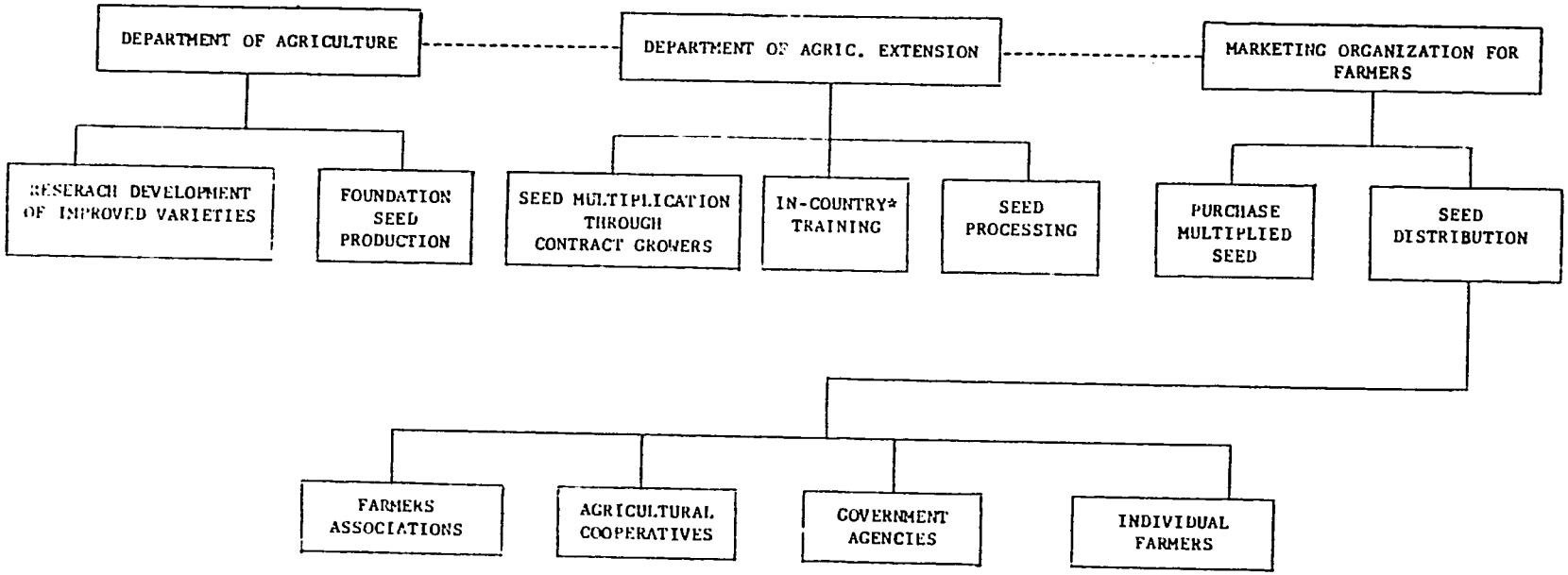


*Includes Farmers, TG and Private Sector Personnel

SEED MULTIPLICATION PROJECT

RESPONSIBILITIES BY PROJECT YEAR

YEARS 3 AND 4

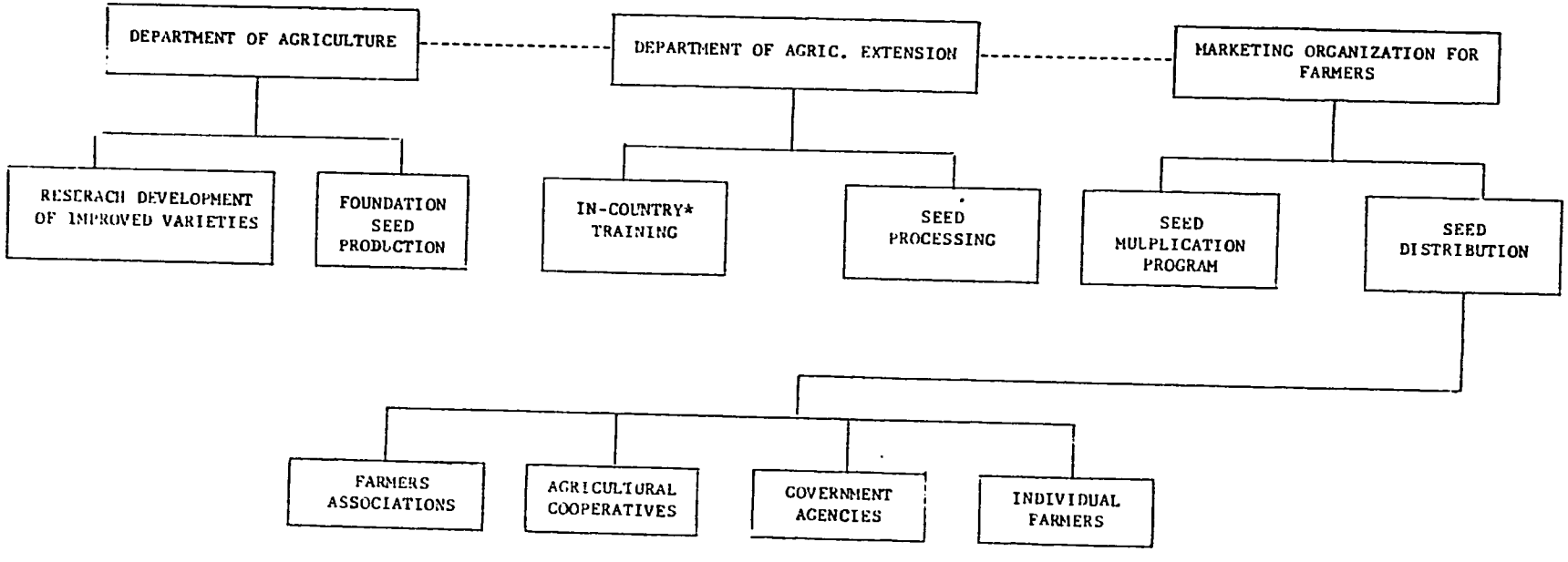


* Includes Farmers, RFG and Private Sector Personnel

SEED MULTIPLICATION PROJECT

RESPONSIBILITIES BY PROJECT YEAR

YEARS 5 AND 6

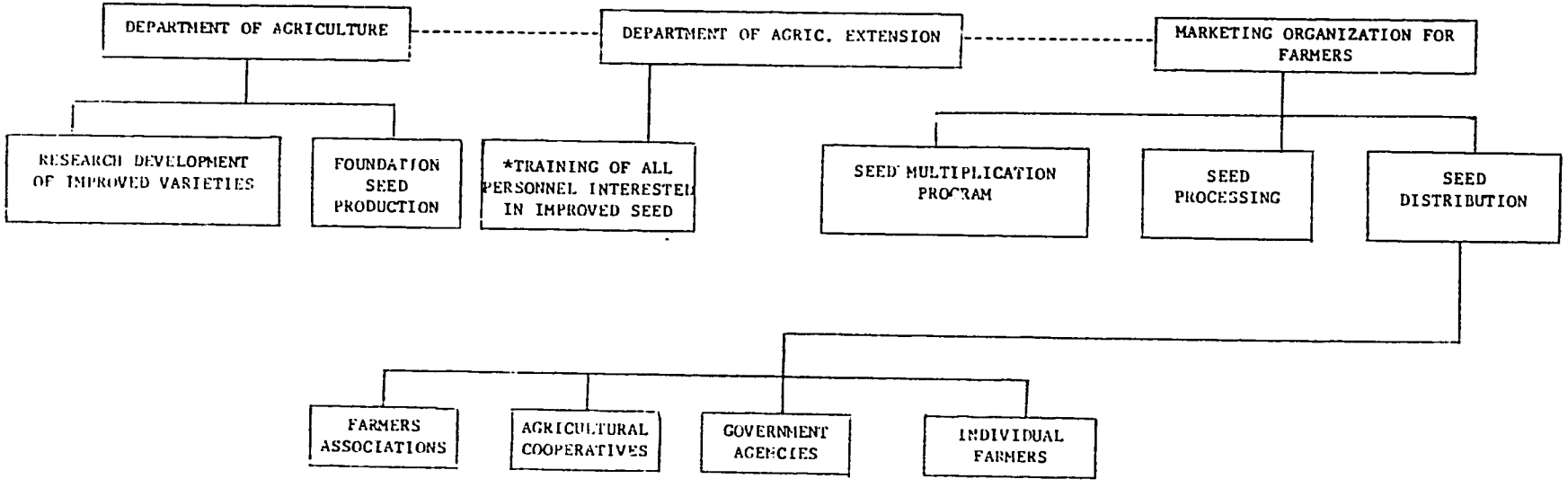


*Includes Farmers, ITG and Private Sector Personnel

SEED MULTIPLICATION PROJECT

RESPONSIBILITIES BY PROJECT YEAR

YEAR 7 AND BEYOND



*Includes Farmers, RTG and Private Sector Personnel.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: (A-1)	Measures of Goal Achievement: (A-2)	(A-3)	Assumptions for achieving goal targets: (A-4)
Increase the farm income of the people who live in the rural areas, and who are on the lower end of the income scale.	1. Farm income in target areas increase 15%. 2. Farmer productivity in target areas increases through yield increases associated with use of project seed as follows: Soybean 20 % Corn 20 % Rice 15 % Peanuts 20 % Mungbean 15 % Sorghum 20 %	Ministry of Agriculture and Cooperatives, NESDB, and NSO Statistics. Base line data obtained by personal interview survey of impact areas in 1975 and comparable surveys after project implementation.	1. Project seed will result in increased yields even with existing cultivation practices and technology packages currently used by Thai farmers. 2. Increases in productivity will be realized in higher income to the farmers rather than only as lower prices to consumers.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Project Purpose: (B-1) To cause the use of improved seed on Thai farms with outreach to farms at the lowest end of the income scale.	Conditions that will indicate purpose has been achieved: End of project status. (B-2) 1. By project year six improved project seed, at reasonable prices, will meet the following % national requirements: Soybean 31% Corn 6% Rice 2% Peanuts 6% Mungbean 5% Sorghum 7% 2. 75% of farms in target area including poor farmers will use seed of improved varieties provided as a result of project activities by year six. 3. At least 10% of project seeds are made available (via sales) to RTG agencies that have programs designed to improve the welfare of the very poor.	(B-3) 1. MOAC, Marketing Organization for Farmers, NESDB records and statistics. 2. Base line data obtained by personal interview survey of impact areas in 1975 and comparable surveys after project implementation.	Assumptions for achieving purpose: (B-4) 1. Security situation will not interfere with project. 2. Weather conditions "average". 3. That RTG poor farmer oriented agencies will utilize the seed provided them. 4. Target areas are representative of rural Thai conditions.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS								MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs: (C-1)	Magnitude of Outputs: (C-2)								(C-3)	Assumptions for achieving outputs: (C-4)
