FINAL REPORT
ON
EAST JAVA MAIZE PROJECT

1968—1974

JAPAN INTERNATIONAL COOPERATION AGENCY

Feb. 1975

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FOREWORD

The annual production of maize in Indonesia reached to the volume of around 2.6 million tons, and it represents the second largest production among countries in South and South East Asia, only next to India. Since the product had been consumed mostly by producing farmers themselves and sold in the domestic market, exportation of maize was very much limited.

Therefore, the Government of Indonesia worked out a plan of increasing production of maize in East Java in order to stimulate the production in the region and to promote its export, and asked the Government of Japan to cooperate with the plan.

Upon this request, Japan International Cooperation Agency (J.I.C.A. - formerly called Overseas Technical Cooperation Agency) had worked in cooperation with the Government of Indonesia for this project for six years from April, 1968 to July, 1974. This project was expected to play an important role as a pilot scheme of maize production development in Indonesia by means of extending a comprehensive technical cooperation including increase of mazie product, improvement of varieties, development of transaction organization and upbringing of agricultural cooperatives.

Now, this technical cooperation has been terminated, having completed its important responsibilities and in admiration of Indonesian authorities.

This report is a compilation of individual reports submitted by each expert and was edited as a final report of the technical cooperation in this project.

I should be most happy if this report could be a useful document for those who not only directly participated in this project, but also are going to take part in international cooperation project in this field in the future.

Finally, I would like to express my heartfelt thanks to the authorities concerned in Indonesia and Japan for their intensive and continuous cooperation during the period of the implementation of this project.

February 1976

Shinsaku Hogen
President
Japan International Cooperation Agency

Preface

This project named the Maize Project in East Java has cooperated in development of maize production, supply of seeds, fertilizers and farm machinery, culture, collection, processing, storage, domestic marketing in five selected districts in East Java and promotion of export of products to Japan, keeping a close connection with the Ministry of Agriculture of Indonesia, the National Federation of Agricultural Cooperative Associations and key farmers participating under this Project.

This report mainly consisted of each account submitted by the exports who had been engaged in this project since 1967 when the Record of Discussions was renewed for further cooperation between the Governments of Indonesia and Japan.

In looking back upon the Project lasted for six years, the author does feel that it would not be so easy for the experts to carry out their responsibility in dealing with other added activities as well as their own professional ones in the respective projected areas.

The Project been considered unprecedented in a system of technical cooperation activity, there have been various trials and errors on the way of project implementation. On the other hand, it is our great pleasure to hear the favourable evaluation on the achievement of this Project by authorities concerned, in which Indonesian local staff have experienced the foundamental principles of agriculture such as farming production, distribution and marketing of products, establishment of Organizations and their management.

The authors wish this report will be of any help for future agricultural projects, considering Agricultural cooperation with developing countries will become more and more important in future.

In conclusion the authors should say that they wish to express their gratitude to the authorities of the Central Government of Indonesia, the Ministry of Agriculture, the Provincial Government of East Java, the National Federation of Agricultural Cooperative Associations, the key farmers, the Embassy of Japan and J.I.C.A. (formerly called O.T.C.A.) Jakarta Office which had been greatly assisting us in implementing the Project effectively and, at the same time, we present our sincere condolences to Mr. Hiroshi Tokunaga, former chief for Japanese Experts, who passed away on the way of his duty in Indonesia.

Yoshiharu Tamura
Chief of Japanese Experts for the Project
Japan International Cooperation Agency

CONTENTS

CHAPTER I

INTRODUCTION

Section 1: Introduction (Gist)

(Yoshiharu Tamura, Leader, Japanese Expert Team)

Chapter 1: General Outline on Agriculture in East Jave

1. Natural Environment Factors

East Java is a topographically blessed area the soil of which is generally productive and very few natural disasters break out, but there exist minus areas where there is a lack of food, such as Madura Island and the mountainous southern part of Malang.

Topographically, volcanoes of 2,000 to 3,000 meters in height exist from east to west in the middle part of East Java. The dry fields encompassed in this project stretch over the vast skirts of the volcanoes. Consequently, the relationship with the volcanoes cannot simply be ignored.

Alluvial plains stretch along the Bengawan Solo, Java's longest river; the Brantas, the second longest river; and rivers both in Banyuwang and Lumajang. The basins of these rivers overflow in the rainy season of every year, thus making it possible for water containing volcanic ashes to retain fertility of the soil.

The annual rainfalls average 1,800 mm in 65 percent of the area, 2,700 mm in 27 percent and upwards of 2,700 mm in the remaining eight percent (consisting mostly of mountains). Consequently, it might well be said that East Java is blessed with abundant rain.

2. Cultivated Land

Cultivated land accounts for about 58 percent of the total area of East Java, and this percentage is by far higher than the rate of nine percent registered for the entire national land of Indonesia. Therefore, high hopes cannot readily be pinned on a further raise in the acreage of cultivated land. In order to boost farm production, there would presumably be no alternative but to encourage better uses of land, such as redevelopment of the foundations of farmland, uses of better seeds and fertilizer and rotated cultivation.

3. Surplus Manpower

East Java Province has a population of 25,527,000 (population density at 539 persons per square kilometer), and the population continues to increase at a rate of 2.4 percent (or about 612,000 persons, which corresponds to the population of Tottori Prefecture) a year, with the consequence that unemployment poses a grave social problem. The population of farmers accounts for 65 percent of that of East Java. Due to the existence of a traditional system of equally apportioned land inheritance, the subdivision of cultivated land and the increase of Buruh Tani (landless farm workers) are being accelerated.

4. Mechanized Farming

The per capita national income of Indonesia is reported as standing at U.S.$70 ∿ 80, but the per capita income of farmers in East Java Province is extremely low (about $30). Most of the formers make it a practice to live on agriculture, instead of accepting it as an enterprise, and the surpluses from their consumption are put on the market. Consequently, it would be economically difficult for these farmers to shift to mechanized farming.

5. Role as Food Supply Base

Farm produce in East Java Province comes in a wide variety, and its main crops account for 20 ∿ 40 percent of the national output, the surpluses being diverted to other Provinces.

Rice crops have been increasing year after year due to Bimas Pady enforced under the First Five-Year Program. On the other hand, dry field crops, particularly maize, have been gradually decreasing year after year both in terms of harvest acreage and output.

6. Role of Overseas Chinese in marketing system

The distribution structure is virtually in the possession of Overseas Chinese, and their function and role in the commercialization of agriculture in East Java Province cannot be disregarded. It cannot be ignored, either, that this phenomenon has driven East Java's agricultural economy to come to a standstill. As a countermeasure, the Government has come up with the idea of bringing up BUUD (See Datum 2).

Section 2: Features of the Project

1. Source of the Project

In Indonesia, (1) the Tani Mahmur Lampung Project, (2) the West Java Food Increase Project, (3) the Bogor Joint Food Crop Research Program, and (4) the Tajum Pilot Scheme are in force. All these projects are placed under the jurisdiction of OTCA's Department of Agricultural Development Cooperation, whereas the Maize Project was managed by the defunct Products Development Cooperation Office.

2. Test Pilot of One Package Formula

With respect to the desirable way of agricultural cooperation, there has in recent years been an increasing awareness of the necessity of the One Package Formula (an integrated project encompassing diversification of development items, fabrication adjustment and consolidation of foundations for distribution), and there have been increased signs for aid receiving nations to go in for this formula. The Maize Project, which differs somewhat from this formula and smaller in dimension, has evolved in a manner similar to this formula.

3. Development and exportation

The Maize Project, as clarified in RD, is designed primarily to boost the trading of maize between Indonesia and Japan. The ways and means to accomplish this purpose include the induction of a credit system, expansion of the production of maize with new cultivating technology and streamlining of the distribution structure by farmers' organizations.

From the first through the fourth years, the Maize Project had been evolved mainly for exportation. As many parts of the world suffered from early cold weather or droughts in 1972, the shortage of food in Indonesia became acute, with the consequence that the Indonesian Government was forced to tide over the predicament with the importation of massive foreign rice and maize. In the meantime, the Indonesian Government's agricultural policy has been so changed that priority is shifted from the acquisition of foreign currency with exports to the satisfaction of the domestic demand. In the light of these changes, Indonesia gave up maize exports to Japan since the fifth year of the Maize Project and placed emphasis on cooperation with Bimas Jagung and the upbringing of model BUUD's.

BUUD (Village Unit Enterprise), essentially, is a village-unit enterprise entity organized primarily in a rice plantation area, and its main line of business is to (1) stabilize rice prices, (2) store, and take custody of, rice in cooperation with the Government, and (3) finance farmers for fertilizer, seeds and farm management. In 1973, the Government established BUUD's in dry field farming areas, absorbing the erstwhile BUUD's. This policy of the Government is strategic in nature in that it is apparently designed to establish BUUD's, each covering at least 600 ∿ 700 hectares, in place of the conventional BUUD's which was eatablished for each Desa and whose area coverage was limited, and also bring up a powerful group to meet the Overseas Chinese Organization.

4. Local Resident System

The Maize Project has evolved in the five Kabupaten (Kediri, Malang, Lumadjang, Bondowso and Bonyuwang) specified in an appendix to RD. These districts are situated 128, 90, 154, 196 and 297 kilometers, respectively, from Surabaja. To put this project into force, therefore, there arose a need to station experts in these districts. The local resident system has its own merits and demerits, and it would be difficult to draw a hasty conclusion as to which is better, the local resident system or the regional concentration system. (See Datum 3.)

Chapter 3: Measures Necessiated by Termination of the Project

On termination of the Project, the most difficult questions with which we, the experts, were confronted were: (1) In what pattern should the achievements of the six-year Project be left in East Java?; (2) What should be done for a smooth turnover of technology and clearical work to the Indonesian side?; (3) What measures should be taken for post-Project care?

With respect to (1), it would seem difficult to leave corporeal assets, such as real estates (buildings), in the light of the nature of technological cooperation specified in the Project. As an idea, it was proposed to build a training center on the compounds of the Bedali Agricultural Development Center with a view to expanding and strengthening this organization, but this plan eventually proved abortive. Equipment to be supplied in 1973 was selected with primary emphasis placed on the supplying of repair parts for the existing instruments and machines.

As regards the turnover of technology and clearical work in (2), above, they were such in nature that they should be carried out at all times by us, the experts, as their primary duty prescribed in the Project. As the last work of the final year of the Project, all the Japanese experts and the Inspector of Agricultural Extension Service of the East Java Provincial Government and other parties concerned joined in holding a two-day Indonesia-Japan conference at Maura, Malang, in February this year to assess and discuss overall problems. Again in March this year, the OTCA Survey Team, Japanese Experts' Team and officials of the Agricultural Extension Service held a joint meeting to assess the situation. For about 30 days in May through June, each expert held an agricultural technology seminar for three to five days at the Malang Agricultural Development Center. In July, the Japanese experts held meetings with the Director for Development Production of Food and the Director General for Agriculture, both of the central Government.

With reference to post-Project care in (3), above, negotiations with the Indonesian side were started last year, and it was informally decided that experts on quality control, distribution improvement and breeding are left for another one or two years. This plan, however, has been scrapped in line with a decision of OTCA.

Mr. Martono, Inspector of the Agricultural Extension Service, and Mr. Soehandi, Director for Development Production of Food, were enthusiastic about the continued stationing or new assignment of experts for post-Project care. At the same time, they called for the formulation of a new project for second crops, which would take the place of the Maize Project.

Section 4: Evaluation of the Project

1. Effects of the Project in Productivity

(a) Propagation of Farm technology

In the past five years, the Project has been evolved in five Kabupatan covering a total area of 25,443 hectares, and the farm households which have participated in this Project total 38,608. In other words, this Project encompassed only 2.6 percent of the total area of East Java and merely 1.1 percent of its total population. The learning by these farm households of the merits of the cultivation standards, credit system, quality seeds and fertilization stipulated in this Project will contribute greatly to the furtherance of dry-field cultivation in East Java Province in the future.

Resident experts were stationed in Kediri, Malang, Lumadjang, Bondowso and Banyuwang under the local resident system adopted for this Project, and we believe that this system was quite instrumental in encouraging them to come into direct contact with local government officials and farmers and served not only in the propagation of agricultural technology but in man-to-man interchanges through the evolution of the Project, such as demonstration farms and training.

(b) Establishment of Seed Production System

Under this Project, in line with the principles of plantation of crops best fitted to given districts, the species suitable for plantation in each district, such as Kretek for Kediri, Harapan for Malang, PS42 for Lumadjang, BC2 for Bondowso, and Metro for Banyuang were selected and supplied to farmers. The production of these seeds had been conducted in each province from the first through third years as extension seeds. Established with the founding of the Maize Center, however, was a system that the Maize Center would take charge of the production of foundation and stock seeds and each province would put out extension seeds.

The Agricultural Extension Service of the East Java Provincial Government came to recognize the excellent quality of Kretek, the purification of which had successfully been done under this Project, and had started "Keretek-zation" in 1973 with a view to propagating it to other provinces. Keretek produced in Kediri was in use for Bimas Jagung on Maura Island both in 1973 and 1974.

(c) Repercussions to Other Provinces

The maize-cultivated area of Kediri totals 32,508 hectares (1972), of which the area in which the Project was unfolded covered 2,268 hectares (1972 ∿ 1973), or about seven percent of the total maize-cultivated area. The percentage shared by this Project was much higher than that of less than one percent registered for four other Kabupatan under the Project.

The production of maize in East Java, as is commonly known, has been on the gradual downturn in terms of acreage, output and per-unit yield, but the output and per-unit yield in Kediri alone is on the

upturn. In East Java Province, the output of maize averaged 1,010,212 tons (1960 ∿ 69) but dropped to 674,186 tons (1972), and the per-unit yield decreased from 7.57 quintals/hectare. Nevertheless, the output of maize in Kediri averaged 50,914 tons (1960 ∿ 69) but increased to 58,285 tons (1972), and the perunit yield rose from 11.11 quintals/hectare to 14.77 quintals/hectare.

Presumably, this increase may be attributed to the fact that the effects of quality Keretek and fertilizer, the use of which had been encouraged under the Project, were increasingly recognized by farmers not only in Kediri but also in other Kabupaten. (See Data 4 and 5.)

2. Effects of the Project in Marketing

(a) Upbringing of BUUD's

For the execution of tasks under the Project, there was a need for cooperation from the local agricultural co-op, the field organizational setup for local farmers, which took the charge of the collection, processing, storing and sales of maize and which granted credits to local farmers. In response to this necessity and also a call from Mr. Sadikin, Director General for Agriculture, Ministry of Agriculture, five model BUUD's were designated in the project area in 1972, and emphasis was put on their upbringing and strengthening with farm machinery (tractors, dryers, threshers, etc.) on lease.

Under the Project, 23 warehouses and 18 drying floors were constructed in the project areas for the collection, drying and storing of maize.

(b) The exportation of mazie from East Java had theretofore been conducted by Tenghulah (maize brokers), traders (foreign traders with Overseas Chinese capital in urban areas) and Japanese trading companies.

In June 1969, maize collected in repayment of the credits granted under the Project could be exported to Zen-noh (National Federation of Agricultural Cooperative Associations) in Japan through GAKOPERTA (Gabungan Koperasi Pertanian). Although maize exports to Japan could not be realized in the fifth and sixth years for the aforesaid reason, it was exceedingly significant that a system of maize exports to Japan was established through the farmers' organizations, BUUD's and GAKOPERTA.

(c) In East Java, maize was harvested concentratedly in the middle of the rainly season, so that crops were frequently rotten due partly to the few adequate drying facilities. Under the Project, the utilization of threshing and drying machines was encouraged, and efforts were made to prevent the decomposition and improve the quality with new exports quality standards.

3. Effects of the Projects in Economy

(a) The average yield per unit area by the participating formers in the Project stood at 25.2 quintals/hectare, over two times more than the 10.2 quintals/hectare registered by those who did not participate in the Project. Even when the quantity of 4.4 quintals/hectare which had to be paid as repayment of the credit granted by the project is subtracted, the average yield of the farmers which took part in the Project increased by 10.0 quintals/hectare. When this increase is computed in terms of the farmhouse delivery price of RP/25/kg, it means that the formers which took part in the Project could afford to raise their income by RP25,000/hectare with single cropping in the rainy season. Besides, the farmers which participated in the Project

could receive guidance on cultivating technology from Japanese experts and local agricultural extension officers and used quality seeds and fertilizer, so that the quality of harvested maize was far better than those of non-participating farmers and that participating farmers could put their products even on the domestic market in more advantageous conditions.

(b) The prices of fertilizer and seeds supplied to farmers under the Project were officially fixed, and the interests were extremely low (one percent a month) as was the case with Bimas Jagung. This system contributed to a lowering of the interests in the Ijon system which had been customarily enforced in rural communities.

4. Other Effects

(a) The achievements under Bimas Jagung (1973 ∿ 74) in five pilot Kabupaten of East Java was rated at as high as 98 percent, as against the national average of 72 percent and the East Java average of 81 percent. Particularly, Kediri and Malang attained the goal. The area of five Kabupaten in which Bimas Jagung is in force accounts for 25 percent of Indonesia and 40 percent of East Java, suggesting that the unfolding of Bimas Jagung centers around East Java's five Kabupaten.

(b) The Maize Center established as a result of the conclusion of the second RD has now developed into the nucleus of agriculture in East Java as an agricultural development center.

(c) Twenty-eight trainees trained in Japan have been playing a leading role in various fields since their return to Indonesia.

Chapter 5: A Review of the Project

1. Advisability of Selecting East Java as Maize Development Base

When consideration is given to the population of East Java and its population growth, availability of land for conversion into farmland, extremely low income level of local inhabitants, and the state of rural communities consisting mainly of petty farm hoseholds, any projects designed to develop and export a food crop indispensable for local inhabitants are not fitted to East Java as well as Java Island.

2. Local Dispersion of the Project and the Local Resident System

The local dispersion of the project and the local resident system have their own merits and demerits. No hasty conclusion could not readily be made as to their advisability.

The effects of the local resident system are exceedingly significant in terms of dissemination and propagation of agricultural technology and man-to-man interchanges.

The effects of this system are not powerful in terms of concentration of all the power available for this Project.

3. Adoption of In-Kind System

The adoption of an in-kind system in the early phase of the Project might be looked upon as conforming to the realities in the light of traditional practices in rural communities (such as the Ijon system). Now that Bimas Jagung has been enforced, the existence of two different credit systems in one and the same province not only puts farmers into confusion but also puts heavier burdens on the Agricultural Extension

Service which is responsible for the implementation of Bimas Jagung. Consequently, the existence of the two systems is undesirable.

4. Goals of the Project Versus Japanese Experts

For the implementation of any project, a full advance survey should be conducted, goals set and implementation programs formulated for presentation to Japanese experts.

When Japanese experts are to be replaced, we would consider it necessary to refrain from replacing at least one expert, who could follow up on the project from beginning to end.

5. Equipment Supplied

In the selection of equipment to be supplied, full consideration should be given to local manpower, wages, electric power and government budgets. We would consider it necessary to refrain, as much as possible, from supplying the kind of equipment whose management, maintenance and storage are expensive.

Mr. Martono, Inspector of the East Java Provincial Government's Agricultural Extension Service, and Mr. Soehandi, Director for Development Production of Food, Ministry of Agriculture, have strongly called for the implementation of agriculture development projects designed not only for maize but also for second crops.

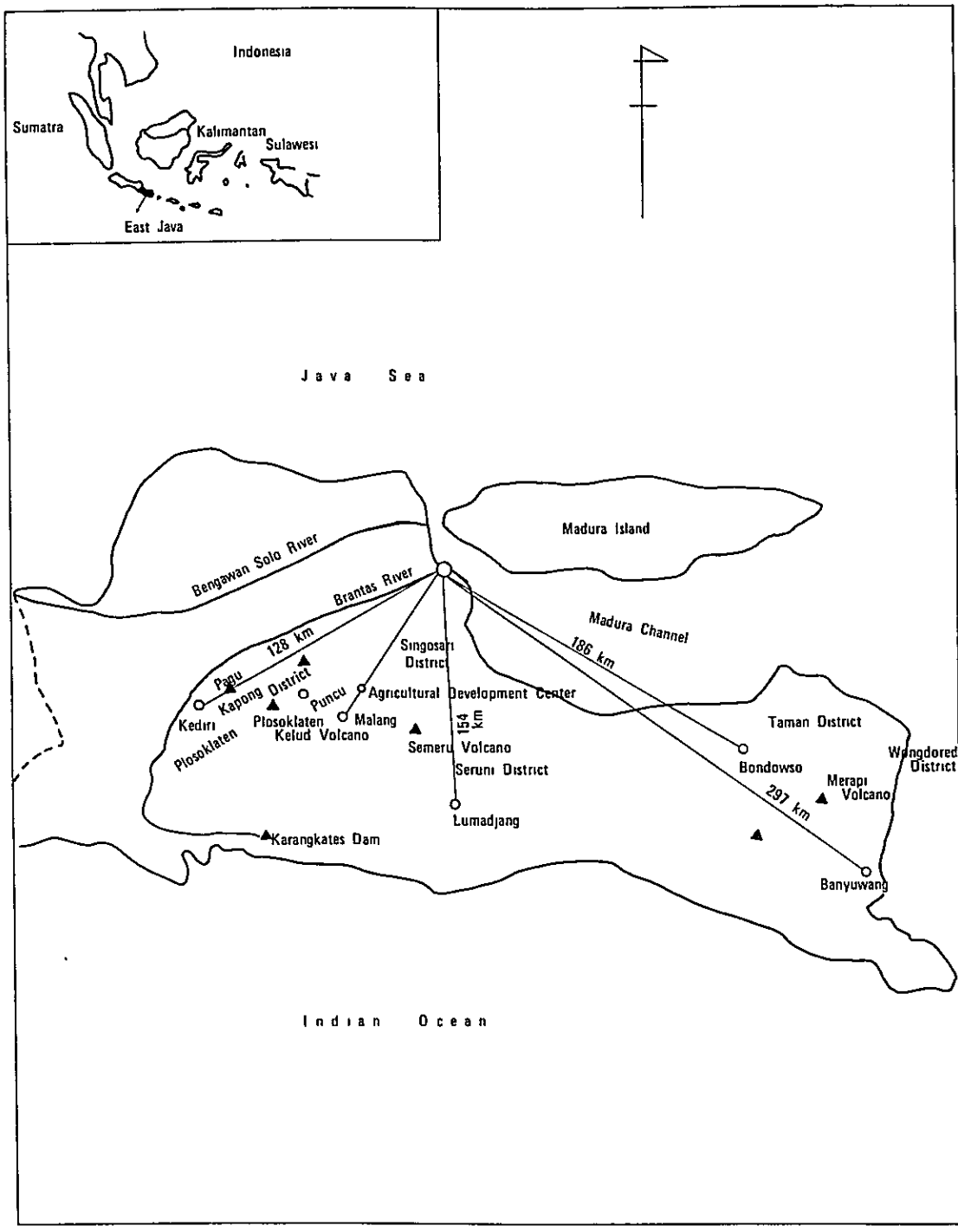
Against the background of this call is presumably the necessity of cooperation in the Bimas Parawija project (maize, soy beans and peanuts in the first year and maize, soy beans, peanuts, cassava and sorghum in the second year).

As regards the way agricultural cooperation to Indonesia should be, it is understood that emphasis is placed on the development of external territory. Now that the programs for the promotion of dry-field crops have been started, we would consider it advisable to carry on agricultural cooperation to East Java, as we know that effective achievements could be anticipated with limited budgets and personnel in the development of internal territory.

Section 6 Reference Data

Datum 1 : Sketch Map of Project Areas

(East Java Maize Project)



Datum 2: GENERAL OUTLINE OF EAST JAVA

1. State Capital	2. State Population	3. Area of the Province	4. Province's Population Density	5. Main Rivers	6. Main Volcanoes	7. Rainfall
Surabaja Provinces: 29 Population: 1,797,000 Governor:	Population: 25,527,000 Rates: 33% of Java Island's population 31% of Indonesia's population Farmers' population: 16,630.000 (65%) Japanese residents: 125	47,366 km^2 (larger than Kyushu, Japan, which covers a total area of 43,043 km^2) Rates: 35% of Java Island's total area 2.3% of Indonesia's total area Cultivated land: 2,724,000ha (57.5%)	539 persons/km^2 Java Island: 565 persons/km^2 Indonesia: 59 persons/km^2 Population growth: 2.4%	Solo River: 350 km Brantas River: 275 km Dams: Karangkates Dam Kalicont Dam Lengkong Dam	Kelud (1.731 m) in Kediri Ardjuna (3,339 m) in Malang Semeru (2,302 m) in Malang Lamongan (1,668 m) in Lumadjang Raung (3,332 m) in Bondowso Merapi (2,800 m) in Banyuwang	Precipitation mm 300 200 100 1 2 3 4 5 6 7 8 9 10 11 12 Average precipitation in Kediri and Malang (63 years, 1879-1941)

(Note) 1971 Census

8. Province's Cultivated Land

Type	Area in hectares	Rate to State's total area
Paddy fields with adequate irrigation facilities	575,600	12.0%
Paddy fields with inadequate irrigation facilities	114,800	2.4%
Rain-fed paddy fields	301,100	6.4%
Dry fields	1,228,000	26.1%
Gardens	504,600	10.6%
Total	2,724,100	57.5%

(Note) Data from Agricultural Extension Service

9. Land Utilization in Indonesia

Classification	Area (in Million hectares)	Rate to Indonesia's total area
Forests	120.0	59%
Primeval forests	80.0	40%
Teak & other withered forests	1.2	1%
Others	38.8	19%
Cultivated Farm Land	17.5	9%
Edible crops	12.9	6%
Commercial crops	4.6	3%
Others	64.4	32%
Total	201.9	100%

(Note) World Bank Report

10. Types and Outputs of Province's Main Farm Produce

Type	Area Harvested (1,000 ha)	Output (1,000 tons)	Rate to Indonesia's total output
(1) Rice	1,170	3,646	30%
(2) Maize	1,260	1,010	35.7%
(3) Cassava	468	3,255	31%
(4) Sweet potato	89	462	21%
(5) Peanut	125	79	28%
(6) Soy bean	335	210	42%
(7) Vegetable	174	569	
(8) Fruit	82,515	1,196	(Note)
(9) Kapok	6,460	14.4	National
(10) Cotton	2	0.6	output in
(11) Japanese tobacco	48	22.5	1970
(12) Virginian	28	11.5	
(13) Sugar cane	22	168.5	
(14) Coffee	12	6.2	
(15) Castor bean	3	1.4	
(16) Coconut	14,512	668,610	

(Note) Data from Agricultural Extension Service (average values in 1960 ~ 69)

11. Province's Total Output and Revenue and Farmers' Earnings

Classification	1969	1970	1971	1972	In terms of dollars, 1972
Total output (1,000,000 RP)	188,320	209,454	206,726	220,406	532.3 million dollars
Revenue (")	180,788	201,075	196,456	209,860	506.9 "
Number of Farmers (1,000 persons)	15,864	15,995	16,314	16,630	
Income per Farmer	11,396	12,571	12,042	12,619	30.5 dollars

(Note) Agricultural Extension Service

Datum 3:

1. Mutual Agreement: Mutual Agreement for Technical Cooperation for Development of Maize in East Java Province, Republic of Indonesia

2. Signing and Term: First R.D. signed December 6, 1967 Period 3 years
Japanese side: Motonaga Ohto, Leader, Japanese Survey Team (Executive Director, OTCA)
Indonesian side: Imam Sumadi, Chief, Foreign Relations Bureau, Department of Agriculture
Second R.D. signed April 2, 1971 Period 3 years
Japanese side: Yoshio Matsubara, Chief, Primary Products Development Cooperation Office, OTCA
Indonesian side: Sadikin Sumintawikarta, Director for Agriculture, Ministry of Agriculture

3. Provisions: Purpose (Article 1), Dispatch and Treatment of Experts (Articles 2 and 3), Privileges of Experts (Article 4), Dispatch of Trainees (Article 5), Offering and Ownership of Equipment (Articles 6 and 7), Obligation of Indonesian Government (Articles 8 and 9), Duties of Experts (Article 10), Term and Mutual Cooperation (Articles 11 & 12).
Extension of R.D. (Article 1), Area Conducted (Article 2), Purpose (Article 3), Dispatch of Experts (Article 4), Offering and Use of Equipment (Articles 5 and 6), Dispatch of Trainees (Article 7), Obligations of Indonesian Government (Articles 8, 9, 10), Dispatch of Experts (Article 11), Term and Mutual Cooperation (Articles 12 and 13).

4. Purposes:
(1) Increased production of maize in East Java Province
(2) Improvement of the quality of export maize
(3) Streamlining of distribution channel of maize for export
(4) Promotion of maize trade between Indonesia and Japan

(1) Advice to farmers on agricultural technology (cultivation, fertilization, damage by blight and noxious insects)
(2) Advice to farmers' organizations on improvement of the quality of export maize (drying, fabrication, etc.)
(3) Streamlining of the distribution channel of maize through farmers' organizations
(4) Promotion of maize trade between Indonesia and Japan
(5) Research and experiment for control and improvement of agricultural technology, seed production and distribution, and training to staff officials.

