REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF AGRICULTURE

FEASIBILITY STUDY ON IMPROVEMENT OF SEED PRODUCTION AND DISTRIBUTION, AND ESTABLISHMENT OF APPROPRIATE SEED STORAGE SYSTEM

Main Report

November 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Japanese Government decided to conduct a feasibility study on the Improvement of Seed Production and Distribution, and the Establishment of Appropriate Seed Storage System and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a survey team headed by Mr. Takayoshi YAMAZAKI of Nippon Koei Co., Ltd., composed of members from the same company and System Science Consultants Inc., three times between November 1989 and September 1990.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted field surveys. After the team returned to Japan, further studies were made and the present report was prepared.

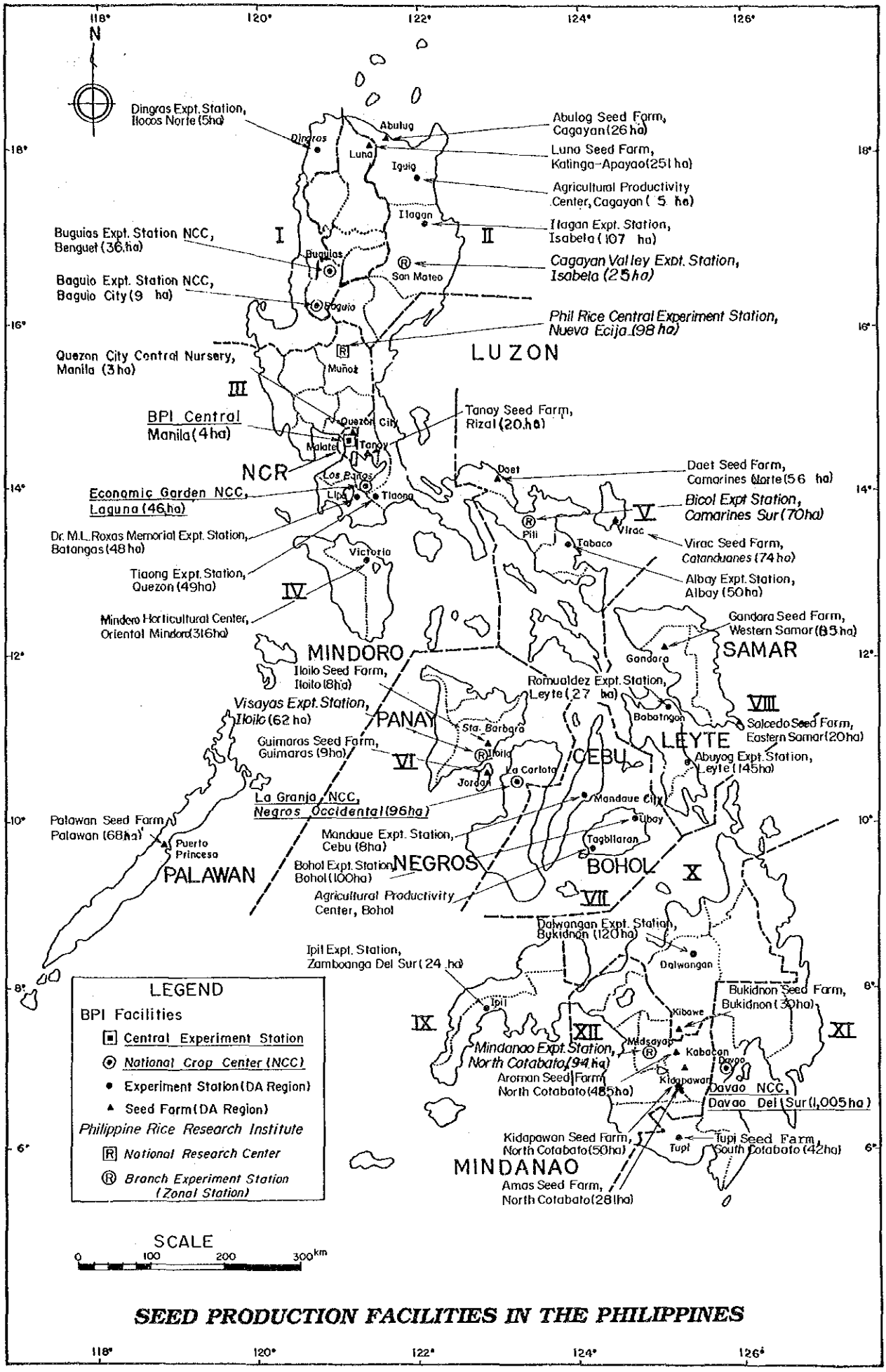
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincerest appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.

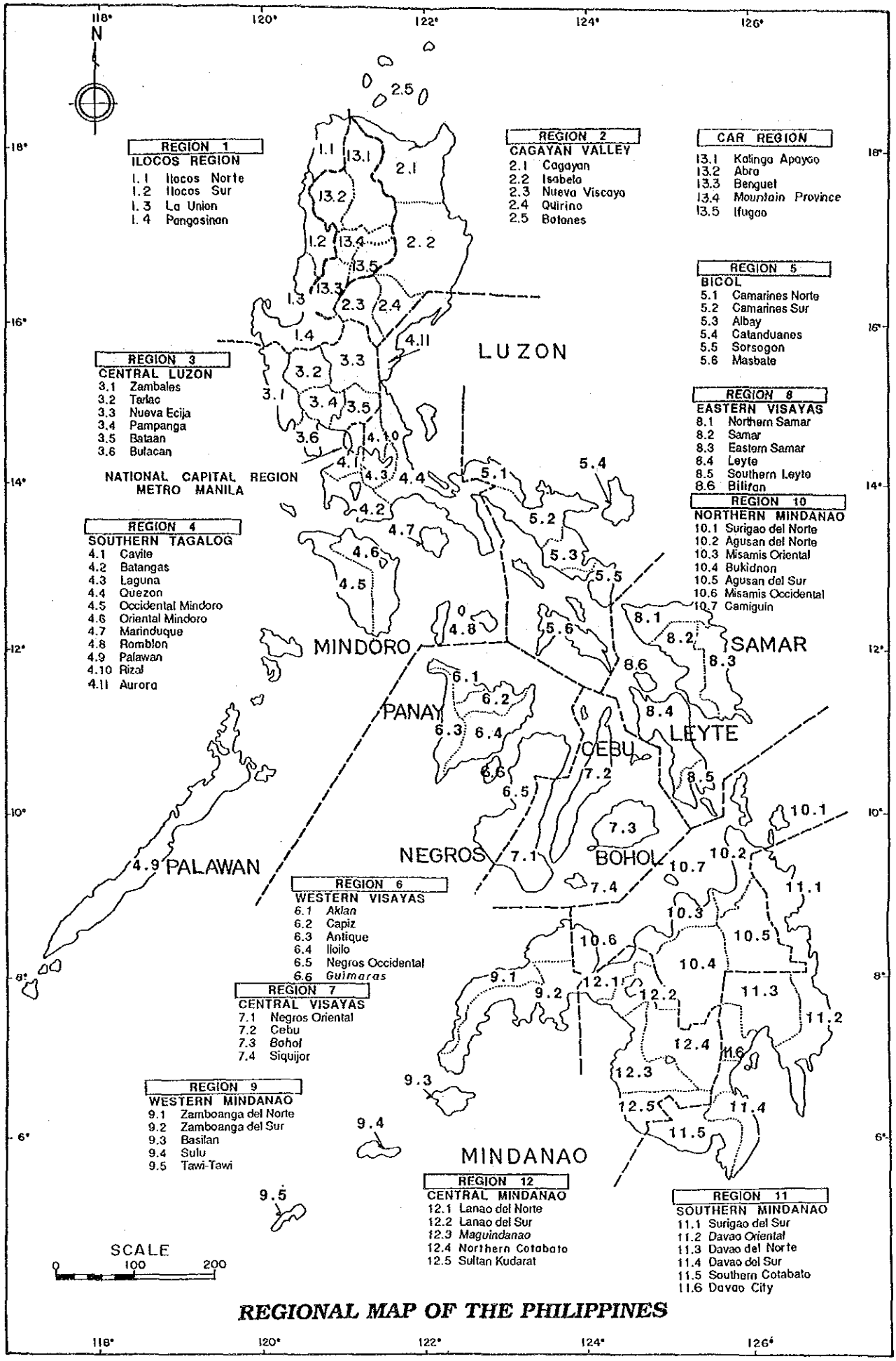
November 1990

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency



SEED PRODUCTION FACILITIES IN THE PHILIPPINES



REGIONAL MAP OF THE PHILIPPINES

Summary

Background of the Study

1. The Government of the Philippines (GOP) has published its "Medium -Term National Development Plan, 1987 - 1992", in which the Department of Agriculture (DA) put the development objectives in the agriculture sector as to ensure food security, to increase and stabilize earnings from agricultural exports, and to reduce import dependence in products where the Philippines has a comparative advantage. In the seed production sector, the DA pursues seed policies to expand the supply of high quality seed and seedlings.

2. The Government of Japan (GOJ) provided assistance in establishing the present seed production and distribution facilities through the first Yen Loan (1973 - 75), KR II (1976 - 77) and the Seventh Yen Loan (1978 - 80). As a result seed processing units have been facilitated at seventeen (17) agricultural experiment stations and seed farms under the Bureau of Plant Industry (BPI), the Philippines Research Institute (Phil Rice) and the DA regional offices.

3. The Philippines has constraints for the increase in supply of high quality seed which cannot be solved by single-phase development of seed processing and storage facilities. To increase in farm family income, establishment of a stable supply system for high quality seeds as well as appropriate countermeasures from production to distribution are essential and crucial.

4. With the background stated above, the GOP requested the GOJ to undertake a Feasibility Study on Improvement of Seed Production and Distribution, and Establishment of an Appropriate Seed Storage System in September 1987. In reply to this request, JICA sent a preliminary survey team for the said Study and the implementing arrangement (I/A) was signed between GOP and GOJ on February 15, 1989.

Objectives of the Study

5. The objectives of the Study were (i) to formulate a Basic Improvement Plan in the Philippines for the purpose of high quality seed production and distribution for rice, corn and peanuts, and (ii) to formulate Model Improvement Plans in model areas selected for each crop on the basis of the above Basic Improvement Plan, and (iii) to verify the technical, economic and financial feasibility of the Plans.

Present Organization for Seed Production and Distribution

6. The DA has been promoting the seed industry in the country including the private sector. The BPI in the DA, assigned as the lead agency to implement the seed production and distribution program of DA by virtue of Special Order No. 298, has responsibility for formulation, implementation, monitoring and evaluation of the seed production and distribution program throughout the country. Regional and provincial seed coordinators designated throughout regional and provincial agricultural offices plan and coordinate seed production and distribution activities at the regional level.

7. At present, there are thirty eight (38) seed production establishments under the DA, of which four (4) are National Crop Centers under the BPI, five (5) are experiment stations under Phil Rice and the remaining twenty nine (29) are stations or seed farms under Regional Agricultural offices.

8. The main participating agencies related to rice, open pollinated corn and peanuts may be summarized as follows :

Seed Production Stage	Rice	Corn(Open Pollinated)	Peanuts
Breeder Seed	Phil Rice Central E.S IRRI	IPB, Ilagan E.S	IPB, Economic Garden
	.....Agricultural Colleges and Universities.....		
Foundation Seed	Phil Rice Central E.S La Granja E.S	.....BPI National Crop Centers(NCC).....	
Registered Seed	(1) Experiment Stations and Seed Farms, others (2) Selected seed farmers in provinces without experiment stations		
Certified Seed	Private Seed Growers(Members of seed growers association)		

Note : E.S ; Experiment station S.F ; Seed farm NCC ; National Crop Center

Seed Production and Distribution Plan

9. Since establishment of the BPI, seed production and distribution programs have been implemented in coordination with crop production programs; Masagana 99 and the Intensified Rice Production Program for rice, Maisagana 99 and the Expanded Corn Program for corn. The BPI prepares the annual seed production and distribution plans which include the target areas and production in every seed class for stations and seed farms, and seed growers in each region together with a seed inspection program both in the field and in laboratories. The objectives of the seed program may be summarized as follows :

a) To produce adequate quantities of basic seed (breeder, foundation, registered) including security stock for timely production of certified seed,

b) To produce high quality certified seed on a continuing supply basis,

c) To improve efficiency in production of high quality seeds,

d) To preserve the viability and quality of basic and certified seeds while in storage, and

e) To intensify promotion of farmers adoption of high quality seeds.

10. The Intensified Rice Seed Production and Distribution Program under the BPI has been implemented since May 1989 as one of the components of the Rice Production Enhancement Program II (RPEP II). An increase of 800 thousand cavans of certified seed production from 100 thousand ha of seed fields is programed under the Intensified Rice Seed Production and Distribution Program. The production targets of certified seeds for corn and peanuts in 1989 are 7,900 t and 2,600 t, respectively.

11. In addition to the above programs, the DA has appropriated ₱ 15 million in 1990 for procurement of seed buffer stock to provide 15% to 20% of the planned certified seed production of rice, corn and some vegetables.

Seed Production Activities

12. The following numbers of experiment stations and seed farms produce basic seed such as foundation and registered seeds of rice, corn and peanuts for the government .

(Unit : Numbers of Experiment Stations and Seed Farms)

Seed Class	Lowland Rice	Upland Rice	Corn	Peanuts
Breeder	2(IRRI)	2(IRRI)	2(IPB)	2(IPB)
Foundation	11	3	8	8
Registered	22	8	21	11
(Foundation & Registered)	(23)	(9)	(22)	(17)

13. The seed production targets of the BPI program in 1989 and actual seed production are summarized as follows :

Seed/	Lowland Rice			Corn			Peanuts		
Item	F.S	R.S	C.S	F.S	R.S	C.S	F.S	R.S	C.S
BPI Target									
Area (ha)	10	700	7,312	5	77	124	10	260	2,600
Production (t)	32	2,520	26,324	15	229	371	10	260	2,600
Actual									
Area (ha)	35	654	3,427	12	173	144	3	13	11
Production (t)	66	1,131	5,623	12	220	150	1	8	6

14. The problems in seed production are the low yield of the crops as well as the low seed yield owing to the low percentage of screened and approved seed. The BPI seed production program is set at a relatively high level compared with the actual production.

Seed Quality Control

15. The Seed Quality Control Services (SQCS) Section of the Crop Production Division of the BPI is assigned as the executive agency for the seed certification program. At present, seed testing for seed quality control is conducted at eighteen (18) Seed Testing Laboratories (STL) strategically situated throughout the country. The SQCS Section also functions as the Central Office of these STLs. There are two hundred and seventy-eight (278) seed inspectors working throughout the country. The seed certification system is maintained and operated by both the field activity of the seed inspectors and seed testing in the STLs.

16. The objective area of field inspections in 1989 was 20,934 ha and the total number of seed samples tested was 82,405. In the case of rice, the approval rates of field inspection for governmental seed farms and private seed growers were 86% and 77%, respectively. Furthermore, the rejection rate for rice seed produced by seed growers was at the high level of 12%. The causes of rejection were mainly the excessive occurrence of other varieties, low germination and high moisture content in the case of rice, and for corn and peanuts it was low germination.

Seed Production, Processing and Storage Facilities

17. Almost all the paddy seed farms already have irrigation systems using as water sources of rivers, springs and/or wells. Some of these farms, however, occasionally suffer problems of water shortage, saline water and so on. On the other hand the farms for corn and peanut seed production are rain-fed basically and sprinkler or drip irrigated occasionally. These crops are affected severely by the natural calamities particularly in droughts.

18. Of the 38 DA seed farms, only fifteen (15) have complete seed processing plants. The other twenty-three (23) have no such facilities except for traditional seed cleaning apparatus. Regarding the durability of the plant, the estimated life span of almost all the plants has been exceeded, so repair or replacement of plant may be required for continued operation of the plants.

19. Of the 38 DA seed farms, only eleven (11) have storage facilities. The remaining twenty-seven (27) have no seed storage facilities, although ten (10) are using warehouses for agricultural materials as seed storage for convenience. Furthermore, the existing seed

storages are not necessarily suitable for keeping seeds in viable condition due to lack of air-conditioned facilities being open-style structures.

Basic Improvement Plan for Seed Production and Distribution in the Philippines

20. The basic concepts for improvement of seed production and distribution identified through the Study are as follows :

1) To establish a proper seed a production and distribution program and to strengthen its executive organization through clarification of production and distribution functions at each seed multiplication stage, specifically :

   a) The BPI should prepare a nationwide and regional seed production and distribution plan in consultation with the agencies concerned, taking the condition of seed stations into consideration. The plan should consist of both an annual plan and a long/medium term plan.

   b) For the establishment of timely coordinated activities in seed production and distribution, the reporting system should be improved, and capabilities for collection and analysis of data and information in the BPI should be increased.

2) To establish a clear-cut line of responsibility for each governmental agency involved in producing seed and its jurisdiction for distribution, and to improve related facilities in those agencies to the maximum extent. And to take necessary measures to produce and maintain the buffer stock of seeds stipulated in the Administration Order No. 32.

3) To strengthen seed inspectors both in quality and in quantity and to improve STL facilities, so as to operate seed quality control services effectively.

4) A nationwide improvement plan for seed processing facilities should be established in accordance with the following procedure :

   a) Reactivation of the plant in Cagayan E.S destroyed by typhoon ,
   b) Overall rehabilitation or repair of the plants installed under the First Japanese Yen Credit, if necessary, and
   c) Repair or replacement of the plants installed under the seventh Japanese Yen Credit, if necessary, and improvement of processing facilities in the 25 remaining seed farms.

5) As a first step seed storage facilities should be established at every seed farm in which produce both of foundation and registered seed, and then gradually expanded to other seed farms. It is recommended that the headquarters of BPI should have air-conditioned seed storage facilities in order to strengthen the role of the BPI and the nationwide seed procurement and distribution system.

6) In order to improve the seed growers' production technologies, the government support services, especially in extension, credit and organization set-up, should be strengthened.

Approach to the Improvement

21. Taking all the above into consideration, it would be desirable for the BPI to take the necessary measures as soon as possible. However, it would neither be practicable nor efficient to start implementation of all of the improvement plans immediately throughout the country from the viewpoint of the limited availability of investment funds. As an initial measure, therefore, the following approach should be considered :

a) Establishment of model projects in the selected model areas for each crop of rice, corn and peanuts,

b) In addition to the model projects, an emergency improvement plan should be established taking into account the degree of emergency and the expected effect of project implementation.

Selection of the Model Area

22. On the basis of the following criteria, Regions VI, XI and II were selected as the model areas for rice, corn and peanuts respectively :

a) Model areas should be in main producing regions for rice, corn and peanuts respectively,

b) Regions selected as model areas should have an NCC under BPI or a Branch E.S under Phil Rice in case of rice,

c) Active seed producers associations should exist in the model areas, and

d) Model areas should have no on-going projects with the same nature as this project.

Present Condition of the Model Areas

23. The proposed Model Areas in the respective regions are as follows :

Items	Region II	Region VI	Region XI
Objective Areas	Whole region	Except Negros Occ.	Whole region
Total Population in 1990 (000)	2,147	5,670	4,961
Total Area (000 ha)	2,272	2,023	3,243
-Paddy land	200	344	266
-Diversified crop land	194	429	299
-Other land	1,878	1,250	2,678

24. The objective stations for improvement are Ilagan E.S for peanut seed, Visayas E.S for rice seed, and Davao NCC and Tupi S.F for corn seed.