		Project Year								
		0	1	2	3	4	5	6		
1. Expanded foundation seed production to meet project requirements.	1.	Tons Foundation Seed							1. DA production records.	1. That the Marketing Organization for Farmers will develop into an effective seed production--marketing organization.
	Soybean	50	16.7	27.9	53.0	69.0	83.6	92.0		
	Corn	16	2.5	6.3	10.0	15.2	18.9	20.1		
	Rice	150	0	8.7	32.2	40.9	67.2	87.6		
	Peanuts	10	0	29.2	58.5	87.9	131.7	175.7		
	Mungbean	5	0	1.1	3.2	6.3	10.5	12.6		
	Sorghum	2	0	0.8	1.5	2.2	2.9	2.9		2. That personnel trained and experienced in seed production, processing and marketing techniques will become available at the rate equal to the projected increased in volume of operation.
	Total	233	19.2	74.0	158.5	221.5	314.8	390.9		
2. A seed multiplication (increase) program ceveloped around contract farmer seed growers.	2.a)	Tons Seed Multiplied							2. DOAE seed multiplication records.	
	Soybean	114	440	723	1282	1815	2200	2420		
	Corn	0	220	550	880	1320	1650	1760		
	Rice	0	0	330	1210	1760	2530	3300		
	Peanuts	0	0	220	440	660	990	1320		
	Mungbean	0	0	28	83	165	275	495		3. That the DOAE will continue to accelerate its emphasis on effective farmer level demonstrations and training concerning input utilization.
	Sorghum	0	0	55	110	165	220	220		
	Total	114	660	1906	4005	5885	7865	9515		
	b) Contract Growers	50	349	800	1499	2100	2722	3114		
	c) No. rai (000)	.6	3.5	9.3	19.8	27.1	36.4	44.2		4. That implementation of the seed marketing regulatory law will assist, not impede, legitimate seed marketing operations of the private sector and the Marketing Organization for Farmers.
3. Operational seed processing plants established in selected areas of Thailand.	3.a)	Tons Seed Processed							3. Processing plant records.	
	Soybean	104	400	667	1166	1650	2000	2200		
	Corn	0	200	500	800	1200	1500	1600		
	Rice	0	0	300	1100	1600	2300	3000		
	Peanuts	0	0	200	400	600	900	1200		
	Mungbean	0	0	25	75	150	250	450		
	Sorghum	0	0	50	100	150	200	200		
	Total	104	600	1742	3741	5250	7150	8650		
	b) Plants operating	1	1	2	4	4	4	4		
(Continued)				(Continued)					(Continued)	

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs: (C-1) (Continued)	Magnitude of Outputs: (C-2) (Continued)	(C-3) (Continued)	Assumptions for achieving outputs: (C-4)
6. Seed producers, processors, and farmers will be trained.	6. Training during the project.	6. Project training records.	
(Continued)	(Continued)	(Continued)	