5. Experts Dispatched

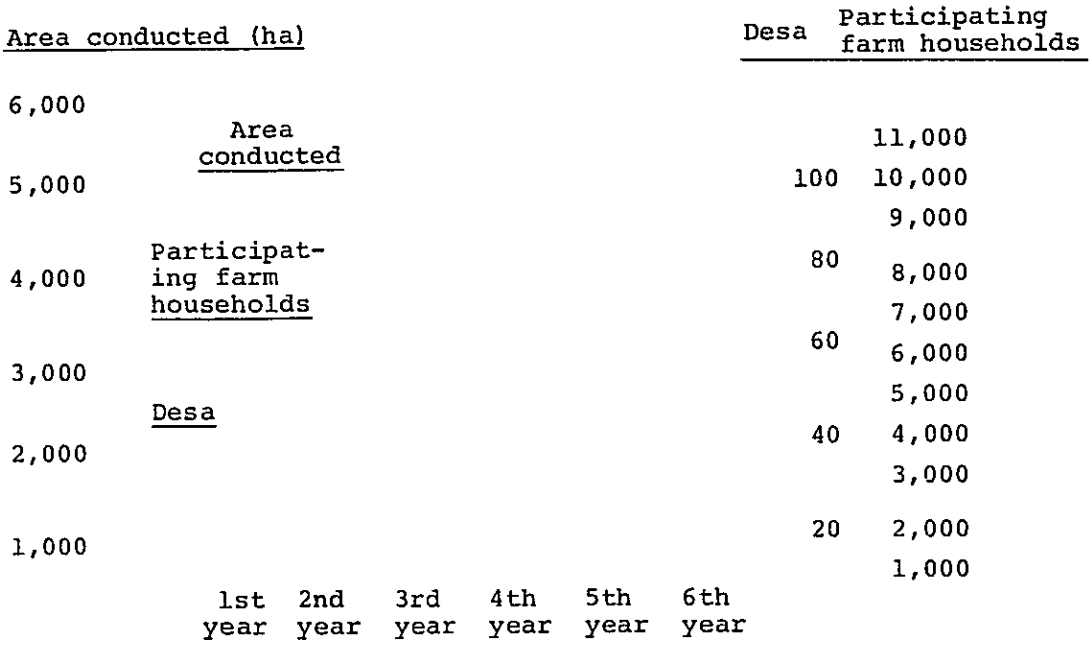
Name	Official Title at Assignment	Term	Station	Duty Assigned
Eiichi Komuro	OMIC	Apr 68-Jun 71	Surabaja	Quality control (Leader)
Kazue Yasuda	Ministry of International Trade and Industry	Apr 68-Apr 71	"	Planning and coordination
Toshio Shimizu	Zen-noh	May 68-May 71	"	Marketing improvement
Toshitsugu Yamazaki	Hokkaido Agricultural Experiment Station	Sep 68-Jan 71	Malang	Agronomist
Nikichi Suga	Mokkooen KK	Sep 68-Jan 71	"	"
Hiroshi Tokunaga	Ministry of International Trade and Industry	Jun 71-Oct 71	Surabaja	Planning and coordination (Leader)
Yoshiji Tamura	"	Jun 72-Jul 74	"	"
Toozaburo Fukusato	Dispatched by OTCA	Aug 70-Jul 74	"	Agronomist
Eiichi Koochi	Zen-noh	Jul 71-Jul 74	"	Marketing improvement
Haruhiko Sakamoto	Dispatched by OTCA	Jul 71-Jul 74	Kediri	Agronomist
Shohei Hirose	"	Dec 70-Dec 73	Malang	Breeding
Yoshisuke Yoshizumi	Overseas Agricultural Development Foundation	Jul 71-Jul 74	"	Quality control
Masakiyo Morita	OTCA	Mar 71-Jul 74	Banyuwang	Agronomist

6. Indonesia's Responsible Officers and Counterparts:

Highest Responsible Officer;	Sadikin Sumintawikarta, Director General for Agriculture, Ministry of Agriculture
	Soegandi, Director General for Agriculture (Feb, 73)
	Achmad Affandi, Director General for Agriculture (Feb, 74)
Officer in Charge of Policy;	Achmad Wazir, Director for Development Production of Food, Ministry of Agriculture
	Soehaedi Wireaatmadja, Director for Development Production of Food (Feb, 74)
Officer Responsible for the Implementation;	R. Soejoedi, Inspector, Agricultural Extension Service, East Java Provincial Government
	Martono, Inspector Agricultural Extension Service (Feb, 72)
Counterparts;	Staff officials of the Agricultural Extension Service
	Directors of divisions and departments of Agricultural Extension Service

Datum 4:

1. Area Project Conducted, Participating Farm Households and Desa



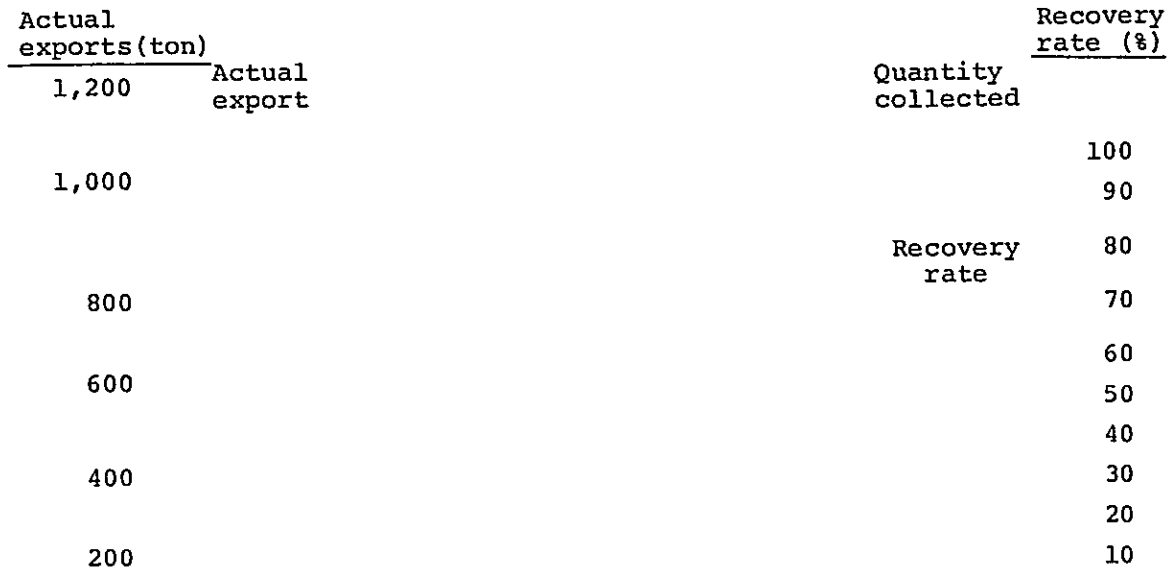
Year / Classification	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	Total
Area conducted (ha)	680	4,582	5,468	6,114	3,995	4,604	25,443
Participating farm households	822	5,088	7,633	10,439	6,800	7,826	38,608
Desa	9	55	85	63	36	51	299

2. Area Maize Harvested and Output in Kediri

	1960-1969		1968		1969	
Area	Output (ton)	Area (ha)	Output (ton)	Area (ha)	Output (ton)	Area (ha)
Kediri	50,914	44,892	76,382	55,159	40,984	36,237
Per-unit yield	11.11		13.94		13.57	
East Java Province	1,010,212	1,133,247	1,025,471	1,474,397	697,573	1,091,460
Per-unit yield	7.57		7.22		6.73	

	1970		1971		1972		1968-72
Area	Output (ton)	Area (ha)	Output (ton)	Area (ha)	Output (ton)	Area (ha)	Average per-unit yield
Kediri	60,522	43,669	19,998	39,660	58,285	32,508	
Per-unit yield	14.06		18.19		17.31		14.77
East Java Province	874,964	1,370,623	1,243,027	674,186	674,186	966,826	
Per-unit yield	6.62		7.04		6.90		6.66

3. Exports, Recovery and Collection Under Maize Project



Classification \ Year	1968/69	1969/70	1970/71	1961/72	1972/73	1973/74	Total
Exports (tons)	253.7	1,101	1,264.4	825	-	-	3,440
Quantity collected (ton)	269.2	1,090.3	1,331	1,865	1,131.6	-	5,696
Recovery rate (%)	100	55.5	54.9	66.6	73	-	70

Datum 5: Evolution of Maize Project and Actual Records

(1) Outline of Evolution

Area evolved	1st year (1968-69)			2nd year (1969-70)			3rd year (1970-71)			4th year (1971-72)			5th year (1972-73)			6th year (1973-74)			Total		
	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household	Area evolved	Participating farm households	Area per farm household
Kediri	200 ha	349	0.573 ha	1,689 ha	2,735	0.618 ha	1,836 ha	2,942	0.623 ha	3,197 ha	5,140	0.622 ha	2,268 ha	3,960	0.572 ha	2,375	4,037	0.58	11,565	19,170	0.59
Malang	162	189	0.857	394	351	0.701	1,229	1,632	0.753	1,099	2,298	0.478	625	923	0.677	600	882	0.68	4,188	6,275	0.686
Lumajang	100	139	0.719	-	-	-	100	138	0.725	312	598	0.521	325	842	0.385	850	2,125	0.40	1,687	3,842	0.493
Bondowso	-	-	-	-	-	-	301	714	0.422	196	714	0.422	125	275	0.454	100	220	0.45	722	1,923	0.441
Banyuwang	218	145	1.503	2,500	2,002	1.249	2,002	2,200	1.099	1,310	1,689	0.768	616	800	0.770	679	562	0.82	7,325	7,398	1.22
Total:	680	822	0.827	4,583	5,088	0.865	5,468	7,633	0.716	6,114	10,439	0.562	3,995	6,800	0.582	4,604	7,826	0.58	25,487	38,608	0.66

(2) Actual Collection

Area evolved	1st year (1968-69)			2nd year (1969-70)			3rd year (1970-71)			4th year (1971-72)			5th year (1972-73)			6th year (1973-74)			Total		
	Area harvested	Quantity collected	Collection rate (%)	Area harvested	Quantity collected	Collection rate (%)	Area harvested	Quantity collected	Collection rate (%)	Area harvested	Quantity collected	Collection rate (%)	Area harvested	Quantity collected	Collection rate	Area harvested	Quantity collected	Collection rate (%)	Area harvested	Quantity collected	Collection rate (%)
Kediri	200 ha	100 ton	100	1,689 ha	593.7 ha	66.9	1,817.4 ha	540 ton	61.5	3,197.7 ha	942 ton	66.1	2,268.3 ha	604.9 ton	60	2,375 ha	ton	-	11,547 ha	2,780 ton	70.9
Malang	40.3	20	100	349	143	75.4	1,182.5	341	60.4	973	349	73.1	625	196.7	73	600	-	-	3,770	1,050	76.4
Lamajang	100	40	100	-	-	-	100	47	100	312	168	63.1	325	70 8	81	850	-	-	1,687	326	86.0
Bondowso	-	-	-	-	-	-	225	60	52.4	181.5	33	30.6	125	42.7	77	100	-	-	631	136	61.5
Banyuwang	218	109	100	1,815	362.6	40.1	1,799.3	343	91.9	1,318	373	53.9	616.5	216.5	77	679	-	-	6,445	1,404	62.6
Total:	558.3	269	100	3,853	1,099.3	55.5	5,124.2	1,331	54.9	5,982.2	1,865	66.6	3,959	1,131.6	73	4,604	-	-	24,080	5,696	71.5

(Note) Quantity collected and collection rate column "Total" represent the results of five years.

(3) Actual Exports and Domestic Sales

	1st year (ton)	2nd year (ton)	3rd year (ton)	4th year (ton)	5th year (ton)	6th year (ton)	Total (ton)
Exports	253.7	1.101	1,260.4	825	0	0	3,440
Domestic sales	190	186	0	738	1,131	1,131	2,245

Datum 6: Credit for Maize Project

(1) Offering of Fertilizer and Seed and Their Repayment

year / Credit	1st year 1968/69	2nd year 1969/70	3rd year 1970/71	4th year 1971/72	5th year 1972/73	6th year 1973/74
Fertilizer (urea)	200∿250 kg/ha	200 kg/ha	200 kg/ha	200 kg/ha	200 kg/ha	Bimas
Seed	25 kg/ha	25 kg/ha	25 kg/ha	25 kg/ha	25 kg/ha	
Quantity compensated (maize)	500 kg & L/ha	525 kg/ha	500 kg/ha	444 kg/ha	444 kg/ha	

(2) Credit Repayment Rate

(i) For repayments in the 1st through 3rd years, a compatible percentage system of 2.5 kg of maize for 1 kg of fertilizer and 25 kg of maize of the same price for 25 kg of seeds was adopted.

(ii) Repayment rate in the 4th and 5th years

(Price of urea per kg) (Per hectare) (Price of seeds per kg) (Per hectare) (Five months' interests) (Quantity of maize repaid (dried seeds))

$$\frac{(26.60^{RP} \times 200^{kg}) + (24^{RP} \times 25^{kg}) + 5{,}920^{RP} \times 5\%}{14^{RP}} = 444 \text{ kg}$$

(Maize Market Price)

(3) Credit for Bimas Jagung in 1973-74

Area / Credit	Kediri		Malang	Lumajang	Bondowso	Banyuwang
	Kapang,Puncu	Pagu				
Urea	(200 kg/ha) 8,000 RP	(150 kg/ha) 6,000 RP	(200 kg/ha) 8,000 RP	(200 kg/ha) 8,000 RP	(200 kg/ha) 8,000 RP	(200 kg/ha) 8,000 RP
Compound	-	(100 kg/ha) 4,000 RP	-			
Agro-chemical	-	-	-			
Seed	-	-	-	(25 kg/ha) 1,000 RP		
Fund for farm management	2,000 RP	2,000 RP	3,000 RP	2,000 RP	2,000 RP	2,000 RP
Total :	10,000 RP	12,000 RP	11,000 RP	11,000 RP	10,000 RP	10,000 RP

Datum 7: East Java Agricultural Development Center (Maize Center)

1. Circumstances Leading to the Center's Establishment

Year	Jurisdiction	Utilization
1956	Hollander	Estate (orchard)
1956 ∿ 1962	Central Government	Agricultural training center for staff officials of the estate
1962 ∿ 963	Ministry of Eduction and Culture	Vocational training center for graduates from North Sulawesi Middle School (SMP)
1963 ∿ 1971	Provincial government	Agricultural training and study center for government officials and others
1971	-ditto-	Eatablished as Maize Center under 2nd RD
1972 ∿ 1973	-ditto-	Reorganized as Development Center of Palwidja (Second Crop Center)
1974	-ditto-	Reorganized as Agricultural Development Center

2. Location and Facilities of the Center

Location	Facilities		Area	
Butali in Malang	First Field	Second Field	24 ha	
80 km north of Surabaja 10 km south of Malang's center	Office, Lecture hall, Billet, Metearological facilities, Hot-house, Garage	Office, Billet, Warehouse	First Field 0.04 ha	Second Field 6.4 ha

3. Main Equipment Supplied

	Q'ty.		Q'ty.
Toyota jeep	1	Thermometers	6
Honda Motors	2	Tachometers	4
Kubota Trailor L350	1	Corn sheller	2
Dryer FIE978	5	Winnower	10
Dryer HD360	30	Ricopy BC320	1
Kubota Power Tiller K700	3	Other test equipment	

4. Functions of the Center

(1) Systematization of seed production (capable of covering all aspects of the Bimas project)

(2) Improvement of conventional species

(3) Experiments related to cultivation technology of maize

(4) Cultivation tests with mechanization, such as tractors

Training

	1972	1973
Frequency	7	8
Term	7 days	7 days
Number of Persons	365	377

Contents of Training

Control of BUUD, training of PPL (agricultural extension officers), orchard and gardening, measures against damage from blight and noxious insects, agricultural training for Army personnel, seed production control, publicity activities on agriculture

5. Plans for Development of the Center

1974/75	Government budget	RP50,000,000
	Provincial government budget	RP10,000,000
	Total	RP60,000,000
2nd 5-year program	Government budget	RP60,000,000 (expansion of the fields)
	Provincial government budget	RP100,000,000 (the fields to be expanded from 10 to 30 ha; training center)

6. Organization

East Java Provincial Government's Agricultural Extension Service

Bureau of Production Development

Section of Foodstuff

Japanese experts

Chief of the Center

Technical staff

Administrative section

1st field

2nd field

Datum 8:

1. Bimas Jagung

(1) Execution of Biams Jagung in 1973-74

(Unit: ha)

	Goal	Area Evolved	Participating Farm Households	Attainment Rate (%)
Indonesia	112,600	81,276		72%
East Java Province	61,350	49,650	53,929	81%
Kediri	10,000	11,469	15,945	115%
Malang	4,000	4,026	4,448	100%
Lumajang	2,000	2,033	2,137	101%
Bondowso	1,500	739	843	49%
Banyuwang	2,800	1,660	1,458	59%
Total of 5 Kabupaten	20,300	19,927	24,831	98%

(2) Execution of Bimas Jagung

(i) The items covered under this project are limited to maize, soy beans and peanuts, and 132,700 hectares will be set aside for their development in 12 provinces.

(ii) The districts where Biams Jagung will be executed will be selected from among those which may be controlled by BRI branches, which are free from floods, droughts and damage from blight and noxious insects, and where production per hectare may easily be raised.

(iii) The farmers allowed to participate are those capable at paying in accordance with the terms and conditions of credit determind by BRI.

(iv) The districts must also be the areas where the supplying of producers' goods, and communication and liaison may be readily be conducted.

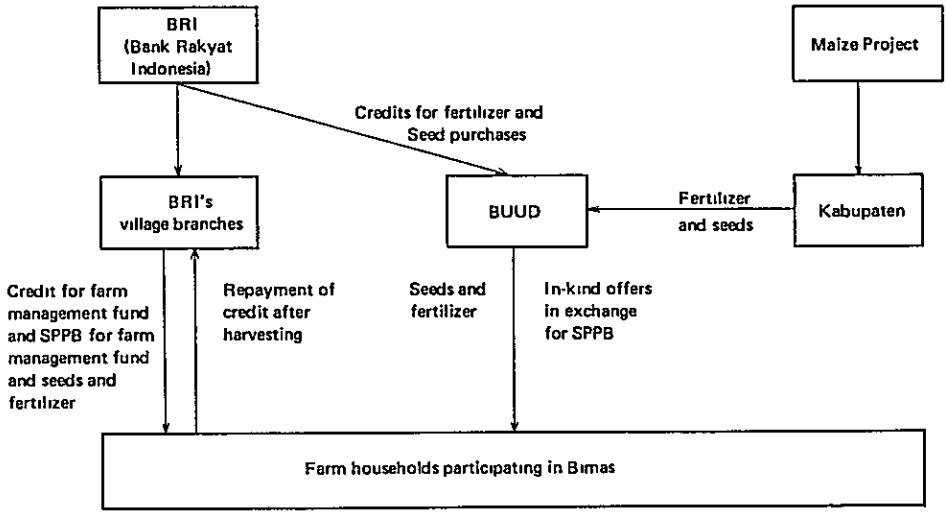
(3) Credit

Urea	200 kg/ha	RP5,320
TSP	75 kg/ha	RP1,995
Agro-chemicals	1 ℓ/ha	RP1,000
Seeds	25 kg/ha	RP1,000
Farm management funds		RP2,000

(4) Seeds for use in Bimas Jagung, LP3 (Central Research Institute for Agriculture), and quality seeds propagated from the stock seeds of the Butari Agricultural Development Center will be used.

(5) Arrangements will be made so that the producers' goods required for the execution of Bimas Jagung may arrive at BUUD at least five days prior to the plantation.

(6) Credit system for Bimas Jagung


BRI
(Bank Rakyat
Indonesia)
Maize Project
Credits for fertilizer and
Seed purchases
BRI's
village branches
BUUD
Fertilizer
and seeds
Kabupaten
Credit for farm
management fund
and SPPB for farm
management fund
and seeds and
fertilizer
Repayment of
credit after
harvesting
Seeds and
fertilizer
In-kind offers
in exchange
for SPPB
Farm households participating in Bimas

Datum 9:

1. Production Goals for Main Dry Field Crops under Second 5-year Economic Program

Crop	Classification	1974	1975	1976	1977	1978
Maize	A	2,250	2,330	2,700	2,420	2,850
	B	2,614	2,481	3,090	3,223	4,150
	C	10.25	10.65	11.44	13.32	14.56
Sorghum	A	50	70	100	130	150
	B	55	93	150	197	240
	C	11.00	13.28	15.00	15.17	16.00
Cassava	A	1,400	1,410	1,420	1,440	1,450
	B	9,906	10,425	11,025	11,775	12,750
	C	70.76	73.94	77.64	81.77	87.93
Sweet potatoes	A	350	360	370	390	400
	B	2,100	2,160	2,220	2,340	2,400
	C	60.00	60.00	60.00	60.00	60.00
Soy beans	A	670	690	705	725	750
	B	498	553	600	632	671
	C	7.43	8.01	8.51	8.72	8.95
Peanuts	A	370	385	405	425	450
	B	275	291	315	332	356
	C	7.43	7.56	7.78	7.81	7.91
Mug beans	A	130	137	142	152	160
	B	66	73	76	84	91
	C	5.08	5.33	5.35	5.53	5.69

(Note) A Area harvested 1,000 ha
B Tonnage harvested 1,000 tons
C Yield per unit tons

(Date from Directorate for Development Production of Food, Ministry of Agriculture)

2. Targets for Execution of Bimas and Inmas as Means to Accomplish Second 5-year Program (Indonesia)

(Unit: 1,000 ha)

	1974	1975	1976	1977	1978
Maize	290	370	600	950	1,400
Sorghum	10	30	60	80	100
Cassava	1	10	50	100	200
Soy beans	75	150	200	240	270
Peanuts	22	44	70	94	110
Mug beans	3	6	10	16	20

(Note) Data from Derectorate for Development Production of Food, Ministry of Agriculture

3. Targets for Execution of Bimas and Inmas as Means to Accomplish Second 5-year Economic Program in East Java Province

(Unit: 1,000 ha)

Bimas and Inmas	1974	1975	1976	1977	1978
1 Rice					
Total area	1,250	1,250	1,250	1,250	1,250
Bimas	550	550	550	550	550
Inmas	320	345	370	395	420
2 Maize					
Total area	1,200	1,200	1,200	1,200	1,200
Bimas	60	60	75	110	200
Inmas and Kreteksization	100	200	325	425	525
3 Cassava					
Total area	460	460	460	460	460
Bimas	10	15	20	25	30
Mukibat	480	2,400	4,000	6,400	8,000
4 Sweet potatoes					
Total area	58	58	58	58	58
Inmas	10	12.5	14.5	16	18.5
5 Peanuts					
Total area	130	130	130	130	130
Bimas	10	20	35	50	65
Inmas	65	70	65	60	55
6 Soy beans					
Total area	364	364	364	364	364
Bimas	10	20	40	80	160
Inmas	200	250	375	270	104

(Note) Data from East Java Provincial Government's Agricultural Extension Service

4. Production Targets of Farm Produce in East Java Province under Second 5-year Economic Program

(Unit: 1,000 ton)

Types of Farm Produce	1974	1975	1976	1977	1978
Food crops					
1. Rice	5,705	5,842	5,982	6,119	6,272
2. Maize	1,025	1,147	1,282	1,439	1,612
3. Cassava	3,141	3,222	3,317	3,408	3,502
4. Sweet potatoes	346	355	365	374	382
5. Soy beans	276	299	322	347	372
6. Peanuts	104	113	122	131	141
7. Sorghum	40	60	100	200	300
Gardening Crops					
1. Vegatables	694	726	763	798	837
2. Fruits	1,449	1,544	1,622	1,712	1,808
Commercial Crops					
1. Copra	186	181	196	209	225
2. Sugar beat	211	220	237	255	273
3. Coffee	10	11	11	12	12
4. Kapok	10	21	22	24	26
5. Cotton	1.2	1.8	2.7	3.0	4.0
6. Tobacco					
Virginian	12	12	12	12	12
Javanese	25	26	28	30	33
7. Cloue	-	-	0.15	0.15	1.0
8. Vanila	0.12	0.15	0.18	0.2	0.25
9. Castor beans	7.8	10.0	12.75	15.0	20.0

(Note) Data from East Java Provincial Government's Agricultural Extension Service

Questions which should be taken into consideration for realization of the Second 5-year Program

1. There is a need to continuously receive rice supplies.

2. Wheat imports must be continued in the form of flour or grains.

3. The exportation of about 30 percent of the total output of maize and tapioca should be authorized.

4. The high rises registered in the prices of food in the latter half of 1972 and the early half of 1973 stemmed from psychological repercussions caused by an extraordinary drought in 1972.

Discussion between the Japanese Survey Team
and the Indonesian Counterpart regarding
the Technical Cooperation for the development of maize.

This is the Record of Discussion between the Japanese Survey Mission and the Indonesian agricultural authorities concerned for the implementation of the Technical Cooperation for the development of maize in Indonesia.

Under instruction from the Government of Japan, the Japanese Survey Mission, organized by the Overseas Technical Cooperation Agency and headed by Mr. Ohto, visited to Republic of Indonesia and stayed there from 20 November 1967, and exchanged views and discussed the project with the authorities concerned of the Government of Indonesia.

The record of discussions between the Mission and the Indonesian authorities is given in the following paper.

The matter recorded herein shall not be binding legally either to the Government of Japan or to the Government of Indonesia, as the former intends to make the final decision after studying this Record of Discussion upon the return of the Mission to Japan.

This Record of Discussion should, however, from the basis for arrangement required for the Implementation of the projects by both Governments.

Djakarta, dated the 16th day of December, 1967.

Mr. MOTONAGA OHTO	Mr. IMAM SUMADI
Japan	Indonesia
Team Leader	Chief of Foreign Relations Bu. Department of Agriculture
Signed	Signed

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RECORD OF DISCUSSION BETWEEN
THE JAPANESE SURVEY MISSION AND THE AUTHORITIES CONCERNED OF
THE GOVERNMENT OF INDONESIA OF TECHNICAL
CO-OPERATION FOR THE DEVELOPMENT OF MAIZE IN INDONESIA.

I. The Japanese Survey Mission and the Indonesian authorities concerned, promoting mutual co-operation in implementing the technical co-operation for the development of maize in Indonesia, have reached the following conclusion through discussion:

The two Governments shall co-operate with each other in implementing the technical co-operation program for the purpose of:

1) Increasing production of maize in the Province of East Java (herein after referred to as the Province) through improved techniques and their extension;

2) Improving quality of maize for export produced in the Province;

3) Rationalizing marketing system of maize for export; and

4) Facilitating business-transaction of maize between the two countries.

II. In implementing the above technical co-operation, the Government of Japan will, in accordance with laws and regulations in force in Japan, dispatch experts in the fields of general planning, production techniques, quality control, and marketing improvement, upon accepting the Colombo Plan Bureau Form A-1 from the Indonesian Government under the technical Co-operation Program of the Government of Japan.

The Government of Japan will bear necessary expenses such as the salaries of the experts in Indonesia and their travel expenses.

III. The Japanese experts and their families shall be granted in Indonesia the privileges, exeptions and benefits no less favourable than those granted to the experts of their countries or the United Nations under circumstances.

IV. In accordance with laws and regulations in force in Indonesia the Indonesian Government shall exempt the Japanese experts and their families from:

1) Income tax and charges of any kind imposed on or in connection with the renumeration received from abroad;

2) Import and Export duties and any other charges in respect of reasonably necessary personal and household effects, including one motor vehicle, one refrigerator, one air conditioner per-family, other minor electric appliances and optical instruments which may be brought into Indonesia from Japan.

3) Such other privileges, exemptions and benefits including local medical services as admissible to the experts of the third country or the United Nations assigned to Indonesia under similar circumstances.

V. The Government of Indonesia shall undertake to bear claims, if any arise, againsts the Japanese experts resulting from, occurring in

the course of, or otherwise with the bonafide discharge of their functions in Indonesia covered by this co-operation.
In accordance with the technical co-operation scheme in Japan, the Government of Japan shall take necessary measure to grant awards for the training of Indonesian technicians engaged in the projects, upon accepting the Colombo Plan Bureau Form A-2 and A-3 from the Indonesian Government under the technical co-operation program of the Government of Japan.

VI. In implementing the above technical co-operation, the Government of Japan shall, in accordance with laws and regulations in force in Japan take necessary measure to provide at their own expence materials, equipments and machinery, upon accepting the Colombo Plan Bureau Form A-4 from the Indonesian Government under the technical co-operation program of the Government of Japan.

VII. The articles referred to above shall become properties of the Indonesian Government upon being delivered c.i.f. at a port of Indonesia to the Indonesian authorities concerned.
The articles referred to above shall be utilized exclusively for the purpose of the project in consultation with the Japanese experts.

VIII. The Indonesian Government shall, in accordance with laws and regulations in force in Indonesia, provide at their own expence:

1) Indonesia counterpart for each of the Japanese experts;

2) Office space with suitable accomodation for the Japanese experts;

3) Transportation for duty travels of the Japanese experts with in the Province.

IX. The Government of Indonesia, in accordance with laws and regulations in forces in Indonesia, shall meet:

1) Expenses necessary for clearance and transportation of the articles provided by the Government of Japan to Indonesia as well as for operation and maintenance of;

2) Other incidental expenses necessary for the implementation of the technical co-operation.

NOTE: Incidental expenses necessary for the implementation of the technical co-operation include:

a) Fuel for operation of the machinery and vehicles;

b) maintenance and repair of the machinery and vehicles; and

c) travel expenses of the Indonesian counterparts.

X. The Japanese experts shall give technical and managerial guidance and advice to the Indonesia authorities concerned, who shall assume overall responsibilities for the technical co-operation mentioned in paragraph I above.

XI. The period of the technical co-operation will be 3 (three) years, starting from 1968, while by mutual agreement the period may be extended for a further specified period.

XII. There shall be mutual consultation between the two Governments for successful operation of the technical co-operation.

This is the Record of Discussion to be approved by the respective Government.

Djakarta, 16 December 1967.

Signed *Signed*

MOTONAGA OHTO IMAM SUMADI

RECORD OF DISCUSSIONS ON THE TECHNICAL COOPERATION FOR THE DEVELOPMENT OF MAIZE IN THE PROVINCE OF EAST JAVA, INDONESIA.

The Japanese team of experts organized by the Overseas Technical Cooperation Agency visited Indonesia from March to April in 1971 for the purpose of working out the details of the extension of the period of technical cooperation for the development of maize production and its marketing system in the Province of East Java. The team has a series of discussions in Djakarta with the authorities concerned of the Government of the Republic of Indonesia concerning the above project and both parties agreed to record the following.

I. In presuance of the present technical cooperation based upon the Record of Discussions signed between the Japanese Survey Team and authorities concerned of the Government of the Republic of Indonesia on December 16th, the Government of Japan and the Government of the Republic of Indonesia, hoping to secure continued successful implementation of the existing cooperation, agree to extend the period of cooperation for the development of maize production and its marketing system in the Province of East Java (hereinafter referred to as "the Maize Project") until the end of July, 1974.

II. The area of the above cooperation will cover the regencies as specified in Annex I (hereinafter referred to as "the Area") and the two Governments will jointly identify and develop the Maize Production Centers in the Province of East Java (hereinafter referred to as "the Centers").

III. To implement the Maize Project the two Governments will jointly carry out the following technical cooperation in the Area and at the Centers:

(1) Technical advice to the farmers in the Area and on the improvement of agricultural techniques such as cultivation method, fertilizer application, plant protection to increase maize production;

(2) Technical advice to agricultural cooperative associations and other organizations related to the Maize Project on improving the quality of maize for export such as drying, processing, fumigation, grading and storage;

(3) Technical advice on rationalizing marketing system for export through the establishment and promotion of the marketing organizations among agricultural cooperative associations;

(4) Facilitating business transactions of maize between the two countries;

(5) Applied research and experiment to improve agricultural techniques and management, applicable to the Province of East Java in line with and within the framework of the national research program in Indonesia;

(6) Production and distribution of foundation seed, stock seed, and extension seed for the Maize Project in line with and within the framework of the national policy and program on the development of a sound seed industry in Indonesia;

(7) Training of Indonesian officials, members or leaders of agricultural cooperative associations and key-farmers associated with the

Maize Project.

IV. In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures to provide at its own expense the services of Japanese experts specified in Annex II through normal procedures of the technical cooperation scheme of the Government of Japan under the Colombo Plan. The Japanese experts and their families will be granted privileges, exemptions and benefits no less favourable than those granted in the Republic of Indonesia to the experts of other countries or of international organizations such as the United Nations serving under similar circumstances.