25. The production area of commercial peanuts in Region II is 4,480 ha in the wet season and 21,520 ha in the dry season on the average of 3 years (1986 - 88). Production is

concentrated in Isabela province covering 83% of the area and accounting for 86% of the production in the region. Peanut seed growers are limited to 9 farmers at present. The quality peanut seed is unsatisfactory and establishment of seed production system is indispensable.

26. The rice production area in Region IV averaged about 449 thousand ha in 1987 - 89. Among the provinces, Iloilo is the largest rice producing province with 46% of the area and 44% of the paddy production in the region. There are about one hundred rice seed growers in the region. Visayas E.S suffers from a shortage of irrigation water, hence registered seed production heavily relies on the efforts of selected seed growers.

27. The corn production area in Region XI averaged 602 thousand ha in the wet season and 174 thousand ha in the dry season of 1987 - 89. South Cotabato province is the main producing area having around 60 % of the regional corn area. Corn seed growers have increased the Corn Productivity Enhancement Program.

28. The present number of seed inspectors is 24 in Region II, 13 in Region VI and 14 in Region XI. Full-time seed inspectors are rare. Most of the inspectors have additional duties other than their inspection activities and the shortage of staff is serious. Insufficient seed testing facilities as well as lack of transport means make effective inspection and seed testing difficult. The buildings of Seed Testing Laboratories are too small and lack storage space for testing samples which is an essential part of the procedure.

29. The objective experiments stations and seed farms have the same constraints as other government facilities such as insufficient irrigation facilities, shortage of farm machinery, insufficient or superannuated processing facilities, etc.

Model Improvement Plan

30. Seed Production and Distribution Plan

1) To secure stable provision of rice, corn and peanut seed, the following improvement plan is considered :

Item	Rice Seed	Corn Seed	Peanut Seed
Seed rate (kg/ha)	45	20	100
Renewal rate (%)	20	11	10
Average yield (t/ha)			
Foundation	3.15	2.5	1.0
Registered, Certified	3.60	3.0	1.0
Buffer stock (%)			
Foundation	100	100	100
Registered	20	20	20
Certified	10	10	10

2) Peanut foundation and registered seeds required in Region II are to be produced at Ilagan E.S, while about 2/3 of the required registered seed in the dry season have to be produced by selected seed growers. Certified peanut seed production will be 215 t in the wet season and 45 t in the dry season.

3) Rice foundation and registered seed are to be produced at Visayas E.S, while about 55% of the registered seed required in the dry season has to be produced by selected seed growers. The production target for certified rice seed is 3,229 t and 2,597 t in the wet and dry seasons respectively.

4) Davao NCC has to produce all the foundation seed required in Region XI, the registered seed required in the region except South Cotabato, and some quantity of certified corn seed. Certified corn seed production will be 376 t and 1,244 t in the wet and dry seasons respectively.

31. Facilities Development Plan

1) Seed Production Fields

a) Irrigation Facilities

Item	Ilagan E.S	Davao NCC
1) Objective Crops	Peanuts	Corn
2) Objective Areas	33 ha	20 ha
3) Irrigation Methods	Sprinkler Interval - 6 day	Sprinkler Interval - (Max) 3 day
4) Water Conveyance Facilities		
- Designed diversion discharge	12.0 l/s	35 l/s
- Water source	Pinacanuan River	Lapidas River
- Diversion work	Pumping site, Suction sump, Pump	Mountain river diversion work Settling tank
5) Water Conveyance System	Pumping system Pipeline (Portable traveling system)	Closed type pipeline by gravity (Fixing system)
6) Irrigation Facilities	Lateral pipe, Sprinkler irrigation equipment	Distribution tank & pipe, Sprinkler irrigation equipment

b) On Farm Road Improvement

Davao NCC	No. 11 field lot	W = 3.0 m	l = 750 m
	No. 9	W = 3.0 m	l = 500 m
	Un-paved earth road		

c) Davao NCC-Manambulan S.F Connection Road

Effective Width	3.0	m
Total Length	6,000	m
	Concrete paved road	

2) Seed Related Equipment

a) Farm and Harvesting Machinery

Machinery	Ilagan E.S	Reg. II Private	Visayas E.S	Reg. VI Private	Davao NCC	Tupi S.F	Reg. XI Private
Tractor (60PS)	2	–	–	–	1	1	–
Tractor (35PS)	–	–	2	–	–	–	–
Tractor (15PS)	2	–	–	–	–	–	–
Power Tiller (7PS)	3	–	2	–	2	2	–
Disc Plow	2	–	1	–	1	1	–
Scraper	2	–	1	–	–	–	–
Disc Harrow	2	–	–	–	1	1	–
Trailer	4	–	4	–	2	2	–
Rotary	2	–	2	–	–	–	–
Sprayer	10	–	10	–	10	10	–
Corn Seeder	–	–	–	–	1	1	–
Weeder	–	–	5	–	–	–	–
Thresher	2 (peanuts)	5 (peanuts)	2	4	–	–	–
Corn Sheller	–	–	–	–	2	1	5
Peanuts Sheller	2	5	–	–	–	–	–

b) Others

Machinery	Ilagan E.S	Reg. II Private	Visayas E.S	Reg. VI Private	Davao NCC	Tupi S.F	Reg. XI Private
Excavator	1	1	1	-	1	-	-
Forklift	1	-	1	-	1	1	-
Workshop Tools	1	-	1	-	1	-	-
Improved Prefabricated Warehouse	-	1	-	4	-	-	-

3) Seed Processing Machinery and Facilities

Machinery	Ilagan E.S	Reg. II Private	Visayas E.S	Reg. VI Private	Davao NCC	Tupi S.F	Reg. XI Private
Dryer	3 t x1	10 t x1	2.8 t x6	2.8 t x4	1 t x1	1 t x1	–
Seed Separator	–	–	–	0.5TPH x 4	–	–	0.5TPH x 5
Seed Processing Plant	0.5TPH x 1	1TPH x 1	1TPH x 2	– -	0.5TPH x 1	– -	– -

4) Transportation Equipment

Machinery	Ilagan E.S	Reg. II Private	Visayas E.S	Reg. VI Private	Davao NCC	Tupi S.F	Reg. XI Private
Medium Truck	2	–	2	–	1	1	–
Small Truck	–	–	2	–	1	1	–
Pick-up Truck	2	–	2	–	1	1	–

5) Buildings :

For storage of tested samples of seed for at least 2 years, a seed storage house with air conditioning should be constructed for the existing seed testing laboratories in Cagayan Valley E.S, Visayas E.S and Davao NCC. The following scale of buildings for seed processing plant and seed storage should be constructed at the various sites.

(Unit :m^2)

Buildings	Region II		Region VI	Region XI	
	Ilagan	Cagayan	Visayas	Davao	Tupi
Laboratory (Expansion)	–	201	201	201	–
Processing Plant	520	–	660	520	–
Storage House	660	–	1,370	350	470

32. Seed Quality Control Plan

The following improvement measures will be taken to increase the seed production area and the number of seed growers :

1) Field Inspection Activities :

Item	Region II	Region VI	Region XI	Total
Number of Seed Inspectors	24	11	14	49
Field Inspection Kits	24	11	14	49
Motorcycles	24	11	14	49

2) Seed Testing Activities (one set for each seed testing laboratory) :

a) Moisture testers (3)
b) Purity testers (3)
c) Germination testers (3)
d) Set for seed pathology tests (3)
e) Data processing equipment with tag printer (3)
f) Seed inspection vehicles (3)

33. Improvement of Planning and Monitoring System

In the preparation of practical seed production and distribution plan and strengthening of monitoring and evaluation activities in the Model Areas, the following improvement measures will be indispensable :

1) Close coordination between seed related institutes and seed growers association by the regional seed coordinators,
2) Introduction of micro-computers to the institute concerned for effective data consolidation and evaluation, and
3) Establishment of a communication network using fax machines.

Project Cost

34. The costs of implementing the Model Improvement Plans mentioned above were estimated as follows :

(Unit : '000 ₱)

Region		Local Currency	Foreign Currency	Total
Region II	(Peanut Seed)	21,373	65,309	86,682
Region VI	(Rice Seed)	34,477	101,814	136,291
Region XI	(Corn Seed)	27,991	92,024	120,195
Total		83,841	259,327	343,168

Economic Evaluation

35. Economic internal rates of return are 3.3 % for peanut seed in Region II, 32.8 % for rice seed in Region VI, 25.3 % for corn seed in Region XI and 24.9 % in total.

36. In addition to the direct benefits used in the economic and financial evaluation, various secondary and intangible benefits may be expected from implementation of the Plans as follows :

1) Utilization of Surplus Seed ; Seed production will exceed requirements in the Model Areas. This surplus seed could be supplied to other regions and contributes to their increased crop production.
2) Emergency Seed Supply from Buffer Stock ; Buffer seed stock could be distributed in the event of natural calamities such as typhoon and drought. Production recovery by use of buffer seed will be rapid.
3) Development of Related Industries ; Crop production will increase through the increase and stable supply of improved seed. Furthermore, related industries to crop production such as supply of agricultural inputs and marketing of crops will be developed and employment opportunities will increase in these industries.

Recommendation

37. Early Implementation of the Model Improvement Plans ; taking into account the large effects and importance of the plans, it is recommended that the necessary arrangement for early implementation of the plans be taken as soon as possible.

38. Organization and Training ; For smooth implementation of the plans, the Project Office should be established in the BPI as well as assignment of the necessary staff at regional and provincial levels. Practical training for the technical staff should be given according to training programs prepared.

39. Implementation of Seed Related Development Plan ; Early implementation of the following plans is recommended :

1) Establishment of Central Seed Storage System and Facilities in the BPI Head Office for the strengthening of the BPI's coordination activities in seed procurement and distribution in the country,
2) Establishment of a Central Seed Quality Control Center in the BPI Head Office in order to promote high quality seed production and distribution, improve the proficiency and efficiency of seed testing activities, develop appropriate seed testing technology, and strengthen the nationwide monitoring and evaluation system of the Regional Seed Testing Laboratories, and
3) Replacement of the seed processing plant in the Cagayan Valley E.S.

FEASIBILITY STUDY ON
IMPROVEMENT OF SEED PRODUCTION AND DISTRIBUTION, AND
ESTABLISHMENT OF
APPROPRIATE SEED STORAGE SYSTEM

MAIN REPORT

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ABBREVIATIONS

ACAP	Agricultural Colleges Association of the Philippines
AMC	Area Marketing Cooperative
ATI	Agricultural Training Institute
BAT	Bureau of Animal Industry
BAR	Bureau of Agricultural Research
BCOD	Bureau of Cooperative Development
BPI	Bureau of Plant Industry
BS	Bureau of Soils
CPEP	Corn Productivity Enhancement Program
E.S	Experiment Station
FACOMA	Farm Cooperative Marketing Association
IPB	Institute of Plant Breeding
IRRI	International Rice Research Institute
JICA	Japan International Cooperative Agency
KRII	Kennedy Round II
LBP	Land Bank of the Philippines
LEAD	Livelihood Enhancement for Agricultural Development
NAPHIRE	National Post Harvest Institute for Research and Extension
NCC	National Crop Center
NCSIP	National Cooperative Seed Improvement Program
NCSO	National Census and Statistics Office
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NFA	National Food Authority
NIA	National Irrigation Administration
NCR	National Capital Region
OECF	Overseas Economic Cooperation Fund
PAEC	Philippine Atomic Energy Commission
PCA	Philippine Coconut Authority
PNB	Philippine National Bank
PSB	Philippine Seed Board
PSC	Philippine Sugar Commission
PTA	Philippine Tobacco Administration
RH	Relative Humidity
STL	Seed Testing Laboratory
S.F	Seed Farm
SQCS	Seed Quality Control Services
UNDP	United Nations Development Program
UPLB	University of the Philippines, Los Baños
USAID	United State Agency for International Development

ABBREVIATIONS OF MEASUREMENTS

Length

mm	=	millimeter		
cm	=	centimetre		
	=	0.39 in.		
m	=	meter	=	1.09 yd
	=	3.28 ft.		
km	=	kilometre	=	0.62 ml
in.	=	inch	=	2.54 cm
ft.	=	foot	=	30.48 cm
yd.	=	yard	=	91.44 cm
ml.	=	mile	=	1.61 km

Area

cm^2	=	square centimetre		
m^2	=	square meter		
km^2	=	square kilometre		
	=	100 ha		
ha	=	hectare	=	0.01 km^2
	=	2.5 ac		
ac	=	acre	=	0.41 ha
	=	4,047 m^2		
ft^2	=	square feet		
	=	0.09 m^2		
$mile^2$	=	square mile	=	2.59 km^2

Electrical Measures

kW	=	kilowatt	=	1,000 watt
MW	=	megawatt	=	1,000 kW
GW	=	gigawatt	=	1,000 MW
kV	=	kilovolt	=	1,000 Volt

Other Measures

%	=	percent
°	=	degree
'	=	minute
"	=	second
℃	=	degree in Celsius
lakh	=	10^5
crore	=	10^7
Hp, PS	=	horse power
TPH	=	ton per hour

Volume

lit.	=	litter		
cm^3	=	cubic centimetre		
m^3	=	cubic meter		
	=	1,000 lit.		
MCM	=	million m^3		
	=	$1x10^3$ m^3		
ft^3	=	cubic feet	=	0.028 m^3
	=	28.32 lit.		
ac-in.	=	acre inch	=	102.79m^3
ac-ft.	=	acre feet	=	1,234 m^3

Weight

g	=	gram			
kg	=	kilogram			
t	=	metric ton	=	1,000	kg
lb	=	pound	=	454	g
cavan	=	sack (bag)			
		paddy	=	50	kg/sack
		paddy seed	=	45	kg/sack
		corn seed	=	50	kg/sack
		pod peanut seed	=	25	kg/sack

Time

sec	=	second		
min	=	minute	=	60 seconds
hr	=	hour	=	60 minutes
	=	3,600 seconds		
day	=	24 hrs	=	1,440 minutes
	=	86,400 seconds		
yr	=	year		

Derived Measures

m^3/sec	=	cubic meter per second (Cumec)
ft^3/sec	=	cubic foot per second (Cusec)

Monetary

US$	=	US dollar
¥	=	Japanese yen
₱	=	Philippine peso

1. INTRODUCTION

1.1 Authority

This Main Report was prepared in accordance with the Implementing Arrangement (I/A) on the Technical Cooperation for the Feasibility Study on Improvement of Seed Production and Distribution, and Establishment of Appropriate Seed Storage System in the Philippines agreed upon between the Department of Agriculture (DA) and Japan International Cooperation Agency (JICA) on February 15, 1989. This report presents the results of the Study during the period of November 1989 to October 1990. Main contents of the report are clarification of the present seed production and distribution system, formulation of a basic improvement plan in the Philippines, selection of model areas, and formulation and evaluation of the model improvement plans.

1.2 Background of the Study

The Government of the Philippines (GOP) has published its Medium Term Plan for national development for the period 1987-1992, in which the DA put the development objectives in the agricultural sector as to ensure food security, to increase and stabilize earnings from agricultural exports, and to reduce import dependence in products where the Philippines has a comparative advantage. In the seed production sector, the DA pursues seed policies to expand the supply of high quality seeds and seedlings.

The Government of Japan (GOJ) provided assistance in establishing the present seed production and distribution facilities through the first Yen Loan (1973 - 75), KR II (1976 -77) and the seventh Yen Loan (1978 - 80). As a result seed processing units have been facilitated in seventeen (17) agricultural experiment stations or seed farms under the Bureau of Plant Industry (BPI), the Philippines Rice Research Institute (Phil Rice) and the DA regional offices.

The Philippines has the following constraints for the increase in supply of high quality seed which could not be solved by single-phase development for seed processing and storage facilities :

1) An unstable supply of foundation and registered seeds caused by insufficient field infrastructures and technical facilities,
2) Deterioration of seed quality due to improper seed processing and storage facilities,

3) Weak organization for seed marketing and distribution, and
4) Low extension of high quality seeds due to limitations in farmers' understanding.

Establishment of a stable supply system for high quality seeds as well as appropriate countermeasures from production, storage to marketing and distribution are essential and crucial to increase production and productivity and thereby increasing farm family income.

With the background stated above, the GOP requested the GOJ to undertake a Feasibility Study on Improvement of Seed Production and Distribution, and Establishment of Appropriate Seed Storage System in September 1987. In reply to this request, JICA sent a preliminary survey team, and the implementing arrangement (I/A) and the minutes of meeting of preliminary survey for the said Study as shown in Attachment I and II respectively were signed between GOP and GOJ on February 15, 1989.

1.3 Outline of the Study

1.3.1 Objectives

The objectives of the Study are as follows :

1) To formulate a Basic Improvement Plan in the Philippines for the purpose of high quality seed production and distribution for rice, corn and peanuts, and

2) To formulate Model Improvement Plans in model areas selected for each crop on the basis of the above Basic Improvement Plan, and to verify the technical, economic and financial feasibility of the plans.

1.3.2 Study Crops and Area

The objective crops are rice, corn and peanuts. During discussion of the Inception Report, peanuts was selected for study of the beans from the view points of 1) potentiality of peanuts as a monocrop and as a diversified crop, 2) availability of improved varieties of peanuts and demand of seed growers and consumers, 3) necessity of import substitution of peanuts and its processed goods, 4) investment opportunity in peanuts processing industry, and 5) present unavailability of quality peanuts seeds as shown in Attachment III, the minutes of meeting on the inception report.

The study covers the whole country for the Basic Improvement Plan and the model areas selected for each objective crop.

1.3.3 Activities of the Study Team

The work procedure of the Study is shown in Fig. 1.3.1. The Study was implemented in two stages, i.e. Phase I and Phase II during November 1989 to March 1990 and June to October 1990 respectively. The principal activities of the study team were summarized as follows :

(1) Phase I Study (November 1989 - March 1990)

1) Collection of data and information related to the study,
2) Site survey and investigation carried as shown in Table 1.3.1 comprising :
   a. social and economic survey,
   b. seed production survey,
   c. seed quality control survey,
   d. seed related facilities' survey,
   e. seed marketing and distribution survey,
   f. interview survey to seed growers, and
   g. survey on seed related support services.
3) Preparation of the "Progress Report" on the results of the Phase I Field Survey,
4) Formulation of the Basic Improvement Plan for improvement of seed production and distribution in the Philippines, based on the results of field findings, the minutes of meeting on the Progress Report in Attachment IV and comments from BPI, clarification of the present constraints and identification of basic concepts for the improvement,
5) Selection of model areas by each study crop and preliminary formulation of model improvement plan, and
6) Preparation and explanation of the "Interim Report" as the results of the Phase I Study (See Attachment V).

(2) Phase II Study (June - October 1990)

1) Field survey in the model areas of Region II, VI and XI comprising :
   a. organization survey of seed production plan and execution,
   b. seed production survey,
   c. seed quality control and inspection facilities' survey,
   d. seed related facilities and management survey,
   e. seed marketing and distribution survey,
   f. interview survey of seed growers and ordinary farmers,
   g. survey of seed related support services, and
   h. unit prices and evaluation survey.

2) Formulation of a Model Improvement Plan in each model area on the basis of the discussion with the Philippines side as shown in Attachment VI and estimation of costs and benefits,
3) Evaluation of the Model Improvement Plans from the economic, financial and socio-economic points of views,
4) Preparation of the schedule and the organization for the Implementation of the Model Plans,
5) Preparation of the "Draft Final Report" as the results of the Study,
6) Explanation of the "Draft Final Report" to the Government of the Philippines, and
7) Preparation of the "Final Report" based on the minuets of meeting on the Draft Final Report as shown in Attachment VII.