Project Year

	0	1	2	3	4	5	6
5.c) Demonstration plots established	0	10	20	30	40	50	60
Farmer leaders selected & trained	0	10	20	30	40	50	60

Number Trained
Project Year

Type Training	1	2	3	4	5	6
In Country						
Seed tech. (3 weeks)	25	25	25	25	25	25
Skills develpmt. (2 weeks)	30	30	30	15	15	15
Seed awareness (4 days)	30	60	60	60	60	60
Cont. Growers (1-2 days)	300	400	500	600	600	500
Farmer Training (1-2 days)	2000	4000	5000	5000	5000	5000
3rd Country						
Seed Prod. (3 mos)	1	1				
Seed Proc. (3 mos)	1	1				
Seed Mktg. (3 mos)	1		1			
Seed Cert. (3 mos)	1		1			

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs: (C-1) (Continued)	Magnitude of Outputs: (C-2) (Continued)	(C-3) (Continued)	Assumptions for achieving outputs: (C-4)
4. A seed marketing and distribution system established to serve the farmer.	4.a) Recipient — Project Year 0, 1, 2, 3, 4, 5, 6 — Tons Seed Marketed Farmers Assocs. 104, 360, 1045, 2244, 3150, 4290, 5190 Cooperatives 0, 120, 348, 748, 1050, 1430, 1730 "Poor Farmer" Agencies 0, 60, 175, 374, 525, 715, 865 Individ. Small Farmers 0, 60, 174, 375, 525, 715, 865 Total 104, 600, 1742, 3741, 5250, 7150, 8650 b) No. rai distributed seed will plant (000) 21, 122, 331, 674, 950, 1268, 1492 c) No. of farmers seed will reach at 20 rai/farm 1050, 6100, 16500, 33700, 47500, 63400, 74600 d) Agricultural Inputs Division of the MOF staffed as planned.	4.a) MOF and DOAE marketing records. b) Farmer surveys.	
5. Seed education and demonstration programs will be established.	5.a) Seed literature prepared and distributed to at least 50% of farmers in target areas. b) Regular radio and TV broadcasts with emphasis on seed.	5.a) DOAE central records. b) Changwat Extension Officer records. c) Farmer surveys and DOAE recording records.	
(Continued)	(Continued)	(Continued)	

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PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Seed Development 493-21-130-270

Life of Project:
From FY 76 to FY 82

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs: (C-1) (Continued)	Magnitude of Outputs: (C-2) (Continued)	(C-3) (Continued)	Assumptions for achieving outputs: (C-4)
7. Seed certification and regulatory program established.	7.a) 80% of seed marketed with quality equal to certified seed by year six. b) Regulatory agency fully staffed and operating as planned.	7. MOF/DOAE marketing records and sample surveys.	
8. Inoculum available to farmers.	8. Inoculant distribution by Project Year 200 gm. packages (000): 1 — 5; 2 — 7.5; 3 — 25; 4 — 50; 5 — 75; 6 — 100 Tons Soybean inoculated: 1 — 25; 2 — 37; 3 — 125; 4 — 250; 5 — 375; 6 — 500	8. Inoculant distribution records. MOF sales records.	