V. In accordance with laws and regulations in force in Japan, the Government of Japan will also take necessary measures to provide at its own expense such equipment, machinery, vehicles, tools, spare parts and other materials required for the implementation of the Maize Project through normal procedures of the technical cooperation scheme of the Government of Japan under Colombo Plan. The goods referred to above will become the property of the Government of the Republic of Indonesia upon being delivered c.i.f. at the port of disembarkation to the Indonesian authorities concerned.

The goods referred to above will be utilized exclusively for the implementation of the Maize Project in consultation with the Japanese experts.

VI. A part of the goods referred to in paragraph V may be rented at reasonable rates to the farmers in the Area and a part of con sumable items such as fertilizers, pesticides, etc., may also be transferred at reasonable prices to the farmers in the Area in accordance with laws and regulations in force in Indonesia.

The proceeds from such rentals or transfers will be used exclusively for the Maize Project in accordance with laws and regulations in force in Indonesia.

VII. In accordance with laws and regulations in force in Japan, the Government of Japan will take necessary measures to receive Indonesian officials, members or leaders of the agricultural cooperative associations and key-farmers associated with the Maize Project for technical and managerial training in Japan through normal procedures of the technical cooperation scheme in Japan under the Colombo Plan.

VIII. The Government of the Republic of Indonesia will undertake to bear claims, if any arises, against the Japanese experts resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions covered by this Record of Discussions.

IX. The Government of the Republic of Indonesia will take necessary measures to provide at their own expense:

(1) Indonesian counterpart officials and other personnel as listed in Annex III;

(2) Land and buildings as well as facilities for the Maize Project;

(3) Supply or replacement of equipment, machinery, vehicles, tools and any other materials necessary for the implementation of the Maize Project other than those provided by the Government of Japan under paragraph V;

(4) Transportation for duty travels of Japanese experts within the Province of East Java.

X. The Government of the Republic of Indonesia will take necessary measures to meet:

(1) Expenses necessary for transportation within the Republic of Indonesia of the materials referred to in paragraph V as well as for installation, operation and maintenance thereof;

(2) Other incidental expenses necessary for the implementation of the Maize Project including those listed in Annex IV;

XI. The Japanese experts will give technical and managerial guidance to the Indonesian counterparts, while the Government of the Republic of Indonesia will assume overall responsibilities for the administration, operation and implementation of the Maize Project.

XII. The Maize Project may be extended for a further specified period by mutual agreement between the two Governments.

XIII. There will be close cooperation between the Japanese experts and the Indonesian officials and counterparts concerned for the successful operation of the Maize Project.

The present Record of Discussion need to be approved by the respective Governments.

Djakarta, April 2, 1971.

Signature

(YOSHIO MATSUBARA)
Head of the Japanese
Team of Experts

Signature

(SADIKIN SUMINTAWIKARTA)
Director-General of Agriculture,
Department of Agriculture

ANNEX I.

List of the Area;

Regency of Kediri	:	About	3,000 Ha.
" of Malang	:	"	2,000 Ha.
" of Banjuwangi	:	"	4,000 Ha.
" of Lumadjang	:	"	500 Ha.
" of Bondowoso	:	"	500 Ha.

Note: The Area mentioned above, as necessity arises, may be changed in its size or location, through consultation between Japanese authorities concerned and Indonesian authorities concerned.

ANNEX II.

List of the Japanese Experts:

(1) Expert on Agronomy. . . . . 1.
(2) Expert on Breeding. . . . . 1.
(3) Expert on Farm Machinery. . . . . 1.
(4) Expert on Agricultural Extension. . . . . 1.
(5) Expert on Quality Control (Proccessing) . . 1.
(6) Expert on Marketing Improvement (Agricultural Cooperative Association) . . 1.
(7) Expert on General Planning. . . . . 1.

Note: (1) The team leader will be nominated from amongst the above Japanese experts by the Government of Japan.

(2) Besides the experts mentioned above, additional experts may also be dispatched by the mutual agreement between the two Governments through normal precedures under the Colombo Plan Technical Cooperation Scheme.

ANNEX III.

List of the Indonesian Counterpart Officials and other personnels:

(1) Agronomist. . . . . 1.

(2) Agricultural Engineer (Farm Machinery). . . . . 1.

(3) Extension worker. . . . . 6.

(4) Technician on Marketing Improvement (Agricultural Cooperative Association) . . . . 1.

(5) Technician on Quality Control (Processing). . . 1.

(6) Coordinator . . . . . 1.

(7) Labourers

(8) Clerical and service employees for the Maize Project.

Note: The manager of the Maize Project will be nominated from amongst the counterparts by the Government of the Republic of Indonesia.

ANNEX IV.

List of incidental expenses include expenses for:

(1) Farming materials such as seeds etc. except for those provided by the Government of Japan.

(2) Fuel for the operation of machinery and vehicles.

(3) Expendable stationery, etc.

CHAPTER II

INDIVIDUAL REPORT BY EXPERTS

PREFACE

We herewith would like to submit the Final Report of the Maize Project East Java to the Indonesian Government before we leave this country due to the termination of the Record of Discussion in July, 1974.

This report consists of two volumes or sections; the first volume is a description on the result of the implementation of the Project and some problems which we had faced during our activities here for the past six years, from 1968 until 1974, and the other volume contains the reports and suggestions which were already presented to the Indonesian Government c.q. the Directorate General of Agriculture and which we consider to be useful in the field of the agricultural development in the future.

The writers of these reports are Mr. Y. Tamura, Mr. T. Fukusato, Mr. H. Sakamoto, Mr. Y. Yoshizumi, Mr. M. Morita and Mr. E. Kochi. Each expert deals with his own field. Besides those mentioned above, this report also contains Dr. S. Hirose's report and some reports of the former Japanese experts, namely, Mr. Komuro, Mr. Yamasaki and Mr. Shimizu.
Dr. S. Hirose already left Indonesia in 1973.

We would like to say thank you very much to all the Indonesian officials for their kindness and cooperation during our activities in the Project and during the implementation of the Project, especially to:

The Governor of East Java Province	: Mr. Mohammad Noer
The Director General of Agriculture	: Ir. Affandi and the former Directors, Ir. Soegandhi Soerjo Amidharmo and Mr. Sadikin
The Director of Production Development	: Ir. Suhaedi Wiraatmadja and the former Director, Mr. A. Wazir
The Inspector of the Agricultural Extension Service East Java Province	: Ir. Martono Soeronegoro and the former Inspector, Mr. Soejoedi

The Counterparts and other officials of the Agricultural Extension Service East Java Province.

Finally, we would like to pray for the soul of the former leader of the Japanese Expert Team, Mr. TOKUNAGA, who had passed away on his way on duty in 1972.

Surabaya, July 1st, 1974

JAPANESE EXPERT TEAM LEADER
MAIZE PROJECT EAST JAVA

YOSHIHARU TAMURA

CHAPTER I GENERAL INTRODUCTION

By Y. TAMURA

1. The Outline of the Project

The Maize Project has carried out the planting of maize in 5 (five) Kabupatens, namely, Malang, Lumajang, Kediri, Bondowoso and Banyuwangi, in accordance with the Record of Discussion between the Japanese Government and the Indonesian Government c.q. the Department of Agriculture, which was signed on the 16th of December, 1967 for the period of 3 (three) years (1968 - 1971).
Then, it was renewed on the 2nd of April, 1971 for the period of another 3 (three) years (April, 1971 - July, 1974).

The budget for this Project consisted of the budget from the Indonesian Government and the budget from O.T.C.A., through the donation of the Japanese Government, in the form of materials and equipments.

The purpose of this Project, based on the Record of Discussion, are mainly as follows:

(1) Increasing the production of maize through agricultural technique such as cultivation, fertilizer application and plant protection.

(2) Promoting the quality of maize through techniques such as drying, processing, fumigation, grading and storing.

(3) Rationalizing the marketing system of maize for export.

(4) Expanding the transaction of maize between the two countries.

Aside from the above mentioned, the Project also has the purpose of promoting the welfare of the participating farmers who produce maize, especially those in the upland areas, giving the skill to the farmers in handling maize from the time of planting up to export, as well as bringing up the Primer Koperta (B.U.U.D.).

To reach the above purposes, the Project gives credits in the form of fertilizer, superior seeds, warehouses and gives a chance to the farmers utilize agricultural macninery such as tractors, corn shellers, dryers, etc, through the Primer Koperta (B.U.U.D.). All of these are done in the framework of promoting the production, preventing the damage and loss caused by processing after harvest, helping the growth and development of the Agricultural Cooperative (B.U.U.D.) smoothening the marketing of maize in the village as well as, not only smoothening the export from those regions, but also selling the maize in the domestic market with a good price.

2. The Organization of the Project

2.1. Organization

The Project, assisted by Primer Koperta (B.U.U.D.), GAKOPERTA, the Directorate of Cooperative and the local admin-

istration concerned, has carried out the giving of credits to the farmers, planting and collection of maize, processing, exporting maize to Japan, selling maize in the domestic market, etc.

Acting as the Leader of the Project is the Chief of the Agricultural Extension Service East Java Province, who is assisted by a Secretary, a Treasurer as well as several chief sections concerned in the Project that are also the members of the counterparts.

The responsibility of the implementation of the Project mainly lies upon the Chief of Diperta Kabupaten, who is assisted by a fulltimer.

2.2. The Relation between the Japanese Experts and the Indonesian Counterparts

At the first stage of the implementation of the Project (1968-1971), 5 (five) Japanese experts were dispatched from O.T.C.A., based on the Record of Discussion. Afterward, 2 (two) more experts were added to the Project, but, on December, 1973, Dr. Hirose went back to Japan.
At present, 6 (six) Japanese experts are engaged in the activities of the Project. While on the other side, there are 6 (six) full timer counterparts and 10 (ten) part timer counterparts.
But, under the reformation of the administrative organization of the Agricultural Extension Service, the system of full timer was abolished in April, 1972. Under this new organization, 16 (sixteen) officials were nominated as part timer counterparts, as shown below.

THE JAPANESE EXPERTS AT THE MAIZE PROJECT EAST JAVA

Name of Experts	Speciality	Terms
1968 - 1971/1972		
1. H. KOMURO	Team Leader	1968 - 1971
2. H. TOKUNAGA	Team Leader	1971 - 1972
3. K. YASUDA	General Planning	1968 - 1971
4. T. SHIMIZU	Marketing	1968 - 1971
5. N. SUGA	Agronomist	1968 - 1971
6. S. YAMASAKI	Agronomist	1968 - 1971
1971/1972 - 1974		
1. Y. TAMURA	Team Leader	June, 1972 - July, 1974
2. T. FUKUSATO	Production Technique	Aug., 1970 - Aug., 1972
3. S. HIROSE	Breeding	Dec., 1970 - Dec., 1972
4. H. SAKAMOTO	Production Technique	Mar., 1971 - July, 1974
5. M. MORITA	Farm Machinery	Mar., 1971 - July, 1974
6. Y. YOSHIZUMI	Processing	July, 1971 - July, 1974
7. E. KOCHI	Marketing	July, 1971 - July, 1974

THE INDONESIA COUNTERPARTS AT THE MAIZE PROJECT EAST JAVA

Name of Counterparts	Speciality
1. Ir. MARTONO SOERONEGORO	Project Leader
2. Ir. SADROEN MARTOATMODJO	Production
3. Mr. SOEDEWO	Foodstuffs Section
4. Mr. SOETATWO	General Cooridnator
5. Mr. ISKAMAR WINOTO	Fumigation
6. Mr. SOEPOJO RAHARDJO	Social Economy
7. Mr. ADIMOELJO	Marketing
8. Mr. DARDJOKO	Statistics
9. Mr. TEGOEE SOEGIANTO	Bureau of Technique
10. Mr. REKANTO	Mechanization
11. Ir. ACHMAD DAZULI	Quality Control
12. Mr. SALAMET TITROWIJOSO	Plant Protection
14. Mr. PRAMONO SOEGITO	Education
15. Mr. SOEWITO POEDJOSOEMIJARTO	Information
16. Mr. SOETARJADI	Extension system

2.3. Regional Station System of the Project

Since 1968, the Project has been adopting the regional system station. At the first stage (1968 - 1971), the experts only stayed in Malang and Surabaya, but, since 1972, 5 (five) experts have been stationed in Kediri, Malang, Bondowoso and Banyuwangi and the other 2 (two) are staying in Surabaya.

The purpose of the adoption of this system are:

First : to have close connection with farmers and the official as concerned at the regions.

Second : to give concentrated guidance to the participating farmers in the field of agricultural technique.

Third : to cooperate with the officials concerned and Primer Koperta (B.U.U.D.) to implement the extension and collection of maize smoothly.

3. The Basic Policy of the Project

3.1. Why we had chosen East Java as the Project's area

After studying the maize situations, including the production, consumption, etc, in each province, we had chosen East Java as the Project's area because of the following reasons:

a) As it is well known, East Java is one of the main foodstuff production basis in Indonesia. East Java supplies, not only maize, but also rice, ground-nut, soy-bean and cassava, top other provinces.
On the maize cultivation, East Java possessed 1.32 million

hectares harvested area (1968 - 1972) and could produce 966 thousand tons. This production shared 37% of the whole maize production in Indonesia.

b) Most of the East Java populations prefer maize for their main food or for their supplemental food. Moreover, the soil and climate condition are suitable for planting maize.

c) There are 4 (four) harbours for maize exportation around the Project-areas, namely, (1) Surabaya, (2) Probolinggo, (3) Panarukan and (4) Banyuwangi.

d) In giving credits and collecting maize for the repayment of the credit, we need the cooperation of Primer Koperta (B.U.U.D.). The agricultural cooperatives in East Java were rather developed as compared with those in other provinces.

3.2. The Reasons why we had chosen the 5 (five) Kabupatens

During the past 6 (six) years, the Project has carried out the planting of maize in the scale of 4,000 Ha. every year at 5 (five) Kabupatens. (Kediri, Malang, Lumajang, Bondowoso, and Banyuwangi).
The planting of maize was implemented at Labuhan season, which means that the planting was done in the rainy season from October until November. The reasons why we had chosen those 5 (five) Kabupaten are as follows:

(1) Those five Kabupatens are the main production areas of maize, and their average production per hectare is higher than other Kabupatens. In 1960 - 1969, they could produce 307,572 tons of maize and the harvested area could reach 291,942 Ha. These figures are equal to 40.4% and 25.7% of the East Java maize production and harvested area, respectively.

(2) The maize production of those five Kabupaten per person, except Banyuwangi, is very high as compared with the other Kabupatens, as shown on Table 3 - 1.

(3) There are very big amounts of upland and non-irrigated land in those five Kabupatens. Moreover, the surounding land is big enough for the expansion of the maize planting in the future.

Table 3 - 1. Maize Productivity per Person in Five Kabupatens

	1973	Note
Target of consumption per Person based on Pelita I.	30.9 Kg	
Maize Productivity per person in East Java	36.3 Kg	1973 maize production : population
Kediri	42.2 Kg	- " -
Malang	41.5 Kg	- " -
Lumajang	63.4 Kg	- " -
Bondowoso	86.4 Kg	- " -
Banyuwangi	17.1 Kg	- " -

(4) These Kabupatens are located at a distance around 150 Km. from the main harbours in East Java.
In order to execute the collection and transportation of maize rationally and economically, it is necessary for the Project to have maize areas which are not far from the harbours.

(5) The Project can spend the fund for implementation, from the budget of the Indonesia Government and O.T.C.A., for supplying seeds, fertilizer, insecticide, fumigant, machinery, etc.
But, the above mentioned budget is limited, so it is difficult to expand the area to reach more than 4,000 - 5,000 Ha.

3.3. The Choice of 5 (five) Varieties

The maize varieties used in the Project are chosen among improved varieties which are most suitable for the regions concerned and able to meet the export demand of maize.
The varieties used are as follows:

Kediri	Kretek variety
Malang	Harapan variety
Lumajang	P.S. 42 variety
Bondowoso	B C 2 variety
Banyuwangi	Metro variety

In accordance with our experience and the testings done during the past six years, Kretek variety has proved to be more superior than the other varieties in the point of nutrient content and plant rotation. But, each area or district has its own special weather condition and social economy. So, if we want to expand the use of Kretek variety in the Project areas, it is better to expand it gradually.

4. The Credit and Repayment Systems of the Project

4.1. The Function of the Project

On the implementation of the business the Project characteristically has two functions. The first is a supplying function in which the Project supplies the goods needed by the participating farmers, as a credit in the form of fertilizer, seeds and agricultural machinery.
And the second is a selling function in which the Project has to export the maize abroad (to Japan) or to sell them in the domestic market after collecting the repayment of the credit given to the farmers in the form of maize.

On the supplying function, Diperta East Java Province directly supervised and is responsible for its implementation. Their duties are:

1. Diperta East Java Province has to recieve, to keep and to distribute the materials and equipments granted from O.T.C.A., in accordance with the suggestion and recommendation of our experts, by using their own budget.

2. Diperta East Java Province, after determining the amount of the credit and repayment, has to give the credit, in the form of fertilizer and superior seeds, to the participating

farmers.

On the selling function, Primer Koperta of Gakoperta is responsible for the collection of maize, as the repayment of the credit, under the contract concluded between Koperta - Gakoparta.
Diperta has to process the maize and export them to Japan or sell them in the domestic market under the direction of the Project.
The two functions are shown on Chart 4 - 1.

4.2. The Credit and repayment

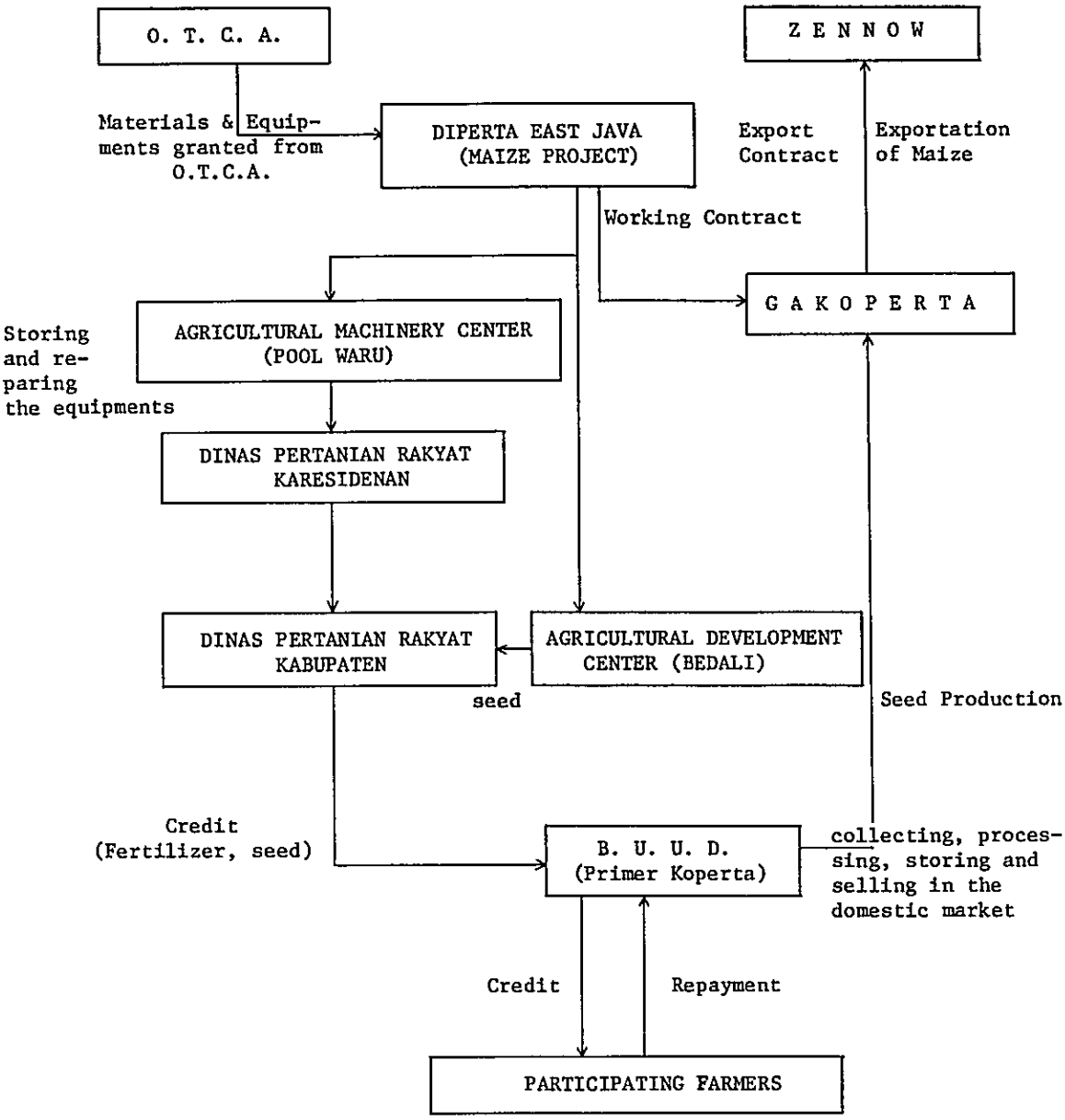
According to the Record of Discussion, the Project is a Technical cooperation Assistance. From this point of view, the Project, in carrying out the business, should not seek a profit as done by commercial organs. One of the main purposes of the Project is to expand the maize transaction between the two countries. So, we should collect maize, as the credit repayment, for export.
The amount of the credit given to farmers and the amount of its repayment should be determined by considering also the conditions of the farmers, so that it does not hamper their will to produce and their profit (according to the maize marketing price).

During the past 5 (five) years, the Project had given credit in the form of fertilizer (200 Kg./Ha.), seeds (25 Kg./Ha.) and pesticide to the participating farmers.
After harvesting their maize, the farmers are entitled to submit some parts of their production, in the form of dry kernel maize or ear corn, to the Project as the repayment of the credit received. (About 450 to 500 Kg./Ha.). We called this system as an "in kind system".
The formula of this system had been determined as follows:

Year	Amount of Credit	Amount of Repayment
1968 - 1969	Fertilizer : 200 - 250 Kg./Ha Seeds : 25 Kg./Ha.	500 Kg +
1969 - 1970	Fertilizer : 200 Kg./Ha. Seeds : 25 Kg./Ha.	525 Kg.
1970 - 1971	Fertilizer : 200 Kg./Ha. Seeds : 25 Kg./Ha.	500 Kg.
1971 - 1973	Fertilizer : 200 Kg./Ha. Seeds : 25 Kg./Ha.	444 Kg.

In the first stage of the implementation of the Project (1968-1970), the repayment system was not formulated officially.

Chart 4 - 1. Supplying and Selling Functions



But in 1971/72, the formula of the repayment was determined officially as follows:

$$\frac{(\text{Rp. } 26.60 \times 200 \text{ Kg}) + (\text{Rp. } 24.00 \times 25 \text{ Kg}) + (\text{Rp. } 5{,}920.00 \times 5\%)}{\text{Rp. } 1400} = 444 \text{ Kg.}$$

Urea price; Urea/Ha.; Seed price; Seed/Ha.; Interest (5 months); Market price of maize; Dry Kernels

But, due to the request of the Government to integrate the Project to BIMAS Jagung which was started in 1973, this system has been changed into BIMAS's credit system.
The formulation of the BIMAS Jagung credit is as follows:

1. Urea	200 Kg.	= Rp.	8,000.-
2. T.S.P.	75 Kg.	= Rp.	3,000.-
3. Pesticide	1 lt.	= Rp.	1,000.-
4. Seeds	25 Kg.	= Rp.	1,000.-
5. Living cost		= Rp.	2,000.-
T o t a l		= Rp.	15,000.-

4.3. Collection of the Production and Export

Based on the formula of repayment mentioned above, the farmers participated in the Project should submit their maize production after harvest to the Primer Koperta in accordance with the contract made between Diperta and Primer Koperta.

The Primer Koperta, as the collector and processor of maize, has the responsiblity to collect and process maize from the farmers at the warehouse. The maize collected from the farmers could be in the form of ear corn without husk or in harvest dry maize kernels. (The moisture content of the ear corn is ± 40% and the harvest dry kernels is 35 %).
When the processing in the region does not meet the quality conditions for export, the maize is reprocessed in Surabaya before it is exported. The standard quality for maize export is as follows:

a. Moisture content	14.5%
b. Damaged kernels	5 %
c. Broken kernels and foreign materials	5 %
d. Other classes	3 %

When after reprocessing the quality obtained is still under the export standard quality, the maize is sold in the domestic market under the direction of Diperta East Java Province.

5. The Extension of Agricultural Technique and Agricultural Development Center

Since the beginning of the Project in 1968, there had been many problems which had to be solved in the field of maize production, such as seed production, harrowing, fertilizer, control of diseases and insect pest, and so on.

As already well known, for increasing the maize production and raising the maize quality, it is very important to produce enough seeds of good quality which can be used for supplying the need of the farmers.
To fulfill this purpose and based on the Record of Discussion, a Palawija Development Center was established in Malang three eyars ago. One of the functions of the Center is to secure superior seeds to be distributed to the participating farmers in the Project areas. So, the Center has carried out its function by producing stock seeds and extension seeds under the strict selection procedure.

Speaking about diseases and insect pests, Downy Mildew is a big problem now, because it is very difficult to be prevented or to be destroyed by fungicide.
As a guidance to the farmers, we suggest them not to miss the suitable planting time and to evade the infection of the disease as much as possible by planting maize just after the first rain fall.

As it is possible to reduce the damage caused by Holtorichia heleri by coating 1% of aldrin, we are recommending a timely planting and seed coating in order to avoid the damage caused by the disease mentioned above.

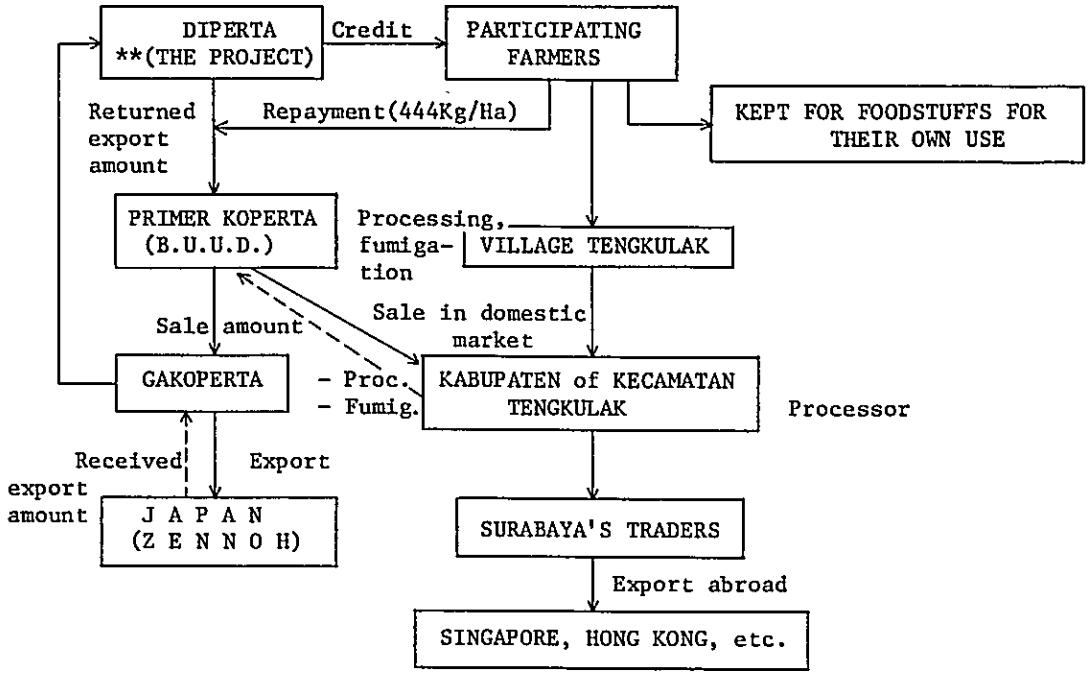
In the case of fertilizing, we are suggesting the farmers to practise applying fertilizer into a hole made by a stick in order to prevent the run-off of the fertilizer nutrients by rainfall, and to apply one third of the fertilizer at the planting time and two thirds of the rest at about 25 to 30 days later.

As far as plant population is concerned, the facts show that low density of plants per unit area is a great factor for increasing the yield. So, we are suggesting the farmers to attain more than 60,000 plants per Ha., in adjusting the number of hills and the number of plants per hill. For this purpose, we put an emphasis on the importance of good seedling emergency by using improved plow and cultivator.

About harrowing by using tractors, we are making efforts to promote the tractor cultivation in Banyuwangi area and at the Center.
We are of the opinion that the result of these efforts will be able to be used in promoting and improving the traditional harrow and plow in the future.

6. Marketing

On the marketing of maize, Mr. E. KOCHI will report in detail about it on Chapter VI of this report. But in brief we think that in improving the marketing of maize, we should pay attention to (1) the flow of goods (maize) and (2) the flow of capital (credit and money).
The flows of maize and credit in the Project area are as follows:



Before the Project started plating maize in the Project areas, the flows of maize and credit were governed by the so called "Tengkulak organization". For a long time the farmers were bound by the "Ijon system" (credit before planting or harvest) to the brokers, such as Tengkulak. The farmers had to do business with those brokers under the disadvantage conditions. So, they could not increase their income, even if they could increase their maize production.
To improve that marketing channel and to compete with the power of the broker, the Project had made efforts to grow up the organization of Primer Koperta (B.U.U.D.) by supplying it with processing equipments, etc.

In 1972, we had selected 5 (five) Model Primer Koperta (B.U.U.D.) in the Project areas. We supplied them with equipments, facilities and tools for the management of the Model Cooperatives mentioned. We also arranged processing machinery, such as corn shellers, dryers, winnowers, tractors, etc. which they could utilize. The Model Cooperatives mentioned are as follows:

Region / Kabupaten	Name of the B.U.U.D.
1. Kediri	Kepung, Pagu I and Pagu II.
2. Malang	Dengkol
3. Banyuwangi	Wongsorejo

During six years, some of those cooperatives are able to strengthen their organization and to accumulate their own capital. They also are able to carry out their own project by using their own capital.

7. Quality Control

The main purposes of the improvement of the quality control are as follows:

First : to prevent the damage of the maize contents, namely,

protein, fat, etc. and to prevent the loss of the maize amount.
We heard that the losing amount of drying by exposing to the sun-shine during the rainy season amounted to 4 %.

Second: to add their commercial value, so that it is easy to sell them in the domestic or international market with & high price.

Third : to create new market at home or abroad because the demand of high quality maize is increasing. At present, the world's demand for second crops, to be used as food or feed, is increasing and the price is going up and up.