2. PRODUCTION OF THE STUDY CROPS

Agricultural land in the Philippines is estimated at 8.8 million ha which is around 29% of the total land area of 30 million ha. The proportion of rice fields in the total agricultural land is estimated at 22% on the average ranging from 5% to 54% by region. The proportions of harvested area of rice, corn and peanuts in relation to the total harvested area of food crops (8.2 million ha) are estimated at 41%, 42% and 0.6%, respectively.

Major rice producing regions, Regions III, VI, II, IV, I and XII, produced 17%, 13%, 12%, 11%, 9% and 9% respectively of the total paddy production of 8.9 million tons. Of the total harvested area of rice fields in the country, estimated at 3.4 million ha, irrigated and rainfed rice area occupied 56% and 40%, respectively. The remaining 4% was upland rice area. The average unit yield of irrigated rice between 1986 and 1988 in the country was estimated at 3.2 t/ha. That of rainfed and upland rice was 2.1 t/ha and 1.2 t/ha, respectively. The unit yields of irrigated rice are generally higher than those of rainfed and upland rice. This may be explained by the difference in climatic conditions and the difference in farming practices, etc., while the extension degrees of high yielding varieties (HYVs) in the irrigated land influence the present unit yield in the regions as follows :

Extension Range of HYVs	Irrigated Land Yield Range(t/ha)	Region
More than 90%	2.75-3.78	II,III,IV,V,VI,VIII,X,XII
80% - 90%	2.85-3.29	I,IX,XI
79%	1.98	VII

Note : Data in 1985, BAS

Domestic production of corn is estimated at 4.3 million t with Region XI contributing the largest volume of about 30% followed by Region XII and Region II which share 24% and 9%, respectively. The majority of the harvested area of corn in the country was occupied by white corn with 75% of the total area of 3.7 million ha. The remaining 25% was yellow corn. Average yields of corn in the country from 1986 to 1988 were estimated at 1.0 t/ha for white corn and 1.5 t/ha for yellow corn. Most of the white corn varieties planted in each region are assumed to be local varieties for food use, hence the yields of white corn are lower than those of yellow corn.

In the case of peanuts, production is concentrated mainly in Luzon, particularly in Region II with 47% to the total production of 42 thousand tons, followed by Region I (21%) and Regions IV, III and VII with 6%, 4% and 4%, respectively. Most of the areas devoted to peanuts production are under rainfed conditions using local varieties. The average yield of

peanuts in the country from 1986 to 1988 was estimated to be 0.8 t/ha. The average yield in Region II was about 0.7 t/ha and lower than the national average.

The cost and return per ha of rice, corn and peanuts were estimated as follows :

(Unit : ₱1000 / ha at 1988 constant price)

Item	Rice		Corn		Peanuts	
	1985-86	1987-88	1985-86	1987-88	1985-86	1987-88
Production Cost	5.2	5.9	1.7	1.8	2.8	3.0
Gross Return	6.9	8.2	3.0	3.5	8.6	9.4
Net Return	1.7	2.3	1.3	1.7	5.9	6.4
Net Profit Cost Ratio	0.3	0.4	0.8	0.9	2.1	2.1

Note : Average values in each two year are indicated.

The net profit cost ratio of rice is lower than that of corn and peanuts due to the high requirement of farm inputs including labor compared with other crops. The profitability of peanuts decreased slightly between the two periods, while rice and corn increased.

For the period of 1980-1988, rice production in the Philippines was fluctuating and showed a positive or negative growth rates by year with the highest record in 1985 and the lowest in 1983. Negative growth rates were mainly due to the severe drought in 1983 and 1987. Because of shortage in rice supply, the government imported rice in 1983, 1985 and 1988. In the case of corn, the country is steadily importing substantial quantities of corn primarily to supply to the feed manufacturing industry. Likewise, the supply and demand of peanuts is fluctuating. The country has been a net importer of peanuts since 1980 except in 1983. The country imported more than 10 thousand tons of peanuts in 1986 and 1988. The volume of peanuts importation has tended to increase recently.

The country has had a deficit of 103 thousand t/year of rice and 72 thousand tons/year of corn in recent past three years. The per capita deficit of rice in the country is estimated at 1.8 kg/year. The regions with deficits greater than 60 kg of rice/year is Region VII (63 kg) and National Capital Region (NCR) (103 kg) and 8 to 30 kg/year are Region IV (13 kg), VIII (22 kg), IX (9 kg), X (11 kg) and CAR (9 kg). Most of the regional deficit of corn arises from the increase in feed demand for livestock and poultry, especially the area around NCR where most of the feed mills and poultry/livestock firms are located.

3. PRESENT SEED PRODUCTION AND DISTRIBUTION SYSTEM

3.1 Organization of Seed Production and Distribution

The Department of Agriculture (DA) has been promoting the seed industry in the country including the private sector. The Bureau of the Plant Industry (BPI) in the DA has responsibility for formulation, implementation, monitoring and evaluation of seed production and distribution programs in the country. Regional and provincial seed coordinators designated in regional and provincial agricultural offices are planning and coordinating seed production and distribution activities at the regional level.

BPI was assigned as the lead agency to implement the seed production and distribution program of DA by virtue of Special Order No. 298 in 1989. The Central Office including nursery, seed testing laboratory and storage facilities in Manila, Central Nursery in Quezon City and four National Crop Centers (NCC) consisting of Buguias/Baguio NCC in Benguet, Economic Garden NCC in Laguna, La Granja NCC in Negros Occidental and Davao NCC in Davao City are under the administrative management of BPI at present.

The Philippine Rice Research Institute (Phil Rice) was established in 1985 for the strengthening of rice research and development (R & D) activities in the country. The Phil Rice R & D network comprises 4 entities: the Central Experiment Station at Muñoz, Nueva Ecija; four branch stations, namely Cagayan Valley Experiment Station, Bicol Experiment Station, Visayas Experiment Station and Mindanao Experiment Station; regional research centers consisting of state colleges and universities; and cooperating stations under the DA.

Aside from the eleven (11) stations and nurseries under the BPI (6) and the Phil Rice (5), there are another twenty nine (29) stations or seed farms in the country which consist of twelve (12) experiment stations, fifteen (15) seed farms and two (2) agricultural centers as shown in Table 3.1.1. These twenty nine stations are directly managed by the regional agricultural offices.

The Philippine Seed Board (PSB) is organized to promote and coordinate breeding activities both in public and private sectors. The Board is composed of eleven (11) members chaired by the Director of BPI. The Board is assisted by Recommending Committee in formulating policies, rules and regulations to carry out the national crop development program. Under the Recommending Committee, the Technical Working Group conducts testing program in the experiment stations involved to evaluate and determine performance of

new crop varieties. The Recommending Committee submits the evaluation results of new varieties to the Board for approval as recommended varieties for commercial plants.

Breeder seeds are produced by the Phil Rice Central Station and IRRI for rice, Institute of Plant Breeding(IPB) and Ilagan Experiment Station for corn, and IPB and Economic Garden for peanut. Government corn breeding activities are mainly concentrated on open pollinated varieties based on the agricultural development policy. Hybrid corn varieties are produced by private seed companies like Pioneer, San Miguel, East West, etc. Agricultural Colleges and Universities also participate in breeding of rice, corn and peanuts. Multiplication of foundation seeds for rice, open pollinated corn and peanuts are done by the government agencies.

Members of the seed producers association designated by the DA Regional Office and the associations located in the provinces which are not covered by the stations or seed farms could be provided with foundation seeds for multiplication of registered seeds needed in each province. For registered seeds requirements, production is not only done by stations and seed farms but also by the designated members of the seed producers association. Certified seeds are mainly produced by private seed growers which are also the members of seed producers association in the respective provinces.

The main participating agencies in seed production and distribution are outlined in Fig.3.1.1 and the agencies related to rice, open pollinated corn and peanut may be summarized as follows :

Seed Production Stage	Rice	Corn(Open Pollinated)	Peanuts
Breeder Seed	Phil Rice Central E.S IRRI	IPB, Ilagan E.S	IPB, Economic Garden
	.....Agricultural Colleges and Universities.....		
Foundation Seed	Phil Rice Central E.S La Granja E.S	.....BPI National Crop Centers(NCC).....	
Registered Seed	(1) Experiment Stations and Seed Farms, others (2) Selected seed farmers in provinces without experiment stations		
Certified Seed	Private Seed Growers(Members of seed growers association)		

Note : E.S ; Experiment station S.F ; Seed farm NCC ; National Crop Center

3.2 Policies and Development Plans

3.2.1 Seed Production Policies and Regulations

At present, there is no law to regulate production and distribution of seeds in the Philippines. The DA presented a Philippine Seed Act to congress in 1987. However, the proposed Act is still pending in the legislative department. Therefore, the seed production and distribution policies are generally stipulated through Executive Order, Special Order, Administrative Order and Memorandum Circular, each order is being issued by the President, the Secretary of DA, the Undersecretary of DA and the Director of BPI, respectively.

The basic Order for stipulating general policies on seed is the "Revised Policies and Guidelines on Seed Production and Distribution System "Administration Order No. 32, Series of 1988. The outline of this Order is as follows :

(1) Production of breeder seeds shall be the responsibility of institutions that developed the variety such as: Bureau of Plant Industry, University of the Philippines at Los Baños (UPLB), International Rice Research Institute (IRRI), Agricultural Colleges Association of the Philippines (ACAP), and other private agencies are involved in the varietal improvement program.

(2) Purification of breeder to foundation seeds shall be done by major Experiment Stations and Seed Farms of the BPI.

(3) Multiplication and maintenance of breeder seeds shall be the responsibility of the plant breeder.

(4) The Stations/Institutions and Seed Growers designated to multiply different classes of seeds (foundation and registered seed) shall produce and maintain 10 percent buffer stock in addition to the seed production program targets for contingency use.

(5) As a general rule, the production of certified seeds shall be done by members of the Seed Producers Association and the program shall recognize only one Seed Association in each province. However, in a Province with five (5) or less seed growers, a farmer could be allowed to produce which will be sold within his area and properly monitored subject to the recommendation of seed coordinators.

(6) Breeder, foundation and registered seed classes shall be allocated proportionately to stations/regions/province through the Regional Seed Coordinators in coordination with the Regional President of Seed Growers Association.

(7) Registered seed shall be distributed to bonafide certified seed producers designated by Provincial Seed Coordinators.

(8) Only analyzed, tested, certified, tagged and sealed seeds shall be distributed.

(9) No breeder and foundation seeds shall be distributed by the breeding institutions without proper clearance from the BPI.

(10) Only the PSB approved varieties will be recommended for distribution.

(11) The Regional Seed Coordinator shall be responsible for monitoring the seed distribution and production program of Experiment Stations, Seed Farms, Private Seed Companies, and other seed production entities in their area.

3.2.2 Development Plans

The new emphasis on the development of agriculture as outlined in the Medium-Term Development Plan (1987-1992), policies, priorities and programs of action shall concentrate on the following objectives :

a. To increase farmers income,
b. To sustain the increase in farm productivity,
c. To effect equitable distribution of the factors and return to production,
d. To attain food self-sufficiency, and
e. To create/increase agro-based employment opportunities among rural population particularly landless workers.

In order to attain food self-sufficiency through the increase in farm productivity, one of key policies and strategies is to increase high quality seed production. Utilization of high quality seeds is a very important factor in increasing productivity and profitability of farm management. The cost of adopting high quality seeds needs to be only a small part of the total production costs, yet present use of high quality seeds in the country is still low among the majority of farmers. For achieving an effective and economical increase in farm productivity, increasing the production and extension of high quality seeds will be indispensable.

High quality seed production requires proper farm management and post harvest activities ; reduction of field harvesting losses, proper drying and quality control during seed processing and storage. These technologies for seed production would be utilized for the ordinary crops production. The quality of end products produced from the high quality seeds will be increased through the reduction of damage from pests and diseases. Seed processing and marketing industries would contribute to the rural economy through the expansion of employment opportunities.

Another important aspect of the seed industry is its linkage and coordination with the Comprehensive Agrarian Reform Program (CARP). This Program aims at the improvement of the social and economic situations of landless farmers in the rural areas through the establishment of owner cultivation with an economic size of farm, promotion of agro-based industry for increase in employment opportunities, and development of social and

economic infrastructure as required. High quality seed distribution will be indispensable for the establishment of owner cultivators through increase in farm productivity.

Since the establishment of the BPI, seed production and distribution programs have been implemented in coordination with crop production programs ; Masagana 99, Intensified Rice Production Program and Rice Action Program for rice, Maisagana, Expanded Corn Program and Corn Productivity Enhancement Program for corn. The BPI prepares the annual seed production and distribution plans which include the target areas and production in every seed class for stations and seed farms, and seed growers in each region together with a seed inspection program both in fields and laboratories. The objectives of these seed programs may be summarized as follows :

(a) To produce adequate quantities of basic seed (breeder, foundation, registered) including security stock for timely production of certified seed,
(b) To produce high quality certified seed on a continuing supply basis,
(c) To improve efficiency in production of high quality seeds,
(d) To preserve the viability and quality of basic and certified seeds while in storage, and
(e) To intensify promotion of farmers adoption of high quality seeds.

The Intensified Rice Seed Production and Distribution Program under BPI has been implemented since May 1989 as one of the components of the Rice Production Enhancement Program II (RPEP II). For the increase in certified seed production and achievement of scheduled seed distribution, 800 thousand cavans of certified seed produced on 100 thousand ha of seed fields is programmed under the Intensified Rice Seed Production and Distribution Program. Under the RPEP II, certified seeds will be purchased by DA from seed growers and distributed to farmers together with fertilizer through National Food Authority (NFA) warehouses or exchange stations.

In addition to the above programs, the DA has appropriated the investment outlay of ₱15 to 19 million/year during recent three years for procurement of seed buffer stock, mainly for rice, corn and legumes. The DA has procured certified seed as emergency measures in order to supply required seed to farmers suffered from natural calamities. The DA proposes seed buffer stock for timely seed supply consisting of 100% of foundation seed, 20% of registered seed and 10% of certified seed under the programs. No appropriate storage system or concrete procedures for implementation of this have yet been prepared.

3.3 Seed Production Activities

3.3.1 Seed Production

Basic seed production such as foundation and registered seeds of rice, corn and peanuts is a government responsibility. The following government experiment stations and seed farms have produced basic seed since 1984, together with selected private seed growers who are allowed to produce registered seed :

(Unit : Number of Experiment Stations and Seed Farms)

Seed Class	Lowland Rice	Upland Rice	Corn	Peanuts
Breeder	2(IRRI)	2(IRRI)	2(IPB)	2(IPB)
Foundation	11	3	8	8
Registered	22	8	21	11
(Foundation & Registered)	(23)	(9)	(22)	(17)

Seed production data and information conducted by stations, seed farms and private seed growers were based on the BPI Annual Report in 1984 to 1988. There are no seed production records from some stations and seed farms, hence average production record in the above five (5) years can be estimated in two ways, i.e. either assuming no production (minimum average) or producing the average yields in the other years reported (maximum average). Average seed production in the country are estimated by stations and seed growers as shown in Table 3.3.1 and 3.3.2 respectively, and the average of maximum and minimum productions may be summarized as follows :

Kind of Seed	Harvested Area(ha)		Crude Production(t)		Crude Yield(t/ha)	
	Station	Grower	Station	Grower	Station	Grower
Lowland Rice						
Foundation	35	-	106	-	3.0	-
Registered	145	510	368	1,886	2.5	3.7
Certified	41	3,386	95	12,273	2.3	3.6
Upland Rice						
Foundation	2.3	-	4.3	-	1.9	-
Registered	9.6	14.8	17.1	47.4	1.8	3.2
Certified	1.7	22.0	3.3	76.9	1.9	3.5
Corn						
Foundation	12	-	15	-	1.3	-
Registered	65	108	69	272	1.1	2.5
Certified	53	91	46	233	0.9	2.6
Peanut						
Foundation	2.6	-	0.6	-	0.2	-
Registered	11.0	2.0	8.4	0.4	0.8	0.2
Certified	7.7	3.0	7.1	3.2	0.9	1.1

Net seed production is considered as quantity of seed approved through field inspection and laboratory tests. Percentage of approved seed to total crude seed production and net seed yields are estimated in Table 3.3.3 and summarized as follows :

Kind of Seed	Approved Seed (%)		Net Seed Yield (t/ha)		
	Station	Grower	Station	Grower	BPI Target
Lowland Rice					
Foundation	62	-	1.9	-	3.15
Registered	69	46	1.8	1.6	3.6
Certified	61	45	1.4	1.6	3.6
Corn /_1					
Foundation	57(94)	-	1.1(0.9)	-	2.5
Registered	70(78)	56(46)	1.1(1.1)	1.6(0.7)	3.0
Certified	50(92)	32(68)	0.6(1.1)	0.9(1.8)	3.0
Peanuts					
Foundation	39	-	0.1	-	1.0
Registered	93	0	0.7	0	1.0
Certified	78	0	0.7	0	1.0

Note : /_1 ; Yellow Corn (White Corn)

The remarkably low percentage of approved seed and low net seed yields may be attributed to mixture with foreign elements and inferior seeds suffering from calamities such as typhoon, flood, drought, water shortage, pests and diseases, and a low germination rate due to the high moisture content of seeds. The BPI target yields are set at higher levels than actual seed yields, hence it will be difficult to secure enough seed if we use the numerical value of BPI target yields without any technical improvement.

The seed production target of BPI program in 1989 and actual seed production are shown in Table 3.3.4 and summarized as follows :

Kind of Seed	BPI Target Area and Production		Actual Area and Production		Actual Record to Target (%)		
	Station	Grower	Station	Grower	Station	Grower	Total
Lowland Rice							
Harvested Area (ha)							
Foundation	10	-	35	-	350	-	350
Registered	478	222	144	510	30	230	93
Certified	-	7,312	41	3,386	-	47	47
Production (t)							
Foundation	32	-	66	-	206	-	206
Registered	1,721	799	255	876	15	110	45
Certified	-	26,324	58	5,565	-	21	21
Corn							
Harvested Area (ha)							
Foundation	5	-	12	-	240	-	240
Registered	25	52	65	108	260	208	225
Certified	-	124	53	91	43	74	116
Production (t)							
Foundation	15	-	12	-	80	-	80
Registered	73	156	73	147	100	94	96
Certified	-	371	45	105	12	28	40
Peanuts							
Harvested Area (ha)							
Foundation	10	-	2.6	-	26	-	26
Registered	260	-	11.0	2.0	4	-	5
Certified	-	2,600	7.7	3.0	-	0.1	0.4
Production (t)							
Foundation	10	-	0.3	-	3	-	3
Registered	260	-	8.0	-	3	-	3
Certified	-	2,600	5.5	-	-	-	0.2

From the above comparative data on lowland rice seed, the actual harvested area and production of foundation seed are more than three and two times the target respectively. Around 70 % of registered seed should be produced by the stations according to the BPI target, while actual registered seed production by the stations and growers is reversed, i.e. the actual area of the stations and growers is 30 % and 230 % of the target area respectively. The actual production of registered and certified seed is limited to 45 % and 21 % of the target production respectively.

Regarding corn seed production, the actual area of foundation seed is more than twice the target area, while the production is limited to 80 %. The actual area of registered seed both of stations and growers is more than twice the target and the production attains to the target. While certified seed production is limited to 40 % of the target of open pollinated varieties.

As to peanut seed, production activity is limited to the stations , while the target is not achieved. Growers' production is negligibly small.

3.3.2 Farming Practices

The effects of day length and temperature on crop cultivation do not differ much between the regions except in mountain areas, while water conditions such as rainfall patterns and irrigation systems are greatly affecting crop production.