Number Trained Project Year

Type Training	1	2	3	4	5	6
Trng. Abroad						
Study tour						
Processing (7 mos)	1	2				
Marketing (7 mos)	1		2			
Inoculant prod. (3 mos)	1		1			
Extension	1		1			
Degree trng.						
Seed prod. (24 mos)		1		1		
Seed processing (24 mos)		1		1		
Seed quality control (24 mos)			1		1	

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Project Title & Number: Seed Development 493-21-130-270

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 76 to FY 8

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUM
Inputs: (D-1)	Implementation Target (Type and Quantity) (D-2)	(D-3)	Assumptions for prov inputs: (D-4)
1. Project Funding: a) RTG	See page 2 Project Paper.	1.a) Loan Agreement b) Expenditure records.	
b) USG	See page 2 Project Paper.		
2. Technical Assistance	2. Technicians (Man Months) — Project Year 1 / 2 / 3 / 4 / 5 / 6 Long Term Sr. Seed Spec. 12 / 12 / 12 / 12 Processing Spec. 12 / 12 Short Term Plant Engineer 1.5 / 1.5 Seed Reg. & Cert. 1.5 Marketing 1.5 / 2 Qunl. Control 1 Inoculant 1.5 / 1.5	2. Project records.	
3. Personnel (RTG)	3. Personnel ($000) Seed Operations Admin. 8.4 / 9.9 / 10.0 / 10.4 / 10.7 / 10.8 Prod.-Proc. 16.9 / 35.7 / 55.8 / 59.1 / 60.0 / 60.6 Marketing 7.1 / 9.6 / 14.6 / 15.9 / 15.9 / 15.9 Inoculant Prod. 6.6 / 10.7 / 16.1 / 16.1 / 16.1 / 16.1 Tech. [illegible] & Ext. 20.7 / 21.9 / 23.1 / 25.0 / 22.9 / 22.9	3. Project records.	

ANNEX D

The Project Performance Tracking Chart is considered vital to implementation and monitoring of the project; however it could not be completed prior to PP submission. It is being developed and will be forwarded to AID/W before June 30, 1975.

ANNEX E

STATUTORY CHECKLIST

BASIC AUTHORITY

1. FAA Section 103

This loan will be made under the authority of Section 103 of the Foreign Assistance Act of 1961, as amended.

The purpose of the project which the loan will assist is to increase agricultural productivity by providing farmers with adequate quantities of improved seed at reasonable prices. The project will contribute to the achievement of the broader goal of increasing the per capita income of people living in the rural areas of Thailand who are on the lower end of the income scale.

COUNTRY PERFORMANCE

2. Progress Towards Country Goals

A. FAA Section 201 (b)(5), (7) & (8); Section 208

Discuss the extent to which the country is

(i) Making appropriate efforts to increase food production and improve means for food storage and distribution.

One of the highest RTG priorities for its Fourth Five Year Plan (1977-81) is to modernize Thai agriculture, promoting more intensive cultivation with higher productivity. The RTG goal is to expand food production and maintain its presently high level of agricultural exports, particularly of rice. The principal emphasis will be on high impact programs combining modern technology packages and support functions in a coordinated fashion for selected commodities and geographic areas. At the same time, the RTG will provide

greater farmer incentives by shifting internal terms of trade in the farmers' favor through such mechanisms as price support, buffer stock storage, some regulation of the private marketing mechanism, and promotion of cooperatives.

The RTG has recently passed considerable legislation to support this strategy, including a Land Consolidation Law, Seeds Marketing Law, and an act creating a Marketing Organization for Farmers. In addition, the credit program of the Bank of Agriculture and Agricultural Cooperatives is being greatly expanded with greater emphasis on long-term loans and loans to individual farmers.

(ii) Creating a favorable climate for foreign and domestic private enterprise and investment

The RTG policy is to encourage the development of the private sector and that sector's dynamism has been a major factor in Thailand continuing good economic performance. The Kukrit Government has adopted a "private production", "public(ly controlled) distribution" policy. The Investment Promotion Act was revis revised in October 1972 to improve investment guarantees and benefits, and to make promotional policies more flexible and selective. Standard investment incentives include guarantees against nationalization and competition by new state enterprises; authorization of own land, transfer funds abroad and hire foreign experts; and various tax reductions are available under reasonable

	controls. Joint ventures of Thai and foreign partners accounted for 70% of the registered capital promotional privileges from 1960-73.
(iii) Increasing the public's role in the developmental process	A new constitution promulgated in October 1974 provides for a representative government with both Prime Minister and Cabinet responsible for an elected Parliament. The current parliament was elected in January 1975 and the current government took office in March 1975. Current RTG planning indicates that the Fourth Five Year Plan will assign high priority to social goals such as increasing rural income and services to the rural population, amelioration of urban life, and social equity.
(iv)	
(a) Allocating available budgetary resources to development.	The share of development expenditures in total public expenditures was about 40% from 1970-1974.
(b) Diverting such resources for unnecessary military expenditure (See also Item No.20) and intervention in affairs of other free and independent nations. (See also Item No. 11).	During the period 1970-73, expenditures on defense, police, and related administration represented 20-22% of total public expenditures. In this period the U.S. actively encouraged RTG defense and police progr ms.