If the price, quality and amount of maize can meet the desire of the buyers abroad, it will be very easy to sell them, and further, we can maintain a reasonable price for farmers in the domestic market.
Now, in the domestic market of East Java, there is no clear classification of the grade in buying and selling maize. But, when the broker buys maize from the farmers, he discriminates the price of maize based on his own grade classification. According to the report of Mr. M. MORITA (Banyuwangi), the price of maize in the domestic market is as follows:

(April, 1974)

Classification	Moisture Content	Selling Price in Banyuwangi	Selling Price in Surabaya
1. Raw grain	20 - 22%	Rp. 28.-/Kg.	
2. High class	-		Rp. 45.-/Kg.
3. Middle class	16 - 17%	Rp. 38.-/Kg.	Rp. 43.-/Kg.
4. Low class	16 - 17%	Rp. 37.5/Kg.	Rp. 34.4/Kg.
5. Bad class	16 - 17%	Rp. 35.-/Kg.	Rp. 30.-/Kg.

The balance of selling price between raw grains and dry grains is more or less Rp. 10.-/Kg. So, the farmers or B.U.U.D. should make efforts to obtain the good quality.

Most of the farmers in the Project areas keep some of their harvested maize for their own use or consumption and the rest will be sold in the domestic market. The amount of the maize sold by each farmer is not big, because the farmers' land in the Project areas is only 0.7 Ha. averagely. So, it is not necessary for each farmer to have his own drying floor or processing equipments. But, B.U.U.D., whose functions, among others, are to collect and sell the maize in the domestic market as well as abroad, is necessary to have those facilities and capital to collect or buy maize from the farmers.

8. Budget, Materials and Equipments Granted from O.T.C.A.

8.1. O.T.C.A.'s Budget

The Project had been implemented for (six) years, beginning in 1968, in 5 (five) districts of the East Java Province. During that period, O.T.C.A. had provided the expenses for the activities, materials and equipments of the Project. The total amount of the budget is about U.S. $.1,738,313 or equal to Rp. 719.6 million. If we also calculate other budgets, such as the expenses for trainees to Japan, the Indonesian

Government budget and the Kennedy Round Food Aid, the total amount of the expenses used by the Project will be more or bigger than that. The budget of the Maize Project from 1967 until 1974 is shown on Table 8 - 1 below.

Table 8 - 1. Budget of the Maize Project from 1967 until 1974.

Classification	1967/68 ($)	1968/69 ($)	1969/70 ($)	1970/71 ($)	1971/72 ($)	1972/73 ($)	1973/74 ($)	Total ($)
1. Expenses for investigation	13,677	9,889	10,836	7,881	9,364	6,027	6,027	63,701
2. Expenses for Japanese Expert	1,061	53,367	56,367	77,608	113,857	119,119	119.119	540,250
3. Expenses for Project's activities	0	10,422	11,719	11,661	18,665	22,519	22,519	97,505
4. Expenses for Material and Equipments	0	91,008	58,767	110,702	214,980	280,700	280,700	1,036,857
TOTAL	14,738	164,686	137,441	207,852	356,866	428,365	428,365	1,738,313

Notes: 1. Exchange rates: a) U.S. $. 1 = ¥ . 360 (From 1967 to 1971)
b) U.S. $. 1 = ¥ . 308 (In 1971/1972)
c) U.S. $. 1 = ¥ . 260 (In 1972/1973)

2. The 1973/1974 budget is an estimation, because it is not known yet.

8.2. Materials and Equipments Granted from O.T.C.A.

The budget of the materials and equipments granted from O.T.C.A., from the beginning of the Project up to 1974, will reach about Rp.429.2 million.
The selection of these commodities were decided under the consultation of both sides (Japanese and Indonesia Governments). They consist of:

Urea	3,800 tons,	
Toyota Land Cruiser	12,	
Trucks	10,	including 6 pick ups,
Honda motor cycles	35,	
Tractors	7,	
Trailers	6,	
Dryers	82,	

Corn shellers and other agricultural appraratus.
The list of the goods is shown on Table 8 - 2.

Most of those equipments are used for the agricultural deveopment in the 5 (five) Kabupatens and the rest are kept in Pool Waru. (See Table 8 - 3).
In order to use the equipments effectively and to maintain them

in good condition, the Project had asked O.T.C.A. to send spare-parts for tractors, dryers, corn shellers and hand - tractors in the 1973 budget. But we have not yet received those spare-parts, because of the rising prices of all commodities due to last year oil crisis. Those goods will arrive in August, 1974 (See Table 8 - 4).

At present, our experts are keeping some of the equipments, on our responsibility, to be used on their activities in the Project. Later, before the Project finished, those equipments will be returned to Diperta (See Table 8 - 5).

Table 8 - 2. List of Commodities Received From O.T.C.A. Japan (Colombo Plan) For The Maize Project East Java.

1968/1969		1969/1970	
Materials		Materials:	
1. Urea	180 tons	1. Urea	620 tons.
2. T.S.P.		2. T.S.P.	26 tons
Equipments:		Equipments:	
1. Toyota Land Cruiser	1	1. Corn sheller	5
2. Toyota Land Cruiser Station Wagon	1	2. Dryer	1
3. Toyota Truck, 6 Ton	2	3. Isuzu ELF Double Cabin Truck	1
4. Toyota Truck, 3.5. Ton.	2	4. Platform Scale	4
5. Kubota 4 Wheeled Tractor L-200 RE	3	5. Motor Cycle Honda 90 cc.	5
6. Kubota 4 Wheeled Tractor L - 35 RP.	1	6. Corn Cutter	4
7. Moisture Meter			
8. Vinnyl Sheet			
9. Methyl Bromide			
10. Soil Examiner			
11. Balance			

1970 / 1971			
Materials: Urea	600 tons		
Equipments:			
1. Toyota Land Cruiser	5	8. Electric Calculator	1
2. Farm Tractor L-350	2	9. Recopy	1
3. Dryer Model FE-97	3	10. Thermometer	1
4. Dryer Model FD-77	3	11. Rain Gauge	1
5. Elasan Dust	3 ton	12. Moisture Meter	10
6. Honda Motor Cycle	20	13. Corn Sheller	5
7. Portable Type Writer	1		

1971 / 1972		1972 / 1973	
Materials:		Materials:	
1. Urea	1,300 tons	1. Urea	1,000 tons
		Compound	100 tons
		2. Fumigant	500 Kg.
Equipments:		Equipments:	
1. Toyota Land Cruiser	4	1. Truck, 1 ton (peck-up)	5
2. Micro-bus	1	2. Farm Tractor L-350 with Rotary	1
3. Processing equipments	5	3. Trailer for L-350	4
4. Winnower	10	4. Disk Plough for L-350	4
5. Plane Table	4 sets	5. Rotary Cutter for L-350	4
6. Electric Calculator	4 sets	6. Farm Tractor Ferguson	1
7. Ricoh Electric Copy	1	7. Trailer for MS-13 2 ton	1
8. Filing Cabinet	4	8. Corn Sheller Rotary type	16
9. Storage Cabinet	4	9. Maize Moisture Meter KETT Model E-10	40
10. Rotary Hand Duster		10. Winnower with engine	25
11. Power Duster Winster	13	11. Rear car, human operator	10
12. Typewriter	4	12. Wheel barrow	10
13. Etcetera		13. Motor Cycle Honda	10
		14. Fork Lift 1.5 ton type	4
		15. Corn planter, hand operated type	6

1973 / 1974			
Materials:			
1. Urea	100 tons		
2. Compound	50 tons		
3. Pesticide	500 lit.		
	2,000 Kg.		
Equipments:			
1. Spare-parts for tractor, dryer corn sheller and hand tractor		3. Hand tractor	2
2. Printing Unit		4. Movie Projector 28 mm	1
		5. Diesel, Gasoline half cut engine	1
		6. Etcetera	

Table 8 - 3. LIST OF THE MAIN EQUIPMENT DISTRIBUTION
(Except Jeep and Truck)

Item / Type	Malang	Kediri	Lumajang	Bondowoso	Banyuwangi	Surabaya	UGM. Jogja	Bedali	Total	Units
1. Farm Dryer FE97B	-	1	-	-	-	-	-	4	5	5 new
2. Farm Dryer FE97	-	2	-	-	1	-	-	-	3	3 new
3. Farm Dryer FD 77	-	-	-	-	1	2	-	-	3	3 new
4. Vertical Dryer (Colica)	12	16	1	3	9	16	1	2	60	60 used
5. Horizontal Dryer (Kaneko)	3	-	2	3	8	-	1	1	18	18 used
6. Power Corn Sheller (Rotary)	1	6	-	-	3	1	-	1	12	12 used
7. Corn Sheller (Gear 2 HP)	9	1	2	6	-	-	1	1	20	20 used, 10 lost= 30
8. Corn Sheller (Hand Operation)	-	2	-	-	-	57	-	-	59	57 new, 2 used
9. Corn Separator (Gear 3 HP)	2	2	1	1	5	2	-	1	14	6 new, 8 used
10. Knapsack Sprayer	-	-	-	1	1	20	-	-	22	20 new, 2 used
11. Hand Duster	-	-	-	1	1	78	-	5	85	78 new, 7 used
12. Pour Mist Blower	-	-	-	-	1	1	-	-	2	2 used
13. Seed Equalizer	-	-	-	-	-	6	-	1	7	4 new, 3 used
14. Winnower	-	1	-	-	2	-	-	6	15	9 new, 6 used
15. Corn Cutter STAR	-	-	-	-	-	4	-	-	4	4 new
16. Corn Husker Kawasaki	-	-	-	-	-	6	-	-	6	6 new
17. KETT Grain Moisture Meter SP 1.	1	1	-	-	-	4	-	4	10	10 used
18. KETT Maize Moisture Meter E-101	1	2	-	-	1	-	1	5	10	10 used
19. Soil Moisture Tester SP 202	-	-	-	-	1	8	-	1	10	10 new
20. P.H. Meter	-	-	-	-	-	9	-	1	10	10 new
21. Fork for Best	-	-	-	-	-	24	-	-	24	24 new
22. Platform Balance 500 Kg.	2	1	-	1	2	-	-	-	6	6 new, 2 - lost= 8
23. Platform Balance 180 Kg.	-	2	-	-	-	-	-	-	2	2 used, 2 lost = 4
24. Platform Balance 100 Kg.	3	1	-	2	1	1	-	-	8	8 used
25. Platform Scale 500 Kg.	-	-	-	-	-	3	-	1	4	3 new, 1 used

Item / Type	Malang	Kediri	Lumajang	Bandowoso	Banyuwangi	Surabaya	UGM. Jogja	Bedali	Total	Units
26. BRENNER'S Grain Balance	-	-	-	-	-	4	-	1	5	5 new
27. KUBOTA Farm Tractor L-350	-	1	-	-	2	-	-	1	4	4 used
28. KUBOTA F. Tractor L-200	-	-	-	-	1	2	-	-	3	3 used
29. Power Tiller K700	-	1	-	-	-	-	-	2	3	2 new, 1 used
30. Generator 7.5 KVA.	-	-	-	-	-	-	-	1	1	1 new

Table 8 - 4. LIST OF EQUIPMENTS TO BE PROVIDED BY THE GOVERNMENT OF JAPAN FOR THE MAIZE PROJECT EAST JAVA IN 1972/73

No.	Description of Goods	Breakdown/Type	Quantity
1.	Fertilizer	Urea (Compound 27.27)	300 tons 100 tons
2.	Fumigant	Mathyl Bromide	500 Kg.
		Interformeter type gas analyzer. (Ricoh gas analyzer 18 type)	5
		Gas detector (Dorages gas analyzer)	4
		Gas Mask with canister	20
		Canister (Spare)	40
		Balance weight (1 Kg.)	4
		Measuring tape (20 m)	4
		Cholride Casium (Spare)	3
		Soda Lime (Spare, colorlime)	2
		Pyrethrum Powder	100 Kg.
	EQUIPMENTS:		
1.	Truck	1 ton type (pick-up)	5
2.	Farm Tractor	35 ps (KUBOTA with rotary)	1
3.	Trailer	For L - 350	4
4.	Disk Plough	For L - 350	4
5.	Rotary Cutter	For L - 350	4
6.	Farm Tractor	FERGUSON	1
7.	Trailer	For M.S. 13,2 tons dump.	1
8.	Disk Plough	For M.S. 13, 3 ploughs	1
9.	Diesel engine	For KANEKO HD 360	30
10.	Corn Sheller	Rotary type with diesel engine	32

No.	Description of Goods	Breakdown/Type	Quantity
11.	Winnower	With engine	25
12.	Platform Balance	180 Kg.	40
13.	Maize Moisture Meter	KETT Model E -10	40
14.	Wet and Dry Bulb Thermometer	Regular type	35
15.	Platform scale	5 Kg.	5
16.	Platform scale	200 Kg.	10
17.	Soil tester	F H K	10
18.	Reagents	For FHK Soil Tester	20
19.	Typewriter	Large size	5
20.	Photocopy	Electronic	1
21.	Grain Sample	Small size	4
22.	Ceiling tapestry	With pole, movable	15
23.	Rear Car	Human Operation	10
24.	Single wheeled carrier	Human Operation	10
25.	Plastic cover	500 m^2	10
26.	Electronic calculator	Handy type (Pocket size)	2
27.	Calculating machine	Tiger	10
28.	Motor cycle	Honda	10
29.	Fork lifet	1.5 tons type	4
30.	Microphone	Small type	1
31.	Portable Loud Speaker set		5
32.	Portable Amplifier		1
33.	Halogen Lamp	Elmo 8 m Projector ST-8 TP-A Type JS-24-150	5
34.	Tool set	5 tons	5 sets
35.	Hydraulic Jack	5 tons	5
36.	Chain Block	1.5 - 2 tons	5
37.	Grading Plate		3
38.	Microscope Stereo	15 - 30 x	1
39.	Power Pulling Apparatus	L - 350	2
40.	KETT Moisture Meter Battery		40
41.	Corn planter		6
42.	Spare-parts for Tractor L-200 RB		
43.	Generator		

Table 8 - 5.

A. List of equipments and furniture in the room of the Japanese Expert Team

Item / Remark	Number:
I. Belonging to DIPERTA:	
1. Guest Plastic chairs (3) and table	1 set
2. Filing cabinet "Alma" 4F 224 X and 4F 272 X	2 pieces
3. Small wooden table (for making coffee)	1 piece
4. Brown wooden writing desk with rattan chairs	4 sets
5. Black wooden desk	1 piece
6. Wooden table with one drawer (under photocopy machine)	1 piece
7. Straight rattan chairs	4 pieces
8. Telephone receiver (both out of order)	2 pieces
II. Belonging to O.T.C.A. (A-4 Form)	
1. Filing cabinet "Hilda" G 115 and G 262	2 pieces
2. "Ricoh" recopy Hi-start machine	1 piece
3. "Ricoh" recopy table (annex of recopy machine)	1 piece
4. "Ricoh" photocopy machine BS 310	1 piece
5. "Kumahira" Business safe 3131212 (in Kendaraan room)	1 piece
6. Wall thermometer, wet and dry	1 piece
7. Long carriage "Remington" typewriter	1 piece
8. Storage cabinet "Hida" D 52 Y	1 piece
Inside the storage cabinet, there are the followings:	
9. "Smith Corona" portable typewriter	1 piece
10. "Addo-X" (hand-crank) calculator	1 piece
11. "Tiger" pocket electric calculator (plus adaptor)	1 set
12. "Busicom HL 21" calculator	1 piece
13. "Matsunaga" slide regulator	1 piece
14. Brower grain balance	1 set
15. p^H meter	1 set
16. FHK Soil tester	1 piece

B. List of the equipments kept by the Japanese Expert Team members

Name of Expert	Equipments	Number
1. Mr. T. Fukusato	(1) Balance for grain	1.
	(2) FHK Soil Tester	1.
2. Mr. H. Sakamoto	(1) Scale for grain	1.
	(2) ASMA N Psycrometer	1.
	(3) Soil Tester	1.
	(4) Typewriter	1.
3. Mr. M. Morita	(1) Typewriter	1.
	(2) Soil tester	1.
	(3) Moisture tester (without battery)	2.
	(4) Rope for survey (100 m)	1.
	(5) TAKO meter (turning m ter)	1.
	(6) Gas Testing meter	1.
4. Mr. Y. Yoshizumi	(1) Electric calculator	1.
5. Mr. E. Kochi	(1) Electric calculator	1.
6. Mr. Y. Tamura	(1) Electric calculators (one is broken)	2.
	(2) Insect net	1.
	(3) Motor cycle	1.

8.3. Godowns in the Project areas

Godown is very useful for the implementation of the Project, especially for collecting, processing and storing of maize. Up to now, 24 godowns had been built, by using the Indonesian Government budget, in 5 districts. Some of those godowns are very useful for the activities of the Primer Koperta and for the Project. But, I hope, some necessary measures will be taken in order to be able to use the godowns effectively. (See Table 8 - 6).

Table 8 - 6. LIST OF MAIZE PROJECT GODOWN IN EAST JAVA PROVINCE

KABUPATEN Kecamatan, Desa.	Owner-ship.	Long x Wide x High		P/S	Capacity		Made in Year	Land size
		Godown	Dry. Fl.		Gd	DF		
1. KEDIRI								
Kepung:								
Asmorobangun	Desa	20x7.5x3	20x7.5	s	250	25	1971	35 x 30 m
Bosowo	Desa	18.25x7.4x4	15x10	s	200	20	1972	40 x 25 m
Kepung	Desa	18.25x7.4x4	15x10	s	200	20	1972	38 x 25 m
Kampung Baru	Desa	25x10x4.5	25x10	s	280	30	1972	35 x 30 m
Plosoklaten								
Pranggang	Desa	20x7.25x3.5	20x7.5	s	250	25	1971	25 x 50 m
Trisulo	Desa	20x7.25x3.5	20x7.5	s	250	25	1971	10 x 50 m
Pare								
Palem	Diporta	25x10x4	25x25	p	500	40	1970	30 x 40 m
Wates								
Bedali	Desa	20x7.25x3.5	20x7.5	s	250	25	1971	50 x 60 m
2. MALANG								
Singosari								
Baturetno	Diporta	15x10x4	15x10	s	180	1.2	1971	63 x 20 m
Dengkol	Desa	19x8.5x3.5	18x7	s	200	1	1972	26.5x17 m
Jabung								
Sukolila	Desa	19.5x8.5x4	20x10	s	210	1.5	1972	36 x 12 m
Ngajum								
Plaosan	Diporta	20x10x4	-	p	250	-	1971	55 x 29 m
3. LUMAJANG								
Randuagung								
Wonorejo	Diperta	40x8x3.5	40x8		300	2	1972	
4. BONDOWOSO								
Tegalampel								
Trembungan	Diperta	20x9x4	20x9	s	60	4	1970	
Grujugan								
Dadapa	Diperta	20x9x3.5	20x9	s	100	-	1972	

KABUPATEN Kecamatan, Desa	Owner-ship	Long x Wide x High		P/S	Capacity		Made in	Land size
		Godown	Dry. Fl.		Gd	DF	Year	
5. BANYUWANGI								
Wongsorejo								
Bangsring	Diperta	20x7x4	12x8	s	150	-	1972	30 x 25 m
Wongsorejo	Coop	19x7x4	-	p	150	-	1969/70	34 x 20 m
Alasbuluh	Coop	16.5x6.3.75	-	p	75	-	1969/70	20 x 17 m
Bengkak	Coop	16.5x6x3.75	-	p	75	-	1969/70	53 x 35 m
Sumberkencono	Diperta	18x30x4	10x20	p	400	-	1968/69	
Sidodadi	Diperta	20x7x4	12x8	s	-	-	1970/71	30xx 25 m
Bodolan/ Golekan	Coop.	16.5x3.75	-	s	75	-	1969/70	23 x 22 m
Watukebo	Diperta	20x7x4	12x8			-		30 x 25 m

Remarks:

1. Gd. = godown; Fl. = DL = Drying Floor
2. P/S - whether the building is made permanent (p) or semi-permanent (s).

9. The Realization of The Project Implementation

9.1. The Extended area in Five Kabupatens

As you already know, the Project started the planting of maize in 4 (four) Kabupatens (Kediri, Malang, Lumajang and Bondowoso) in 1968. But later, in 1970, Kabupaten Bondowoso was added to the Project areas. It can be said that these five Kabupatens are the main maize producing areas were able to produce 212 thousand tons of maize in 1972. This figure is equal to 30% of the whole maize production in East Java. While the harvested areas reached about 21% of the whole maize harvested areas in East Java.

In the first year of the Project implementation (1968), the extended areas of the Project was only 680 Ha., but in the second year it reached 4,582 Ha. Compared to the provious year, it is 7 (seven) times bigger. During the past 6 years, the total of the Project's extended areas was 25,443 Ha. This figure is equal to about 40% of the East Java harvested areas. The number of the Desa and participating farmers were 9 (nine) Desas and 822 farmers, respectively. In the 1972/73 period, the number of Desas was 31 Desas and the number of the participating farmers was 6,800 farmers. At present, the total of participating farmers has reached 36,493 farmers. (See Table 9 - 1).

On the yield of the maize in the Project areas, we cannot say exactly how many tons of maize can be produced. According to the result of our experts' survey, the estimated production of maize per hectare reached about 2 to 2.5 tons. So, the total production of maize in the Project areas will be about 50 thousand tons (25,443 x 2 tons).

9.2. Repayment Ratio

One of the most important problem which has been faced by the Project in the implementation of the business was how to improve the repayment ratio. At the first year, the ratio of the repayment was 100%. But, it gradually decreased to 55.5% and 54.9% in the second and third years, respectively. The main cause of the reduction on the repayment ration was the quick spread of the Project areas from 680 Ha. to become 5,000 Ha. at one stretch. So, the Project did not have enough time to survey the economical conditions of the participating farmers, the system of collection and the method of the credit. Besides that, the number of the Japanese experts and the regional officials concerned were not enough to supervise the implementation of the Project.
But, in the fourth and fifth years the Project was able to improve the repayment ratio to reach 66.6% and 73%, respectively. These results especially were due to the hard efforts of Diperta and the regional officials concerned.

9.3. Export and Domestic Sale

The amount of the maize collected from farmers as the repayment of credit was 5,696 tons (in dry kernel) in 1968 - 1973. 3,440 tons from the amount mentioned was exported to Japan through Gakoperta, and the rest was sold in the domestic market under the direction of Diperta East Java Province (See Table 9 - 2).
This exported amount figure is not always sufficient for us. But, I believe, the result of the export has a great significant for the farmers. Since the export was conducted under the farmers's organization of agricultural cooperative itself, the agricultural cooperative could get experience on maize export during the five years, and if they want to export maize, in the future, they can do it by themselves.

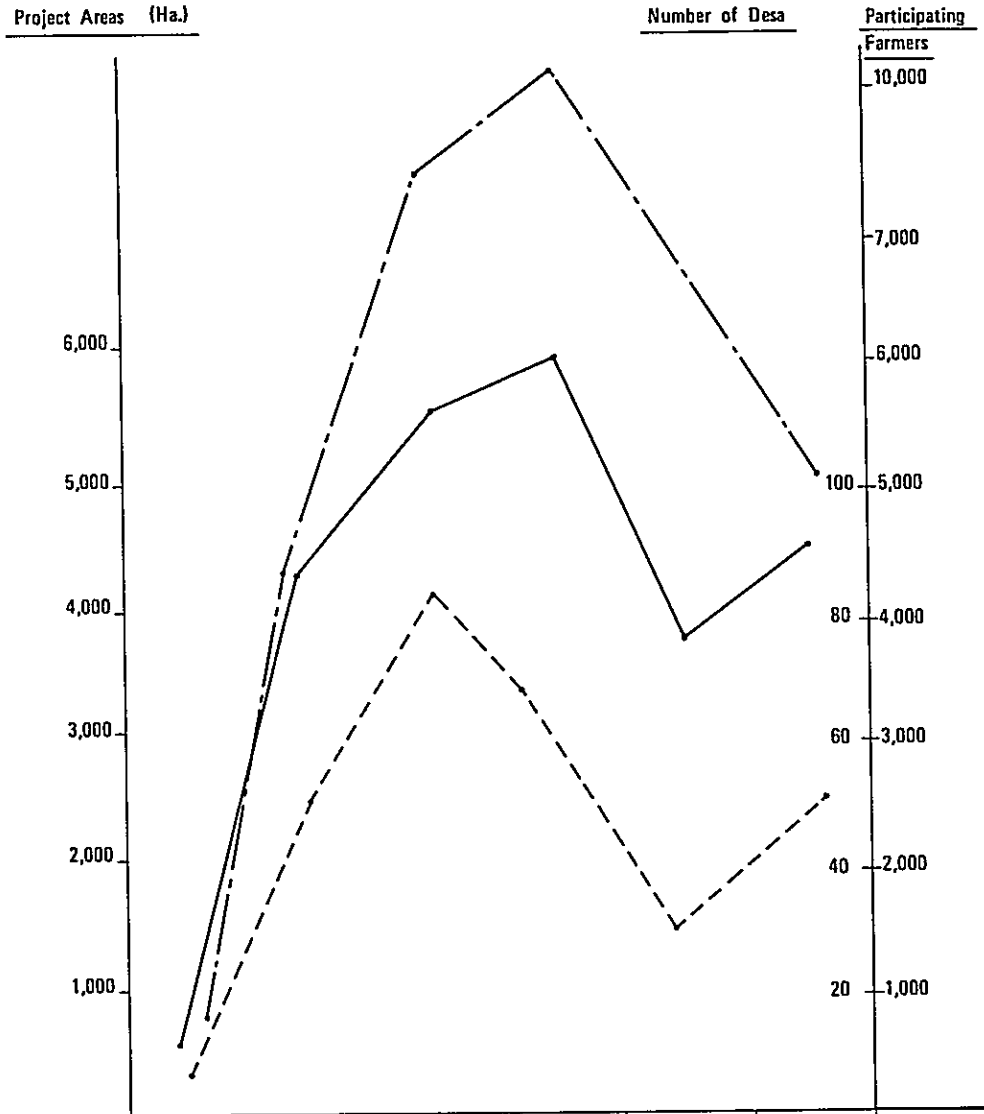
The quality of maize which was produced by the participating farmers was better than those produced by non-participating farmers. So, the amount of maize, which was sold by the farmers to the brokers, was also exported through the commercial traders' hands. Taking this into consideration, the actual amount of maize export will reach bigger than the 3,440 tons mentioned above.

9.4. The Implementation of The Project in 1973/74.

In 1973/74, the project's extension was carried out by the BIMAS credit system. The extended area reached is about 4,604 Ha. in 5 (five) Kabupatens (9 Kecamatans, 51 Desas), it means there is an increase of 645 Ha. as compared with the extended area in 1972/73.
The target of BIMAS Jagung in 5 (five) Kabupatens is 20,300 Ha. and 98.1% of the target mentioned was attained in the Project's areas.

Table 9 - 1.

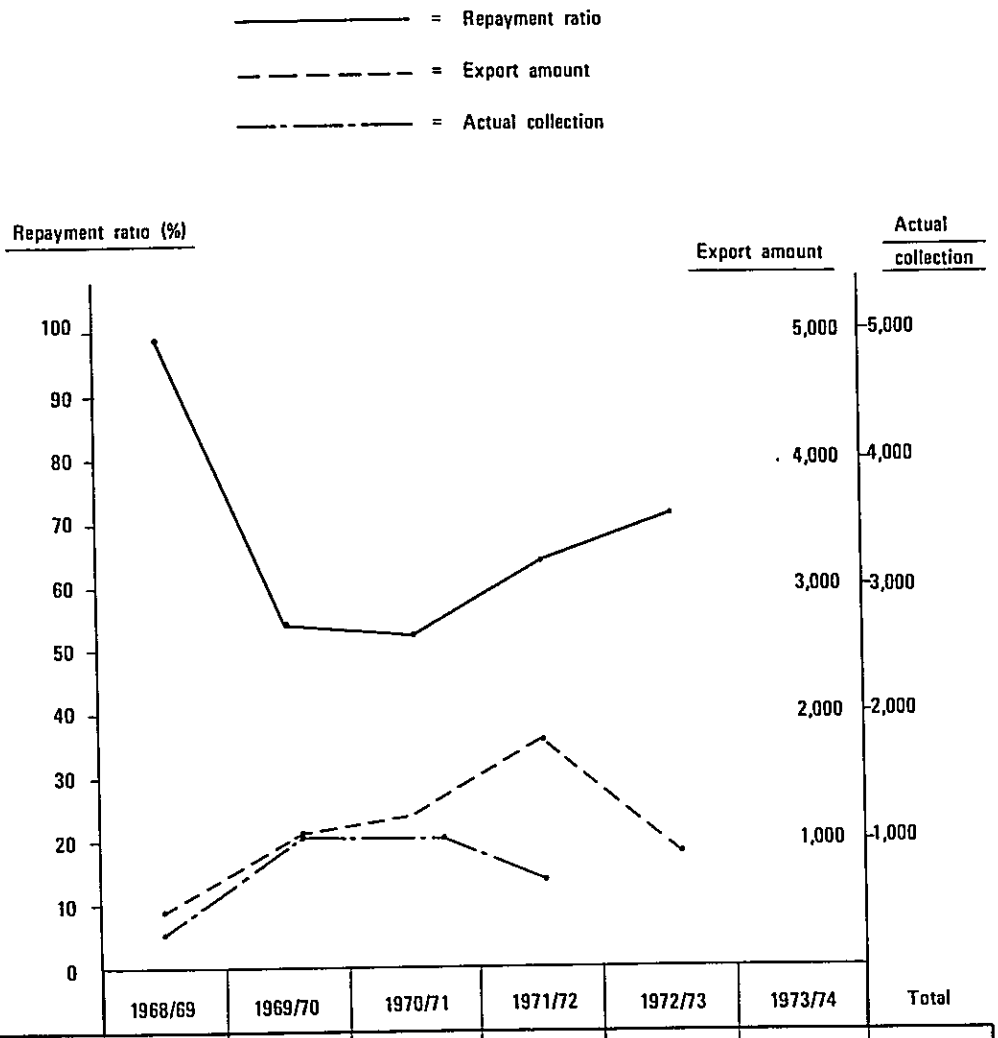
The Graph of The Project Areas and The Participating Farmers



	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	Total
Project's Areas (Ha.)	680	4,582	5,468	6,114	3,995	4,604	25,443
Participating Farmers	822	5,088	7,633	10,439	6,800	5,711	36,493
Number of Desa	9	55	85	63	36	51	299

Table 9 - 2.