As for rice, nearly the same rice varieties are grown throughout in the country. Old varieties such as IR36 are still grown for seed production due to its early maturity with around 111 days to maturity and high productivity. The varieties having traits of early maturity such as IR60, 62, 64, 66, 72 with around 113 - 117 days to maturity are widely planted for seed production. Also, IR64, 70, 74 are commonly multiplied for their good eating quality with high yield. The potential yield of these varieties ranges from 4 - 5.7 t/ha. A seed bed of 400 m^2 must be prepared for one ha of paddy field sowing 45 kg of seeds. The seedlings are planted one per hill after 20 to 25 days from sowing. Rice crops in Regions I, II, III, IV and VIII are seriously affected by typhoons, especially during September to November. It is desirable to ensure rice heading or maturing before these months. In this sense varieties having the trait of early maturity are needed.

In case of corn seed , the seed requirement is 20 kg/ha with rows 75 cm apart, 2 seeds/hill spaced 50 cm or one seed/hill spaced about 25 cm. Harvesting is done by plucking the ears or by machine when the corn silks and husks are thoroughly dried. The ears are dried for 2 - 3 days under the sun and shelled. The shelled grain seed is then dried to 14% of moisture content. Open-pollinated corn varieties currently being used in seed production are IPB Var. 1 (Ginintuan, maturity 105 - 110 days), super sweet yellow corn and IPB Var. 2 (Tonco white, maturity 97 - 107 days), glutinous white corn. Recently (1989) IES Cn 2 (Isabela white Cn 2, maturity 87 - 89 days) developed by Ilagan Experiment Station was approved and recommended by the Seed Board for commercial production in future years.

Regarding peanuts, seed treatment with fungicide is recommended to prevent rotting. Usually 100 kg (65 kg shelled)/ha of seed are needed, while the seed requirement for small seeded varieties is less and are planted more densely. On soil with pH below 5.8 or low in calcium, liming should be done to promote the proper development of pods. Peanuts should be harvested when leaves begin to turn yellow or viens of the shells begin to clear, by pulling the plant or pulling up after loosening the soil with animal-drawn plowing on both sides of furrow. The pods are picked from the plants after drying for 2 - 3 weeks and pods are dried again up to the moisture content of about 12%. Varieties of peanut seed are BPI-Pn 9 (maturity 104 - 119 days), UPL-Pn 2 (maturity 104-110), UPL-Pn 4 (Biyaya 4, maturity 105 - 110 days) and UPL-Pn 6 (Biyaya 6, maturity 101 - 102 days). Recently (1989), BPI-

Pn 2 (Mothi, maturity 100 - 103 days) and UPL-Pn 8 (Biyaya 8, maturity 100 - 110 days) have been recommended by the Seed Board. BPI-Ph 9 gives a large shelled seed and is preferred by consumers. UPL-Pn 8 is tolerant to partial shade and is suitable for mix cropping. The potential yield of these varieties is about 2 t/ha.

3.4 Seed Quality Control

3.4.1 Executive Organization

Seed quality control is a basic function of the seed certification program. Achieving this objective will require the cooperation and mutual trust of seed producers, dealers, and government officials concerned. The Seed Certification and Seed Standard Group in the Technical Committee under the Philippine Seed Board has responsibility for technical matters on seed quality control refer to Fig. 3.4.1.

Seed Quality Control Services (SQCS) Section under Crop Production Division in the BPI is assigned as the executive agency for the seed certification program. The seed certification service is executed by SQCS of BPI, and the organization is shown in Fig. 3.4.2. SQCS Section also functions as the Central Office of 17 Regional Seed Testing Laboratories (STL) as shown in Table 3.4.1 and Fig. 3.4.3. Seed certification system is maintained and operated by both the field activity of the seed inspector and the seed testing in STL.

SQCS Section has been conducting research on improvement and development of quality control techniques as well as cooperation with research activities which are conducted by each regional STL. Training courses and workshops on seed pathology, seed production and distribution, processing and certification, etc. are held every year for seed inspectors, seed analysts, etc., in coordination with regional agencies concerned.

3.4.2 Seed Inspectors

The seed inspectors are organized under the control of provincial seed coodinators, and 163 seed inspectors worked in the field in 1989, while at present there are 278 in total. Their main activities are summarized as follows :

(1) A farmer who intends to produce seeds should submit an application form to the provincial seed coordinator. After receiving the application form, a seed inspector will examine the farmer's qualifications and his proposed seed fields.

(2) During the growing period of seed, each stage of production of seed is inspected by the seed inspector to make sure that contamination is minimal and that varietal purity is maintained.

(3) Seed inspectors are also responsible for sampling for seed tests by the STL concerned and tagging and sealing of certified seed bags.

The various inspections are conducted according to the field seed inspection manual which is authorized by the Philippine Seed Board. The seed inspector plays an important role in checking the maintenance of varietal purity during seed production process. Fig. 3.4.4 shows procedure of field inspection in connection with laboratory tests.

3.4.3 Seed Testing Laboratory (STL)

The seed certification works have been conducted by the 18 STLs located at the points assigned strategically as shown in Table 3.4.1 and Fig. 3.4.3. A new STL has been opened in La Granja NCC, Negros Occidental with the support of No. 9 STL in Visayas ES, Iloilo City. The STL in BPI Central, Manila has the role of being the operation center for all STL nation-wide.

According to the Rice Action Program started since 1990, 13 STLs are to be newly established in 13 provinces nationwide. This will contribute to improving the nation-wide seed certification work.

The key person for the management of STL is the seed analyst; 93 analysts are assigned and acting nation-wide (however the numbers of analysts were only 80 in 1989). However, most of the STLs employ 4 to 5 part-time workers as assistant seed analysts throughout the year. This employment should be improved to ensure smooth seed testing works.

In 1989, the number of samples submitted for testing by seed inspectors was 30,690, and 82,405 tests were conducted. The consolidated data on numbers of samples tested, and total quantity of seed collected as samples are shown as follows :

Kind of Seed	Sample (Number)	Total Quantity (Cavans)
Breeder Seed	83	79
Foundation Seed	200	4,518
Registered Seed	1,520	52,711
Certified Seed	4,102	378,530
Good Seed	303	29,950
Rejected Seed	711	57,737
Total	6,999	523,525

The main reasons for rejection of rice seed are (1) contamination by different valieties and red rice seed, (2) low germination rate, and (3) high moisture contents. For peanuts and corn, low germination is the major reason for rejection.

The seed testing manual of the Philippines was edited in accordance with International Standard for Seed Testing. The sample seed tested is kept for 2 years as the reference sample under the duty of STL.

3.5 Seed Production, Processing and Storage System

3.5.1 Seed Production Field

(1) Government Sector

Among the 40 seed farms under the Department of Agriculture which are objects of the Study, 24 farms produce the rice seeds. Corn and peanut seeds are also produced in 24 farms some of which overlap the other 24 farms.

For the 24 rice seed farms, the irrigation systems are essential. Almost all the farms already have completed irrigation systems using the water sources of rivers, springs and/ or wells. Out of 24 farms, 20 farms are supplied water from rivers by dam or pumping system, and the others are supplied from springs or ground water. Some of these farms however have some problems of water shortage, saline water and so on. As for the composition of the field lots of the rice seed farms, the size of each field lot is usually designed to be about 1 hectare with a rectangular shape. The border of each field is however rather narrow and far from the farm roads, and the area of the fields is only about 0.05 ha to 0.25 ha for each field lot. The irrigation and drainage canals are provided separately on some farms, and most

farms do not have individual canals. The maintenance of canals is usually not well carried out. These canals are clogged with mud and silt, and eroded on both sides on some farms.

On the other hand the 24 farms for corn and peanut seeds production have hill side sites. These crops are rain-fed basically and sprinkler or drip irrigated occasionally. These crops however are affected by the natural calamities of typhoon and/or drought. Particularly in times of drought the crops are severely affected, and give no yield. These farms are generally not provided with farm roads. When some farm roads are provided in a few farms, they are about 4 m to 8 m in width on the flat plain, but are rather fewer and narrower on the hillsides. Almost all roads are unpaved, easily eroded by heavy rain and are not properly maintained.

Regarding the data on seed farms, topographic maps and layout plans of the field lots of them were collected, and general data on the farms were also collected through the answers at interviews carried during the field survey and questionnaires delivered by the team. As for the maps or plans, most of these are drawn by hand, very old, and dating from inauguration of the farm or quite rough drawings and so on except for farms inaugurated recently which have more accurate maps. Out of 40 farms, 8 farms of NCC and experiment stations including Phil Rice in Region II, III, IV, V, VI, XI and XII submitted some data regarding the present situation of the farms.

(2) Private Sector

The seed growers organizing the Seed Growers' Association produce registered and certified seeds of rice and corn in the private sector. Private seed growers are selected and assigned as seed growers by seed coordinator from diligent farmers producing those crops, and are required to be the member of above association. Therefore almost all of them are rather richer and more highly developed farmers than average farmers. Their fields are also highly developed technically and physically.

The interview survey was carried out by the team on 36 seed growers in Regions II, VI and XI regarding the present situation of their farming. According to the results of obtained, all the seed growers have irrigation systems in the lowland rice seed areas. Of these 19 seed growers (43.2%) are supplied with water by NIA irrigation, 8 seed growers (18.2%) by communal irrigation, 5 seed growers (11.4%) by private pumping irrigation and the remaining 12 seed growers (27.2%) by other systems. This shows that almost all of the lowland rice seed growers have highly irrigated fields and at a similar level to government seed farms in terms of irrigation and field lot arrangement.

3.5.2 Seed Related Machienry and Equipment

(1) Farm Machinery and Harvesting Machinery

Most of the farm machinery/equipment for the seed farms of the government Sector was provided under the Expanded Seed Production and Distribution Project (ESPDP) and the two times of 2nd Kennedy Round Food Production Assistance (2-KR). The inventory of the machinery and equipment provided gives the following information :

a) Initial stage of ESPDP
15 units of 4 wheel Tractor (12 HP) with implements, 17 units of 4 wheel Tractor (35 HP) with implements, 8 units of Grass cutter, 8 units of Power sprayer and 20 units of Pump

b) Supplementary stage of ESPDP
9 units of 4 wheel tractor (31 HP) with implement, 11 units of 4 wheel tractor (65 HP) with implement, 10 units of Trailer, 28 units of Power Tiller with implement, 25 units of Grass cutter, 17 units of Power sprayer, 47 units of Knapsack sprayer, 1 set each of Rice seeding machine and Seed coating machine.

c) First 2-KR
82 units of 4 wheel tractor (12.5 HP) with implement, 6 units of Power sprayer, 38 units of Mist blower, 25 units of Knapsack sprayer.

d) Second 2-KR
15 units of Power sprayer, 4 units of 2-Row harvester, 4 units of 1-Row harvester.

Assuming the working period of tractor is less than 3 weeks in the rainy season and 2 weeks in the dry season, the total working days of a tractor will be less than 35 days per year. According to above assumption the numbers of tractors required is as follows :

Class	No.	Total Capacity (ha/year)	
		For Low Land	For Up Land
10 to 15 PS	97	2,037	3,395
30 to 35 PS	26	1,001	1,456
60 to 65 PS	11	616	886
Total	134	3,654	5,737

* Using rotorvator for land preparation in standard Japanese field

On the other hand the average cultivation area for seed production on government sector during recent 4 to 5 years has been 214 ha for low land and 236 ha for upland.

This figure shows the capacity of tractors provided under the above programs is sufficient to cultivate the seed production farms of the government sector. The government seed farms cultivate and harvest many experimental crops in their experiment field, and they utilize the farm machinery effectively also for them.

This farm machinery/equipment was delivered to twenty three (23) DA seed farms under the first stage of ESPDP; nineteen (19) DA seed farms under supplemental stage of the ESPDP; thirty two (32) DA seed farms and thirteen (13) Regional Offices of the DA under first 2-KR; and to the BPI Central Office under second 2-KR.

The questionnaires and interviews were conducted for each government seed farm. The consolidated data show that out of two hundred and thirty six (236) units, one hundred and thirty nine (139) units of farm machinery/equipment (about sixty (60) %) are still functional though the estimated life span is already exceeded. However the machinery exceeded it's life span is nearly retiring, because it is difficult to repair when it is defected. As far as the tractors and the power tillers are concerned, the machinery survival rate is slightly lower than the other equipment though this machinery has a longer estimated life span than the other machinery. It means that this machinery is more utilized than the others.

(2) Seed Processing Facilities

1) Seed Processing Program

The Bureau of Plant Industry (BPI) has been promoted seed processing programs with some foreign assistance. The first program in line with the strengthening of the National

Cooperative Seed Improvement Program (NCSIP) was implemented under cooperative assistance from USAID and UNDP during 1970 to 1972. Under this program a pilot seed processing plant was established and other equipment including some laboratory equipment was provided at Maligaya Rice Research and Training Center, Muñoz, Nueva Ecija.

This program was succeeded by the Expanded Seed Production and Distribution Project which was implemented in 1973-1975 and 1978-1980 under the OECF first Japanese Yen Credit and 7th Japanese Yen Credit respectively. Under the Project, various agricultural machinery, equipment and other seed facilities related to the Project such as seed processing plants were procured and delivered to several seed farms and experiment stations. The seed processing plant machinery, and equipment included seed dryers, seed cleaners and separators, power threshers, corn sellers and cold storage. Under the first Yen Credit, three (3) sets of 1.0 TPH seed processing plant with cold storage facilities were established in the project sites of Visayas Rice Experiment Station and Mindanao Rice Experiment Station, respectively. One 1.0 TPH seed processing plant was established in Cagayan Valley Rice Experiment Station. And one recirculation type of dryer and one cold storage plant were assembled in Maligaya Rice Research and Training Center. Other equipment was delivered to sixteen (16) project sites all over the country. Fourteen (14) project sites (seed farms) were also provided with seed processing plants with capacities ranging from 0.4 TPH to 1.0 TPH. The total capacity of these processing plants is 6.8TPH for rice and 10.4TPH for corn. Assuming the operation time of these plants is 332 hours (8 hours x 25 day / season x 1.66) per year for 2 seasons, total processing capacity is calculated to be about 2,260 tons per year for rice and 3,450 tons per year for corn. The average of crops of seeds harvested during the last 4 to 5 years in all government sector seed farms is shown as follows :

Rice	608 ton
Corn	212 ton
Peanuts	79 ton

* Total of 3 classes seeds of Foundation, Registered and Certified

Considering nation wide seed production by the government sector, the total capacity of seed processing capacity is deemed to exceed the actual production, and is enough to process the seed produced in the seed farms. The plants also are utilized for the crops harvested which are planted as experimental cultivation, and for the seed produced in the neighboring private seed growers.

The questionnaires on seed processing were sent to various seed farms and experimental station and interviews were conducted by the team of enumerators. One hundred and seventeen (117) units of post-harvest equipment out of one hundred forty four (144) units [about eighty one (81) percent] are still functional, but they have exceeded their design life span and some of them are nearly retired.

Regarding the present condition of the Seed Processing Plant provided under the Japanese Yen Credit program, two reports have reached the team, one compiled by BPI officials and the other from periodical inspection reports of the supplier in 1985. According to the information provided by officials of the BPI, even though the periodical inspection reports had reported defects in several plants almost all the plants are entirely or partially functional, if the defective parts are replaced, but the procurement of these parts is difficult for lack of budget. The main defects were the upper and lower screw conveyors of recirculation dryers, limit switches of weighing machines, bearings and several shafts of seed cleaners, gears, rollers and other parts of Uni-flow separators and some parts of sewing machines, etc. Claveria Experiment Station's processing plant was completely burned down and the plant in Cagayan Valley Rice Experiment Station was completely destroyed by a typhoon in 1988.

2) Seed Processing Technology

The modern recommended seed processing flow/methods for rice, corn and peanuts are shown below.

a) Rice

Cutting --- Drying in field --- Threshing --- Pre-cleaning --- Drying paddy --- Cleaning/debearding --- Width/thickness grading --- Length grading --- Gravity grading --- Treating --- Bagging --- Storage

b) Corn

Picking --- Husking --- Drying ear-corn --- Shelling --- Pre-cleaning --- Drying --- Width/thickness grading --- Thickness/width grading --- Length grading --- Gravity grading --- Color sorting ---Treating --- Bagging --- Storage

c) Peanuts

Pulling/digging --- Drying in field --- Picking pods --- Precleaning --- Drying --- Cleaning --- Shape Grading---Gravity grading --- Bagging --- Storage

According to the team's survey, these methods of seed processing are already being employed in respect of rice and corn seeds by plant provided under the Japanese Yen Credit Project.

On the other hand, the private sector seed growers are interested in modernizing this seed processing but have quite limited seed processing equipment such as mechanical dryers, seed cleaners, seed separators and so on. Their seed processing flow/methods may be summarized as follows :

1) Rice
   Cutting --- Drying in field --- Threshing --- Winnowing --- Drying paddy --- Recleaning (--- Winnowing) --- Bagging --- Storage

2) Corn
   Picking --- Husking --- Drying ear-corn --- Shelling --- Winnowing --- Drying --- Shape grading --- Winnowing (--- Width/thickness grading) --- Treating --- Bagging --- Storage

3) Peanuts
   Pulling/digging --- Drying in field --- Picking pods --- Winnowing --- Drying --- Size grading --- Bagging --- Storage

Although this approach to processing seed is almost the same as with modern methods, the machines/ apparatus being used are inferior. This is particularly so in the harvesting, drying, cleaning and grading methods because these are done manually. Cleaning for example is done manually with the use of a basket, locally known as "BILAO" or manually operated winnower is locally known as "HUNKUYANG". For grading, hand held sieves and BILAO are used. For drying, sun drying is popular both in traditional and modernized preparation of seed in the Philippines.

(3) Conditioned Cold Storage

Some of government seed farms that produce breeder, foundation and register seeds and have to store their seeds for more than six months, are requesting the provision of conditioned cold storage facilities.

Under the initial Japanese Yen Credit Project, BPI was provided with three (3) sets of conditioned cold storage, one each in Maligaya Rice Research and Training Center,

Visayas Experiment Station and Mindanao Experiment Station. Out of the three (3) storages only the set of Maligaya Rice Research and Training Center was operatable. The other sets have the common problem of providing cooling water for the sets. The set requires large volumes of cooling water and electricity for their operation. These were not provided and the storage facilities have remained inoperable at these two (2) sites, and also the sets were designed to achieve storage conditions of 7°C with less than 40% of relative humidity. Such conditions are not required to store ordinary seeds for short periods. This was another reason for these sets not being used. However the heat insulated chambers of the set are utilized with window air-conditioners as the cold storage rooms.

(4) Transportation Equipment Provision

Under the ESPDP most of the transportation equipment was provided to the BPI, and no other projects/programs have provided transportation equipment to the BPI except for pick-up trucks and the station wagons. The consolidated inventory shows the following information: sixty (60) units of Jeep, two (2) units of Dump truck and twenty seven (27) units of Cargo truck have been delivered to twenty four (24) project sites of the BPI.

The questionnaires and interviews were conducted for the transportation equipment, and the results are given in Table 3.5.8 as Vehicles gave the following: regarding the Jeeps and the Stake trucks provided under the project of ESPDP eighty (80) % are still functional though the equipment is already more than ten (10) years since the time of delivery. Some of them have been used for over 400,000 km, it means they have exceeded their estimated life span and have been quite efficiently utilized. They are very important for the seed farms. These machines exceed their life span, and are in a condition to be retired because of frequent defects which can not be repaired completely.

(5) Private Sector

The seed grower's mechanization has been promoted with the land preparation machines such as power tiller and so on while major seed cultivation works are actually executed by manual power except the land preparation works.

The data showed that the level of most seed growers belongs to the rich farmers. Therefore, most seed growers are deemed to have mechanized their seed cultivation.