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(v)	Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom, initiative, and private enterprise.	Thailand's tax structure is heavily weighted towards taxes on international trade and domestic transactions, with relatively low income and property taxes. In line with recommendations made by the World Bank Economic Survey Team of 1974, the RTG has recently established the policy of increasing revenues from direct taxation. In the rural sector, the RTG passed legislation on Land Consolidation and farmland rents in 1974, and a Land Reform Law in 1975, which authorize programs to improve the equity position of small farmers.
(vi)	Willing to contribute funds to the project or program	The RTG will finance at least 50% of the total project cost.
(vii)	Otherwise responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help messures.	The recent establishment of representative government and emphasis on legitimate social goals in the Fourth Five Year Plan are reliable indicators of RTG outlook.
B.	Are above factors taken into account in the furnishing of the subject assistance?	These factors are addressed in the Development Assistance Program for Thailand - 1976-81, which provides the context and justification for subject assistance.

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Treatment of U.S. Citizens and Firms

3. FAA Sec.620 (c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?	No
4. FAA Sec. 620 (e) (1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?	No

5. FAA Sec.620 (o); Fishermen's Protective Act Sec.5. Has country seized, or imposed any penalty or sanction against, any U.S. fishing vessel on account of its fishing activities in international waters?	No
Relations with U.S. Government and Other Nations	
6. FAA Sec.620 (a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?	No
7. FAA Sec. 620 (b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?	Yes
8. FAA Sec.620 (d). If assistance is for any productive enterprise which will compete in the United States with United States enterprise, is there an agreement by the recipient country to prevent export to the United States of more than 20% of the enterprise's annual production during the life of the loan?	The agricultural commodities resulting from this loan will not so compete with U.S. production.
9. FAA Sec. 620 (f). Is recipient country a Communist country?	No

10. FAA Sec. 620 (i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?	No
11. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?	In the recent student demonstrations following Mayaguez incident, RTG provided police protection adequate to prevent access to Embassy premises and limit mob destruction of USG property to token minimum. RTG has offered to provide adequate compensation.
12. FAA Sec.620 (l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, in convertibility or confiscation, has the A.I.D. administration within the past year considered denying assistance to such government for this reason?	No
13. FAA Sec. 620 (n). Does recipient country furnish goods to North Viet-Nam or permit ships or aircraft under its flag to carry cargoes to or from North Viet-Nam?	No
14. FAA Sec. 620 (q). Is the government of the recipient country in default on interest or principal of any A.I.D. loan to the country?	No

15. FAA Sec. 620 (t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?	No
16. FAA Sec. 620 (u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the A.I.D. Administrator in determining the current A.I.D. Operational Year Budget?	Thailand is not in arrears in payment of its U.N. obligations.
17. FAA Sec. 481. Has the government of recipient country failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?	The RTG is engaged in a two-fold program designed to reduce poppy cultivation and interdict opium trafficking in Thailand. Increased enforcement activity by the Thai National Police and Department of Customs has resulted in the seizure of considerable quantities of illicit drugs and the arrest of a significant number of smugglers and processors. A parallel effort is being made to find and install an alternate economic system, including crop substitution, to that of opium cultivation in the North. The overall program is assisted by the U.S. and the U.N.

18. FAA Sec. 659. If (a) military base is located in recipient country, and was constructed or is being maintained or operated with funds furnished by U.S., and (b) U.S. personnel carry out military operations from such base, has the President determined that the government of recipient country has authorized regular access to U.S. correspondents to such base?	Yes

Military Expenditures

19. FAA Sec. 620 (s). What percentage of country budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? (Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RC).	From 1970-1974, expenditures on defense and police represented 20-22% of total public expenditures (Approximately 4% of GDP). From 1971-1973, expenditures on military imports average 1% of the value of total merchandise imports.

Conditions of the Loan

General Soundness

20. FAA Sec. 201 (d). Information and conclusion on reasonableness and legality (under laws of country and the United States) of lending and relending terms of the loan.	The proposed loan contains a concessionary rate of interest - 2% per annum during the grace period and 3% per annum thereafter in the remaining years of the repayment period. The interest rate is substantially lower than Thailand's applicable legal rate of interest.

21. FAA Sec. 201 (b) (2); Sec. 201 (e). Information and conclusion on activity's economic and technical soundness. If loan is not made pursuant to a multilateral plan and the amount of the loan exceeds $100,000, has country submitted to A.I.D. an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?	The activity has been determined to be economically and technically sound. Refer to Parts III, D.and III A., respectively, of the Project Paper for the detailed analysis. The RTG has submitted a formal application for an AID loan to finance this activity. Refer to Annex H
22. FAA Sec. 201 (b) (2). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.	Thailand has the capacity to repay the loan. Refer to Annex A of the DAP/Thailand for detailed analysis.
23. FAA Sec. 201 (b) (1). Information and conclusion on availability of financing from other free-world sources on reasonable terms, including private sources within the United States.	Such assistance for this activity is not currently available from other free-world sources. Refer to Part II A of the Project Paper for comment.
24. FAA Sec. 611 (a) (1). Prior to signing of loan will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the United States of the assistance?	Such plans and estimates have been prepared and are included in the Project Paper. (Refer to Parts III A. and D).