The Graph of Repayment Ratio, Export Amount and Actual Collection



	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	Total
Reported Ratio	100	55.5	54.9	66.6	73	-	70%
Exported Amount	253.7	1,101	1,260.4	825	-	-	3,440
Actual Collection	269.2	1,099.3 3	1,331	1,865	1,131.6	-	5,696.1

Table 9 - 3. THE EXTENDED AREA OF THE PROJECT AND BIMAS JAGUNG IN 1973/74

KABUPATEN	Kecamatan	Desa	Project's Extended Areas (Ha)	Number of Farmers	Target	BIMAS Jagung		
						Number of Farmers	Realized	%
Kediri	3	32	2,375		10,000	15,945	11,469	115
Malang	3	5	600		4,000	4,448	4,026	100
Lumajang	1	5	850		2,000	2,137	2,033	101
Bondowoso	1	1	100		1,500	843	739	49
Banyuwangi	1	8	679		2,800	1,458	1,660	59
TOTAL :	9	51	4,604	5,711	20,300	24,831	19,927	98

9.5. Training

During 6 (six) years, the Project had sent 24 trainees to Japan to study the new technique and knowledge concerning the production of maize, quality control and cooperative activities. Those officials, the former trainees, are now very active in leading other officials and farmers in the Project areas. (See Table 9 - 3).
In the 1974 budget, we are scheduled to send 5 (five) trainees; 2 persons will study on agricultural cooperative and 3 persons on quality control.

Table 9 - 3. LIST OF O.T.C.A. TRAINEES FROM 1968 TO 1974

Year	Name	Age	Subject	Period	Note
1968	1. Iskamar Winoto	36	Fumigation	3 months	Diperta Jatim.
	2. Kambali Soeprapto	37	-"-	(Sep-Dec)	Diperta Kediri
1969	1. Soetarto Koeswosoehardjo	32	Production	80 days	Diperta Jatim
	2. Ir. Kadijono	29	-"-	(Sep-Nov)	" Pasuruan
	3. Jacobus Soewondo	43	-"-		Diperta Malang
	4. Aliman Soekendo	41	-"-		" Bondowoso
	5. Djoko Sasmito	44	-"-		" Sidearjo
1971	1. D. Soepadrijono	45	Cooperative	1 month	" Malang
	2. Drs. Wagijono Djoewito	30	Cooperative	(Jul-Aug)	" Jatim
	3. Soemantri	40	Cooperative		" Jatim
	4. H.M. Maksoem	55	Cooperative		Prim.Koop.Malang
1972.	1. Achmad Kosim	45	Quality Cont.	3 months	Kar. Kediri
	2. Hartono	37	-"-	(Oct-Dec)	Central Govt.
	3. M. Scoetardjan	44	Cooperative		Bedali Center
	4. Abdoel Rasjid	41	-"-		Kars. Besuki
1973	1. Soepojo Rahardjo	51	Cooperative	25 days	Diperta Jatim
	2. Lukman Hakim	38	-"-	(Jul-Aug)	Central Govt.
	3. Mohammad Imam B.A.	31	-"-		BUUD Banyuwangi
	4. Mohammad Irzak	48	-"-		BUUD Malang

Year	Name	Age	Subject	Period	Note
1973	5. Sardjono	46	Cooperative		BUUD Kediri
1974	1. Hadiwiyoto		Quality Cont		Diperta Banyuwangi
	2. A. Djazoeli		-"-		Diperta Jatim
	3. Ismail Zahri		-"-		" Lampung
1974	1. Soetrisno				Kars. Malang
	2. Mochamad Maksum				BUUD Pagu II Kediri
	3. Soeropo				BUUD Lawang
	4. Wardji				BUUD Lamongan
	5. Undecided yet				

10. The Evaluation of the Project's implementation.

I think the meaning of evaluation is not only to discuss the merits and demerits on the results of the Project's implementation, but also to look for the best way to be used in the next step of the new Project and to make efforts to utilize in the future the knowledge and skills which have been accumulated during the activities of the Project for six years.

10.1. The Joint Meeting on the Evaluation of the Project.

A joint meeting on the evaluation of the Project was held at Murnajati on the 1st and 2nd of February, 1974, participated by Mr. Martono Soeronegoro, the Inspector of Diperta Jatim, the Diperta Officials, local administrative concerned and the Japanese experts. The explanation, discussion, exchange of view and debate were conducted for two days under the following subjects.

1) Promotional Program of B.U.U.D. in the framework of the Project. (Key note speaker: Mr. Soepojo Rahardjo, Ir. Sadroen and Ir. Ali).

2) Distribution and the usage of the equipments of the Project. (Key not speaker: Mr. Tegoeh).

3) Mechanical Maize Drying and its Marketing. (Key note speaker: Mr. Adimoeljo).

4) The Evaluation of the Project. (Key note speaker: Mr. Y. Tamura).

Finally, we agreed to adopt the "Conclusions of the Maize Project Technical Meeting" as follows.

I. In the Development of B.U.U.D./Jagung (maize)

1. To make the promotion easy, it is considered necessary that the Primer Koperta existing in the Unit Desa should merge themselves into B.U.U.D. in amalgation.

2. The legal status of B.U.U.D. should be immediately realized, such as with other existing cooperatives, or replacing Law No. 12 of 1967, into one which is suitable

to the development of B.U.U.D.

3. To increase the farmers' income and to increase the production yield that could be collected by B.U.U.D., then B.U.U.D., side by side with the Government, should be active in the implementation of the intensification/ Bimas.

4. While waiting for the legal regulation, the existing B.U.U.D. should establish a federation in the provincial level, and a coodination at the Kabupaten level. This is to make the contact with the foreign countries easy, should we need any trade connection / export (among others, with ZEN-NOH), etc.

5. By the existence of the federation and coordination at the Kabupaten, it will be easy for the collection, processing and marketing the production of the members. By this pooling system, more profit could be obtained by B.U.U.D. or the members, especially to face the big capital ownerd.

6. In the contact with the foreign cooperatives, the B.U.U.D. Federation should make a direct contact winth the Cooperative Federation existing in the country concerned (such as Japan, Malaysia, South Korea, etc.), without any intermediary.

7. Government protection odd non-spoiling nature as well as giving the facilities (especially in capital / credit), are all needed in facing other stronger social powers.

8. The formation / education of cadres, skilled enough in becoming a B.U.U.D. exponent that could change the old fashioned opinion into a modern one.

9. As B.U.U.D. should be a purely private organization, th then the appointed officials of the Government are only temporarily until the B.U.U.D. has enough skilled cadres and officials.

10. Regular and continuous supervision are very much needed and it should not be postponed at the time when the activities are in the climax, to prevent any unwanted matters.

11. Good mutual services between the participation of the community as the members and the supporters for the establishment of B.U.U.D. which is subjective to the higher organization, and the service of B.U.U.D. to the members as best as it could be, either technically or economically, of the non-technical / non-economical ones should be promoted.

II. <u>The Distribution and Utilization of the Equipment of Maize Project.</u>

12. As there are various existing equipments, it is necessary that before the equipments are distributed to the regional places, they should be re-inventoried and rechecked. For that purpose, a team should be appointed, consisting of officials from the Diperta and the Japanese Expert Team who will carry out the above.

13. The target of the distribution for the equipments should be meant for:

    a. Badan Usaha Unit Desa (B.U.U.D.)

    b. The under-organization of the Agricultural Extension Service.

    c. As demonstration instruments for extension and education, and

    d. Scientific instruments (for research) should be handled by an able and responsible official.

14. Especially for B.U.U.D., before the distribution of the equipments is carried out, it is necessary to confirm the kind and type of equipment needed and the usage of them, either technically, economically and sociologically.

15. In the framework of the promotion of B.U.U.D. into modernization, then the distribution of the equipments should fulfil the following conditions:

    a. The equipments have still the status of belonging to the Diperta.

    b. The B.U.U.D. is entitled to handle and care for the maintenance of the equipments, in such away that in a certain period of time the B.U.U.D. could buy or own the equipments of their own, and later on, the equipments belonging to the Diperta Office will be withdrawn.

16. For the sake of the smoothrunning of the utilization of the equipments, continuous supervision and technical promotion are needed, either for the officials of the Agricultural Extension Service or the B.U.U.D.

III. Maize Processing and Marketing

17. Production:

    Based on the average 5 years figure, maize production in East Java is 65% harvested in the months of rainy season. On that account the production increase in Pe Pelita II should be saved, especially in the drying process. Recalling that in the promotion of B.U.U.D. it would be the reservoir for the Farm Management of maize, which will be collected in a very great amount, then for the drying process, machineries are needed.

18. Marketing:

    For the implementation of handling the production problems, the following conditions are needed:

    a. Supplying the equipments needed:

    b. Providing skilled and trained officials to handle the equipments.

    c. Collection facilities and saving the production.

d. Development of marketing.

19. Maize marketing is centered on:

a. Certain quality and standard, according to the demand.

b. Export development and consumption, including domestic industry that needs maize.

c. Guarantee for the smooth running activities in marketing (collection, processing, transportation, etc.) with good finance and management.

20. For marketing of maize, maize quality supervision board is needed for:

a. Deciding the standard quality.

b. Guiding the producers and processors to produce profitable quality.

c. Being an arbitrator in any claim or dispute on the quality between the purchaser and the buyer.

IV. The Evaluation of the Project/

21. Maize Production:

Maize Project has shown the success in increasing the maize production in the Project regions and introducing the agricultural technology, (equipments, superior seed variety, fertilizer dose, etc) to the maize farmers. Before the Project, the average yield was 6.66 qt/Ha., and in the Project it was 24.7 qt/Ha.

22. Improvement of Quality:

In quality, the Project was successful in improving the export quality. The maize export to Japan has never met any claim.

23. Marketing Rationalization:

The Maize Project contributed in the development of Primer Koperta so that the Koperta was able to collect, process and sell the maize to Gakoperta, and in such away it broke down the "Tengkulak" channel.

24. Smoothening Trade Transaction:

The Maize Project has created a new channel for maize marketing, namely, Gakoperta as the exporter and ZEN-NOH as the importer. Through Gakoperta, 3,440.100 tons of maize had been exported to Japan for the past five years (1968 - 1973).

25. Skilled Officials:

During the implementation of the Maize Project, several skilled officials were trained either domestically or abroad, so that they could support the success of the Project. There are 14 trained officials for fumigation, production, koperta promotion and quality control,

and 6 (six) key farmers for cooperative management.

26. Production Development Center:

The Maize Project has positively supported the establishment of the Maize Center, which later on developed into Palawija Development Center and further on into Pusat Pengembangan Pertanian (Agricultural Development Center).

27. Extension / Prolongation of the Project.

Based on the impact that could be felt on:

a. Second-crop production development.

b. Development of farmers' efforts through B.U.U.D.

c. The increase of farmers' income.

It is necessary to suggest for the extension or prolongation of the project, or at least the aid of the experts needed.

10.2 The Evaluation of O.T.C.A. Technical Advisory Team

The Team, consisted of 6 (six) persons and accompanied by Mr. OTO as the Team's Leader, visited East Java for 3 (three) weeks, from the 20th of February until the 15th of March, 1974, for the purpose of evaluating the Project. During those three weeks, the Team had met Mr. Martono Soeronegoro, the Inspector of Agricultural Extension Service East Java Province, his staff members, Bupatis, Kabupaten's officials, representatives of B.U.U.D., key farmers and other people concerned with the Project.

In carrying out its evaluation of the Project, the Team was able to get close and intimate cooperations from the staffs and officials concerned. Based on the result of this survey, the Team submitted the following report to the Indonesia Government.

I. THE EFFECTS OF THE PROJECT

1. Effects in relation to the Indonesia agricultural policy.

(1) The fact that the Project areas are now forming the nuclear of the Bimas Palawija, started in 1973, is an important effect of the six years experience of the Project.

(2) The Maize Center at Bedali, of which foundation was established through the Project, has been developed into the Agricultural Development Center and now playing the important role for the agricultural progress of East Java. This is an important effect of the Project.

(3) As an effect of the Project, the Primekoperta which had grown up through the Project provided the basis for introducing B.U.U.D. in upland areas of East Java.

(4) Through the Project, valuable experiences have been gained in dealing with maize from multiple and overall points of view, combining production, processing, marketing and export.

2. Direct Effects of the Project.

(1) In production side, the following effects are observed:

a. Through the Project, the technique for economical increase of production by such measures as the introduction of improved seeds, adoption of rational application of fertilizaers and establishment of demonstration farms, have been established and brought about actual increase in yield per hectare, in Project areas.

b. By the implementation of the Project, experiences of utilizing machines, such as tractors, for maize production has been obtained.

(2) Some local varieties of maize have been purified through the Project. Out of them, Kretek purified variety has outstanding character, and has been expanded in East Java and contributed to the production increase.

(3) By the implementation of the Project, farmers experienced new marketing which their Koperta and B.U.U.D. utilized, and such new functions are still developing. In some parts of the Project areas, the profit of the new system has been actually paid back to the farmers.

(4) By means of mechanical processing (drying and shelling) adopted by the Project, experience was gained in getting good quality maize in large quantity even in the rainy season.

(5) Through the Project, the provision of materials and equipments, accompanied with the technical guidance for their use, promoted the development of model B.U.U.D. and through such a B.U.U.D. farmers recognized the importance of their own organized activities.

(6) In some Project areas, farmers surrounding the areas positively absorbed the technique shown within the area. This indicates the expanding effect of production increase technique of the Project.

(7) Through the implementation of the Project, participating farmers actually experienced the increase of income by the increased yield.

(8) In many of the Project areas, the "Ijon system" by Tengkulak was tamed to the benefit of the farmers.

(9) Especially the Koperta Bulupasar (present B.U.U.D. Pagu II) in Kediri established the business of extension seed production through the Project. The Koperta produced not only the seeds for its members but sold it to outside area and thus contributed

great deal to the expanded use of Kretek variety (Kretekization).

(10) Since the beginning of the Project, especially a new channel of maize export through farmers organization came into existence. In the early period of the Project, the export of maize from the Project areas to Japan exceeded 3,400 tons, the above amount is not a small amount from the point of view of the new farmers' organization, and the existence of expert prohibition.

(11) Under the Project, a number of trainees in maize production, agricultural cooperative movement, quality control, etc., were sent to Japan and acquired techniques and knowledges for the benefit of the agricultural progress in East Java.

II. PROBLEMS

(1) Within the Project areas, maize yield per hectare has increase about two or three times as against pre-project. Nevertheless the trend of total maize production in East Java Province has decreased since 1963. This fact suggests a limitation of the pilot project as the Maize Project.

(2) Repayment ratio has not always been satisfactory through the Project. One of the reasons was that farmers did not fully agree with the repayment in kind. Another reason was the deficiency in the channel of collecting the maize repayment. The merit and demerit of payment in kind and cash, however, needs more careful study in the future.

(3) The activity of the Bedali Maize Center should have started earlier from the very beginning of the Project, actually it began only from 1971.

(4) Distribution of extension seeds to farmers was occasionally too late for its planting time. It is desirable to advance production of extension seeds.

(5) Some of equipments brought through the Project have not always been used effectively. Selection of equipments should have been more careful.

(6) The Project activity including evaluation study has been obstructed by the shortage of statistical data. To get accurate data is most fundamental for the progress of the Project.

III. RECOMMENDATION TO DIRECTORATE GENERAL OF AGRICULTURE

1. The Team sincerely hopes that the successful effects of the Project during the past six years be fully maintained, utilized and further expanded in the process of BIMAS Palawija.

2. In particular, the Bedali Agricultural Development Center which has developed through the Project, should be further expanded and strengthened in order to contribute to the agricultural development of East Java especially in the following points:

(a) further development and improvement of seed production system which has been established by the Project.

(b) maintaining and further expanding various trials commenced by the Project.

3. Various supports should be given to the sound development of B.U.U.D. Above all, B.U.U.D. should undertake wide range of activities throughout the year and develop itself on its strong foundation. Early establishment of the upper organization of B.U.U.D. is especially hoped.

4. Among the modern techniques of processing and mechanized cultivation introduced through the Project, those which can be usefully applied for the agriculture in East Java should continue and settle in this Region.

5. Materials and equipments brought into East Java through the Project be used effectively for the development of agriculture in this Province.

6. The techniques and knowledge acquired by many trainees studied in Japan under the Project be fully utilized for the benefit of agriculture in East Java.

In order that the effects of the Project can be fully utilized for long, those officials concerned are requested to cooperate closely with the Japanese experts in taking over their activities during the rest of the Project period terminating at the end of July, 1974.

On the basis of the above observation and recommendations, a final discussion was held with the Inspector of Agricultural Extension Service East Java Province and his staff members at Murnajati, Lawang, on 13th of March, 1974.

The Inspector and his staff members, agreeing with the evaluation of the Team, expressed their desire for Japanese cooperation after the termination of the Project in the following aspects.

(1) For the development of the Agricultural Development Center at Bedali, in Pelita II, an additional foreign aid fund about 350 million rupiahs is needed for laboratory equipments, library, technical aid and training for personnel.

(2) For the upper organization of B.U.U.Ds., an expert be appointed as a consultant at the said upper organization.

(3) Through the establishment of the upper organization of B.U.U.Ds., which is the business tool of the activities of the Indonesian farmers, the cooperation with the Japanese farmers through ZENNOH (National Federation of Agricultural Co-operative Association) be continued and developed.

In view of the important role of the Bedali Center and B.U.U.Ds. for maintaining and further expanding the effects of the Project in the BIMAS Palawija, the Team took note of the above desire of the Inspector and promised that the Team

would convey it to the attention of the Directorate General of Agriculture in Jakarta as well as to O.T.C.A. and ZEN-NOH in Japan.

11. The Main Effects of the Project Activity.

11.1. The Increase of the Yield per Hectare and the Farmers' Income

As has been known well, in East Java there were about 1.1 million Ha. of maize harvested area and 1.0 million tons of maize production a year (1960 - 1969 average). While the harvested area and production of maize in five Kabupatens (Kediri, Malang, Lumajang, Bondowoso and Banyuwangi) in the same period were 291,942 Ha. (25.7%) and 307,572 tons (30.4%), respectively. (See Table 11 - 1.).
The average yield in the five Kabupatens showed 1.5 tons per Ha. It means those areas are more suitable for planting maize than the other areas. This is due to the better soil, weather as well as geographical conditions of those areas.

The farmers who had participated in the Project could learn the application of fertilizer, the use of superior seeds, how to controle the disease and post, etc. from the Project. By those measures, they were able to produce, averagely, 2 - 2.5 tons of maize per hectare during six years. So, if they returned the repayment of the credit, 100% to the Project, they would get 0.5 - 1.0 ton profit per hectare.
Besides that, the participating farmers would get good quality of maize, as compared to the non-participating farmers, and they could sell the rest of their maize with a rather high price in the domestic market. According to our study on the farmers' income in three Kabupatens, we obtained the following facts. (See Table 11 - 2.).

Table/Graph 11-1

Maize Production and Harvested area in Five Kabupatens

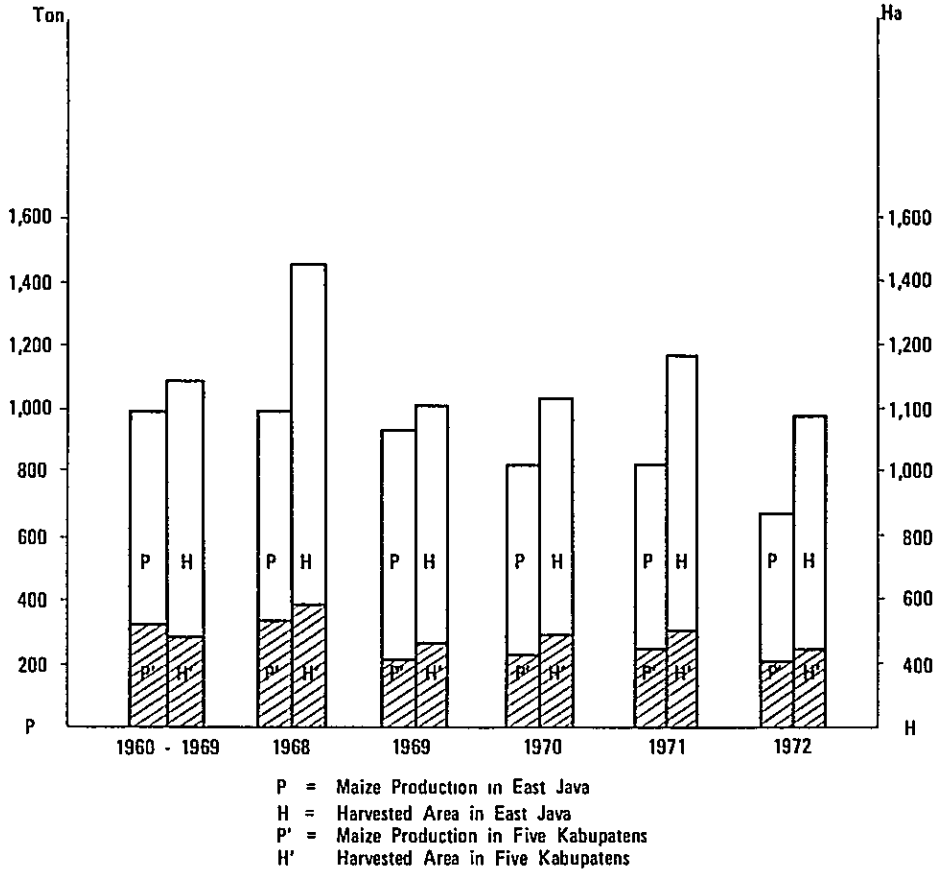


Table 11 - 2. Participating Farmers' Production.

Kabupatens	Farmers' Own Land (Ha.)	Participating the Project (Ha.)	Production (Ton)	
			Before Joining the Project	After joining the Project
Malang	A Upland 0.25	0.25	1.0 (unshelled)	2.5 (unshelled)
	B " 0.25	0.25	1.6 (unshelled)	2.0 (unshelled)
Kediri	A " 0.5	0.5	0.6 (grain)	1.0 (grain)
	B " 1.0	1.0	1.0 (grain)	2.0 (grain)
	A " 0.5	0.5	0.5 (grain)	1.0 (grain)
	B " 2.0	2.0	1.6 (grain)	3.0 (grain)

11.2. Effects Influence to the Areas

Kediri has occupied the most important role on the implementation of the Project. During the six years period, the Project has extended to reach 23,081 Ha., of which Kediri occupied 11,547 Ha. or about 50% of the whole Project areas.

As has already known, the production of maize in East Java has been decreasing every year, but not in Kediri. Before the implementation of the Project, the production of maize in Kediri was 50,900 tons (average production 1960 - 1969) and the yield per hectare was 11.11 quintals. In 1972, those figures have increased to reach 58,285 tons and 17.31 qt. respectively.
The ratio of the harvested area of the Project areas in East is only 0.4%, but Kediri's ratio is over 6%. (See Figure 11 - 3). From this fact, we can say that the Project is able to give its contribution to the increase of maize production in Kediri districts. I heard that some of the farmers have begun to buy and use fertilizerby themselves. If it is true, it is very good, because it indicates that the farmers have realized the advantage of using fertilizer. Most of the farmers who have realized the effect of the fertilizer on their plants always want to use the fertilizer in order to increase their production.

11.3. The Establishment of the Seed Production System of Maize.

The production of pure seed is one of the most important factors in increasing the maize production and improving the quality of maize. Since the beginning of the Project, 1968, we have prepared extention seeds (5 varieties, namely, Metro, Harapan, Bogor Composite 2, Kretek and P.S. 42) to be distributed to the farmers in the Project areas. The extension seeds of maize mentioned were produced in contract with selected seed-growers or key-farmers.
Until the Maize Center was established, we mainly got foundation seeds and stock seeds from the Branch of L.P.3 and from the Kabupaten own seed farm. However, the foundation and stock seeds they provided were not always enough both in quality and quantity. And moreover, Kretek and P.S. 42 were not national varieties and were not handled by L.P.3. or its branches.
Because of the above reasons, since 1971 Palawija Center has started to produce the foundation seeds (except the national varieties) and also the stock seeds.

As known already, maize is a cross-fertilizing crop and maize varieties in Indonesia are composite varieties. So the seed production should be carried out under the strict isolated field, including time isolation and uniform selection procedure.
Up to now, the Project has been carrying out a systematic seed production scheme in accordance with the following periodical schedule.

First of all, we should get the foundation seeds. Then, the foundation seeds must be planted in order to get the stock seeds. These stock seeds are replanted in order to supply or provide the needs of the farmers in the Project areas. At present, the above procedures have been completely and successfully implemented under the supervision of the Agricultural Development Center at Bedali and the needs of seeds for the Project can be fulfilled. Because the Project

areas were not so big, there was no need to produce a big amount of seeds. But, to fulfil the big need of seeds for BIMAS Jagung, the seed production of Palawija Center is not enough. So, I hope, a new seed production system would be established in accordance with the suggestion of Dr. S. Hirose on his book "Some Problems on Second Crop Culture", November, 1973.

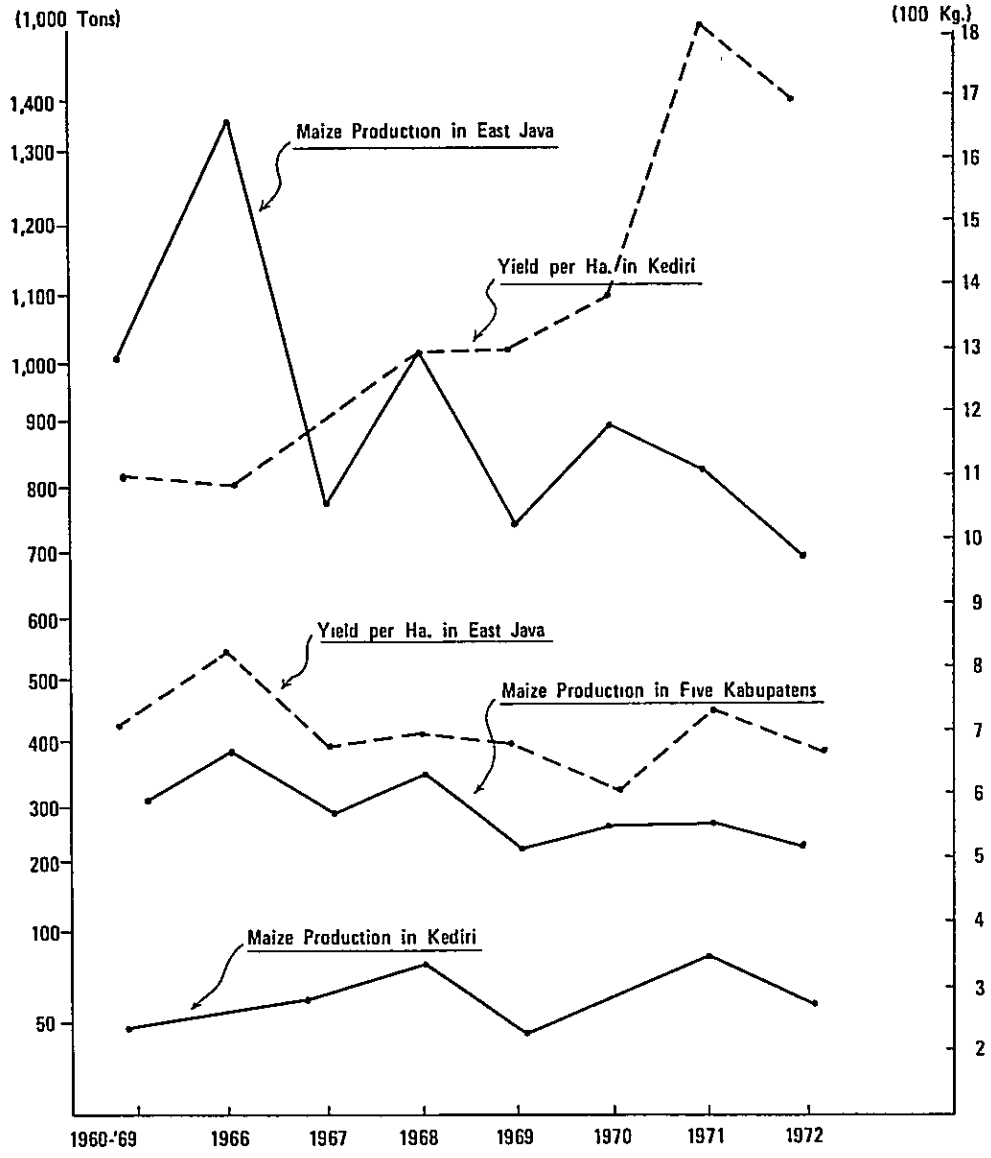
11.4. Setting up the Marketing Channel for Export

(1) From 1968 until 1973, the Project had exported about, 3,440 tons of maize to Japan through GAKOPERTA. But, I think, this result is not satisfactory for us, because the export target which was planned by Mr. Komuro, the former Project Leader, was 8,000 to 10,000 tons in 1973 / 1974. We herewith would like to explain the reasons:

a) In order to increase the amount of the export, the Project gradually has to expand the extended areas in the five kabupatens. In this case, we have to secure a rather big budget to meet the demand of the participating farmers, that is to supply the seeds, fertilizer and equipments needed. But, unfortunately, the budget of the Project from O.T.C.A. (Japanese Government) is limited. So, we cannot obtain enough fertilizer and equipments for the expansion of the extended areas. The budget in 1972 was about 50 million yens and the fertilizer granted from O.T.C.A. was 1,100 tons (equal to 5,500 Ha.).

b) The marketing system of the project was not enough. The production of maize has been carried out under the contract between Diperta - Gakoperta - Primkoperta - Farmers.

Figure 11 - 3. Maize Production and Yield per Ha. in East Java and Kediri



The capitals of the Primkoperta and Gakoperta were small and were not sufficient to collect the maize from the farmers, aside from the farmers, aside from the portion of the credit repayment (444 Kg/Ha, 1972/73). Furthermore, the Project could not get the capital from O.T.C.A. for collecting the maize.

As you already know, the Project areas are located in five Kabupatens, Kediri, Malang, Lumajang, Bondowoso and Banyuwangi are about 128 Km., 90 Km., 154 Km., 196 Km. and 295 Km. from Surabaya harbour. Besides that, the fields of some participating farmers are far from the Project's godowns or from Primkopertas and the condition of the road in some regions is very bad, especially in the rainy season. All these facts add the difficulty of the Project to collect the maize from the farmers.
Usually the shipping time of maize to Japan is limited to a certain time only. And the Project, due to the different harvest time in each area, could not keep the economical amount of maize shipment (3,000 tons or more) in the warehouse at that time.

c) The supply and demand of foodstuffs and feedstuffs are depended on the natural weather conditions and are always changing.
In 1972 / 1973 period, the Project decided to stop the maize export to Japan, because of the foodstuffs condition in Indonesia. The collected maize was all sold in the domestic market.

(2) For a long time in East Java, the export of maize has been conducted by the trade brokers. But since 1969, the Project was able to export maize to Japan through GAKOPERTA. (Gakoperta is a farmers' organization). Gakoperta was able to continue the transaction business with ZEN-NOH in the past four years. It means the farmers could exploit a new market abroad by themselves. So, they can sell their production to Gakoperta of to the "Tengkulak" with a good price in accordance with price in the international market.