Usually the seed produced by the private seed grower is sold to seed consumers or to the government agencies. In the case of seed consumers and government agencies the seed is transported by the buyers themselves.

3.5.3 Buildings

Seed testing laboratories, seed processing plants, seed storage houses, have been constructed at every Experiment Station or Seed Farm in twelve (12) regions. Construction plans for many of these buildings were worked out on the basis of the Rice and Corn Production Program and the Expanded Seed Production and Distribution Project launched since 1959 on a nationwide scale. The buildings have been successively constructed at the sites proposed as soon as project finance has been granted.

The buildings are constructed of reinforced concrete columns and girders, regular block walls and wooden trusses directly roofed with corrugated galvanized steel sheet. The buildings other than laboratories are provided with hanging doors on, louvers made of and hollow concrete blocks in walls. The openings between roof and exterior walls are left open without applying eaves fillets.

Of the Experimental Stations and Seed Farms located at forty (40) sites all over the country, the main buildings have only been constructed at seven (7) sites, two of these buildings have been constructed at five (5) sites, and the sites where none of them have been constructed number sixteen (16) (Table 3.5.1).

The current situation for each type of building use is :

(1) Seed testing laboratory

Eighteen (18) laboratories are now active throughout the country (Table 3.5.1).

The buildings are a double-sided corridor type and partitioned into some small rooms. Each room is twelve square meters (12 m^2) which allows space for two (2) office persons (Fig. 3.5.1). Another room is for tested seed storage. The faces of the ceiling in several rooms are spotted with the oozing rain water. Air changes in the rooms depend on natural draft utilizing glazed jalousie windows installed in the exterior walls. The work therefore is performed under poor conditions.

(2) Seed processing plant (Fig. 3.5.2)

These Plants were designed at the time of introduction of seed processing plants at fifteen (15) Experiment Stations of the forty (40) Experiment Stations in the country (Table 3.5.1). The Plants are now worn out after more than ten to twenty years service but have not been yet constructed at any other Experiment Stations.

(3) Seed storage house

Seed storage houses are classified as A, B and C on the building scale. Class A is 6.0 x 10.0 x 4.0 m, Class B is 12.0 x 12.0 x 4.0 m and Class C is 12.6 x 18.0 x 4.0 m. Nylon sacks in which seed is packed are stacked on wooden blocks. A cluster of sacks consists of a tier of eight sets and one set consists of a formation of four or five sacks. Assuming a cluster consists of a tier of eight sets, each of which is formed of five sacks for rice seed, the storage capacity of every class and of a storage room (dimension of 18.0 x 18.0 m) in the processing plant building are calculated as follows :

Class	Storage Capacity (tons)	Total Sacks
A	9.5	210
B	44.1	980
C	66.2	1,470
Storage room in a processing plant	99.2	2,205

The maximum storage period for seed at present is less than six (6) months in existing seed storage houses. The seed from private seed farms so far are not stored in the storage houses. To this day no cold seed storage facilities have been constructed at any Experiment Stations and Seed Farms.

The seed storage houses are buildings of monitor roof type. The buildings are ventilated by natural draft through steel louvers installed in the monitors and through hollow concrete block louvers installed in the walls (Fig. 3.5.3). Conditions of high humidity, however, shows poor ventilation. On-off loading work is done by manpower, not by conveyors, stackers and forklifts. The eaves height is 4.0 m. No fumigation has been implemented against vermin.

3.5.4 Laboratory Equipment

The equipment of STL were reinforced under the Expanded Seed Production and distribution Project and their equipment was delivered in 1981 and 1982.

Since most of the equipment is about ten (10) years old, much of it in no longer accurate. It can be said that, maintenance of equipment is poor compared with the testing procedure which is prescribed in the official seed testing manual in the Philippines.

3.6 Seed Marketing and Distribution System

3.6.1 Government Seed Distribution System

(1) General

Generally, breeder and foundation seeds are equitably and proportionately allocated to the different regions according to the national seed production and distribution program through the regional and provincial seed coordinators designated in each regional and provincial agricultural offices. Regional federation and provincial seed producers associations coordinate directly with the regional and provincial seed coordinators for foundation and registered seed allocations.

(2) Rice Seed Distribution

Breeder seed of rice is usually procured by the BPI and allocated regularly to the five stations consisting of the Phil Rice Central, Cagayan Valley, Bicol, Visayas and Mindanao Experiment Stations and La Granja National Crop Center for production of foundation seed. Those six (6) facilities distribute foundation seed to other stations and seed farms covering the specific regions which are demarcated by geographical locations such as Northern and Central Luzon, Bicol, Visayas and Mindanao areas, and also distribute foundation seed to seed producers in provinces which are not covered by stations or seed farms.

The above five (5) stations excluding La Granja NCC are comparatively well developed and in major rice producing areas. The distribution of breeder seed to the above stations and foundation seed to other stations and seed farms in the respective regions is sometimes delayed and which accrues difficulties for timely seed production.

(3) Corn Seed Distribution

Hybrid seed are produced by the private seed companies, i.e. Pioneer, San Miguel, East West, etc., and distributed to seed dealers in provinces. In case of open pollinated corn, the government breeding institutes have been distributing breeder seed of corn directly to the sixteen (16) stations and seed farms in the country. The BPI has procured breeder seed in regularly from the breeding institutes at present due to the limited production of breeder seed.

From 1984 to 1988, production of corn foundation seed was done by only the eight (8) stations or seed farms consisting of Ilagan E.S, Abulog S.F, Economic Garden NCC, IPB, Dr. M.L. Roxas E.S, Tiaong E.S, Daet S.F, and La Granja NCC. Foundation seed production in Dr. M.L. Roxas E.S, Tiaong E.S and Daet S.F was not regularly done. This means that breeder seed allocation is limiting to the above eight stations and is unstable at present. Delayed seed distribution makes timely seed production difficult.

(4) Peanut Seed Production and Distribution

Peanut seed production and distribution has been done by only a limited number of stations and seed farms compared with those for rice and corn. Breeder seed of peanuts has been procured by the BPI and allocated to nine (9) stations and seed farms covering specific regions.

Limited production of peanut breeder seed makes proper distribution difficult. Foundation seed is not regularly produced by the said stations and seed farms. Ilagan E.S, Economic Garden NCC, Tiaong E.S, Tanay S.F and La Granja NCC have produced foundation seed since 1984, but their production has not been regular except at Ilagan E.S and Economic Garden NCC. Some of the stations are not suitable for producing peanut foundation seed due to low productivity and difficulties in foundation seed distribution to the other areas.

(5) Government Certified Seed Procurement and Distribution

In early 50's to 70's, the BPI had been designated to undertake the procurement and distribution of rice and corn certified seed as government buffer stock using the fund of investment outlay. However, in view of decentralization of the DA organization, those activities have been changed from centralized system to the regional operations and crop seed expanded not only to rice and corn but also to other crops such as field legumes, vegetables and plant materials. The investment outlay during 1987 to 1989 was increased from 15 to 19

million/year. The investment outlay plan for the procurement of rice, corn and field legumes during 1991 to 1995 was prepared by the BPI. This plan aims at the procurement of 15 % of the national requirements as buffer stock.

Procurement and distribution of certified seed in case of natural calamities is an additional undertaking to rehabilitate the destructions on crops. The Disaster Coordinating Committee chaired by the Defence Secretary is implemented for the emergency seed procurement and distribution activities in the national level under the coordination of the BPI, the DA regional and provincial agricultural offices. Certified seed procured by the investment outlay could be used to this emergency purposes.

3.6.2 Seed Distribution Record and Cost

Annual average of seed distributed by the BPI through 1986 to 1989 is summarized as follows :

(Unit : kg)

Allocated Seeds	For Wet Season Cropping	For Dry Season Cropping	Total
Rice Seed			
Breeder Seed	662	487	1,149
Foundation Seed	1,774	447	2,221
Corn Seed			
Foundation Seed	259	825	1,084
Peanut Seed			
Breeder Seed	18	60	78
Foundation Seed	0	61	61

Rice seed allocation for wet season cropping was larger than for dry seasons, especially for foundation seed. On the other hand, corn foundation seed allocation for dry season cropping was larger than for wet seasons as well as peanut seed. The BPI has to allocate corn seed also in the event of drought damage during dry planting season. Peanut seed is mainly produced as a dry season crop, hence distribution of peanut seed is concentrated in dry seasons.

The BPI usually uses private transportation companies for seed distribution. Polyethylene bags are used for seed transportation of rice, corn and peanuts. Seed distribution costs from the BPI head office to the stations and seed farms for the door to door delivery are summarized as follows :

(Unit : ₱)

Destination	Per Sack (40 kg)	Per Kg
Luzon	< 200	< 5
Mindoro	200	5
Visayas	150 - 250	3.75 - 6.25
Mindanao	260 - 300	6.50 - 7.50

3.6.3 Private Seed Marketing Activities

Based on the results of interview surveys of 39 seed growers in Cagayan Valley, Visayas, Southern Mindanao Regions, registered seed growers are procuring foundation seed from the stations or seed farms in their respective regions through the arrangement of the provincial seed coordinators. In case of certified seed, most of the seed growers are procured from the stations/seed farms and/or registered seed producers in the respective regions. However, some seed growers are procured from the stations outside their respective region such as Phil Rice Central Station and IRRI.

Delayed registered seed production and shortage of registered seed in the area accrue procurement of seed outside the respective regions. Proper allocation of registered seed produced by seed growers is difficult due to insufficient coordination by provincial or regional seed producers associations.

Government procurement of rice seed is carried out under the Production Enhancement Program of rice and corn. Around a half of the rice seed was procured by the government, hence most of the rice seed growers interviewed were considered to be participants of the above program. Marketing channels for open pollinated corn seed are underdeveloped as compared with hybrid corn seed. Marketing quantity of corn seed was limited to only 15% of the total product as follows :

(Unit : %)

Item	Rice Seed	Corn Seed	Peanut Seed
Approved Seed	78	15	100
Government procurement	(50)	(12)	-
Neighboring farmers	(14)	(3)	100
Middleman	(7)	-	-
Producers' cooperatives	(7)	-	-
Others(Non certification seed)	22	85	-

Rice seed is sold from October to December for the wet season harvest and from April to June for the dry season harvest. Most of the seed growers sold their products about thirty (30) days after harvesting both wet and dry seasons.

The average selling price of certified seed is ₱6.7/kg for rice, ₱15/kg for corn and ₱20/kg for peanuts. Most seed growers feel that the government procurement prices of certified seed are lower than prevailing marketing prices. In fact, around thirty (30) percent of the rice seed producers sold at ₱7.1 - 8.0/kg in 1989 compared with the government price of ₱6.7/kg on the basis of the questionnaire survey to the seed growers carried out in December, 1989 to January 1990.

The latest government recommended prices of the objective seed in April 1990 are summarized as follows :

(₱/kg)

	Rice		Corn		Peanut	
	Buying	Selling	Buying	Selling	Buying	Selling
Foundation Seed	9.4 (425/cav.)	9.8 (440/cav.)	20	22	20	23
Registered Seed	8.7 (390/cav.)	9.0 (405/cav.)	18	20	20	23
Certified Seed	8.0 (360/cav.)	8.3 (375/cav.)	15	17	20	23

Note: 1 cavan of rice seed; 45 kg

3.7 Seed Producers Association and Other Support Services

3.7.1 Organization and Activities of Seed Producers Association

(1) Organization of Seed Producers Association

The DA particularly BPI intends to achieve its goal in seed production and distribution with the active participation of individual seed growers. The seed growers is formed and organized into an association by province in order to coordinate their activities for seed production and distribution within the province. The organization of a provincial seed producers association is coordinated by the provincial agricultural officer and the provincial seed coordinator. The association has to be registered to the Securities and Exchange Commission. The association has a set of officers consisting of President, Vice-President, Treasurer and Secretary duly elected among the members. The function of the president is to administer and manage the activities of the association. Their tenure of office is one year.

The seed producers associations are grouped by province which in turn are federated at a regional level. The regional federation is usually organized with the participation of the presidents of provincial seed producers associations. The federation also has set of officers duly elected or appointed by the members during their annual conference conducted by DA. The Federation president administers, manages and coordinates the plans, programs and project activities of the seed producers association in the region. At present, only two federations in Region VI and Region XI are active.

(2) Rice Seed Growers

The present (1989) total number of rice seed growers for the whole country is estimated at 1,333. On average, the number of seed growers per region is 103, ranging from 16 members in CAR to 242 members in Region III. The area for rice seed production by region is lowest in CAR at 46 ha and highest in Region III at 2,620 ha. The average rice seed production area per seed grower, ranges from 3 ha in Region XI to 11 ha in Region III.

It is noted that there are provinces without rice seed growers at all. These are mainly concentrated in CAR, like Abra, Benguet, Mountain Province and Ifugao. Other provinces include without rice seed growers are Batanes in Region I, and Sulu in Region IX.

(3) Corn Seed Growers

The total number of corn seed growers as of 1983 is estimated at 285 covering around 952 ha throughout the entire country. The region with the highest number of seed growers is in Region II with 59, while the regions with the least number is in Region I and X with five of seed growers each. In terms of area, out of 952 ha devoted for corn seed production 217 ha is in Region X and only 10 ha in Region I. On average, the area devoted to corn production is 3.0 ha per farm.

(4) Activities of Seed Producers Associations

The function of the seed producers associations is to help the seed growers to produce the certified seed required by the farmers within each province or region. In relation to the demand of certified seeds in the province or region, the association (in coordination with the regional seed coordinator and seed inspector) determines the varietal requirement to be produced and distributed. Activities of seed growers associations are summarized as follows :

a) To render assistance and coordinate the procurement of seeds from Experiment Stations and Seed Farms for distribution to members,

b) To assist in the distribution and marketing of the seed produced by members,

c) To disseminate information in respect of new farming technologies and market prices of farm inputs and outputs,

d) To help the members with crop production loans .

3.7.2 Seed Growers' Profitability

Profitability of seed production is higher than that of commercial production. Higher investment is required for seed production, but in return this gives a higher profit as follows :

(₱1,000/ha)

Item	Rice (irrigated)		Corn		Peanuts	
	Seed	Ordinary	Seed	Ordinary	Seed	Ordinary
Production cost	10.6	5.9	10.0	1.8	7.4	3.0
Gross return	21.0	8.2	30.0	3.5	24.0	9.4
Net return	10.4	2.3	20.0	1.7	16.1	6.4
Net profit cost ratio	1.0	0.4	2.0	0.9	2.2	2.1

3.7.3 Other Support Services

The present services on the proper seed production practices by the Agricultural Production Technicians (APT) of DA are still minimal. Very few seed growers were able to avail the services of the APT, hence seed growers have to depend on their own seed production technology. The services of the seed inspector are also confined to seed certification, and the seed inspector only comes to the seed growers' field when seed certification is needed.

Training system for extension workers, seed inspectors, and operators for seed related facilities is still inadequate. Cooperative activities for production and marketing are still weak among seed growers. Support services from the government on this aspect is still lacking.

4. CONSTRAINTS ON SEED PRODUCTION AND DISTRIBUTION

4.1 Seed Production

4.1.1 Seed Production

From the viewpoint of crop cultivation, the low yield of the crops is one of the most important problems in seed production. The potential yield of varieties are 4 - 5.7 t/ha in rice, 4 - 5 t/ha in corn and 2 t/ha in peanuts. However, actual yields are very low, i.e. 2.5 - 3.1 t/ha in rice, 1.1 - 1.3 t/ha in corn and about 0.7 t/ha in peanuts, this might be attributed to typhoon, flood, shortage of soil moisture, drought, insect pests and diseases, and might be related to planting in unsuitable fields and miss-management of cultivation on critical points.

The second problem in seed production is low seed yield owing to the low percentage of screened and approved seed as certified seed ; 1.8 - 1.9 t/ha in rice, 1.1 t/ha in corn and less than 0.7 t/ha in peanuts. This might be attributed to mixture of inferior seed, owing to natural calamities, insect pests and diseases, and contamination of off-types, foreign elements in the field or during processing, and degradation of seed quality under unsuitable conditions.

4.1.2 Seed Demand and Supply Condition

Stations/farms produce more foundation seed than the target set in BPI seed production program, but they produce remarkably less registered seed than the BPI target. Similarly, private seed growers are producing registered seed beyond their quota, while producing the certified seed in very small quantities. This may due to the higher profitability of the higher class of seed in marketing.

Though the BPI seed production program target for certified seed production is very small quantity compared with the target for registered seed production, the actual quantity of certified seed produced by seed growers is smaller than the BPI target. There is no relationship between the quantity of registered seed produced and the planted area for the certified seed production.

The coverage percentage of the certified seed in BPI program for the harvested area of the objective crop was 16.6% in rice, 10.8% in corn total, 0.5% in open-pollinated corn and 49.6% in peanuts. While the coverage of the actual production of certified seed was

3.6% in rice, 0.3% in open-pollinated corn and 0% in peanuts. Thus, production of certified seed was very low. Especially there was no production of the certified seed in peanuts.

4.1.3 Seed Production Technology

It is considered that the level of seed production technology in the Philippines is generally high owing to the activities of IRRI, Universities and other research institutions. However, the yields of seed remain low due to frequent calamities.

Most of the seed in the wet season is dried under the sun. The quality of seed deteriorates due to the unfavorable drying condition. This is one of more serious problems in peanut seed production.

Although several varieties of rice are planted to decrease the risks of calamities, this system increases the possibility of mixture with volunteer plants from the previous season, seedlings from other plots as well as the risk of careless management during harvesting and processing. Since diseases deal fatal blows to seed production, careful inspection and management is needed to eliminate the problem, especially since there is a high possibility of virus contamination of peanuts production in certain fields. Corn is a cross-pollination crop, therefore special attention is required to prevent out-crossing with other varieties. A high possibility of out-crossing can be expected for open-pollinated corn seed production in the field in an open area without any isolation facilities in a corn productive area of hybrid or local varieties.

4.2 Seed Quality Control System

Seed producers have a responsibility to maintain high varietal purity and then offer the maximam freedom from undesirable contaminants. Seed crops are cultivated by the seed producers under the supervision of agricultural farm technicians and seed inspectors according to the regional seed production program and farming manual. Seed crop farming practices are prescribed in the manual. If the seed producer observes this manual and technical guidance from the persons concerned, the approving rate of a seed field certification will be at a higher level.

The rejection rate of rice and corn seeds by the kinds of seed producers is as follows;

	Rice Seed	Corn Seed
Seed produced by public sector	5.5%	0.2%
Seed produced by private sector	11.7%	2.7%

As indicated above the approval rate for seeds from the private sector is lower than that of the public sectors. The above may suggest the necessity for strengthed guidance for seed crop farming by private seed producers. These matters should be considered in seed production plan under the Model Area Project.

It was observed that most of the facilities which are used as seed storage warehouses, lack the conditions for seed storage such as the preventive measures against the entrance of birds and rodents exclusive use for seed storage and proper sanitation control,especially in storage facilities of the private seed producer.

In connection with this, it is important to note that good seed storage is an important phase of seed processing, and so it is essential for a successful seed production and distribution program. Also this is the responsibility of seed producers themselves.

In most seed warehouses with concrete floors, seed bags are piled on wooden pallets to prevent considerable less of seed due to moisture build-up and transmission through a concrete floor. AS for seed storage facilities, improvement for inadequate facilities should be considered.

In 1989, 20,934 ha. of seed fields, corresponding to 1.7 times of the previous year, was inspected by the seed inspector. The number of covered seed producers, area of seed field and number of sites, etc., greatly vary depending upon the topographic conditions and the dispersion of the seed field site (refer to Table 3.4.2 &3.4.3).