25. FAA Sec. 611 (a) (2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of loan?	No further legislation is required. Legislation creating the Marketing Organization for Farmers and providing for regulation of seed marketing has already been enacted by the RTG.
26. FAA Sec. 611 (c). If loan is for Capital Assistance, and all U.S. assistance to project now exceeds $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?	The Mission Director has so certified. See Annex G.
Loan's Relationship to Achievement of Country and Regional Goals.	
27. FAA Sec.207; Sec.113 Extent to which assistance reflects appropriate emphasis on: (a) encouraging development of democratic, economic, political, and social institutions; (b) self-help in meeting the country's food needs; (c) improving availability of trained manpower in the country; (d) programs designed to meet the country's health needs;	(a-b) The project purpose is to increase agricultural productivity by providing improved seed at reasonable prices. The project is expected to result in increased production of soybeans, rice, maize, mungbeans, sorghum, and groundnuts, (c)The project has a significant training component and will improve availability of trained manpower for seed development (See Part IV of PP).

(e) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (f) integrating women into the recipient country's national economy.

(e) The project calls for eventual transfer of management responsibility for the seed processing plants to the newly formed Marketing Organization for Farmers. An important element of the project will be to insure the development of the required managerial capability within the MOF.
(f) Addressed in the PID. Refer to Section 2 c.

28. FAA Sec. 209. Is project susceptible of execution as part of a regional project? If so why project not so executed?

No. Project will not go beyond a small fraction of Thailand's own needs for improved seeds.

29. FAA Sec. 201 (b) (4). Information and conclusion on activity's relationship to, and consistency with, other development activities, and its contribution to realizable long-range objectives.

This activity will directly contribute to the broader goal of increasing the per capita income of people living in the rural areas of Thailand. Lower income farmers will be specifically assisted by assuring supply of improve of seeds to RTG programs directly supporting such farmers. Refer to Annex B of the DAP/Thailand for a statement of the relationship of this project to other development activities.

30. FAA Sec. 201 (b) (9). Information and conclusion on whether or not the activity to be financed will contribute to the achievement of self-sustaining growth.

Achieving project output targets will supply only a portion of the improved seed requirements of Thai farmers. It is expected that the successful experience of this activity will demonstrate the profitability of using improved seed and result in steadily increasing demand for such seeds, which should attract private sectorp participation.

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31. FAA Sec. 209. Information and conclusion whether assistance will encourage regional development programs.

The activity is not designed to encourage regional development programs, and will not do so.

32. FAA Sec. 111. Discuss the extent to which the loan will strengthen the participation of urban and rural poor in their country's development, and will assist in the development of cooperatives which will enable and encourage greater numbers of poor people to help themselves toward a better life.

The beneficial impact of the project on the rural poor will be assured through concentration of some project activity in selected "poorer" areas and supplying improved seed to RTG programs currently focussed on lower-income farmers.

An essential element of the project is the strengthening of the newly-formed Marketing Organization for Farmers capabilities in procurement, supply, marketing, and eventual management of seed processing plants. The MOF will utilize Farmers Cooperatives and Farmers Associations as the primary outlets for Project seed.

33. FAA Sec. 201 (f). If this is a project loan, describe how such project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development.

The project will result in increased agricultural production and, concomitently, increased farmer incomes through raising yields/acre planted with improved seed.

Refer to the DAP/Thailand, Annex B., for extensive treatment of relationship of the Project to overall economic development.

34. FAA Sec. 281 (a). Describe extent to which the loan will contribute to the objective of assuring maximum participation in the task of economic development on the part of the people of the country, through the encouragement of democratic, private and local governmental institutions.

Maximum popular participation in economic development will be primarily assured through the use by the Marketing Organization for Farmers of the Farmers Associations and Cooperatives for widespread distribution of the Project seed.

35. FAA Sec. 281 (b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

The project is directly concerned with raising the incomes and thereby increasing the welfare of the rural population in Thailand. Success of the project requires the Thai farmers' participation in more intensive agriculture, using the improved seeds produced by the project and modern technology packages necessary to maximize productivity. To this end the project will finance a strong educational and training program, directed at farmer advisors, seed growers and farmer users.

36. FAA Sec. 201 (b) (3). In what ways does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities?

Improved seeds, with more reliable germination, will result in higher agricultural yields per unit of land and labor with significant increases in total production.

37. FAA Sec. 601 (a). Information and conclusions whether loan will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

a) The loan should result in an increase in the export of agricultural commodities from Thailand.

b) The Thai agency responsible for project implementation will encourage the interest of private sector representatives in project activities, including possible participation in the educational and training aspects of the project. Once the seed processing plants have demonstrated their profitability; the RTG will encourage private sector investment in expanded production.

c) Cooperatives and Farmers' Associations will be major users of project seed, distributing it to individual farmer members. The Marketing Organization for Farmers will supply credit to small farmers.

d) Monopolistic practices are not a concern in this field of activity. However, seed production by the Marketing Organization for Farmers will help to insure reasonable price.

e) The project will result in increased agricultural productivity (yield/acre).

f) Not applicable.

38. FAA Sec. 619. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?

Thailand is not a newly independent country.

Loan's Effect on U.S. and A.I.D. Program.

39. FAA Sec. 201 (b) (6). Information and conclusion on possible effects of loan on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving the U.S. balance of payments position.

This loan will result in an increase in the volume of agricultural commodities exported by Thailand and an improvement in the quality of some of these commodities. To the extent that these commodities compete successfully with U.S. produced food commodities in the world market, the loan could have some fractional adverse effect on the U.S. economy. However, the project's potential for helping to alleviate the world food problem will more than offset the possible adverse effect on U.S. EXPORTS.