(3) In 1972, the Project selected 5 (five) model Primkopertas in order to promote the agricultural co-operative movement in the Project areas with the purpose of increasing the farmers' income and accumulating their own capital. These five Primkopertas, at present, have developed and have become B.U.U.Ds. which cover several Primkopertas. The Project has given its contribution to the Primkopertas, so that they can carry out their own business by using the facilities and equipments lent by the Project.

Primkoperta has the function of collecting, processing, storing and selling the maize. At present, they have already had the ability to process the maize which can meet the export standard conditions.

In B.U.U.D. Dengkol, the godown, which was given by the Project, is always used for its office, for storing fertilizer and maize, and also for processing activities. Besides carrying out its own Project, B.U.U.D. Dengkol also gives credits to the farmers and does the selling/ buying of maize.
From these activities, B.U.U.D. Dongkol can accumulate its own capital. And the capital has been used for the farmers' interests.
B.U.U.D. Wongsorejo in Banyuwangi is also carrying out its own business by using the tractors lent by the Project.

11.5. Contribution for BIMAS Jagung in East Java.

We can say that the implementation of BIMAS Jagung in East Java is successful. According to the data of the Diperta, the target area of the BIMAS is 61,350 Ha, and its realization is 49,650 Ha. So, the ratio of the realization reaches 81%.
While in the five Kabupatens (Kediri, Malang, Lumajang, Bomdowoso and Banyuwangi), the target area is 20,300 Ha. and its realization is 19,927 Ha. The ration of the realization is 98.1%.

Table 11 - 4. Target and Realization of BIMAS Jagung in 1973/74

	Target Area (Ha)	Realized Area (Ha)	Ratio (%)
INDONESIA	112,600	81,276	72.1%
EAST JAVA	61,350	49,650	81.0%
Five Kabupatens	20,300	19,927	98.1%
Kediri	10,000	11,469	114.7%
Malang	4,000	4,026	100.0%
Lumajang	2,000	2,033	101.6%
Bondowoso	1,500	739	49.3%
Banyuwangi	2,800	1,660	59.3%

I think, the Project has contributed or given its good influence to the implementation of the BIMAS Jagung.

1) As has been known, the credit system of the Project was changed into Bimas system. The credit for seeds, fertilizer and living cost, was given to the farmers in cash through B.R.I. (Bank Rakyat Indonesia) and the actual goods needed, namely, seeds, fertilizer and pesticide were supplied by the B.U.U.Ds.
The formula of the credit system between BIMAS and the Project was rather different on its measure. But, I think, they are the same in their original characters, that is, that the farmers, who receive the credit, have to return it later.

2) During the five years, the farmers have obtained experience of getting credit and returning credit to the Project. While the regional officials, the staffs of Primkoperta (B.U.U.D.) and the leader of the Desa had known the system of the credit and repayment. Based on their experiences during the implementation of the Project, they can establish an organization which can supply fertilizer and collect the repayment of the credit systematically.

3) At the planting period of maize in 1973, the Project could prepare enough fertilizer supply for the extension of the Project. Some of those fertilizers were not used in the Project areas, but were also used in the BIMAS areas and for seed production.

4) Finally, the realization of the target, 98.1%, was depended upon the continuous endeavour of the Diperta office and the local officials concerned.

12. Some Proposals

12.1. Setting up a Periodical Joint Meeting on the Agricultural Cooperation Project between the Indonesian Government and O.T.C.A.'s Top Leaders.

The Leader of the Japanese Expert Team, who was dispatched from O.T.C.A., is actually, within the framework under the Record of Discussion concluded between the two Governments, the implementor of the Project. In inplementing the business the Project had been faced with various problems which had to be solved. This is due to the fact that the situation of the agricultural environments in the country is always influenced by the weather conditions, the world's foodstuffs demand and supply, and other elements. So, sometimes, it was necessary for the Project to change or modify some of the Project's aims.
But, under the framework of the Record of Discussion mentioned, the Leader did not have the right to change or modify the basic policy of the Project.

Here I propose to set up a new periodical meeting between the Indonesian Government and the Japanese Government (O.T.C.A's. Top Leaders). I propose that such a meeting will be held once a year either in Jakarta or Tokyo. If this meeting is already fixed, the changing or modifying of the Project's aims and the improvement of the Project's implementation will become easier and more effective.

12.2. Setting up a Sub-Liasion Committee of the Joint Meeting

The periodical meeting between the Ministry of Agriculture and the Embassy of Japan, including the Project's Leader, had been held on August, 1972 and 1973 in Jakarta. This meeting was very useful for us, because through this meeting we could make a close friendship, communication easier and were able to solve various problems. But, unfortunately, we did not have enough time to discuss all the problems of the Project on this meeting.

I think the problems on materials and equipments granted from O.T.C.A., the determination of the commodities, the period and budget handover, setting up a plan of distribution, storage and the maintenance of the equipments are not faced by the Maize Project only, but also by other Projects of sim lar nature.
In the case of Maize Project East Java, after determining the commodities, it took nearly one whole year to hand over the materials and equipments. If a sub-liaison committee could be set up, it would be very easy for the Project to solve the problems. This meeting should be held three times a year in Jakarta or in the location of the project.

12.3. Some Ideas on the New Project in East Java

After the termination of the Project, what new project should be set up in East Java?
As I already discussed in my report, East Java Province has a great role in increasing the production, not only rice, but

also second-crops as foodstuffs or supplemental foodstuffs to other provinces. Besides that, BIMAS Jagung, which was carried out in East Java in the 1973/74 planting period, was successfull.

But, the realization of the extension seed production and the supply of superior seeds to be distributed to the participating farmers were not satisfactory. And the Project itself could not solve some problems concerning the unification to one superior seed variety for the five Kabupatens, the finding out of new variety which is resistant toward Downy Mildew, the setting up of maize planting rotation which is suitable for each area and the establishment of a wide system of extension seed production.

Considering all the above problems, I propose to set up a Technical Cooperation Project for the development of second-crops in East Java.
The main purpose of this new Project will be to cooperate with the BIMAS Palawija in the field of increasing the second-crop production, improving the quality of the second-crops, rationalizing the marketing system and increasing the farmers' income. To obtain the above purposes, the Project should carry out the following technical cooperation in the areas as well as at Bedali Center.

1) To cooperate with the Agricultural Development Center at Bedali in the field of the second crop cultivation methods, seed production of local varieties, utilization of farm machinery, introduction of home agricultural industry and training for local administrative officials and key farmers.

2) To set up three or four pilot demo-farms which cover an area of 100 to 200 Ha. for the production of extension seeds for BIMAS Jagung in Kabupaten Kediri and Malang.

3) The production and collection of the extension seeds will be carried out under the cooperation with B.U.U.Ds.

4) To bring up B.U.U.Ds. through the implementation of the extension seed production.

CHAPTER II TECHNICAL GUIDANCE ON THE CULTIVATION OF MAIZE

By T. FUKUZATO

1. The tendency of decreasing maize yield

In East Java, we can see the tendency of maize yield going down since the year 1963. Concerning this matter, we have the following consideration.

(1) It will be changed into other crop, from the point of comparatively economical advantage.

(2) There was not so much effort to increase the maize production, compared with rice production.

(3) By the decrease of the yield per ha, total yield decreases, too.

In this case, we can expect the upland rice a competitive crop, but the harvested area of upland rice has not increased in these recent years. Harvested area of soy bean and ground nut are increasing, but this may not have so much influence to the harvested area of maize, as these crops are mostly planted after the rainy season.

According to this point, we can think that the decrease of maize production will be influenced especially by the decrease of the yield per ha. According to our opinion, the reason which brought up the decrease of the yield per ha. are as follows :

(1) Continuous cropping of maize for long years, under non-fertilizing.

(2) The tendency of soil acidity.

(3) The fall of soil fertility through the exhaustion of organic matters.

(4) Losing surface soil by water erosion.

(5) No renewal of improved seed.

The data are shown in Table 1, 2, 3 and 4.

TABLE 1. HARVESTED AREA AND YIELD OF MAIZE IN EAST JAVA

(1962 - 1971)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Harvested area (1,000 Ha)	1,341	1,128	1,575	1,111	1,620	1,303	1,420	1,037	1,322	1,169
%	119	100	139	98.5	143	115	126	90.4	117	104
Production (1,000 ton)	1,070	1,031	1,358	950	1,351	1,088	1,025	698	875	823
%	104	100	132	92.0	131	105	97.5	67.6	84.7	79.8
Yield / Ha (Q)	7.98	9.15	8.62	8.56	8.34	7.07	7.22	6.73	6.62	7.04
%	87.1	100	94.2	93.6	91.1	77.3	78.9	73.5	72.4	76.9

TABLE 2. HARVESTED AREA AND PRODUCTION OF UPLAND RICE IN EAST JAVA

(1962 - 1971)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Harvested area (1,000 Ha)	87	68	62	68	74	71	76	68	64	65
%	128	100	91	100	109	104	101	100	94	96
Production (1,000 ton)	149	103	105	104	122	96	126	109	110	103
%	145	100	102	101	118	93	122	106	107	100

TABLE 3. HARVESTED AREA AND PRODUCTION OF SOY BEAN IN EAST JAVA

(1962 - 1971)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Harvested area (1,000 Ha)	332	308	306	315	327	340	355	353	391	391
%	108	100	99.5	102	106	110	115	114	127	127
Production (1,000 ton)	215	209	197	199	210	216	188	206	222	232
%	103	100	95	96	100	103	90	99	106	111

TABLE 4. HARVESTED AREA AND PRODUCTION OF GROUND NUT IN EAST JAVA

(1962 - 1971)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Harvested area (1,000 Ha)	123	119	130	119	124	122	138	121	133	135
%	103	100	109	100	104	102	116	102	112	113
Production (1,000 ton)	76	76	63	76	70	73	84	75	81	83
%	100	100	83	100	92	96	110	99	107	109

TABLE 5. HARVESTED AREA AND PRODUCTION OF CASSAVA IN EAST JAVA

(1962 - 1971)

	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Harvested area (1,000 Ha) ...	463	495	492	548	442	488	465	488	450	451
%	94	100	99	111	90	99	94	99	91	91
Production (1,000 ton)	3,425	3,378	3,311	3,551	3,073	3,243	3,183	3,164	2,904	2,897
%	101	100	98	105	91	96	95	94	86	86

1.1. The decrease of the yield by the continuous cropping of maize under non fertility:

Concerning the decrease of maize yield by the continuous cropping, we can see it through the result of the trials at Kikyogahara in Japan, it tells us the following:

(1) When maize is grown continuously, the yield tends to decrease gradually, even if sufficient fertilizer is applied.

(2) In the continuous maize cropping, especially in the case of non fertilization, the yield is not only low in the early period of continuous cropping, but also the more cropping year go by the less the yield becomes.

(3) It is possible to prevent the decrease of maize yield in some degree by applying compost and calcium in parallel with chemical fertilizer.

Continuous cropping:

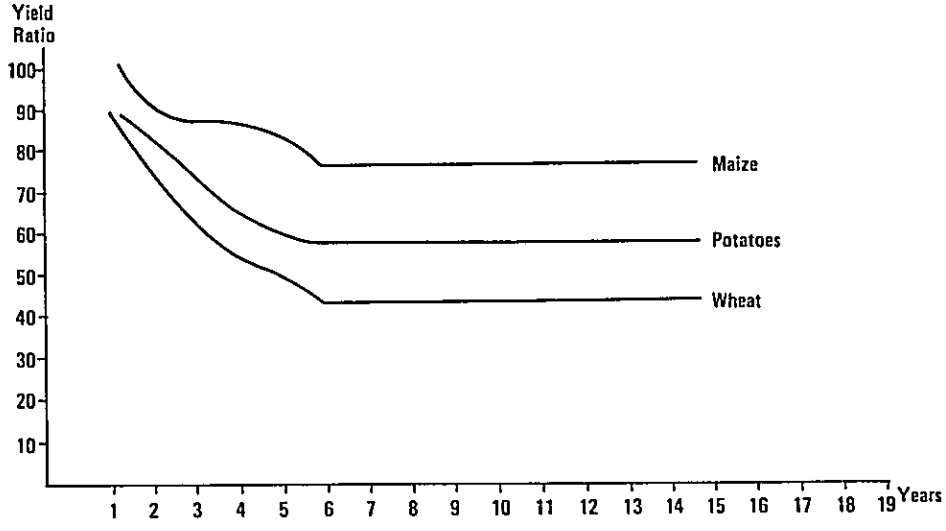
(1) Through continuous cropping, if we happen to meet injury of continuous cropping (usually 2 - 4 years after we take continuous cropping), the injury increasing radically in 5 - 8 years, and the yield decreasing.

(2) After 5 - 8 years past since we meet with injury of continuous cropping, the injury showing mostly first degree, then injury is not so intense even if we still continue continuous cropping.

(3) If we deduct or reduce the amount of fertilizer, we can expect more severe tendency of continuous cropping injury. This point may be the biggest reason which brought about the decrease of the maize yields., as we planted without fertilizer in continuous cropping for long years.

As above mentioned, after we continued some term of continuous cropping, if the yield become fixed for some period of time, we can decide that the injury of continuous cropping may not appear after a few years from that fixed point of time. We have to pay attention to this point of time before we decide the injury of repeated of continuous cropping.

Figure: DECREASING TENDENCY FROM THE BEGINNING OF CONTINUOUS CROPPING INJURY (Estimated line)



According to the variation of yield of continuous cropping at Hokkaido we can recognize that the decrease of yield is rather smaller by using a compost on each crop, as shown in the following table.

TABLE ON YIELD VARIATION ON CONTINUOUS CROPPING AT HOKKAIDO (Index)

Number of year of continuous cropping	Spring seeding barley		Soy bean		Potatoes		Sugar beet		Peppermint	
	Three elements	Adding compost	Three elements	Adding compost	Three elements	Adding compost	Three elements	Adding compost	Three element	Adding compost
1	91	102	122	96	111	108	93	107	105	115
2	100	98	81	94	92	100	55	81	93	105
3	71	92	68	73	89	90	44	80	85	106
4	74	82	83	87	106	113	16	58	62	75
5	55	91	117	104	73	99	22	58	62	77

According to other examination in the investigation of upland cultivation telling us the tendency of decreasing yield will be prolonged by using compost or green manure. The means to avoid the injury of continuous cropping by using compost is acting by chemically, physically and biologically.

When we use about 2 qt of Urea per ha, then we can expect more than three or four times of maize yield, comparing to the non fertilized maize. But we should remember that even if we can expect high yield by using urea, the yield will be decreased gradually when we repeat the continuous cropping.

Mostly the soil of East Java contains plenty of nutrients. But when we repeat the continuous cropping, the nutrients will be used up in a few years and the soil fertility may be gradually decreased.

Eventhough you can expect the supply of nutrients by the volcanic eruption, but we should make our best efforts to protect the soil fortility, which may bring us good annual yield.

1.2. The Tendency of Soil Acidity:

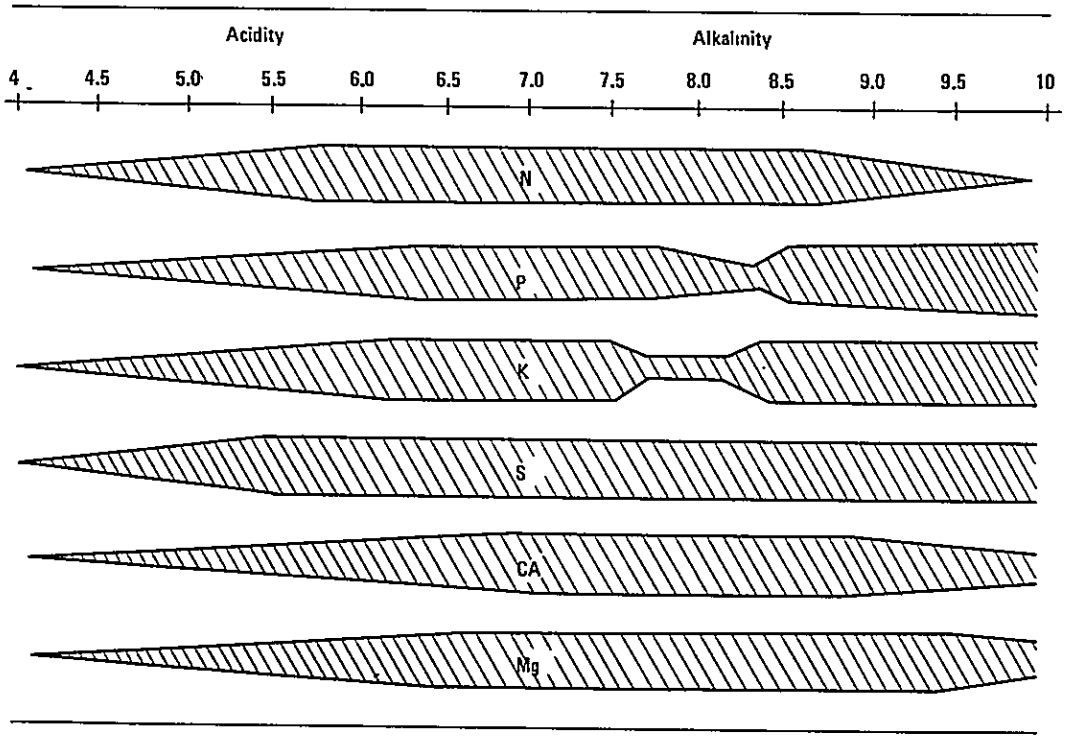
Under high temperature and heavy rains such as in Indonesia, much soluble cation will be leaking by the much amount of penetration water, especially much amount of lime will leak out from the volcanic soil.

The upland soil in East Java shows that the tendency of soil acidity is going up, you can see it on the following table of soil sampling test. In the acid soil, according to the degree of soil acidity, causing lack of cation which is essential for the growth and the development of crops, and increasing injurious element for the crops. Accordingly, the yield will gradually decline by both action as has just mentioned above.

Commonly noticeable characters in soil acidity are as follows:

(1) Degree of action saturation is low, showing an acidity reaction, accordingly, easily causing mineral deficiency such as Ca, Ng, K etc.

CORRELATION BETWEEN SOIL REACTION (pH) AND THE DEGREE OF UTILIZATION OF MINERAL ELEMENT



(2) Activation of plants injurious almina, and strengthening its activity.

(3) Strengthening absorption of phosphate, causing available phosphate deficiency.

(4) As the soil born microorganism activities go down, resole ability of soil or ganic also going down and the soil productivity may be weakened.

As mentioned above in soil acidity, according to its degree, we can see the tendency to show the deficiency of cation and phosphate which is necessary to grow crops, increasing plant injurious ingredients.

And then, through the mineral deficiency and excess of injurious ingredients, the plant yield is decreasing gradually, and productivity is going down.

Eventhough, maybe there is no need to consider about the low yield of crop field, but through the soil sampling test, we can find several differences of element in each field. And if we can arrange the fertilizing in accordance with the soil sampling test, then we can expect to increase the yield and to promote the quality, too.

I will show you the example in Japan, as follows:

In growing rice seedling, the optimum condition of the field seedling bed is pH 4.5 - 5.0 if the pH is below pH 4.5, growth of seedling, particularly rooting, becomes poor; and above pH 5.0 seedling tend to dry or rot.

For potato cultivation, pH 5.0 - 5.3 is an ideal condition and when it goes above pH 5.3 potatoes easily get scab.

In growing tomatoes in vinyl culture in an area lacking of magnesium, the yield was about the same as before with better quality when an appropriate volume of fertilizer was given. The tomatoes sold about 20 - 30% higher than the market price.

A shift from ordinary fused phosphatic fertilizer to brown fused phosphate fertilizer resulted in a considerably bigger yield of radish.

Types of fertilizers have changed remarkably as a result of extensive soil diagnosis. Here I can say, the soil sampling test is very important to know the soil character and to treat the soil in good condition.

The data is shown in Table 5.

Table 5: Soil Sampling Test

Bondowoso

Place	Depth	PH		N		P_2O_5	Absorption power of phosphate	K_2O	CaO	Mg	Mn	Aℓ
		H_2O	Kcl	NH_4	NO_3							
	cm			mg	mg	mg		mg	%	mg	P.P.M	mg
1 Maesan	0-10	6.5	5.5	1.0	0.5	20	600	15	0.10	10	2	10
2 "	"	6.5	5.5	1.0	0.5	7.5	600	15	0.10	10	2	10
3 Tasnan	"	6.5	6.0	1.0	0.125	20	500	8	0.10	10	2	10
4 Tasnan (seed farm)	"	6.5	5.5	1.0	0.5	10	800	8	0.10	10	2	10
5 Tansan (seed farm)	"	6.5	5.5	1.0	0.5	10	600	8	0.10	10	2	10
6 Tjongkoron (seed farm)	"	6.5	5.5	1.0	1.25	2.5	1,000	8	0.10	10	2	10
7 Taman	"	7.0	6.0	1.0	0.5	15	700	15	0.20	10	2	10
8 "	"	7.0	6.5	1.0	0.5	15	600	30	0.20	10	2	10
9 Wringin		6.0	5.5	1.0	0.5	0.1	2,000	15	0.10	10	2	15
10 "	"	6.0	6.0	1.0	0.5	0.1	1,250	30	0.15	10	2	10

Bedali

Plot	Depth	PH		N		P_2O_5	Absorption power of phosphate	K_2O	Cao	Mg	Mn	Aℓ
		H_2O	Kcl	NH_4	NO_3							
	cm			mg	mg	mg		mg	%	mg	P.P.M	mg
No. 7	0-10	6.5	5.5	1.0	0.15	2.5	850	0	0.15	10	2	10
10	"	6.5	6.0	2.5	0.125	0.1	1,500	8	0.15	5	10	10
11	"	6.0	5.0	1.0	1.25	0.1	600	0	0.10	10	10	15
13	"	5.5	4.5	1.0	1.25	0.1	1,000	0	0.10	10	2	12
14	"	6.0	5.0	1.0	1.25	0.1	850	0	0.15	10	2	12
17	"	6.0	5.0	2.5	0.125	0.1	1,500	8	0.10	10	10	15
18	"	6.0	5.0	1.0	0.5	0.1	1,000	3	0.10	10	2	15
19	"	5.5	5.0	1.0	0.15	0.1	1,500	8	0.10	10	10	12

1.3. The Fall of Soil Fertility through the Exhaustion of Organic Matters:

Usually, the upland soil is washed away by much amount of falling penetration water of annual rainfall, which is not containing nutrients. This is one of the big reasons to promote the disolving of organic matters in upland soil. Accordingly, solving or melting the crop element and giving impetus to take a bad turn of soil facility, adding this by the carelessness of

soil control at upland area, such as:

(1) Scarcely fertilization of Nitrogen.

(2) Hardly supplying organic matter.

(3) Most of stalks and leaves are carried away from the field for cooking fuel.

By such reasons, year by year, the soil fertility is going down. To protect such condition, and for the maintenance of soil fertility, in order to increase the productivity of upland soil, it will be most important to consider a counter measure of how to supply organic matter.

Generally, we know that in warm districts, the necessary amount of compost in one year may be 30 tons per ha. This is only meaning that the necessary amount to maintain the soil productivity in present condition, but to expect the increase of soil production we must use much more amount than 30 tons in one year.

We can see it through the data of Rozamsted Experiment Station. Since 1843, 35 tons of compost was given per ha each year, then the N% the soil is as follows:

	1843 %	1865 %	1881 %	1893 %	1936 %	1945 %
Nonfertilizer since 1839	-	0.105	0.101	C.094	0.103	0.105
35 ton compost were used since 1843	0.12	0.175	0.184	0.213	0.226	0.236

35 ton of compost were used continuously during 100 years, and we can see that there is a little accumulation of Nitrogen. If the compost wasn't supplied, the Nitrogen % in the soil would fall to less than 0.1% at the latest, and as a matter of course, the soil productivity decreased.

According to the same examination, the calculated amount of organic matter loss, on compost application plot and non fertilizing plot, could be seen as follows, by Kilo calory per acre:

	Compost supply 1 million Kilo calory / acre	Non fertilizing 1 million Kilo calory / acre
Adding amount as Compost and stubbles	16	0.3
Remaining amount in the soil	1	-0.7
lossing amount	5	1

We can see that there is remaining of one million Kilo calory organic matter when we use 35 ton of compost on every year, beside on the non-fertilizing plot, telling that there is annually 0.7 million Kilo calory consumption of organic matter.

In case of experiment in Ohio, after they planted maize for 70

years, against the yield index of 100 of the first year, hey got only 27 at the last year, but when they put in alfalfa, they said that they got 109.

We can see at Banyuwangi area, they planted maize under non-fertilization on the field of just cut down wood, there is much amount of organic matter on the field, and they could get more than 3 ton per ha. Besides, on the cultivated field they can get only 0.7 - 0.8 ton per ha. Through nonfertilizing in continuous cropping for long years, we can easily understand that the consumption of organic matter and the deteriotation of soil productivity of the upland soil of East Java, is resulted from long years of nonfertilizing cultivation, especially through less supply of organic matter and heavy wasteful of organic matter.

Through the reasonable crop rotation we can expect to maintain the yield of maize in high level as following:

YIELD OF MAIZE IN ROTATION SYSTEM, INCLUDING MAIZE

(ton / ha)

Plot number	Rotation system	CROPPING YEAR							
		1951	1952	1953	1954	1955	1956	1957	1958
1.	Maize - Wheat - maize - barley	4.292	4.292	3.826	4.156	4.976	3.712	4.503	5.571
2.	Soy bean - Wheat - Maize - Barley	-	4.700	-	4.972	-	5.165	-	6.352
3.	Sweet potato - Wheat - Maize - Barley	-	4.280		4.046		2.993		5.175
4.	Irish potato - radish - Wheat - Maize Hairyvetch		4.636		4.543		5.453		5.038
5.	Maize - Hairyvetch - Maize - Hairyvetch	4.125	6.088	6.269	6.356	5.880	5.181	6.568	7.607

To protect the decrease of maize production by continuous cropping and through the consumption of organic matter, it would be very important to consider concerning the maintenance of soil productivity by supplying of organic matter and element by fertilizing, or through the reasonable crop rotation and inter cropping.

We have to promote the upland soil productivity to increase production.

1.4. Losing surface soil, by erosion:

1.5. No renewal of improved seed:

Concerning these two items, I think, it will be not necessary to mention.

Through continuous cropping of maize, especially continued under non-fertilizer, the yield of maize in East Java tend to decrease gradually, now it is expected to be in balance at 20 - 30% of the yield decrease, comparing to the yield of the year of 1963.

This tendency showing some difference with the result of Kikyogahara in Japan, as Indonesia is situated in tropical zone,

the hard weathering, rich element excepting nitrogen, good soil conditions as it is showing mostly like an alluviumial property, those factors may be protecting from rapidly decreasing of the yield in East Java.

But we should not neglect to maintain the soil productivity to give back to soil much amount of organic matter, and we should make an effort to research some suitable rotation system instead of continuous cropping or good intercropping for supporting the soil fertility.

2. HOW TO PROTECT FROM THE TENDENCY OF DECREASING MAIZE YIELD:

In Japan, it is said that the hard working (best) farmer is preparing the soil, the medium farmer is preparing the crop and the lazy (not good) farmer is mostly growing weed. Actually, the hard working farmer who can produce more than 9 ton of rice per ha or more than 40 ton of sweet potatoes per ha, are making their best effort to increase the soil fertility or productivity, supplying a large quantity of compost and annual deep ploughing etc. We can see several instances which they have overcome in the bad condition through the good preparation of soil.

I think, to increase the soil productivity is one of the most important basic problem to increase the production.

(1) To protect the soil productivity and to promote the productivity of upland soil, we have to make our best effort to collect a large amount of organic matter.

(2) How to avoid continuous maize cropping is the basic problem to solve, but we have to adapt good rotation or inter cropping, combining with leguminuous, to protect the decreasing of upland productivity, this item may be the most important and easiest way to promote the soil productivity and to protect the decreasing yield in East Java.

(3) We have to pay our best attention to prevent the tendency of soil acidity to using good organic matter, together with suitable amount of lime which is claculated through soil sampling test.

(4) We have to look for some reasonable way to keep the stalks and leaves in the field, to return it in the ground to supply organic matter, so far, after the ears are harvested most of the stalks are carried away and used for cooking fuel.

(5) We have to try to look for some ways for farmers to keep more cattle they can use it for ploughing, carrying and get more compost.

I hope that you should try to do your best to solve these problems to promote the soil productivity, to develop farmers and for the sake of your country's prosperity.

3. TECHNICAL GUIDANCE TO THE FARMERS

3.1. The Foundation to increase production:

The soil is the mother of agriculture, they say. In Japan the excellent farmers have just emphasis on making man and soil. that is to say, agricultural development and farm prosperity are based on the man who carries out the farming. To bring up agricultural man is to prosper the farm houses and farm villages. What is most important is to create man, and the next is

to create fertile soil.

To get big production, it is necessary to increase the productivity of land in plowing deeply and applying organic matters. To do deep plowing, it is necessary to improve ploughing methods. At present, farmers plow till the depth of 12 cm, they should plow deeply up to 20 cm. Deep plowing develops agriculture.

To apply organic matter, you should increase to supply stubbles after harvest and compost and stable manure. A large cattle is to produce 10 tons of stable manure per year. If you can accumulate the stable manure and return it to the soil, you can stipulate the growth of crops, in increasing soil power and in supplying stable manure, and can increase the yield. The utilization of stable manure is expected to increase production in increasing buffer action, and preventing from becoming to acidity.

Most upland in East Java are acid soil, covering pH 5 to 5.5 which shows high acidity for corn. To improve acid soil you had better use lime stone, it is necessary to test the soil acidity by using soil tester, before applying lime stone. You should pay much attention to deep plowing in improving the ploughing method, increase of soil capacity in applying compost and stable manure and improvement of acid soil in utilizing lime stone. What is most important is to increase productivity for increasing crop production.

3.2. The Suitability of Soil Preparation and Germination:

The suitability of soil preparation is well known to influence the germination of crops greatly. Table 6 shows that after plowing, making furrow and planted on the hill. Table 2 shows that it is planted just after plowing without harrowing. In table 6, row spacing is 70 cm and plant population is 54,770 plants per hectare. In table 7, row spacing is 60 cm and plant population is 42,200 plants/ha.
You can easily realize that the suitability of the soil preparation gives a great influence to the germination of crops.

TABLE 6. PURSUING OBSERVATION OF PLANT POPULATION

(Planted on July 1st, Bogor Composite)

Population:	Survey time				Remarks:
	July 30th	August 16th	August 30th	September 9th	
Number of plants /20m long in row	76.6	71.4	70.4	69.2	row spacing 70cm.
Number of plants /1m long in row	3.83	3.57	3.52	3.46	Average from 5 plots
Population / ha	54,770	51,000	50,300	49,480	

TABLE 7.

Number of plants /20m long in row	50.6	46.8	46.4	45.2	row spacing 60 cm
Number of plants /1m long in row	2.53	2.34	2.32	2.26	average from 5 plots
Population /ha	42,180	39,000	38,700	37,670	

From the number of seedling per hill, we can see good or bad of seeding emergence, in the research conducting by providing two different soil preparation treatment.