According to the results of interview surveys, all seed inspector interviewed strongly desired to improve their mobility of inspection activity by introduction of vehicles in place of their present inspection trips using public transportation. The improvement of the traffic means is necessary for smooth performance of seed field inspection activities.

The Seed Testing Manual for the Philippines (Draft) has been adopted as an official procedure for seed testing. This manual was compiled on the basis of the International Rules for Seed Testing Association. This manual strongly emphasizes the necessity for a uniform method in order to obtain the uniformity of test results conducted by the STL, and prescribes the apparatus and supplies to be used for each testing item in principle. However, based on

the field survey and list of equipment facility inventories provided by BPI, it was clarified that most of the existing equipment was not functioning weel.

Replacement and introduction program for the main testing equipment should be considered. Regarding this matter, it will be necessary to coordinate between this project and improvement program of STL's under Rice Action Program (refer to Table 4.2.2)

4.3 Seed Production, Processing and Storage System

4.3.1 Seed Production Field

(1) Government Sector

a) Constitution of the field lot

The design of field lot of the seed farms of the government sector was in a desirable condition, particularly in the lowland rice seed field. The size of each field lot observed was of appropriate scale in both lowlands and uplands.

The farm roads and borders of lowlands uplands however have not been fairly arranged. The borders of lowland fields and the farm road of upland field are rather narrow, few or not correctly arranged. These facts affect mechanized and rational farming.

b) Irrigation

In general, the irrigation system has been arranged fairly in the lowland seed farms of the government sector. The water resources however have occasional problems such as saline water, deep ground water level, irrigation of NIA not in time, poor maintenance of secondary and/or tertiary canals and drainage canals, drying up the water reservoir, and such like in some of the lowland rice seed producing fields. At the upland seed farm, water is supplied by rain, therefore there are serious problems of field dryout during drought. Some of upland farms have been provided with sprinkler or drip irrigation facilities, but they are rear cases. Even though the sprinkler or drip irrigation is provided.

(2) Private Sector

As mentioned above, the private sector seed producers are mostly rich and highly developed farmers. Therefore there is no serious constraint to producing seeds or irrigation system arrangement, constitution of their field and capital capability except the resources of water supply. The water supply for lowland rice fields is distinctly dependent on conditions and the situation of outside factors such as deficits in water resources, water of canals not in

time and natural calamities of drought or typhoon. Thus the water supply for private seed growers occasionally affects their seed production through outside factors as said above.

4.3.2 Seed Related Machinery and Equipment

(1) Government Sector

a) Farm Machinery and Transportation

More or less half of the farm machinery and transportation provided under the programs mentioned above are still operated. Since the estimated life span of the machinery however is also exceed, the machinery is requiring repair with the replacement of some parts. However the provision of spare parts is difficult also to the old model. Some farms provided with the same type of machinery are cannibalizing defective machinery to repair the other defective machinery. The total amount of functional machinery is therefore decreasing all the time. As for the implements of tractors, most of these are utilized in either low land and upland. Some of implements are however not utilized due to the selection being unsuited for the farm.

b) Seed Processing

Out of 40 government sector's seed farms, 17 seed farms have been provided with complete seed processing plant as mentioned earlier. Out of 17 farms 2 farms had lost their plant due to the calamities of fire and typhoon. The other remained 15 farms are utilizing the plant though the minor repairs are required. However the plant in Visayas E.S has been nearly worn out because the plant has been utilized well.

Regarding the capacity of the seed processing plant at the above 17 seed farms, most of the plants have enough capacity for processing the seed produced in related seed farm. The capacity can be applied to the private sector when the private seed growers are adjacent to the plant, so far the plant however is utilized by few private seed growers for reasons of the processing fee, distance, unrecognized advantages in utilize the plant for their certification and so on.

Out of 40 DA seed farms, only 15 seed farms except two farms damaged have complete seed processing plants. The other 25 seed farms process their seed by using traditional seed cleaning apparatus. The estimated life span of all plants has been exceeded, but the urgent renewals are not required in 15 farms above, though the partial repair of plant may be required for continued operation of the plants. However the repair of them is

difficult, because the spare parts cannot be supplied due to shortage of budget and no local agents for the plant.

c) Conditioned Cold Storage

The primaty class seeds such as foundation and registered, and of crops which are objects of this study must be stored rather longer. Four conditioned seed storage facilities cannot be operated due to the lack of water and electricity supply. BPI Central has also 3 rooms of conditioned storage facilities, but they are also not operated efficiently due to the occurrences of mechanical troubles. The capacity, conditions of conditioned storage and period for safety storage have not been confirmed on the basis of definite experimental data on quality deterioration under natural atmospheric conditions in the Philippines. The air-conditioning is however required for medium and long term seed storage under the natural ambient conditions of the Philippines.

(2) Private Sector

a) Farm Machinery and Transportation

There is no report regarding any problem on farm machinery and transportation for their seed among the private seed growers.

b) Seed Processing and Storage

A few private seed growers however have seed processing plants on large farms, while most of the seed growers have only traditional seed processing apparatus though they recognize the necessity for advanced seed processing plant. Seed growers also recognize the effectiveness of the appropriate conditioned storage facilities to avoid the quality deterioration, however conditioned storage is not introduced.

4.3.3 Buildings

The existing buildings having been built more than ten to twenty years ago and before completion of the construction of seed processing plants, water leakage into a building occurs from rusted-steel roof and cracking external walls. Contamination by the droppings of trespassing fowls into a building takes place due to the openings between a roof and an external wall.

High temperature and high relative humidity are inappropriate to store seed. The Philippines is a country with high temperatures and high relative humidity. Storage for two months does not reportedly adversely affect seed in this climate, but storage of more than six months needs an air conditioned room so as to prevent the seed from deterioration of the germination rate. Being under natural conditions and insufficiently protected against heat and moisture, the existing bodegas are inappropriate as Seed Storage Houses a period of several months.

Seed testing has been conducted only on seed carried into a Seed Testing Laboratory by seed inspectors. The Laboratory therefore does not examine all seed produced in its territory. Despite this condition the number of samples for test attains an annual average of 2,500 bags and these samples are handled by an average of thirteen persons. For this the space of the Laboratory is insufficient especially during the two months after harvest, and moreover is further curtailed by equipment which is mostly out of order. Both electricity and water supply show a tendency to shortage, being distributed by the Experiment Station. Water supply always lacks for the Laboratory's activities.

4.4 Seed Marketing and Distribution System

The stations' networks for seed procurement and distribution are still weak and underdeveloped on corn and peanut seed compared with rice seed. Breeder seed allocation of corn and peanuts is limited to the specific stations and unstable at present mainly due to :

1) Production capacities for breeder seed in Ilagan E.S for corn, Economic Garden NCC for peanuts and IPB for corn and peanuts are not sufficient for proper seed allocation among the stations,

2) No concrete production and distribution programs for corn and peanut seed based on concrete production program like the Rice Production Enhancement Program,

3) No strategic siting of stations producing corn and peanut foundation seed based on regional seed requirement and covering other stations and seed farms producing registered seed, and

4) Limited BPI's coordination activities for corn breeder seed allocation as a lead agency; BPI's activities on corn seed allocation are limited to surplus of foundation seed from the stations.

In addition to the specific constraints on corn and peanut seed, common constraints of the study crops are summarized as follows :

1) Weak monitoring and follow-up systems of the BPI Central Office and the DA Regional Offices for the government seed production and distribution activities; seed production and distribution activities of stations concerned have not been monitored completely, hence constraints for seed production and arising needs for procurement of parent seeds are not clarified. There are no communication and reporting systems between the stations and BPI or DA Regional Offices for timely activity,

2) Delayed distribution of breeder and foundation seed causes difficulties in timely seed production and distribution to other stations or seed farms ; most of the stations do not have sufficient and proper storage facilities for breeder and foundation seed.

The following difficulties were identified in seed procurement and marketing by seed growers :

1) Inaccessibility to the stations or seed farms for some seed producers living in remote areas,

2) Lack of information on the availability of foundation and registered seed in the stations. Seed growers have difficulties in proper timing to start planting due to delayed allocation of seeds,

3) Insufficient quantity of seeds, especially foundation and registered seeds of corn and peanuts,

4) Shortage of favorable varieties of seed, and

5) Weak organization of seed producers associations for seed procurement and marketing, i.e. no joint procurement of seeds together with no joint activities for processing, storage and marketing in general.

5. BASIC IMPROVEMENT PLAN

5.1 Basic Concepts for the Improvement

Seed production and distribution activities have an important role in establishment of food self-sufficiency, increase in farmers income and creation of employment opportunities in the rural areas. The BPI and other government agencies concerned have been promoting various improvement efforts in seed production and distribution. The supply of high quality seed to meet the present seed demand, however, is still unstable and delayed mainly due to difficulties in the stable supply of parent seed,deterioration of seed quality,weak organization of seed marketing and distribution, insufficient support to seed growers,etc. For improvement of farmers economic situation through increase in production and productivities of staple food crops (rice and corn) and cash crop (peanuts), establishment of appropriate supply system for high quality seed as well as improvement measures in the all levels from seed production and storage to marketing and distribution are essential and crucial.

The basic concepts for improvement of seed production and distribution identified through the Study are as follows :

1) To establish a proper seed production and distribution program and to strengthen its executive organization through clarification of production and distribution functions by each seed multiplication stage,

2) To improve seed production, processing and storage facilities,

3) To improve the seed quality control system for increase in seed quality,and

4) To improve seed productivity through appropriate seed production technology.

5.2 Seed Production and Distribution System and Organization

5.2.1 Establishment of a Planning and Monitoring System and Organization

The formulation of a nationwide and regional seed production and distribution program as well as the establishing of monitoring system is essential for the BPI to execute the seed administrative affairs effectively. For the formulation of practical programs and their effective implementation, the following points should be considered ;

(1) A plan for breeder seed allocation from Phil Rice Central Experimental station, IRRI, etc. should be prepared by the BPI in consultation with agencies concerned, taking the conditions of foundation seed producing stations into consideration. The plan

will include breeder seed and foundation seed production by the stations as well as varieties and destinations for seed allocation.

(2) The plan should consist both of an annual plan and a long/medium term plan (5/10 years). For the formulation of the plan, coordination works between the BPI, the Phil Rice,the Division of Planning and Monitoring in the DA Head Office, the regional agricultural offices, and breeding institutes out of the DA are essential. It is, therefore, recommended that "coordination meetings on seed production and distribution" be held regularly by the above institutes concerned.

(3) For the establishment of timely coordination activities on seed production and distribution, the reporting system from seed production farms as well as from seed growers associations to the BPI should be improved, and the capabilities for collection and analysis of data and information in the BPI should be increased. The outline of the system improvement from planning to monitoring is shown in Fig.5.2.1.

5.2.2 Establishment of Seed Production and Distribution System

These is already in existence a basic nationwide seed production and distribution system in Philippines under the coordination of BPI. Improvement of the system should be based on the present seed production and distribution system with the following improvements :

(1) The foundation seed production and distribution is actually being done by a number of government agencies. In order to establish a clear-cut line of responsibility for production and distribution, the governmental agencies involved in producing foundation seed and their jurisdiction for distribution, should be established as proposed in Fig.5.2.2 to 5.2.4.

(2) The production and distribution for open pollinated corn and peanuts has been rather less developed than that of rice. Institutes producing breeder seed are located at areas remote from the main producing regions and have no available area for expansion of seed field.. It is recommended that the present corn and peanut production and distribution system should be reorganized and strengthened by the following improvements :

- La Granja NCC should be developed as a research and development institution for corn, peanuts and other upland crops and cover Visayas and Mindanao Areas for stable distribution of breeder seed.

- The distribution area of breeder and foundation seed by each multiplication station should be set on the basis of clear and suitable demarcation by blocks and regions as shown in Fig. 5.5.2 for corn and Fig. 5.5.3 for peanut.

(3) Register seed production is also the responsibility of the government agencies. A substantial volume of registered seeds, however, has been produced by seed farmers. This fact has created the problem of a tendency among the private seed growers to grow registered seed ; a large quantity of registered seed for certified seed production is no use, the dubious seed quality without certification, and the increase of demand for registered seed among commercial farmers. The government registered seed production and distribution system, therefore, should be rationalized. In case of shortage of registered seed production in the DA stations and seed farms, deficits in registered seed could be produced by selected seed growers on government commission. Registered seed growers should be selected in the vicinity of the DA facilities. The seed processing plant could be utilized for the processing of registered seed coming from the seed growers. This improvement could realize stable registered seed production, increase the quality of seed, and ensure timely supply of seed. The regional seed procurement and distribution system is proposed in Fig. 5.2.5.

(4) Certified seed production is mainly done by the private seed growers on a commercial basis. The assurance of seed quality, therefore, should be guaranteed through proper seed inspections of STL. The facilities needed for seed production should be primarily prepared by seed growers and/or seed producers associations. However, in view of the importance of seed production in agricultural development, it is strongly desirable for the DA to assist seed growers through a subsidy and/or a soft loan, etc. In order to encourage the improvement of seed related facilities in the private sector, it is also a subject worthy of implementation of model projects with government support.

5.3 Improvement of the Seed Production Practices

At present, actual yields of seed differ considerably from the target yields which are designed in the BPI seed production program. The BPI should make an effort to increase the actual yields to the targets as follows :

(t/ha)

Kind of Seed	Rice	Corn	Peanut
Foundation	3.15	2.5	1.0
Registered, Certified	3.60	3.0	1.0

The nationwide long term target for around ten (10) years to increase seed renewal rates could be set at 30% in all objective crops. For the achievement of the target, the government should improve and strengthen the seed production and distribution system as well as the other agricultural support services step by step. On the basis of the present low renewal rates of seed use comprising 3.6% in rice, 0.3% in open-pollinated corn and 0% in peanuts, the present target in BPI program; 17% in rice, 11% in corn and 10% in peanuts, should be achieved first.

Buffer stock rate is proposed at 100% for foundation seed, 20% for registered seed, and 10% for certified seed on the basis of the BPI program.

For improvement of the present low yield in seed production, it is important to select fields with fertile soil in suitable locations for crop management, and to prepare seed and fertilizer, etc.ahead of time, also in upland crops to avoid repeat planting of the same kind crop on the same field in order to prevent occurrence of insect pests and diseases and imbalance in nutrient conditions in soil.

Typhoons seem to be the main factor causing low yields in seed production, therefore cultivation techniques are required to avoid the damage by typhoons. These are, for instance in region I, II, IV and VIII which are regular typhoon areas, to plant suitable varieties which will not be flowering during September to November. As crops are also affected even in other growing stages by typhoon, it would be desirable to harvest before the peak season of typhoons.

For raising the approved seed percentage, it is important to practice roguing of off-types and removal of undesirable plants as well as to manage effectively weeding and plant protection, and to prevent contamination with inferior seeds and inert matter, especially when dealing with several varieties, equipment and workshop should be cleaned for the seed treatment and processing. Furthermore, border areas of adjacent fields of different varieties should not be harvested for seed to avoid mechanical mixture and from the seeds of natural crossing.

Various points to be improved and strengthened with technical instruction were recognized, in particular the following points which are important to improve the rate of approval and rejection ;

(1) Rice

a) Strengthening to prevent contamination and perform weeding.
   - Seedling stage deterioration and roguing of off-types and removal of undesirable varieties.
   - First heading stage removal of abnormally headed hills.
   - Full heading removal of abnormally later headed hills.
   - Final stage removal of sterile rice,volunteer plants and other varieties.

b) Timely harvesting of seed
   - When 80% of straw colored with the moisture content of seed rice being kept below 25%.

c) Improvement of drying and storage methods.

(2) Peanut

a) Fields for certified seed production shall be inspected three times;
   - Vegetative stage determination of off-type thru color,size,shape and uniformity of foliage.
   - Flowering stage determination of off-type thru flower color.
   - At maturity 80% of the pod turns brown or at physiological maturity of the crop.

b) Only one variety of the same crop may be grown for seed production on a farm.

c) A 2-5 meter distance will be kept between the seed farm and the land planted to other varieties of peanut.

d) Improvement of drying and storage methods in peanut.

(3) Corn

a) Corn seed intended for seed production shall follow strictly the field inspection and certification standards to prevent or minimize contamination or mixture.

b) Planting of other varieties and/or different seed classes must be 200 meters away or more from the surrounding seed corn areas.

c) Border rows are for isolation and these should not be harvested for seed purposes.

d) Field inspection shall be done during silking,harvesting and processing.
   - there shall not be more than 0.5% detectable mixture with plant of other varieties.
   - there shall not be more than 0.5% off type ears or 1% ears with kernels of the wrong color at harvest time.

5.4 Seed Quality Control

The most important factors in seed production are to maintain the purity and viability of seed produced. The system of inspection and certification of seed are executed to obtain these factors. The seed produced must be strictly controlled by the system in separation from ordinary crop production. The seed producer shall have a responsibility to control and manage the germination of seed planted,the disease and pest of plants and the contamination of different varieties. From the viewpoint mentioned above, the improvement of administration and facilities for seed quality control should be as follows :

(1) Administration

a) Seed inspection and certification; At present,the BPI does not have any administrative control over regional STLs and the seed inspectors. The administrative position of the seed inspector was transferred to being under a provincial agricultural officer from supervision under the chief of STL concerned in 1987. It is recommended that full-time seed inspectors required should be assigned in each province taking accessibility to the seed grower into consideration. Any increase of both the regular staff of STL and seed inspectors should be considered to cope with expansion of seed production area of seed samples to be tested.

b) Seed quality control technology ; The SQCS has been conducting research work on improvement and development of quality control technology in cooperation with the regional STLs. The research activities on improvement and development of quality control should be continued and strengthened.

(2) Improvement of STL

a) A seed testing laboratory (STL) consists of several rooms ; a room is twelve square meters(12 m^2). On the basis of increasing the number of inspectors and of testing samples in reinforcement of the testing system, expansion or rebuilding of the building are essential in most of STLs.

b) Though 18 STLs are now disposed strategically throughout the country, these STLs cover wide dispersed areas. Almost all inspectors have to use public transportation (bus or jeepnee) for their inspection trips. The improvement of the means of transport is necessary for smooth performance of seed and field inspection activities.

c) The Seed Testing Manual for the Philippines has been adopted as an official procedure for seed testing. This manual strongly emphasizes the necessity for a uniform method to obtain the uniformity of test results conducted by the STL and prescribes the apparatus and supplies to be used for each testing item in principle. However, most of the existing equipment was not functioning well. The replacement and reinforcement of laboratory equipment therefore, should be considered to improve the functioning of seed testing.

d) In addition to the points mentioned above, the following should also be considered ;

- Introduction of computers for arranging and analyzing the testing results as accurately and promptly as possible.
- Supply of portable seed testing kits for individual seed inspectors.
- Replacement of printing machines for the certification tag.

5.5 Seed Production, Processing and Storage Facilities

5.5.1 Improvement of Seed Production Field and Agricultural Machinery

No serious constraint is generally observed in rice seed farms under the government sector,while slight problems are observed. On the other hand,there are serious problems in terms of stable supply of upland crops seed, especially in drought years, due to upland seed farms having almost no irrigation facilities. Therefore, irrigation facilities should be provided as far as possible. Priority should be given to the farms located in main producing area of crop concerned and in which produce foundation seeds and register seeds. Thus some upland seed farms might be rearranged and/or integrated.