40. FAA Sec. 202 (a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources.

Approximately $900,000 under the loan will go directly to U.S. private enterprise. About $450,000 will be used to finance imports of equipment from U.S. firms, and approximately $450,000 will be used to finance technical assistance through U.S. universities or private consulting firms.

41. FAA Sec. 601 (b). Information and conclusion on how the loan will encourage U.S. private trade and investment abroad and how it will encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	The Project will encourage US private trade abroad as discussed in #40 above, but will not involve U.S. private investment abroad.
42. FAA Sec. 601 (d). If a capital project, are engineering and professional services of U.S. firms and their affiliates used to the maximum extent consistent with the national interest?	Long-term and short-term professional assistance in seed technology and marketing will be provided by US universities or private US consulting firms. Need for non-Thai engineering services is minimal, but will be provided from US sources.
43. FAA Sec. 602. Information and conclusion whether U.S. small business will participate equitably in the furnishing of goods and service financed by the loan.	US small business will be invited to furnish goods and services in the normal fashion for AID projects.
44. FAA Sec. 620 (h). Will the loan promote or assist the foreign aid projects or activities of the Communist-Bloc countries?	No.
45. FAA Sec. 621. If Technical Assistance is financed by the loan, information and conclusion whether such assistance will be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis. If the facilities of other Federal agencies will be utilized, information and conclusion on whether they are particularly sutiable, are not competitive with private enterprise, and can be made available without undue interference with domestic programs.	Technical and professional assistance funded under the loan will be under contract to a U.S. firm, university or US agency. Requirements are not large (about seven man years over project life) and could be supplied from any qualified US agency without undue interference with domestic programs.

Loan's Compliance with Specific Requirements

46. FAA Sec. 110 (a);Sec.208(e). In what manner has or will the recipient country provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the Loan is to be made?	Total project costs have been estimated in the project paper at $7.2 million, $1.9 million in foreign exchange and $5.3 m. in local currency equivalent. The loan will finance approximately 50% of total cost, and the RTG will finance the remainder.
47. FAA Sec. 660. Will loan be used to finance police training or related program in recipient country?	No
48. FAA Sec. 114. Will loan be used to pay for performance of abortions or to motivate or coerce persons to practice abortions?	No
49. FAA Sec. 201 (b). Is the country among the 20 countries in which development loan funds may be used to make loans in this fiscal year?	Yes
50. FAA Sec. 201 (d). Is interest rate of loan at least 2% per annum during grace period and at least 3% per annum thereafter?	Yes
51. FAA Sec. 201 (f). If this is a project loan, what provisions have been made for appropriate participation by the recipient country's private enterprise?	The RTG agency responsible for project implementation will encourage the participation of private sector representatives in the education/demonstration/ training aspects of the Project. Additional demand for improved seed generated by the Project will increase the market for private sector seed sales.

52. FAA Sec. 604 (a). Will all commodity procurement financed under the loan be from the United States except as otherwise determined by the President?	Yes
53. FAA Sec. 604 (b). What provision is made to prevent financing commodity procurement in bulk at prices higher than adjusted U.S. market price?	No such commodities are to be procured.
54. FAA Sec. 604 (d). If the cooperating country discriminates against U.S. marine insurance companies, will loan agreement require that marine insurance be placed in the United States on commodities financed by the loan?	Yes
55. FAA Sec. 604 (e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	No such commodities are to be procured.
56. FAA Sec. 604 (f). If loan finances a commodity import program, will arrangements be made for supplier certification to A.I.D. and A.I.D. approval of commodity as eligible and suitable?	Loan does not finance a commodity import program.
57. FAA Sec. 608 (a). Information on measures to be taken to utilize U.S. Government excess personal property in lieu of the procurement of new items.	Available excess property will be screened for Project needs. Due to the nature of the Project it is not expected that U.S. excess property can be used.

58. FAA Sec. 611 (b); App. Sec.101. If loan finances water or water-related land resource construction project or program, is there a benefit-cost computation made, insofar as practicable, in accordance with the procedures set forth in the Memorandum of the President dated May 15,1962?	Loan does not finance such construction.
59. FAA Sec. 611 (c). If contracts for construction are to be financed what provision will be made that they be let on a competitive basis to maximum extent practicable?	RTG contract procurement for construction is on a competitive bid basis.
60. FAA Sec. 612 (b); Sec.636 (h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the United States are utilized to meet the cost of contractual and other services.	The country is contributing 50 per cent of total project costs; all in local currency. There is no U.S. owned local currency available for this Project.
61. App. Sec. 113. Will any of loan funds be used to acquire currency of recipient country from non-U.S. Treasury sources when excess currency of that country is on deposit in U.S. Treasury?	No. Excess Thai currency is not on deposit in U.S. Treasury.
62. FAA Sec. 612 (d). Does the United States own excess foreign currency and, if so, what arrangements have been made for its release?	The U.S. does not own excess local currency.