The A of Table 8 shows that the number of hill which having one plant on each hill is 34%, in B 54%, that is to say, more than half is one plant per hill. And also the number of 2-3 plants per hill is 64% in A, and 45% in B. This difference means that good or bad of seeding emergence has close connection with the suitability of soil preparation. The suitability of soil preparation means good or bad of every operation, so it has close connection with the yield.

The suitable soil preparation and right planting influence greatly the germination and the yield in connection with the use of superior seed, we put emphasis on deep plowing and the soil free from clod, by improving the method of plowing and harrowing to level the surface of the soil. Even if the soil is soft, made from sand, it is important to harrow before planting in order to crush the clod and level the soil. In the farm of clayish soil harrowing and levelling is very important for uniform germination.

TABLE 8. SEEDLING EMERGENCE PER ONE HILL (%)

	Population per hill				
	one plant	two plants	three plants	four plants	five plants
A_z	34.1	44.5	18.1	3.3	-
D_z	53.6	39.5	5.1	1.4	-

NOTE: 4 seeds from same source were uniformly sown on each hill.

3.3. PLANT POPULATION AND THE YIELD:

Generally, there are many vacant hill in the farmers field, and harvested plants are 20,000 - 30,000 plants/ha. So, guidance had been done to attain the harvesting plant per ha, as many as possible in the range of suitable plant population. If you attain enough populaton, so you can expect more yield.

In case of bad germination owing to insect and disease and bad growth to attain enough plant by means of sowing more than 3 seed per hill is safer to get good yield. Next table shows the comparison of the yield, the spacing is 80 cm x 40 cm, with two or three plants per hill.

TABLE 9. COMPARISON OF THE YIELD PER HA

(Spacing : 80 cm x 40 cm; two or three plants per hill)

Per hill (Plants)	Length of ear (Cm)	Weight of ear (Gr.)	Kernel weight per ear (Gr.)	Kernel weight / ear weight (%)	Number of ear/ha	Yield/ha
Two	15.51	154.19	87.58	56.15	50,000	4,379
Three	12.79	106.41	52.05	48.72	56,000	2,962

Each two plants of hill, is seen to grow satisfactorily, there was few earless and barren plants. Three plants per hill shows bad growth of plant, earless and barren plants are about 10%.
Two plants per hill gives us almost complete ear, maximum ear length is 22 cm, minimum ear length is 10.5 cm, maximum kernel weight per ear is 148 grams, nimimum is 37 gr.

In three plants, there were ununiform ear bad ripening ear. The longest ear is 18 cm, the shortest ear is 6 cm, biggest kernel weight per ear is 123 gr, smallest 19 gr.

According to other surveys, it seems that two plants per hill is rather advantageous than three plants stand. Of course, this is only applied to completely uniform hill. As you generally see, about 20,000 - 30,000 plants per ha is in the farmers land, and in case that there are many missing plants per hill, you cannot expect better yield without increasing harvesting plants per ha in range of suitable population for each variety to be planted. Experimentation showed that one plant stand is better for increasing yield in case of the same plant population.

3.4. IMPROVEMENT OF PLOUGHING

At Wongsorejo area, when the rainy season sets in, farmers are hurrying to sow maize, to avoid the damage from underground worms. We can see the shortage of cows to plough as the sowing season is concentrated in the beginning of the rainy season, because early sowing is the best way to avoid the damage of underground worms. But it often caused rough ploughing and they cannot crush the soil clod well, such rough ploughing and cloddy soil usually bring about bad germination of crops. We can usually see such sight not only of maize but also on soy bean field. And the insufficient amount of population, causing lower yield of maize, soy bean and other crops.

This same condition, can be also seen in Bondowoso area, farmers are hurrying to sow maize as they are afraid of the damage of downy mildew. To avoid the downy mildew, we have to sow as soon as possible when the rainy season sets in. The improvement of ploughing and harrowing method is very important problem to expect the stability and to increase the production of crops. To expect good amount of yield, we should try to check the bad germination which is caused by rough ploughing and cloddy soil. To keep good germination and to ensure sufficient of plant is the most important factor to increase the yield.

It will be advisable to use tractors as a counter-measure to solve the preparation of farms, but from the point of view of farm condition, and also from the road reason view, I suppose the improvement of the method to use the cattle driven ploughing is the most suitable and important problem in East Java.

As a considerable measure, we can expect as follows:

(1) To solve the shortage of cows in the sowing season, we should take a measure to increase the number of cows and soil preparation should be done thoroughly.

(2) Through the improvement of plough and ploughing method, the soil preparation should be done thoroughly.

3.4.1. To solve the shortage of the number of cows, we would like to expect the Government to take a measure to increase the number of cows through cow-lending system. Poor farmers could not buy cows for themselves, so the Government buying young female cows and lend them to some qualified farmers and those farmers should have the responsibility to breed that cow, and when the cow get a female calf, then they must give it back to the Government. The farmer who carried out his duty can keep the cow as his own cattle. The young female cow then, will be lent to other farmer repeating this way, we can expect to increase the number of cows.

3.4.2 Improvement of plough and ploughing method.

There are two methods:

The first : We can try to improve the traditional double cattle drawing plough and harrow. When we use traditional plough, the depth of ploughing is only about 12 cm. But when we change this to some plough which we can find at Kediri area, we can control the depth of ploughing which we can expect to plough till 18 cm or 20 cm deep. When we use such kind of plough, we may not plough till 18 cm deep at once, but at the first time till 12 cm, at the second time to 15 cm and at the third time we can easily plow till 18 cm deep. After ploughing, we should use improved harrow to crush soil clod and levelling the surface of farm.
The improved harrow is the same type of "Garu" which we can see in paddy field, only we change the tooth of it to hatchet. When we use these two farm implements we can expect pretty good preparation of farm.

The second : This method is to change the double cattle drawing plough to single cattle drawing plough. This single cattle drawing plough, can be seen at Formosa and Malaysia, they were using yellow cow in the upland and buffaloes in paddy field as we can see it in Indonesia.

Formerly in Japan, mostly they adopted the simple cow or simple horse ploughing method. But we used some special kind of plough, which was named "short bed plough". We can easily adjust the depth and width of ploughing, and we can carry it anywhere as its weight is very light. If we can change the traditional double cow ploughing method to simple cow ploughing method, then perhaps we can expect to increase the work in efficiency.

To improve ploughing and the farming method, we have to make a good effort, as it is very important to develop

agriculture in Indonesia, and it will bring good effect to increase the income of farmers.

I hope you make an effort to investigate the ploughing method just as above mentioned.

CHAPTER III SOME PROBLEMS ON SECOND CROP CULTURE (MAIZE)

By Dr. S. HIROSE

The past ten years statistics of East Java show that the production of rice has been continuously increasing. On the contrary, the production of maize and root crops have been decreasing recently as drawn by Regression Lines in Fig. 1.

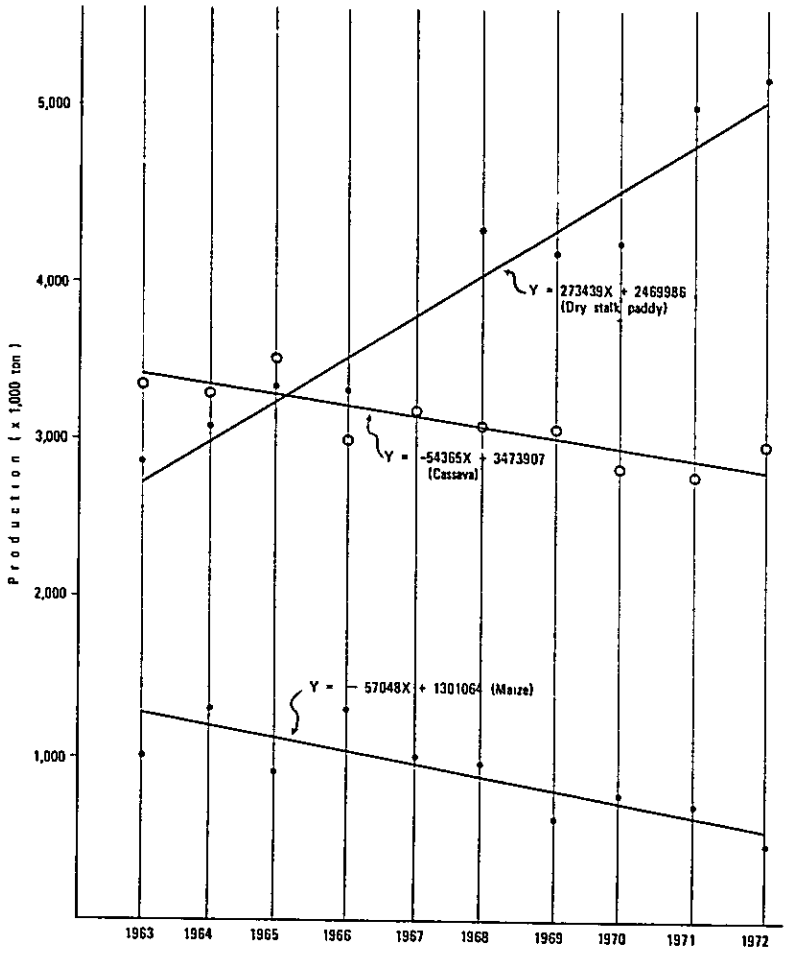


Fig. 1. Annual production of Dry stalk paddy, Maize in dry grain and West cassava in East Java.

Nevertheless, it is true that, aside from rice as the staple food, the second crops, such as maize, root crops and pulse, still have an important role in filling the needs of food.

At present, a lot of peasants in the upland and dry land are still growing the second crops following the traditional system; while the intensification efforts made by Maize Project since 1968 showed us a number of facts as to how peasants were able to increase their maize production by adopting the new production technology. Indonesian Government is going to realize, in a large scale, the increase of the second crops production through Bimas Palawija activity.

I, as a production expert, would like to discuss definitly some problems, especially those connected to the production technique of the second crops in the upland.

1. Cropping System for using effectively the limited area.

According to Dr. Richard Bradfield (IRRI), there are three general methods by which a country can increase its production. The three methods are : (1) Expanding the planted area. (2) Increasing the yields of crop per unit area. (3) Increasing the number of crops grown on the land each year.
It is generally known that, within Java Island, the planted area to be expanded has already reached its limit. In this case, the introduction of a suitable croping system is the only potential way to increase, quickly and cheaply, the crop production per area unit and period unit.

Usually, a good rotation gives a better average yield and results in the slow decline of the soil fertility than when growing the same crop in successive seasons. The fact shows that the yield of maize, rotated with other crops (even with the crops which have the same growth habit, such as the upland rice), is better those rotated with maize. The following data, Table 1, are cited from the data of Slamparejo Seed Farm at Kecamatan Jabung.

Table 1. Maize yield in rotation with upland rice, Kg. per 100 m^2.

S E A S O N	L A B U H A N ---------- M A R E N G A N (Preceding crop)		
1970 / 1971	M A I Z E	64.5 Kg. ---------- M a i z e	46.0 Kg
	Upland rice	53.0 Kg. ---------- M a i z e	52.5 Kg
1971 / 1972	M a i z e	56.5 Kg. ---------- M a i z e	43.0 Kg
	Upland rice	46.5 Kg. ---------- M a i z e	46.5 Kg

Note: Yield, Ear weight from the Slamparejo Seed Farm.

In general, however, the alternation of pulse and cereal crops gives the most advantageous result, because a large amount of the leaf, stem and root of such crops (soy-bean, ground-nut and other pulses) are left on the field where they turn into soil nutrients; and further the succeeding crops get benefits from the nitrogen fixed by pulses.

There are still monocropping areas, planted by maize only, as in Singosari, Tumpang, Jabung and others, even in Kabupaten Malang itself.

It is feared that, for the future farming in these areas, this kind of cropping will cause the decrease of the maize yield and the decline of the soil fertility.

In upland areas, many peasants, "Small holders" having an average farm land of 0.3 Ha, prefer to grow maize in rotation with maize, because the first problem for most peasants is how to secure their own staple food throughout the year. Or in other words, it can be said that the upland farmers' economy has a strong self-supplying tinge. So, without giving any solution to the economical problem as above described, it will be rather difficult to make the traditional cropping pattern convert.

As a first step, we should diffuse more intensively the following simple intercropping system, for example, maize and kacang tunggak" (Vigna sinensis) or maize and "kacang hijau" (Phasseolus radiatus) and so on, which have been used for a long time by some peasants in the upland area.
The comparisons between pure stands and intercropping are affected by many factors, including crop species, planting pattern, soil fertility, weather condition and so on; but experimental data obtained by some workers suggest that, with many crops, intercropping of maize or other cereal crops with pulse crops results in the improvement of the dietary life of the peasants, and also, even if the incedence of diseases and pests cause the failure on one crop's production, the other interplanted crop's production offsets the return from the field.

Last year, we collected a number of pulse crops from LP3 Branch or the rural areas in East Java, and, in order to know their characteristics and yielding ability, we tried to grow them on the field of the Second Crop Center, in Bedali. Table 2 shows the variety used, the yield obtained and other data avilable.

As an example of intercropping, we can show you our data which were carried out in Bedali, where the sorghum yields in pure stand and in interplanted with Mung bean (kacang hijau) were compared. The result showed that the reduction in the yield of interplanted sorghum was offsetted by the high cash return of the production from Mung bean (kacang hijau), as shown on Table 3.

In addition to those mentioned above, the second sorghum crop ratooned was harvested during the dry season and these constitute an additional income for the peasant.

Table 2. Maturity and Yield of the Pulse Crops

	Variety	Maturity	Yielding range	Remark
Kacang hijau, Mung bean. (Phaselus radiatus)	Bhakti	65 - 75	4.0 - 5.0	
	No. 129	62 - 72	4.0 - 5.0	
	Siwalik	80 - 90	6.0 - 7.0	
	Artak ijo	80 - 90	6.0 - 7.0	
Kacang tunggak (Vigna spp.)	V.S. 53 - 3	85 - 90	5.0 - 6.0	
	V.S. 56 - 4	"	"	
	V.S. 56 - 5	"	"	
	V.S. 57 - 1	"	7.0 - 8.0	
	V.S. 58 - 1	"	5.0 - 6.0	
	V.S. 58 - 2	"	"	
	V.S. 58 - 3	"	8.0 - 9.0	
	Local Grati	95 - 100	4.0 - 5.0	
Komak, Hyacinth bean. (Dolichos lablab)	D.L. 10	95 - 105	3.0 - 4.0	The seed contains a glucoside and should not be eaten unless cooked in some way.
	D.L. 37	"	4.0 - 5.0	
	D.L. 40	"	3.0 - 4.0	
	D.L. 41	"	2.0 - 3.0	
	D.L. 45	"	3.0 - 4.0	
	D.L. 56	"	4.0 - 5.0	
Kratok (Phaseolus lunatus)	Local Malang	120 - 140	3.0 - 4.0	Care must be taken in their use since ghey slightly poisonous.
Koro Pedang. (Canavalis ensiformis)	Local Malang	130 - 150	5.0	
Kedele, soy-bean (Glycine soya)	No. 1335	80	9.0 - 10.0	
	No. 1341	85	10.0 - 11.0	
	No. 945	"	"	
	T.K. 5	"	"	
	Sumbing	75	"	
	Ringgit	85		
Kacang tanah, ground-nut. (Arachis hypogaea)	Gajah	100	10.0 - 12.0	
	macan	"	10.0 - 12.0	
	Ruci	90	4.0 - 5.0	
	Tuban	100	10.0	

Note: Yielding range in Kw per Ha.

Table 3. The Comparison between Intercropping and Pure Stand

Crops	Variety	Planting Pattern	Yield/Ha (Kg)	Price at harvest time	Gross in come
Sorghum Mung bean	6 C Bhakti	160 x 20 cm 40 x 40 cm	2,670 480	Rp. 20.-- Rp. 80.--	Rp. 91,800
Sorghum	6 C	80 x 10 cm	4,150	Rp. 20.--	Rp. 83,000

The cropping system described above is the simplest one of a little modified one, but if we follow this idea further, we will come to the multiple cropping system. Multiple cropping is an effort to arrange the combination of one, two or more types of crop on a certain field, and to arrange the crop rotation for the period of one whole year or more. The effort has the purpose of fulfilling the needs of food, enough in quantity and in quality, throughout the year for the peasants as well as increasing their income.

The possibility of multiple cropping is limited by some factors such as climate, field or soil condition, adaptability of the crop, etc. At present, although we can find out some typical intercropping or multiple cropping patterns involving maize or other cereal crops and pulse crops, yet we are still lacking of reliable data to set up a multiple cropping plan which is most suitable and profitable for each area of East Java Province.

Dr. Richard Bradfield (IRRI) mentioned the following ways as the efforts to minimize the number of days the land is idle

1. Bed the soil to accelerate the drying of the top layer where crops are to be planted and cultivated.

2. Keep the volume of soil tilled and the number of tillage operation to a minimum.

3. Use early maturing varieties of crops which produce high yields per hectare per day.

4. Grow ratoon crops where feasible.

5. Grow some crops each season which can be harvested and utilized in an immature stage.

Actually, our provincial Government is planning to introduce sorghum to minus areas, but it can be said that the provincial Government is almost devoid of data as to what cropping system is the most profitable in relation to the introduction of sorghum. Therefore, we feel necessary to make a more detailed study in order to get reliable data as to how and what kinds of crop (whether cash crops or staple food crops) should be combined into intercropping or multiple cropping systems for each area. So, if a new project on second crop development is to start in the near future, a cropping system study project, in order to get the data useful for setting up the most suitable cropping system to be recommended for each area of East Java, is also worth including as one of the activities of the new project.

2. Breeding of early variety and Seed production

For the past five years, our Maize Project has mainly made efforts to increase the maize production in "Labuhan" season only. So that, at the starting time of our project in 1968, and as the most

effective method for obtaining the maximum yield of maize in one season, the early local varieties were replaced by the late high yielding varieties, without taking into consideration the cropping system suitable for the project area to be jointed.

However, numerous peasants still prefer the early local variety to the late improved variety because the latter does not fit with their traditional cropping pattern and is rather susceptible to diseases, especially Downy Mildew.
In Indonesia, such late superior maize varieties, for example, Metro, Harapan, BC - 2, are recognized. While, as far as we know, it is difficult to find out promising early varieties, except Kretek variety.

At present our provincial government is going to impel a campaign to promote the spread of Kretek variety, usually known as "Kretekization", all over East Java areas.
The local Kretek variety was introduced for the first time to our Center on January, 1971, from Kediri, then we made an endeavour to improve this variety by using several useful procedures for breeding through 5 - 6 seasons. As the result, we could recompose the improved Kretek variety which is higher in yield and more uniformal in several properties than the native one.

In the last season, our Center supplied 2,125 Kg and 500 Kg of Kretek stock seeds for 85 Ha and 20 Ha of the extension seed production in Kediri and Madura, respectively. Further, we are taking up the stock seed production for 1974/75 seasons of the Bimas Jagung programme according to our systematic seed production scheme as shown on Fig. 2. So, it is not too much if we say that all seeds of Kretek variety now under growing is originated from our improved source. The improved Kretek variety is a comparatively high yielder for the short mature one, as shown below, but is not always high and short enough, both in yield and maturity, to cover all of the local requirement in East Java.

Table 4. The Yield and Yield Component of the Improved Kretek in Ketindan, June - September, 1973

Number of kernels row	Number of kernels per row	Number of kernels per ear	Cob length (cm)	Ear length (cm)	Ear Diameter (cm)	Dry grain weight per ear (gr)	1000 kernels weight (gr.)
9.76	29.2	284.3	14.3	13.4	3.5	71.2*	264

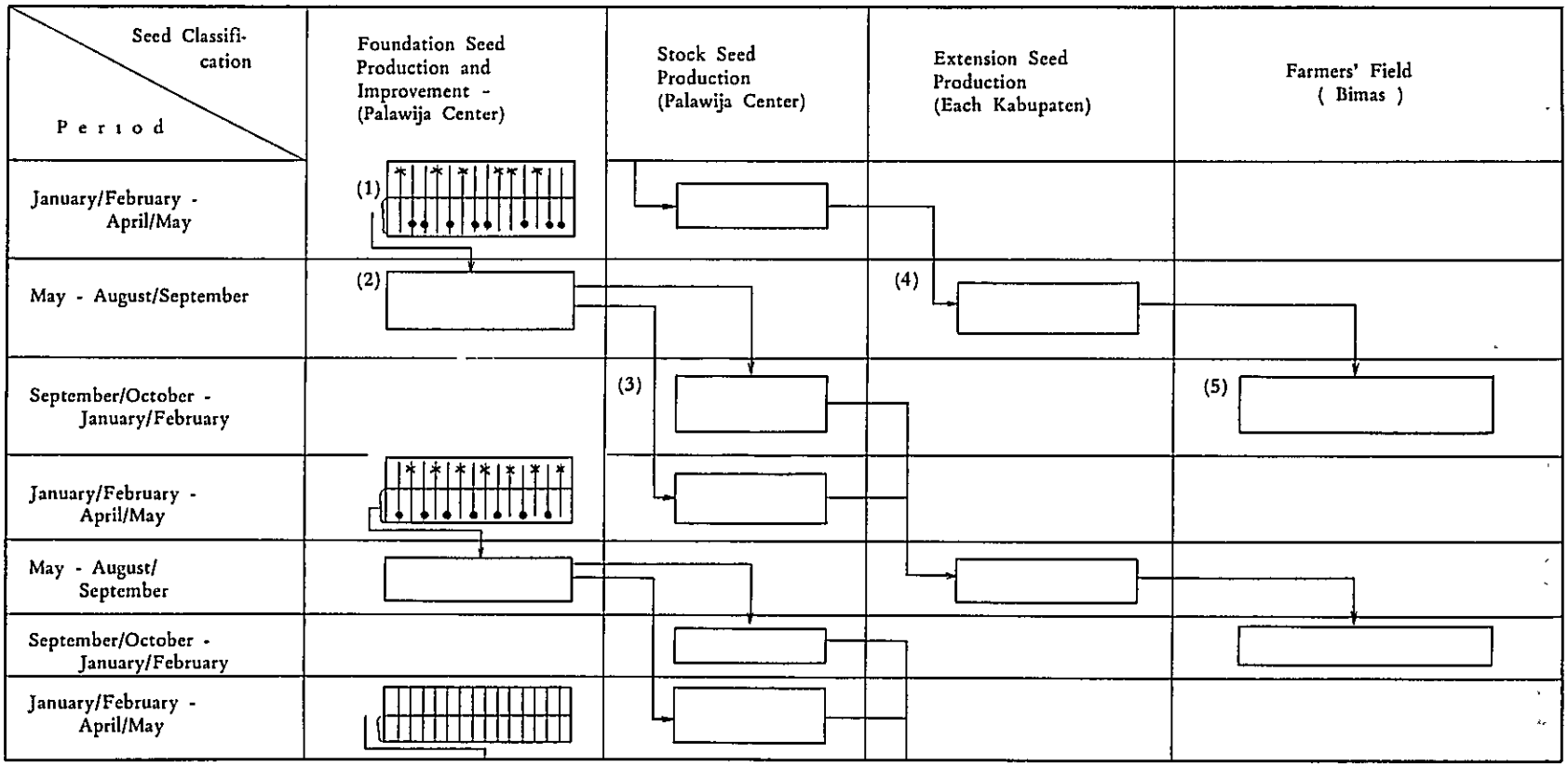
Notes: 1. Average of 50 ears chosen at random.

2. Outline of cultivation; Fertilizer, 200 Kg Urea and 100 Kg TSP; planting pattern, 80 x 30 cm, 1 - 2 plants / hill.

3. * moisture free, ± 15%.

4. Yield estimation per Ha from this field (0.3 Ha) is 3,466 Kg.

Fig. 2. The Present Seed Production System for Maize



Notes :
1. Improvement of some properties by ear-to-row method or others.
2. Mass selection and seed increasing by sib crossing (artificial or in isolated field).
3. Seed increasing under isolation field.
4. Seed increasing under isolation field.
5. Common cultivation.

The breeding of the early high yielding variety is a problem common to all kinds of second crop to be grown by peasants. We can find numerous same cases on ground-nut cultivation; for example, in Mojokerto area, instead of the late improved varieties, the peasants prefer to grow the early mature variety in order to shorten the growth period and to obtain cash earlier for supporting their household economy, although they know that the late improved varieties have a higher yielding ability as compared to the earlier ones.

It is known well that there are many cases where maize crop, as main cash crop or staple food crop, has been combined into rotational cropping system in the upland areas of East Java, therefore, raising up the earlier or higher yielding variety will make the crop production of the peasants smooth throughout the year by facilitating the introduction of the effective and economical cropping system.

Different from other second crops which are self-fertilized crops, maize is a naturally crossed- fertilized crop and its pollen is carried to a considerable distance by the wind. Staray pollen and seed mixtures in processing provide opportunities for out-crossing and constitute additional sources of contamination.
Originally, most of the recommended varieties in Indonesia are composite varieties and have a genetic diverse composition. Because of those reasons, it is a plain truth that the ability of the variety will be gradually lower, if the seed production procedures are not carried out under the strict isolation condition and the uniform selection procedure.

As you already know, last season we made a request to LP3 for the distribution of some foundation seeds, national varieties, such as Metro, Harapan, etc., except Kretek and PS 42, but we could not receive any foundation seed, in good quality, because LP3 has not yet started the systematic maize seed production programme. Under this situation, the East Java Government should also start the systematic seed production, from foundation seed to extension seed, on the national varieties, following the same system as Kretek and PS 42, as soon as possible, if our request was premitted by the Central Government.
The seed production time schedule and the areas for 1974/1975, now in practice in our Center, is given in Appendix 1.

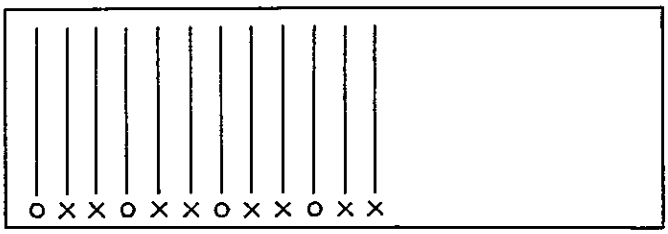
In the rainy season, however, it is quite difficult to provide an isolation condition for the foundation and stock seed production in our Center's fields, because all the farmers' fields, surrounding our fields, are planted with maize; although we have made efforts for taking time isolation and more border rows as shown in the seed certification standard of the International Crop Improvement Association (Appendix 2.).
Moreover, in accordance with the increase of hectarage joining Bimas Jagung programme, it is supposed that much more hectarage for seed production, to be produced within our Center's fields, will be required in the near future.
In thinking over such situations, I suggest that the stock seed production should be carried out in each special production area of the Kabupaten own seed farm as follows:

1. Tugurejo Seed Farm in Kediri, for Kretek.
2. Sudjati Seed Farm in Malang, for Harapan.
3. Labruk Seed Farm in Lumajang, for PS 42.
4. Tasnan Seed Farm in Bondowoso, for Metro.

In this case, each seed farm is to obtain high quality foundation, free or charge, from the Palawija Center in Bedali, Malang.

The maintenance and the increase of the foundation seed must be conducted in our Center and each variety may be increased by the following method (Fig. 3) in an isolation field and by an artificial subcrossing when it is difficult to provide the isolation field.

Fig. 3. Practical Method of Increasing Foundation Seed in an Isolation Field



o : as a male plant, not used as seed.

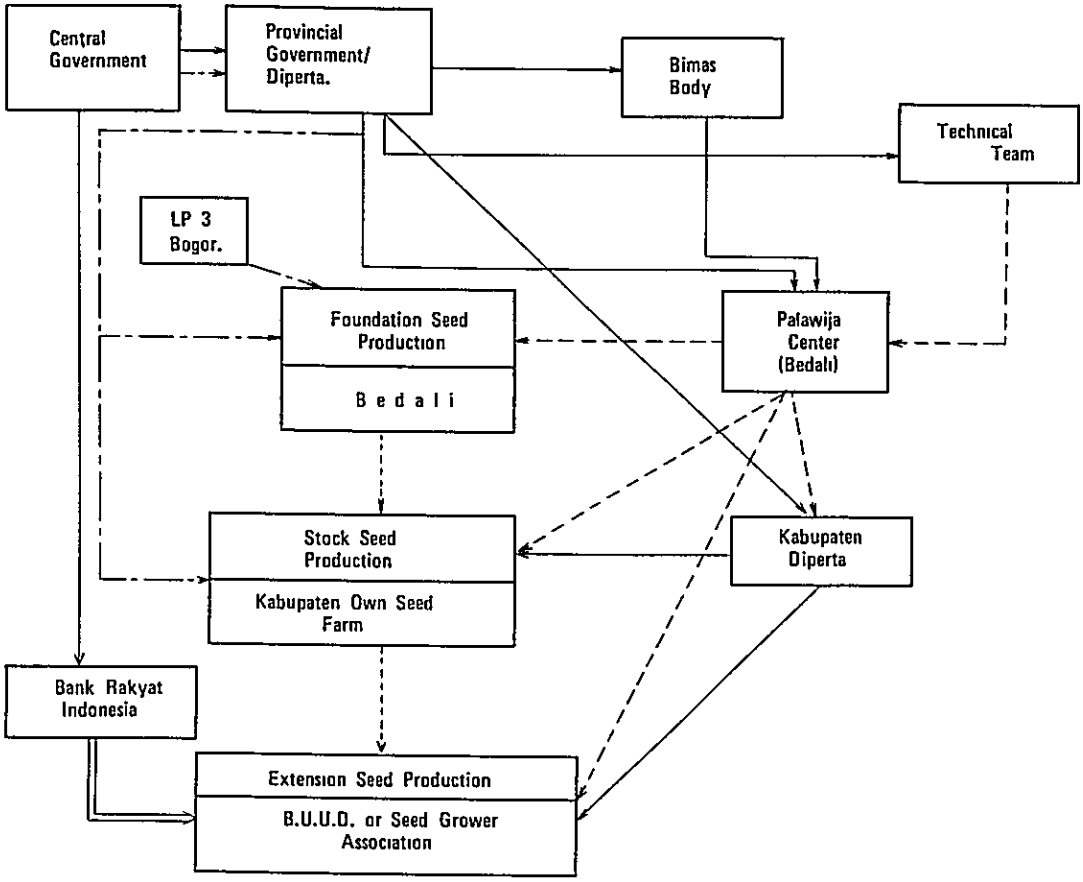
x : as a female plant, detasseled, used for seed.

This special method is a way to prevent inbreeding.

At the stage of the Foundation seed production, it is, of course, necessary to take some procedures to maintain and improve their properties, such as ear-to-row selection or recurrent selection. Further, the Extension seed production had better been conducted in contract with a well-organized seed grower, as seen in Bulupasar, Kediri, under the help of a subsidy and credit package, which will be discussed by the General,Planning and Marketing experts later. Fig. 4. is given to make the seed production system described above clearer.