The estimated life span of most agricultural machinery and transportation vehicles in the seed farms has been exceeded already. This equipment should be renewed under a systematic renewal plan on the basis of the following standards :

Type of Land	Sort of Works	Type of Machinery	Capacity
Plain low land	Land preparation	4WD tractor with rotor-vator	35 PS class
Terraced low land	Land preparation	Hand tractor with rotary	7 PS class
Plain upland	Land preparation	2WD-tractor with plow, harrow ridger, cultivator, trailer and etc.	60 PS over class
Plain upland	Plant management	2WD-tractor with cultivator, sprayer, manure spreader, front-end loader and etc.	35 PS class
Hilly upland	Land preparation	4WD-tractor with disc plow, harrow, ridger cultivator, trailer and etc.	60 PS over class
Hilly upland	Plant management	4WD-tractor with cultivator, sprayer, manure spreader, front-end loader and etc.	35 PS class
Small field lot hilly upland	For all type	Hand tractor with plow, rotary, ridger, cultivator, trailer and etc.	7 PS class

5.5.2 Improvement of Seed Processing Facilities

The plants installed in the first Yen Credit, however, have been timeworn after the lapse of more than twenty years. Other plants are also require repair or replacement for continued operation of the plants. Furthermore, the plant in Cagayan Valley E.S was completely destroyed by the typhoon of 1988 and the plant in Claveria E.S was burnt.

The remaining 25 seed farms out of 40 seed farms above have no seed processing plant except traditional seed cleaners. These 25 seed farms also need to be promoted to facilitate appropriate seed processing facilities for their seeds under a systematic program.

For implementation of the program to renew or repair the seed processing plants, it is important that the plant is designed with optimum capacity and type. The future plant should be designed carefully on the basis of the above concept. The provision of a local agent of the manufacturer is required to provide periodical inspection of its products as after sales services. A nationwide improvement plan of the seed processing facilities should be established accordance with the following procedure ;

- Reactivation of the plant in Cagayan E.S destroyed by the typhoon,

- Overall rehabilitation or repair of the plants installed by the First Japanese Yen Credit, if necessary, and

- Repairment or replacement of the plants installed by the seventh Japanese Yen Credit, if necessary, and improvement of processing facilities in other 25 remaining seed farms.

5.5.3 Improvement of Seed Storage Facilities

Seed storage facilities have an important role in terms of seed quality control likewise seed processing facilities, and are indispensable, particularly in those countries which have high temperature and humidity like the Philippines. The improvement of storage facilities should be implemented systematically in accordance with the following :

(1) The storage facilities with an appropriate capacity, should be established at each seed farm taking the production and distribution plan of BPI into account.

(2) In order to prevent deterioration of seeds, storage facilities would be desirable to be with conditioning system. Such storage facilities should be, as a first step, established at the seed farms which produce both foundation and registered seed, and then should be gradually expanded to other seed farms.

(3) Taking the following into consideration, it is also recommended that the headquarter of BPI should have a conditioned seed storage facility in Manila ;

a) a long period of time to implement a nationwide seed storage improvement plan.

b) the guaranteed seed supply system for breeder seeds.

c) the desirability of keeping a certain quantity of foundation seed in the BPI against emergencies

5.6 Other Support Services

The improvement of seed production technique is basically concerned with the technical and economical abilities of each seed growers. However, sufficient government support services are also needed to assist seed farmers. The following measures should be taken by the BPI in concert with agencies concerned :

(1) Extension services

To produce a sufficient quantity of high quality seed, it is necessary to train all the personnel involved in seed production and distribution,especially in the field of seed production and quality control technique as follows ;

a) to train the seed growers and extend technical services for them especially in seed production, post harvest technique and storage by up-grading the technique of seed inspector/extension workers, and
b) to train officials, staff and workers at seed farms for crop management in the seed farm, operation and maintenance of seed processing and storage facilities and equipment.

(2) Organization of seed growers

The present set up of seed growers must be strengthened by promoting of growers for further increase in high quality seed production through the strengthening of coordination among the seed growers, the following activities will be facilitated ;

a) systematic, proper and timely execution of procurement of inputs, marketing of products,
b) systematic and effective utilization of facilities for seed processing, drying and storage,etc. through the seed growers' activities, and
c) promotion of coordinated efforts between the government and the seed growers to contribute more in the production of high quality seed and expand use of the certified seed by common farmers.

(3) Credit services

To improve the present condition of seed growers, strong support services in the financial aspect will be essential. The envisaged main points to be strengthened are as follows ;

a) To promote crop production programs which include provision of certified seeds and fertilizers to the farmers,
b) To expand the credit items to be granted to the seed growers, such as processing facilities and equipment, storage for seed,etc.

5.7 Approach to the Improvement

5.7.1 Basic Consideration for Plan Formulation

In formulating the improvement plan for the high quality seed production and distribution system for rice, corn and peanuts, the main conditions to be considered are as follows :

(1) Seed production and distribution improvement plan which covers all levels from the breeder's seed production level to certified seed distribution to the farmers level is desirable to be implemented on a nationwide scale. However, the actual plan should take the following matters into account :

(a) The quantity and timing of seed demand in each region vary considerably due to climatic conditions such as droughts and typhoons, cropping patterns and cropping areas. Therefore, a nationwide uniform improvement plan would tend to disregard the constraints in each region.

(b) It would neither be practicable nor efficient to start implementation of all of the improvement plans immediately throughout the country from the viewpoints of the limited availability of investment funds as well as personnel resources.

(2) Improvement plans for seed production and distribution would be coordinated with integrated improvement measures in wide range of inter-related fields such as production, quality control, processing and storage facilities and marketing organization. The effect of improvement is expected to be much greater in a comprehensive improvement plan than under individual measures.

(3) The improvement plan will require urgent implementation of certain fields/facilities. For example, facilities damaged by typhoon should be rehabilitated as early as possible, and improvement measures which might be urgent and effective with a single measure should be implemented as early as possible.

5.7.2 Basic Approach to the Improvement Plan

Taking all the above into consideration, the basic approach to the improvement plan should be formulated as follows :

(1) Model Improvement Plan

(a) Model project(s) will be implemented in the selected model area(s) for each crop of rice, corn or peanuts. The area(s) to be selected is the major production area

of the crop(s), and the area(s) could be expected to demonstrate the improving effects to other areas.

(b) To expand the project implementation areas to the extent that personnel and fund resources permit, applying the experiences obtained through implementation, operation and monitoring of the model projects.

A model area will be selected for each crop, namely rice, corn and peanuts. Where necessary in making the model improvement plan, breeder seed and/or foundation seed production farm(s) located even outside the model area should be included within the model improvement plan.

(2) Emergency Improvement Plan

In addition to the model improvement plan, an emergency improvement plan should be established taking the degree of emergency and the expected effect of project implementation into account.

1) Strengthening of system of seed quality control

From the viewpoints of ensuring the quality of certified seed, quality control including seed testing is essential and crucial. Sixteen seed testing laboratories have already been established to cover the whole country. These laboratories have been experiencing serious difficulties in seed testing due to not only the shortage of seed inspectors but also to insufficient provision of instruments.

2) Rehabilitation of seed processing and storage facilities.

Almost all of the existing seed processing and storage facilities have exceeded their design life and have been kept in operation with difficulties. These facilities should be improved through a rehabilitation plan. In the case of the processing facilities belonging to the Cagayan Valley Experimental Station located in Isabela Province, Cagayan Valley Region, one of the main rice producing regions, these have not been operable for two years due to serious typhoon damage.

6. SELECTION OF MODEL AREAS

6.1 Criteria for Selection of Model Areas

The criteria for selection of model areas for rice, corn and peanut seed respectively were prepared as follows :

(A) Model areas should be the main producing regions for rice, corn and peanuts in the Philippines.

(B) Regions to be selected as model areas shall have the National Crop Centers under BPI or Branch Experiment Station under Phil Rice in case of rice.

(C) Active seed producers associations shall exist in the model areas.

(D) Availability of support services on seed production and distribution shall be high in the model areas.

(E) Model areas shall be located in places accessible to other regions for easy extension of model improvement activities.

(F) Model areas shall have no on-going projects with the same nature of this project.

6.2 Selection of Model Areas

For the selection of model areas, the criteria from A to E above mentioned were translated into the following quantitative measures :

(A) Production percentage of each region in relation to the national average from 1986 to 1988.

(B) Existence and non existence of the NCC for corn and peanuts and Phil Rice Branch for rice in each region were evaluated at ten (10) points and five (5) points respectively.

(C) Existence of active seed producers association was evaluated by:

1. Regional distribution of number of seed growers in the country using percentage,

2. Regional distribution of quantity of approved seed from seed growers in the country using percentage, and

3. Existence (10 points) and non existence (5 points) of regional seed producers association.

(D) Regional support services for seed production and distribution were evaluated by :

1. Regional distribution of the number of seed inspectors in the country using percentage, and

2. Coverage of growers' harvested area by one seed inspector; 25 ha of rice and 2 ha of corn; below the national average (10 points) means more dense inspection can be applied, around the national average (7 points), and above the national average (4 points).

(E) Regional coverage for seed distribution from each region was evaluated through number of regions covered multiplied by 2.2 points.

The above scoring procedures are shown in Tables 6.2.1 to 6.2.6. The candidate regions for model areas were selected by the total point score from the criteria A to E. Model areas for each study crop were finally selected from the candidates applying the criteria F as follows:

Seed	Candidate Region	Model Area
Rice	III, VI, IV, XI, II	VI (Visayas Region)
Corn	XI, VI, IV, II, IX, VII, XII	XI (Southern Mindanao)
Peanut	II, I, IV, XI, VI	II (Cagayan Valley)

7. PRESENT CONDITION OF THE MODEL AREAS

7.1 Outline of the Model Areas

The location of the three Model Areas for the three study crops are separated by island and by region. Model Region for peanuts is in Luzon, while Model Regions for rice and corn are located in Visayas and Mindanao, respectively. The location maps are presented in Fig. 7.1.1 to 7.1.3.

Specifically, the peanut model area is located in Region II, which comprises three adjacent provinces namely, Isabela, Cagayan and Quirino. This is shown in the Table below. Ilagan Experiment Station is located in Ilagan, Isabela Province which is about 150 kilometers away from the DA Regional Office at Tuguegarao in Cagayan Province. The DA provincial offices are located in the respective provincial capital. In the case of rice, Region XI was the selected model region. It consists of five (5) provinces in Panay Island and Guimaras Island, and the model station is in Iloilo city. Likewise it is in these city where the DA. Regional Office is located. With respect to corn, Region XI in Mindanao was selected as the Model Region. It is located in the northern most part of island and it comprises one city and five (5) provinces. Davao city is the seat of the Regional government where the DA Regional office is also located. Davao NCC is also located in this city, while the support model station is located in Tupi, South Cotabato.

Region	Capital Town	DA Regional Office	Model Station
Region II			
Cagayan	Tuguegarao	Tuguegarao	–
Isabela	Ilagan	–	Ilagan
Quirino	Cabarroguis	–	–
Region VI			
Iloilo	Iloilo City	Iloilo City	Iloilo City
Capiz	Roxas City	–	–
Aklan	Kalibo	–	–
Antique	San Jose de Buenavista	–	–
Guimaras	Jordan	–	–
Region XI			
South Cotabato	Gen. Santos City	–	–
Davao	Davao City	Davao City	Davao City
Davao Oriental	Tagum	–	–
Davao del Sur	Digos	–	–
Surigao del Sur	Tandag	–	–

The demography of the three model regions as exhibited in the Table below indicates the following differentiations. In terms of population Region VI is more populated compared to Regions II and XI. Population density is 280 persons per kilometer which estimated three times higher than in Region II and about 1.8-times higher than Region XI. However, based on the average annual population growth rate it has the lowest growth rate of 1.03% compared to 1.22% Region XI and 1.2% in Region II.

The majority of the populations of the three regions are observed to be in rural areas. As shown in the table, the share of rural population is highest in Region II at 79%, and lowest in Region XI at 59. Considering that the three regions are rural areas, the major source of income comes from agriculture.

Items	Region II	Region VI	Region XI
Total Area (000 ha)	2,272	2,023	3,234
Total Population 1990 (000)	2,147	5,670	4,961
Total Households (000)	429	945	789
Average Family Size (No.)	5	6	6
Population Growth Rate (%)	1.2	1.03	1.22
Population Density (Pop/km^2)	94	280	153
Percent of Rural Population (%)	79	67	59
Major Occupation	Farming	Farming	Farming

Note: The figures by Region are confined only to the concerned areas for the three study crops.

Majority of the area in the three model regions is occupied by forest land ranging from 17% of Region VI to 46% in Region II. The share of area devoted for production of irrigated rice ranges from 5% in Region XI to 7% in both Regions II and VI. The share of rainfed area ranges from 2% in Region II to 10% in Region VI.

Diversified crops areas, where corn and peanut are grown, the range is from 9% in Regions II and XI to 21% in Region VI. The share of the area devoted to agricultural production is highest in Region VI with a share of 52% and lowest in Region II with only 23% share. The land use Table is shown as follows :

Land Use	Region II		Region VI		Region XI	
	Area (000 ha)	Share (%)	Area (000 ha)	Share (%)	Area (000 ha)	Share (%)
Total physical area	2,227	100	2,020	100	3,535	100
Rice:						
Irrigated	162	7	150	7	175	5
Rainfed	38	2	194	10	91	3
Diversified crops	194	9	429	21	299	9
Permanent crops	111	5	278	14	554	17
Forest area	1,057	46	334	17	969	30
Pasture land	258	11	5	*	227	7
Grass land	385	17	300	15	641	20
Other land	69	3	332	16	280	9

* Insignificant

7.2 Seed Production and Distribution System and Organization

Experiment stations and seed farms producing parent seed in the Model Areas are Ilagan Experiment Station and Abulog Seed Farm for peanut seed in Region II , Visayas Experiment Station and La Granja National Crop Center for rice seed in Region VI and Davao National Crop Center and Tupi Seed Farm for corn seed in Region XI. La Granja and Davao NCCs are directly managed by the BPI and the other stations and seed farms are under the respective DA regional offices.

Ilagan ES, Visayas E.S and Davao NCC are centers for objective seed production and distribution in the respective regions. Peanut seed production in Abulog S.F is inactive due to unstable distribution of foundation seed from Ilagan ES. There are no large peanut producing areas in and around Abulog S.F. Rice seed production in La Granja NCC is unstable and limited to wet season due to no proper irrigation system. Rice seed distribution area from La Granja NCC to the seed growers is limited to Negros Island, while seed distribution is unstable and short to the seed demand in the area. Tupi S.F distributes mainly registered corn seed to seed growers within South Cotabato Province.

Those center stations in the respective regions procure the breeder and/or foundation seed directly from the IPB for peanut and corn seed, Economic Garden NCC for peanut, IRRI and Phil Rice for rice seed, or through the BPI, Manila. The foundation and registered seed produced by the above stations are distributed to the following registered and certified seed growers in the respective regions, to the other regions, or procured by the BPI and the DA crop production programs :

Item	Region II (Peanut Seed)	Region VI (Rice Seed)	Region XI (Corn Seed)
I. Stations in the Area			
1. B.S to F.S (F.S to R.S)	Ilagan ES	Visayas ES (La Granja NCC)	Davao NCC Tupi S.F
2. F.S to R.S	Abulog S.F	–	–
II. Source of Breeder Seed			
1. Institute (Location)	- Economic Garden NCC (Los Baños, Laguna) - IPB (- do -)	- IRRI (Los Baños, Laguna) - Phil Rice (Muñoz, Nueva Ecija)	IPB (Los Baños)
2. BPI Coordination	- Through BPI, but not always	Through BPI, but not always	Directly from IPB
III. Source of Foundation Seed			
1. Institute	IPB	–	- BPI, Manila - IPB
2. BPI Coordination	Not always	–	Not always
IV. Seed Growers			
1. Registered (F.S to R.S)			
a. Number	–	33	–
b. Area (ha)	–	43	–
2. Certified (R.S to C.S)			
a. Number	9	72	3
b. Area (ha)	10	500	5

7.3 Seed Production Activities

7.3.1 Peanut Seed

Production area for commercial peanuts in Region II is 4,480 ha in wet season (June, July - Sept., Oct.) and 21,520 ha in dry season (Nov., Dec. - Mar., April) on the average of 3 years (1986 - 88). The production is concentrated in Isabela province covering 83% of the area and 86% of the production in the region. Unit yields of the region are 0.5 t/ha in the wet season and 0.8 t/ha in the dry season, and kept at the low level.

Ilagan E.S takes important part of seed production in Region II, multiplying several varieties of foundation, registered and certified seeds using 1 - 2 ha in wet season and 4 - 5 ha in dry season with average yield of 1.0 - 1.7 t/ha. While among the varieties, mostly BPI Pn 9 is distributed to farmers since it has high seed quality. There are 13 private peanut seed growers in this region, but they did not receive certification for their products by seed quality control services.

Due to unfavorable condition for wet season cultivation such as excessive soil moisture content, a less amount of solar radiation and high humidity, quality peanut seed is short. It is urgently needed to settle the seed production system in the wet season by preparation of a drainage system in the field of Ilagan E.S or select the suitable field outside the station. Also it is needed to experiment cultivation method in wet season and simple methods to keep the seed harvested in dry season until next dry season.

In order to secure the breeder seed for the multiplication, it is advisable to produce breeder seed at Ilagan E.S under technical supervision of the breeding institute who released the varieties. Since most of peanut seed growers grow peanuts without any application of fertilizer. It is necessary to investigate the prevailing practices of seed growers and to give adequate recommendations.

7.3.2 Rice Seed

The rice production area in Region IV was around 449 thousand ha in the 3 years (1987 - 89) comprising 57% in wet season and 43% in dry season. Among the provinces, Iloilo is the largest rice producing province covering 46% of the area and 44% of the paddy production in the region. Unit yield of paddy in the region is 2.7 t/ha in wet season and 2.3 t/ha in dry season.

Visayas E.S has an important function in rice seed production in the region producing foundation and registered seed in wet season (May, June, July - Sept., Oct.) with 32 ha and in dry season (Oct., Nov., Dec. - Feb., Mar.) with 5 ha of seed field. The station produced foundation seed of 12 t and 71 t annually of during 1984 to 88. Registered seed of 132 t was produced by the selected seed growers of the region.

Average yield was 1.7 t/ha and 2.5 t/ha for foundation and registered seed respectively, but these includes a drought year. It is said 4.3 - 5.5 t/ha in gross yield and 2.9 - 3.2 t/ha in net seed yield in the normal year. About ten (10) rice varieties are produced by the station. Among them, IR 36, 64, 70, 72, 74 are common for their favorable traits such as high yield, pest resistance, early maturity or good eating quality.

Seed growers, in the average of 5 years' data, produced certified seed of 1,190 t from 723 ha with 1.7 t/ha of average yield. This certified seed production corresponds to 117% in harvested area and 54% in production to the production target. In 1989, area of seed production by seed growers was 555 ha in wet season and about 1/3 of that in dry season. The average seed yield of the growers is said 4.0 - 4.3 t/ha in the normal year.

Visayas E.S suffers from a shortage of irrigation water, hence the seed production area is limited to 5 ha of the 44 ha seed field. Registered seed production heavily relies on the efforts of selected seed growers. Improvement or development of irrigation facilities in Visayas E.S are desired to produce the requirement of registered seed in the region.

Each seed grower was mostly growing several varieties in the same season. This involves a risk of varietal mixture during field management and seed processing. Reduction of the number of varieties grown by a seed grower is needed.

It is worth due consideration that seed requirement will be increased in the future by reason of recent increase in direct seeding of rice using more seed than transplanting owing to a shortage of labor in the rural community. And it is also desirable to mechanize the field management such as weeding, and the laborious work of seed production, as a countermeasure for the shortage of labor.