63. FAA Sec. 620 (g). What provision is there against use of subject assistance to compensate owners for expropriated or nationalized property?	Limitation on authorized uses of loan proceeds will preclude such use.
64. FAA Sec. 620 (k). If construction of productive enterprise, will aggregate value of assistance to be furnished by the United States exceed $100 million?	No
65. FAA Sec. 636 (i). Will any loan funds be used to finance purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States or any guaranty of such transaction?	No
66. App. Sec. 103. Will any loan funds be used to pay pensions, etc., for military personnel?	No
67. App. Sec. 105. If loan is for capital project, is there provision for A.I.D. approval of all contractors and contract terms?	Yes. However, expect to be minimally involved, since most engineering and all construction will be financed by RTG.
68. App. Sec. 107. Will any loan funds be used to pay UN assessments?	No
69. App. Sec. 108. Compliance with regulations on employment of U.S. and local personnel. (A.I.D. Regulation 7).	Loan agreement will require compliance.
70. App. Sec. 110. Will any of loan funds be used to carry out provisions of FAA Sec. 209(d)?	No
71. App. Sec. 114. Describe how the Committee on Appropriations of the Senate and House have been or will be notified concerning the activity, program, project, country, or other operation to be financed by the Loan.	Notification will be made promptly following favorable review at EAPAC meeting.

72. App. Sec. 601. Will any loan funds be used for publicity or propaganda purposes within the United States not authorized by Congress?	No
73. MMA Sec. 901. b; FAA Sec.640 C.	
(a) Compliance with requirement that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed with funds made available under this loan shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.	Provided in the Loan Agreement
(b) Will grant be made to loan recipient to pay all or any portion of such differential as may exist between U.S. and foreign-flag vessel rates?	No
74. Section 30 and 31 of PL 93-189 (FAA of 1973). Will any part of the loan be used to finance directly or indirectly military or paramilitary operations by the U.S. or by foreign forces in or over Laos, Cambodia, North Vietnam, South Vietnam, or Thailand?	No
75. Section 37 of PL 93-189 (FAA of 1973); App. Sec.111. Will any part of this loan be used to aid or assist generally or in the reconstruction of North Vietnam?	No

76. App. Sec. 112. Will any of the funds appropriated or local currencies generated as a result of AID assistance be used for support of police or prison construction and administration in South Vietnam or for support of police training of South Vietnamese?	No
77. App. Sec. 604. Will any of the funds appropriated for this project be used to furnish petroleum fuels produced in the continental United States to Southeast Asia for use by non-U.S. nationals?	No

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

I, James E. Williams, the acting principal officer of the Agency for International Development in Thailand, having taken into account, among other things, the maintenance and utilization of projects in Thailand previously financed or assisted by the United States, do hereby certify that in my judgment Thailand has both the financial capability and the human resources capability to effectively maintain and utilize the capital assistance to be provided by the proposed Seed Development Loan.

In so certifying, I have taken into account the active involvement of Royal Thai Government officials in the planning and design of the proposed Seed Development Project and the soundness of the Thai economy.

James E. Williams
Acting Director

Date: May 27, 1975

Department of State TELEGRAM

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SUBJ: SEED DEVELOPMENT PROJECT, RTG REQUEST FOR FINANCING

1. MISSION HAS RECEIVED LETTER DATED JUNE 19, 1975 FROM RTG MINISTRY OF FINANCE TO AMBASSADOR WHITEHOUSE REQUESTING A LOAN FROM AID/W FOR THAILAND IN AMOUNT UP TO DOLLARS FOUR MILLION FOR PARTIAL FINANCING OF THE SEED DEVELOPMENT PROJECT. BELIEVE NO FURTHER INFORMATION REQUIRED FROM USOM PRIOR TO AID/W AUTHORIZATION OF LOAN THIS PROJECT FY 75.

2. ADVISE ASAP WHICH CONDITIONS AND COVENANTS WERE INCLUDED IN FINAL PP AND STATUS FY 75 AUTHORIZATION.
WHITEHOUSE

UNCLASSIFIED

LOAN AUTHORIZATION

Thailand: Seed Development

Pursuant to the authority vested in me as Assistant Administrator, Bureau for East Asia, by the Foreign Assistance Act of 1961, as amended, and delegations of authority issued thereunder, I hereby authorize the establishment of a loan (the "Loan") pursuant to Part I, Chapter 2, Title I, the Development Loan Fund, to the Government of Thailand (hereinafter called "Borrower") of not to exceed Three Million, Seven Hundred Thousand Dollars ($3,700,000) to finance the foreign exchange and certain local currency costs of goods and services necessary to assist the Borrower in developing facilities and programs to cause the use of improved seeds on Thai farms. The Loan shall be subject to the following terms and conditions:

1. Interest and Terms of Repayment

Borrower shall repay the Loan to AID in United States dollars within forty (40) years from the first disbursement under the Loan, including a grace period of not to exceed ten (10) years. Borrower shall pay to A. I. D. in United States dollars, on the disbursed amount of the Loan, interest at the rate of two percent (2%) per annum during the grace period, and three percent (3%) per annum thereafter.

2. Other Terms and Conditions

(a) Goods and services financed under the Loan shall have their source and origin in Thailand, the United States, or any other independent country eligible under A. I. D. geographic code 941.

(b) A. I. D. shall finance no more than fifty percent (50%) of the total cost of the project.

(c) Prior to initial disbursement of loan funds, Borrower must submit in form and substance satisfactory to A. I. D.:

i - Evidence of adequate organizational arrangements to implement the Project;

ii - An implementation plan and corresponding financial plan for the Project;

iii - A plan for extending Project benefits to farmers at the lowest end of the income scale.

(d) Prior to disbursement for local currency costs, Borrower must submit in form and substance satisfactory to A. I. D.:

i - Evidence of arrangements for the creation, operation, and management of the Project's working capital fund.

(e) The Loan shall be subject to such other terms and conditions as A.I.D. may deem advisable.

_____
Assistant Administrator, East Asia

Date: _____

Draft
June 13, 1975