7.3.3 Corn Seed

Corn production area in Region XI is 602 thousand ha in wet season (May, June - Aug., Sept.) and 174 thousand ha in dry season (Nov. - Feb., Mar.) in the average of 3 years (1987 - 89). White corn is cultivated more widely than yellow covering 68% of the area in the wet season and 90% in the dry. Recently yellow hybrid corn production has increased and occupies about 10% of the area of yellow corn.

Davao NCC and Tupi S.F are producing foundation and registered seed of open pollinated corn for the region. In 1989 Davao NCC planted white corn seed of 2 ha both in wet and dry seasons, and Tupi Seed Farm planted yellow corn seed of 1.5 ha in wet season and 2.5 ha in dry season. Now only 2 varieties, IPB Var 1 of yellow corn and IPB Var 2 of white corn are produced and distributed.

Corn seed production by the private growers was limited in the region. Seed growers produced the following open pollinated registered and certified corn seed in the average of 3 years (1984 - 88) :

Kind of Seed	White Corn		Yellow Corn	
	Area (ha)	Production (t)	Area (ha)	Production (t)
Registered	4.1	6.1	10.1	9.5
Certified	4.5	2.8	12.5	12.7

The DA Regional Office made a plan to increase corn seed fields with 38 ha in the wet season and 129 ha in dry season as well as number of private corn seed growers under the Corn Productivity Enhancement Program. This aims at the certified corn seed production of 419 t in 1990.

Seed production of white corn is about the same quantity with that of yellow corn. While the coverage of white corn production is 74% of the total area in the region. This shows insufficient in extension of recommended white corn varieties and is required more efforts on seed production and distribution of white corn varieties for farmers.

It is said that the corn borer and corn earworm are major constraints to corn seed production in the field, and insufficient drying of wet season products causes deterioration of seed quality. Provision of adequate drying facilities is indispensable.

7.4 Seed Quality Control

7.4.1 Seed Inspection Services

The number of seed inspectors by province in each model area are as follows ;

Region II		Region VI		Region XI	
Nueva Vizcaya	7	Aklan	2	Davao City	1
Isabela	15	Antique	1	Davao del Sur	2
Quirino	2	Capiz	2	South Cotabato	3
		Guimaras	1	Davao Norte	3
		Iloilo	4	Davao Oriental	2
		Negros Occ.	1	Surigao Sur	3
Total	24		11		14

Seed inspectors have been working under the supervision of provincial seed coordinators within the administrative organization, while performing seed inspection activity cooperate with STL in technical matters.

Most of the seed inspectors hold other services or seasonal assignments except in a few cases. Most of the seed production in each model area is rice seed production. Of peanut

seed only 200 cavan (4 samples) produced at Ilagan E.S by STL No. 2 San Mateo was certified, and 243.2 cavan (16 samples) certified by STL No. 15. Davao City according to SQCS Annual Report 1989. At present the seed inspectors executing to the seed inspection service are not familiar with the seeds of peanuts and corn actually. Therefore, additional training in field inspection practices for these two objective seed crops will be necessary.

The seed inspectors perform their field activities in accordance with the seed inspection manual. The frequency of the annual field inspection trip of seed inspector to their assigned seed fields is 12 - 18 times in some cases, and 6 - 9 times in others. The round trip distance between the office and assigned seed fields is differs depending on the topographic conditions and the dispersion of field sites. The provision of transportation for the daily trips of seed inspectors is always a constraint. Therefore, the establishment of new STLs or STL branches is seriously being considered to solve the constraints caused from the remoteness of STLs from the seed fields.

7.4.2 Seed Certification Services

Seed certification is the main service of STL, and presently, the following numbers of persons and engaged in the seed certification services.

Region (STL No.)		Regular Staff				Part-time Staff
		Seed Analyst	Seed Inspector	Others	Total	
Region II (No. 2)	- 1989	6	0	5	11	4
	- 1990	5	0	1	6	4
Region VI (No. 9)	- 1989	8	3	1	12	5
	- 1990	8	3	1	12	5
Region XI (No. 15)	- 1989	5	1	3	9	3
	- 1990	5	1	2	8	3

The certification services are performed by the regular staff who have multiple roles with the cooperation of part-time staff. Smooth operation of STL could not be performed without the experience of the skilled staffs (daily paid). To increase the number of staff or to make part-time staffs regular staff should be seriously considered for the success of this project which will require an intense in the testing of samples.

Table 7.4.1 shows the results of seed certification in each model area in 1989. The number of seeds received for seed certification are shown below;

	Region II	Region VI	Region XI
Peanuts	4	0	1
Rice	656	559	653
Corn	37	2	16
Others	3	0	48
Rejection	53	44	31
Total	753	605	749

According to the summary above, all STLs perform the certification service mainly for rice seed. Consequently it is considered that the certification techniques for peanuts and corn are not yet sufficiently well known to the seed analysts, so training in peanut and corn seed testing techniques must be given to all STL analysts.

The main reason for rejection of seed certification is low germination caused by insufficient drying i.e. high moisture contents, and it is found during the wet season particularly. The testing equipment existing in the STLs has been used for more or less 10 years, so the equipment should be considered for replacement to strengthen the testing systems of STL.

7.5 Seed Production, Processing and Storage Facilities

7.5.1 Seed Production Field

(1) Present Condition of Seed Production Field

The area, formation, geographic and consolidative status of present seed production fields in the representative Farms are as follows :

Item	Ilagan E.S	Visayas E.S	Davao NCC
Total area of Farm Block	33.0 ha	44.0 ha	20 ha
No. of Field block/lot	6-Field lots	10-Field blocks /1 Typical field lot	2-Field lots
Area of Field Lot/Lot	8.8 ~ 3.0 ha	0.25 ~ 0.4 ha	10 ha, 3 ha /2
Kind of Field	Up-land	Low-land	Up-land
Soil	Clay Loam	Clay Loam	Clay Loam
Inclination/Leveling Deg.	Slightly Incline/rolling	Almost Level	1/20 ~ 1/30 Inclined
Consolidation Status	Irregular shape	Readjusted	Irregular shape
Irrigation System	Available	Available	Function Lost /3,4
Drainage Condition	Partially poor drainage	Insufficient maintenance	Plot-to-creek
On Farm Road	Insufficient Maintenance	Insufficient Branch Road	Insufficient Branch Road

/1: Some field blocks include research lots
/2: Exclude permanent crops planted area
/3: Nursery irrigation is made by the domestic water resources
/4: Existing systems have lost initial function, however, it is useful for the Manambulan substation.

(2) Present Conditions of Irrigation Systems

The irrigation system, irrigation method, water supply conditions, and problems existing in the Ilagan E.S, Visayas E.S, and Davao NCC which is representative seed production farm in the model area are as follows respectively :

Item	Ilagan E.S	Visayas E.S.	Davao NCC
Water Source	Pinacanun River Water	NIA Tigum Irrigation System	a) Lipadas River water b) NPC Canal Water /1
Supplemental Source		Lagoon	
Water Intake System	Pumping-up	Gate Controlled Division	Intake without diversion dam
Amount of Water Intake /2	10 ~ 15 l/s	0.2 m^3/s	a) 20 l/s b) 15 l/s
Water Conveyance System	Boost by Pump	Gravity	Gravity
Type	ø100 pipeline Hand carry traveling system	Open concrete flume Fixing	ø100 pipe line Fixing
Irrigation Method	Sprinkler/intermittent and Furrow	Ponding/continuous	Furrow/intermittent
Related Facilities	Pump-site Portable pump/eng. unit Portable main/sub pipe line Portable lateral pipeline Sprinkler	Settling Basin /3 Pump/engine unit/3	Manambulan Farm pond Davao Farm Pond/5
Problems	- Existing equipments, it is too poor to cover the whole field lots. Available sprinklers are 20 sets only	- Cropping intensity for the dry season is below 15% of total seed production field lots.	- Both of these system are lost the initial function because they are old or damaged by the natural disaster

/1: NPC: National Power Corporation
/2: Estimated by the Team
/3: No effective flushing system for sediments, accordingly the basin is full of sediment and weeds

(3) Miscellaneous

a) Drainage Conditions

- Visayas E.S: although it is not always easy to judge that the drainage system is adequate, there are separate systems of irrigation and drainage canals with a total length of 1,326 m.

- Davao NCC: the gravitational drainage flows out plot to plot to a creek according to the present status of the topographical conditions and the establishment of field blocks. Accordingly, there are reasonably good drainage conditions excluding some lower areas along the creek.

- Ilagan E.S: the seed production field block is slightly rolling and inclined, and some fields have a lower zone along the boundary of neighboring lot, where commonly during the rainy season, there is occasional inundation and submergenced of the seed crops, because there is no drainage.

b) On-Farm Road Condition

Except for some trunk roads, most of the on-farm roads are un-pavement and with no maintenance and limited trafficability. In addition to this, there are no-branch roads and temporary ones only occasionally.

c) Manambulan S.F

The Davao NCC is located about 6 km north-west from the Manambulan substation.

Out of 50 ha in total area, 11 ha is seed production field lots, and the foundation seed of open pollinated corn, mungbean, peanuts, and various vegetables are produced.

There is abundant rainfall, but the supplemental watering in the dry season has to be carried out by the furrow irrigation from the water conveyance system of Davao NCC.

7.5.2 Seed Related Machinery and Equipment

(1) Farm and Post Harvest Machinery

Ilagan E.S (Region II), Visayas E.S (Region VI), Davao NCC and Tupi S.F (Region XI) were provided with farm and post harvest machinery under ESPDP, Second Kennedy Round and other projects as follows :

1) Ilagan E.S in Region II

The farm was provided with one large, three medium and 12 small scale of four wheel tractors. The types of tractors provided are suitable for lowland and upland farming on this farm, however the quantity of them is somewhat excessive for the total area of 55.2 hectare. However, 8 units out of fifteen are worn out and beyond repair. The remained 8 units are still operable but quite often require serious repair, and will require replacement in the near future.

2) Visayas E.S in Region VI

The farm was provided with 3 medium and 8 small of 4 wheel tractors and 2 units of hand-tractors. This E.S has only lowland fields, therefore the farm works do not require large scale machinery. The type and capacity of machinery provided are almost suitable to this E.S field, but the quantity if excessive for a field area of 44 hectares in this ES. Of the seven units more than half of these are not functional due to the damage beyond repair. The remained other 6 units are also worn out.

3) Davao NCC in Region XI

The farm was provided 19 tractors, one large, 5 medium and 13 small scale, and other machinery under ESPDP and other projects or BPI self. These tractors were distributed to NCC itself and the neighboring Manambulan farm. The two farms cultivate mainly fruit which does not require the farm machinery. The farms cultivate also crop seeds in the areas of 25 hectares. The total capacity of these machine exceeds the required capacity for these areas. Out of 19 units 11 units are beyond repair, and are not utilized. The remained 8 units are in a similar situation with the other regions, i.e. they require to be renewed. On the other hand in Davao NCC farm, there are a plenty of big stones buried. These stones greatly interfare with farm mechanization. Removal of these stones is necessary for the rational cultivation. Tupi S.F was provided with 2 medium and 3 small scale four wheel tractors

under ESPDP. The farm has 25 hectares of upland fields and 9 hectares of lowland rice fields. The total capacity and types of tractors are appropriate for these fields, however only one medium scale tractor is functional. The other tractors are beyond repair, so the farm is very much lacking mechanical cultivation power. One unit needs to be replaced as it is a very old model.

(2) Seed Processing Machinery and Facility

1) Ilagan E.S in Region II

The farm has a corn seed processing plant, but no machinery or equipment for peanuts seed which is the objective crops for this station. All the harvesting and processing works for the peanuts seed is being done manually.

2) Visayas E.S in Region VI

The farm has a one ton per hour capacity rice processing plant, which is will used. The plant is processing seeds produced not only at the station itself but also by the private seed producers in the province in which it is located as well as in the neighboring province of Capiz. About six varieties of seeds processed, and the plant and dryer have to be cleaned out at every change of variety. This cleaning takes time and lowers the efficiency of the plant use. To improve the efficiency of the plant the capacity of plant needs to be strengthened, by increasing the number of machine sets, not by enlarging the size of machine.

3) Davao NCC and Tupi S.F in Region XI

These farms were each provided with a 0.6 ton corn processing plant. The plant at Davao NCC was transferred to Region XII to meet an emergency requirement. On the other hand the plant supplied to Tupi S.F was fully utilized when first installed but only part of the plant is being utilized now as the requirement from the neighboring private sector has not risen. However, several private seed producers started production in the vicinity of the station and farm in early 1990 under the CPEP project, and it is expected that in future the plant will be fully utilitsed.

The private sector seed producer always considers the method of seed processing in terms of commercial feasibility, so mechanical seed processing is really difficult to promote in the private sector. However, recently seed drying has become required due to multi-cropping becoming popular, and the position may change.

(3) Cold Storage Facilities

Cold and dehumidified seed storage facilities were provided in the model areas of Visayas E.S and Davao NCC. The necessary water, electricity and ancillary equipment for their operation were not provided with the sets. As a consequence the sets have been abandoned since delivery and now after almost 20 years are unusable. Both sets would have used heat insulated chambers with window air-conditioners for cold storage.

The seed producing companies for hybrid corn are utilizing a cold and dehumidified storage warehouse, but general private seed producers do not utilize any conditioned storage facilities at all.

(4) Seed Transportation Equipment

Each government farms in the model area, Ilagan E.S in Region II, was provided with one of the 4 WD multi-purpose vehicle and cargo truck, and these have each run more than 400 thousand kilometers. They have exceeded their working life and require replacement.

Visayas E.S in Region VI was provided with two 4WD multi-purpose vehicles and one cargo truck. These are now in the same condition as those above and require renewal.

Davao NCC in Region XI was also provided with two 4WD multi-purpose vehicles and one cargo truck. They also require renewal.

7.5.3 Buildings

The current situation and reccurring problems in the model areas are not different from those in other regions. There are Seed Processing Plants for corn, rice and corn at Ilagan Experiment Station, Visayas Experiment Station and Tupi Seed Farm respectively. There is no Seed Processing Plant at Davao NCC. New plants are expected to be established at the Ilagan Experiment Station for peanuts, at the Visayas Experiment Station for rice, and at the Davao NCC for corn .

There are bodegas for corn at the Ilagan Experiment Station, and at the Visayas Experiment Station, Davao NCC and Tupi seed Farm for rice . There is also a steel structure warehouse for corn at Quirino.

The Seed Testing Laboratory at the Cagayan Valley Experiment Station is constructed on the basis of the original drawings, but at the Visayas Experiment Station and Davao NCC the laboratories were constructed after amendment of the original drawings. Nevertheless the space in both buildings is still small.

All these laboratories need water. The need of water at the Visayas Experiment Station stems from lack of groundwater and from salty water, while at the Cagayan Valley Experiment Station and Davao NCC the problem is lack of an exclusive-use water supply.

7.6 Seed Marketing, Distribution and Monitoring Activities

7.6.1 Government Seed Procurement and Distribution Activities

(1) Procurement of Seed

Ilagan E.S for peanut seed, Visayas E.S for rice seed, and Davao NCC and Tupi S.F for corn seed procure breeder seed from the Breeding Institutes for multiplication of foundation seed. The distribution of breeder seed to the above stations is unstable except at Davao NCC for corn seed. Ilagan E.S received breeder seed only in dry season cropping and only 3 times in the last 5 years. Tupi S.F received breeder seed 4 times in the wet season in 4 years. Foundation seed distribution to the above stations is considered to be a casual activity except in the case of damage to seed production by natural calamities.

The DA regional office in Region VI procures around 88 t of certified rice seed using ₱ 700 thousand out of the total investment outlay of ₱ one million per year. The seed is mainly procured in Iloilo Province from dry season produce and is distributed to farmers in the region who are affected by natural calamities. This buffer is also used for distribution to other regions under the Calamity Program.

(2) Distribution of Seed

Visayas E.S regularly distributes rice foundation seed, while distribution of corn foundation seed from Davao NCC has been seldom and the other stations' have been unstable. Major destinations of foundation seed have been government procurement for peanut seed, and seed growers within the regions for rice and corn seed. Distribution of registered rice and corn seed were regularly done, while registered peanut seed was distributed by Ilagan E.S in only 3 seasons in the last 5 years. This limited distribution

mainly arose from unstable distribution of breeder seed and shortage of foundation seed. Ilagan E.S has no peanut seed storage facilities for maintenance of germination till the next planting season.

(3) Seed Storage

Seed storage is commonly done by the stations except Davao NCC which has no seed storage facilities. Duration of seed storage is limited to less than 6 months for rice and corn seed in Visayas E.S and Tupi S.F respectively and to 2 months for peanut seed in Ilagan ES. The peak storage period of rice seed is during March to May after the dry season harvest because rice seed needs to be stored up to wet season planting and wet season demand is bigger than dry season. In case of corn seed, the peak storage period was during October to December after wet season harvest . Peanut seed storage in Ilagan E.S was limited to the dry season product during June to July because seed production was mainly done in the dry season.

7.6.2 Private Seed Marketing Activities

(1) Procurement of Seed

Peanut seed growers in Region II exist only in Maddela Municipality, Quirino Province. Source of foundation and registered seed of peanuts is limited to Ilagan ES. The parent seed distribution from Ilagan E.S was unstable, hence peanut seed production by the seed growers is inactive at present. Commercial peanut producers are using non-certified peanut seed prepared from the previous cropping or buying from the neighboring farmers and traders. Non-certified seed has been brought from Pangasinan Province in Region I by traders.

Registered rice seed growers in Region VI are procuring foundation seed from Visayas E.S and selling registered seed to the certified seed growers located in the same province. Procurement of rice parent seed is well coordinated between the station and seed growers under the supervision of regional and provincial seed coordinators as well as the provincial seed producers associations and their federation.

Corn seed growers in the Region XI were officially appointed in 1990 for promotion of the Corn Productivity Enhancement Program (CORN PEP), hence the demarcation between registered and certified seed growers is unclear. Foundation seed from Tupi S.F or the DA Regional Office has been distributed to certified corn seed growers

appointed in South Cotabato Province or Davao city and Davao del Sur province. Distribution of registered seed from the above agencies and Davao NCC has been done in parallel with foundation seed. The corn seed distribution as well as seed procurement by the corn seed growers is not well coordinated. A system and organization for corn seed procurement and distribution in the Region should be established.

Based on the questionnaire survey to the seed growers in the Model Areas, peanut, rice and corn seed growers are procuring parent seed 11, 22 and 19 days before planting respectively. Parent seed procurement by the seed growers is done before or during land preparation at least.

(2) Seed Marketing

The quantity of peanut seed marketed is less than 60 % of the total seed product in Maddela, Region II. Peanut seed is produced on around one ha per grower and only in the dry season, hence home use of seed is larger. Peanut seed was sold within one month and 20 days on average after processing of seed. The main seed marketing outlet is the Maddela Peanut Planters Cooperative.

Rice seed growers in Region IV are selling about 80 % of the total seed product within one month on average after seed processing. The government seed procurement is predominant taking 57 % in the wet season and 44 % in the dry season. Marketing shares directly sold to commercial farmers are 17 % and 28 % respectively. Certified seed produced by the seed growers in the region is distributed to the other regions i.e. Bicol, Bohol, Leyte, Palawan under coordination of the regional seed coordinator as well as the seed producers associations. The quantity of certified seed distributed during 1987 to 1989 was around 200 to 300 t/year.

The marketing share of corn seed in Region XI is around 65 % of the total product. About 38 % of the product is sold to commercial farmers one month after seed processing. The government procurement of corn seed is limited to a few percent.

(3) Seed Storage

The seed growers store less than half of the seed product in the own traditional warehouses. The longest period for seed storage was 3 months for rice and 2 months for peanuts and corn.