As you already know, the seed production is very troublesome technically. These programmes, to cover all over Bimas, will be required to conduct under the supervision of a strong technical team which consists of seed specialists and marketing experts.

Fig. 4. Seed Production System



Notes :

——————— : Instruction / order

– – – – – – – – : Technical guidance

— – — – — – — : National expenditure (Budget)

- - - - - - - - - - - - - : Seed

═══════ : Credit or subsidy

Thus, seed production activities, involving the following items, will take a big weight when a new project is to start.

1) Breeding of the early mature variety, mainly maize, including the improvement of the local verieties which are already adapted by local farmers.

2) Maintenance and purification of ground-nut and soy-bean varieties.

3) Seed preparation of several pulse crops to be introduced into the new cropping system.

4) Establishment of seed circulation system by consolidating infrastructure of seed marketing, especially on pulse crops; this means the development of seed home, or in other words, special seed production area.

5) Supervision and guidance of the seed production to cover all over the Bimas palawija Programme.

3. Sorghum Cultivation

It is commonly known that sorghum crop has the following properties:

1) Sorghum can tolerate both drought and wet soil better than maize.

2) Sorghum can be rationed and three crops harvested from one planting.

3) Sorghum is very easy to cultivate and can yield as much grain per day in the tropics as maize.

4) Sorghum grain is suitable both for human food and for animal feed.

Considering the properties mentioned above, it is expected that the introduction of sorghum crops minus areas, such as dry land, will play an important role for the agricultural development in special areas.
Concerning the introduction of sorghum crops, however, we still have a lot of problems to be solved. The first problem for the peasants in the minus area is how to keep surely their own food by themselves throughout the year. Such a need is urgent in the minus areas.
We have no question for sorghum production at all, if the stabilized market will be prepared for it throughout the long periods. Under the fluctuant situation of the International Market, however, who will be able to give guarantee to the peasants?

In this sense, the following items should be considered in introducing the sorghum crop.

1) To introduce or recommend the combined variety which can be used both as human food and as export commodity.

2) To cultivate sorghum in inter cropping method with other food crops or cash crops, in order to minimize the risk of marketing problems.

3) To promote the food industry which uses sorghum grain as raw materials.

We already knew that the peasants in Grati, Pasuruan or so and so, cultivate, in a small scale, the local sorghum varieties for local cakes or rice substitute.
But the local varieties, usually known as "Cantel" or "Rantai", are not so high in yield and are very difficult in threshing, although its protein content is comparatively high. On the contrary, the recommended sorghum varieties in Indonesia are high in yield, but not always high in protein content (Table 5). Besides problems on sorghum cultivation, there is another troublesome problem, that is, the sorghum grains liked by people are also liked by birds.

In India and some other tropical countries, sorghum is used for food on a large scale, and numerous ways of processing, hulling, milling and cooking it are doubtless known. So, we may have a lot of matters to be studied from the advanced countries on sorghum cultivation.

Sorghum varieties are very diversified in growth habits, taste of grain, type of grain and other properties, so that the success or failure of sorghum cultivation depends on what varieties or types we choose and recommend to the peasants, by considering our purpose on cultivating sorghum or in connection with cropping pattern.

Mr. Westenber has discovered a sorghum variety, called KD-4, which fits for North Sumatra, as the testing result of 340 varieties from U.S.A. Such an effort is greatly valuable at the starting time of a certain programme. Except the grain characters. On cultivation, KD-4 seems to be suitable to our area too, because it is an early variety, ranges from 85 to 95 days in maturity, and a dwarf type. By using such variety, for example, we can imagine the following cropping pattern for Blitar and South Malang areas. These trials have not been put into practice yet. So, Making many efforts for obtaining the reliable data on sorghum production are required, before starting sorghum project.

Finally, for reference, the cultivation data, carried out in Bedali, and nutritious composition data, analyzed in Japan, are presented on Table 5 and 6.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.	Sorghum / Kacang hijau/K.Tunggak					Ratooned Sorghum		Follow		Maize (Kretek)		
2.	Soy - bean		Sorghum			Follow				Maize (Kretek)		
3.	Soy - bean		Sorghum			Follow				Maize (Kretek)		
	Cassava									Cassava		
4.	Paddy gogo		Sorghum / Kacang hijau/K.Tunggak					Follow		Paddy gogo		

Cropping pattern

The Average Rainfall of South Malang (Bantur)

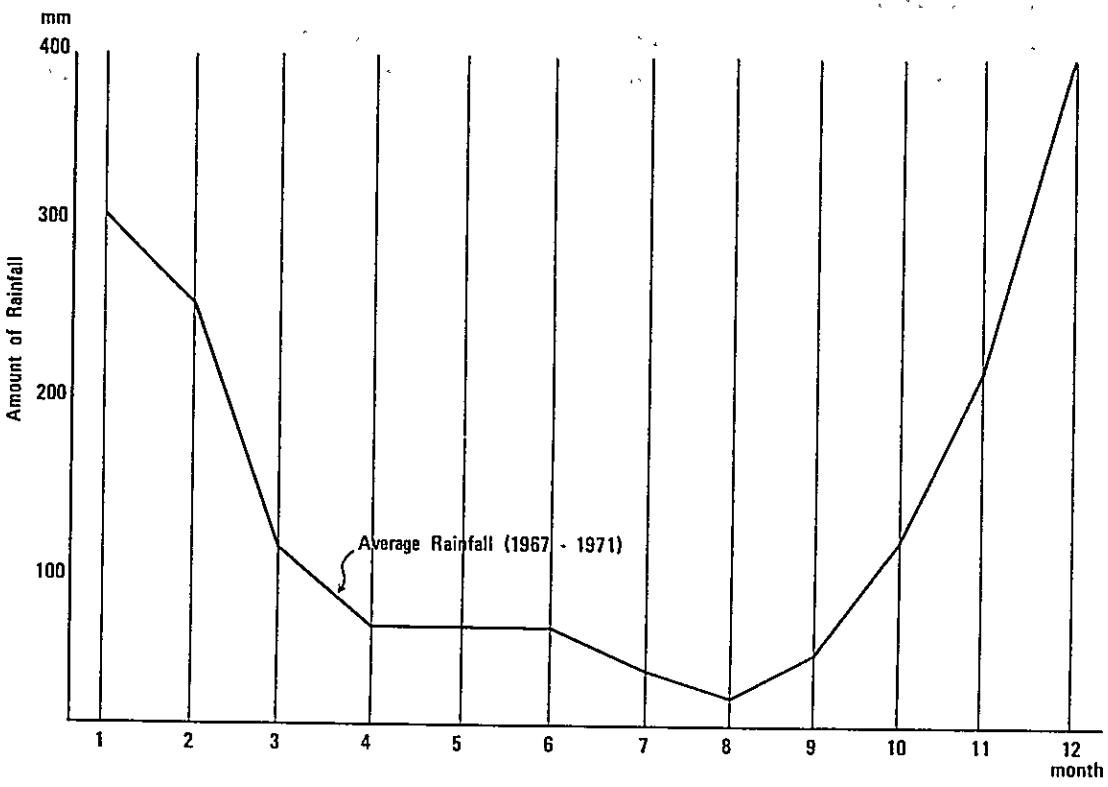


Table 5. Characteristics of Sorghum Varieties

Variety	Days to maturity (days)	Height (cm)	1000 Grains weight	Yielding Range (Ton/Ha)	Degree of damage by Panicle Pest	Grain Colour
1. Sorghum 6C	97	191	30	4.0-5.0	-	chocolate
2. Sorghum 7C	99	182	29	4.0-5.0	+	chocolate
3. Sorghum No. 46	93	195	45	2.5-3.0	-	yellowish brown
4. Sorghum UPCAS-1	97	125	26	3.5-4.5	-	white
5. Sorghum UPCAS-2	96	123	23	3.0-3.5	+	yellowish brown
6. Sorghum Katengu	102	247	37	3.5-4.0	-	white
7. Sorghum KD-4	85-95	100-120	35-40	3.5-4.0	-	chocolate
8. Sorghum Local V in Pasuruan	100	190-200	25-30	2.0-2.5	-	white

(See the next page)

Note: Grain weight in gram unity.

Variety	Glume Colour	Type of Panicle	Threshing
1. Sorghum 6C	black	Medium compact	Medium
2. Sorghum 7C	black	Compact	Easy
3. Sorghum No.46	mahogany	Medium Compact	Easy
4. Sorghum UPCAS-1	mahogany	Medium Compact	Medium
5. Sorghum UPCAS-2	black	Compact	Medium
6. Sorghum Katengu	yellowish white	Loose	Hard
7. Sorghum KD-4	brown	Medium Compact	Easy
8. Sorghum Local V in Pasuruan	yellowish white	Loose	Hard

Table 6-1. Nutritious Composition of Sorghum

(Japan Food Analysis Center, Dec, 1971)

Items	Sorghum No.46	Sorghum 6 C	Sorghum 7 C	Sorghum U.P.C.A. S - 1	Sorghum U.P.C.A. S - 2
Moisture Content (%)	12.68	11.70	12.17	12.24	11.98
Crude Protein (%)	8.32	9.47	8.48	7.68	8.54
Crude Fat (%)	3.11	2.67	3.40	3.60	3.11
Crude Fibre (%)	1.91	3.39	3.12	2.24	3.14
Crude Ash (%)		1.34	1.66	1.23	1.69
Calcium Mg (%)	15.22				
Tannin (%)	0.35	0.19	0.20	0.10	0.13

Table 6-2. Nutritious Composition of Local Sorghum Variety

Item	Sorghum Pasuruan No.1	Sorghum Pasuruan No.2	Sorghum Situbondo	Sorghum Banyuwangi	Sorghum Banyuwangi 2	Sorghum KD-4	Standard in Japan
Moisture Content (%)	11.82	12.53	12.33	13.54	12.52	15.42	13.31
Crude Protein (%)	10.17	9.24	9.76	10.14	6.05	9.47	9.7
Crude Fat (%)	2.94	3.19	3.10	2.41	2.41	2.71	3.1
Crude Fibre (%)	1.46	1.43	1.66	1.66	1.50	1.94	1.9
Crude Ash (%)	1.41	1.48	1.59	1.41	1.29	1.25	1.6
Calcium Mg (%)	0.035	0.043	0.032	0.038	0.037	0.043	0.02
Tannin (%)	less 0.2	more 0.2	more 0.2	less 0.2	more 0.2	less 0.2	less 0.2

(Zenno, 1973)

4. The Essential Points on the Maize Crop Culture

Several trials have been carried out at the Second Crop Center, Bedali in 1971, 1972 and 1973.
The aims of these trials was mainly to accumulate the useful data on the maize crop culture and variety improvement. Herein, based on the data which have been obtained during three years, we would like to show the following essential points on the maize crop culture.

1) Rotation and Soil Preparation

Under the upland soil condition of East Java, maize is grown twice a year. In some areas, maize is in rotation with maize. But, maize is often grown in rotation with other crops, such as soy-bean, ground-nut, cassava and upland rice. Even in tropical areas, it is well known that a good rotation usually gives good average yields and makes moderate the decline of the soil fertility; although it is understood that the soil fertility cannot be maintained by the rotation of crops only.

In general, it is supposed that the alternation of maize and legumes, such as soy-bean, ground-nut and other beans, is more advantageous than that of maize and upland rice. Interplanting green manure, such as Crotalaria Juncea, between maize rows is also advantageous for the benefit of the seceding maize or other crops. However, it is desirable to plough in the green manure crops when it is in the growing stage, so that the planting of the green manure crops should be adjusted according to the ploughing time for the succeeding seasons.

We should recommend the maize growers to sow maize in rotation with other crops, especially legumes, when the economical and the plant husbandary conditions allow.

Maize requires a well prepared field, as far as possible from clod. The upland, which remain fallow during the dry season, also requires thorough ploughing or harrowing to prepare a seedbed suitable for maize to be grown. A cloudy soil leads to ununiformal germination and stand maize plant, and the decrease of the plant number per unit area which can cause the decrease of the maize yield.

Planting time, that is planting soon after the onset of the continuous rain, is also important in controlling the diseases and the insect pests, especially Downy Mildew, which is one of the most serious disease in East Java and of which outbreak is closely related to the planting time.
Figure 5 shows the relation between the planting time and the damage percentage by Downy Mildew and shoot fly in Bedali. From this figure, it can be expected that the delay of the planting time of 1 (one) to 2 (two) weeks can cause the increase of 2 to 3 (three) times as much as the diseased plants, though the damage by Downy Mildew decreases at 1 (one) to 2 (two) months after the onset of the rain; then the damage by shoot fly increases instead of Downy Mildew. So, the planting time has an important effect on the maize yield.

Fig.5-1. Relation between the damage by Downy Mildow and Shoot Fly for Harapan

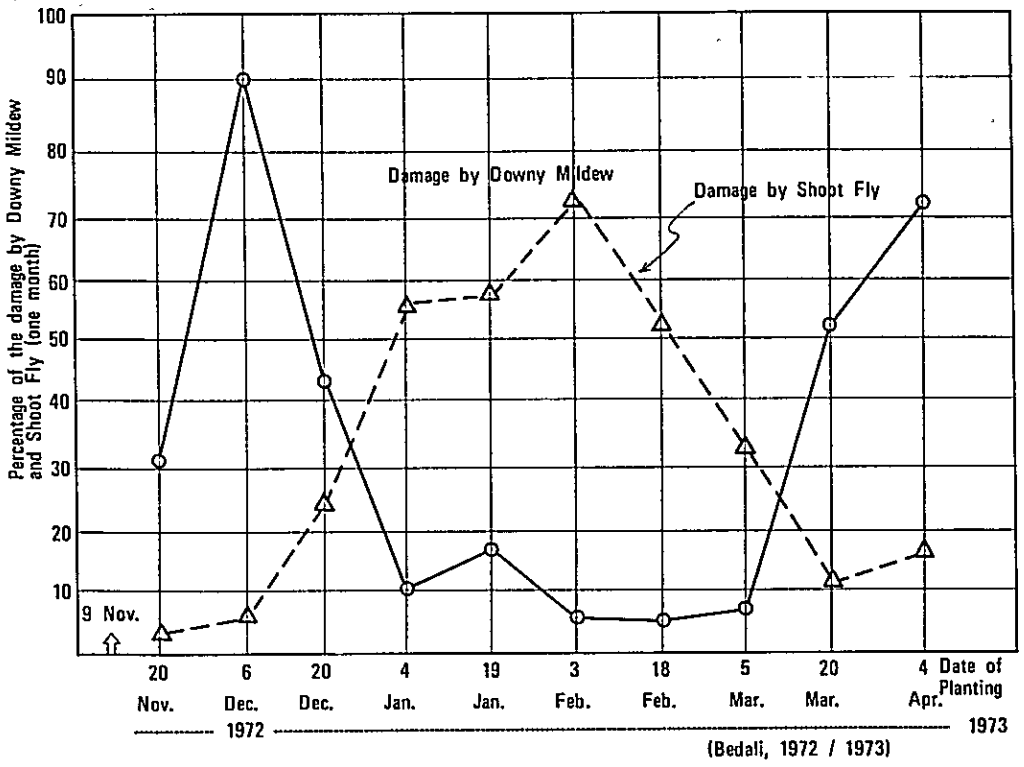
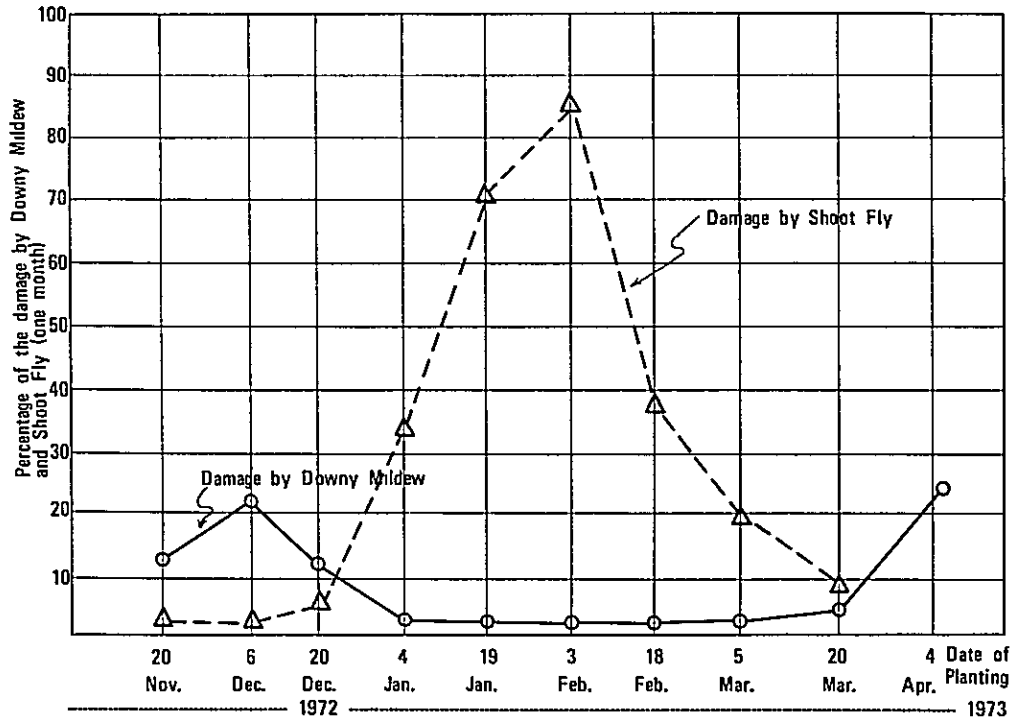


Fig. 5-2. Relations between the damage by Downy Mildew and Shoot Fly For Kretek, Bedali, 1972 / 1973



planting time is not only important as the measures for evading the damage of Downy Mildew, Shoot Fly and wet injury, but it is also important for planting the second crop as quick as possible after the first maize, in some areas, such as in Kediri.

2) Plant Population and Spacing

The optimum plant population depends upon the soil fertility, the soil moisture and the maturity of the varieties to be grown. The relation between the variety and the population per Ha is manifested in the result of the experiments carried out in our Center, Bedali, where two varieties were planted in range from 45,000 to 100,000 plants per Ha by applying 200 Kg Urea per Ha.

Figure 6 shows that for Kretek (early maturing variety), the yields are still rising at the level of 100,000 plants, while for Harapan (late maturing variety), the yields are beginning to decline at the level of 75,000 plants. The early maturing variety requires higher plant population than the late maturing one in order to obtain the maximum grain yield.

The relation between the amount of the fertilizer applied and the plant population is shown in figure 7. (From experimental data of our Center, Bedali). The following plant population should be recommended for each variety, although it is necessary to adjust the above number according to the conditions, such as the soil fertility and the soil moisture.

Kretek — around 100,000 plants per Ha, 80 x 25 cm, 2 plants.

P.S.-42, B.C. 2) — around 72,000 plants per Ha, 80 x 35 cm, 2 plants.

Metro Harapan) — around 62,000 plants per Ha, 80 x 40 cm, 2 plants.

In connection with the plant population, the troublesome problem is how to maintain the said plant population unit the harvesting time, because a number of damages during the growing period cause the decrease of the plant population.

The stand, number of plants per hill, is also as important as the plant population. The following result, given on Table 7, shows its relation.

Table 7. The Relation between the Yield and the Stand (Number of plants per hill)

Number of plants per hill	Kretek Kg/Ha	P.S. 42 Kg/Ha
1. All two plants	2,945	3,043
2. One and three plants hills alternately	2,202	2,597
3. One, two and three plants hills alternately	2,265	3,024

Notes: Kretek - some population of 82,500 plants/Ha. for each plot.
P.S. 42 - same population of 62,500 plants/Ha. for each plot.

(Bedali, Marengan 1972)

Figure 6. Relation between the Yield and the Plant Population (Bedali, Labuhan 1971)

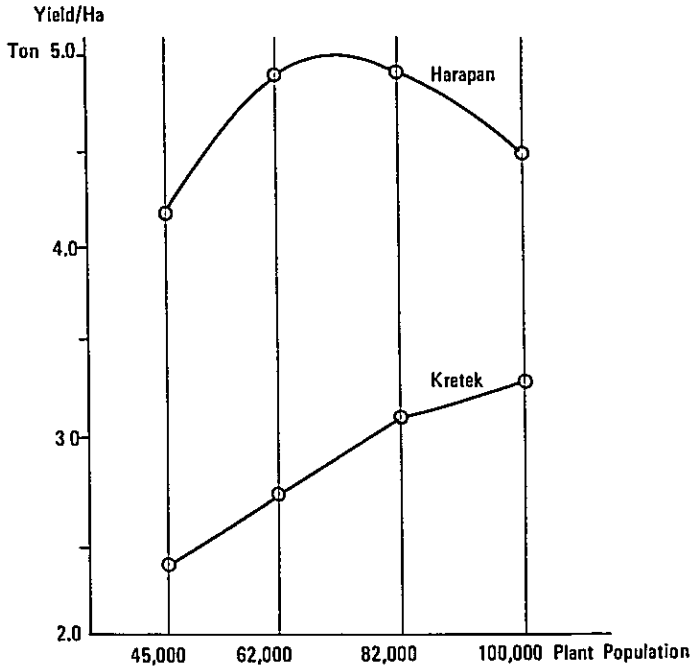
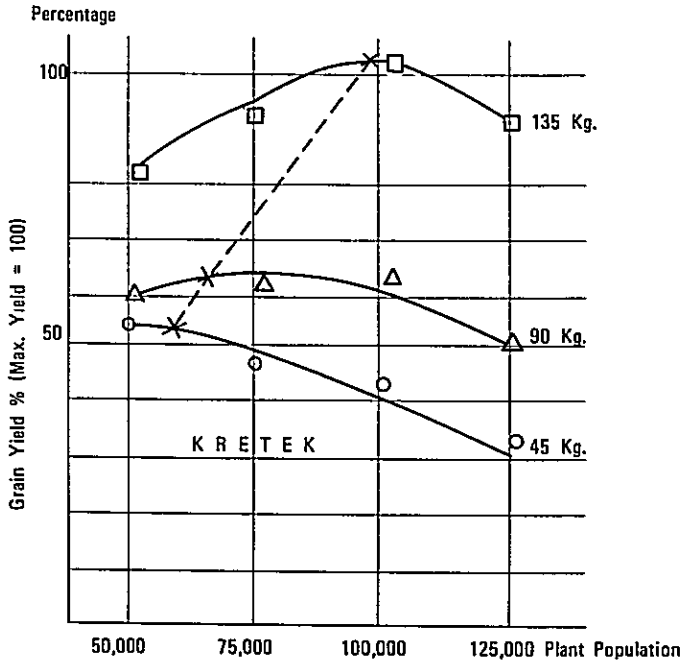


Figure 7. The Relation between the Yield per Ha and the Plant Population at 3 levels of Nitrogen. (Bedali, Marengan '72)



The relation is that the non-uniformity of the number of plants per hill, even if the said plant population is surely obtained at the harvest time, causes the decrease of maize yield as compared to the uniformity of the number of plants per hill.

Seed rates, in order to obtain the said plant population, generally depend on the seed weight. The 1,000-weight, the maturity and the amount of seeds required per Ha are as follows:

Variety	Maturity	1,000-grain-weight	Amount of seeds required per Ha
1. Kretek	85 days	210 - 220 grammes	32 Kg.
2. P.S. 42 3. Bogoro Comp.2)	105 days	250 - 260 grammes	260 Kg.
4. Metro	110 days	240 - 250 grammes	23 Kg.
5. Harapan	115 days	270 - 280 grammes	25 Kg.

The amount of seeds required for one hectare is, therefore, around 25-32 Kg. depends on its variety. At least 3 seeds should be shown in one hill at planting time, and then, one month after the germination, thinning operation with some allowance should be practised in order to get the said plant population.

3) Fertilization:

It is said that the most effective method of increasing the yield of maize in Indonesia is to apply the chemical fertilizer. Our Project's results for the past 5 years have shown that it is usually possible to obtain the average yield of 2 (two) to 2.5 tons per hectare by applying 200 Kg. of Urea, which is our recommended method.

In general, the late maturing varieties, such as Metro and Harapan, are more responsive to fertilizer than the early maturing varieties or the local varieties, such as Kretek. According to the fertilizing experiments on the late maturing varieties carried out in our Center, given in Figure 8, the rates up to 135 Kg. Of nitrogen (300 Kg. of Urea) per hectare are effective to increase the yield under a suitable soil moisture. While on the early maturing ones, the rates up to 90 Kg. of nitrogen (200 Kg. of Urea) are effective to increase the yield in the economical sense.

The amount of fertilizer required in a certain area depends on the soil type, the soil fertility and other conditions, and needs to be derived by means of soil analysis and test for each area. Our Project introduced simple soil analysis apparatus as one of the aid commodities. By using these apparatus, we have known a lot of facts about soil conditions, for example, most of the farmers' fields are not always enough in phosphorous content and the soil in some areas, such as Lawang areas in Malang, are acid soil ranged from 5.0 to 5.5 in pH value.

Even if fertilizer is supplied, we cannot expect to get high yield in the acid soil areas. So, neutralization of soil, by providing such base as lime, is necessary.

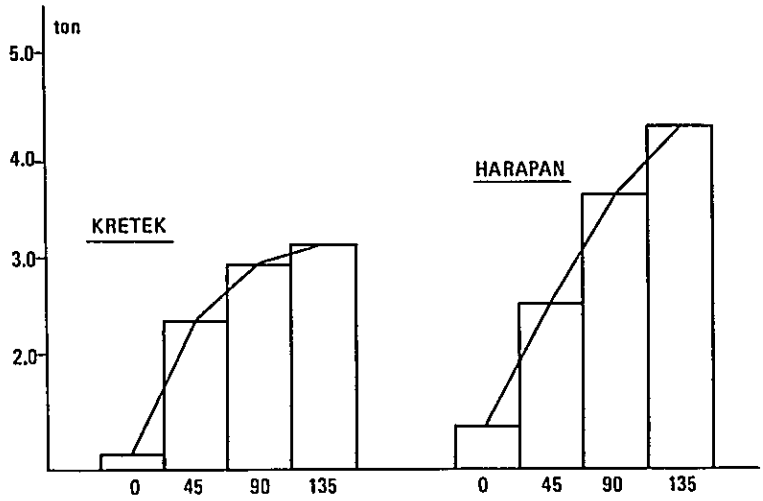
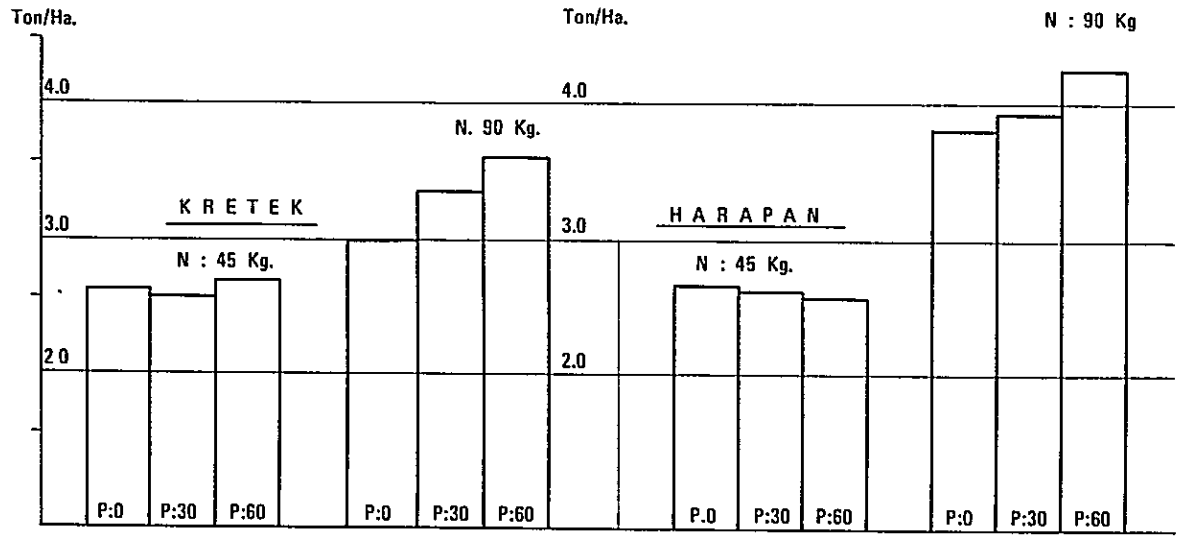


Figure 8. The Relation between the Yield and the Amount of Nitrogen (Bedali, Labuhan 1971)

Figure 9. The Relation between Nitrogen and Phosphorus Fertilizer on Maize Yield (Bedali, Labuhan 1971)



On rather young lateric soil, the application rates up to around 60 Kg. of phosphorus, in combination with more than a certain degree of nitrogeneous fertilizer (around 45 Kg.) when economical condition allows, are effective to increase the yield.

The application of organic matters, such as stuffles, is effective in some extent to maintain the fertility of the upland soil. As the effects of the application of the organic matters, there are some improvements of the soil physical properties and so on, except the increase of the soil nutrient.

Split dressing are generally more effective in preventing the leaching of nutrients, but the best time of the application is different in accordance with the varieties used. Usually, in the first dressing, the whole amount of phosphorous and 1/3 to 1/2 of the nitrogen are applied at the planting time or within one week after germination; and in top dressing, the remainder of the nitrogen is applied between 4 to 5 weeks after germination. For the earlier varieties, it is effective to topdress a little earlier than the late maturing varieties. Hole placement, at a distance of 10 to 15 cm from hill, appears to be the most effective method of the fertilizer application.

4) Insect pests and Diseases

A wide range of insect pests attack maize in our area, and their importance differs according to where and when the crops are grown.
In our area, the planted seeds are generally damaged by underground worms, such as beetles. Seed dressing with a certain insecticide, at 10 - 15 grammes per 1 Kg. of seed, gives very effective control.

Shoot fly (Antherigona exigua) is the most serious insect attacking maize in our Project areas. The fly lays eggs on the underside of the seedling leaves, 3 to 6 days old, and the eggs hatch in 2 to 3 days. Then the larvae crawl down into the leaf whorl. They eat the young shoot and the growing point.

Seed fly damage increases in later planting of the rainy season, as shown in Figure 5, but only the young stages of growth are attacked. So, timely planting and the application of Diazinon, at 4 to 5 days interval for the first two weeks of maize grown, give good control.
Besides the above mentioned insect pests, the following insect pests are troublesome, but not always serious:

Agrotis segetum	Pyrausta nubilalis HBN
Agrotis interjectionist	Helicthis armigera

Downy Mildew is the most serious disease in Indonesia and it is known that the late planted, early rainy season maize, can be seriously damaged by this disease. The effective methods to control this disease are, so far, not known, except for field sanitary practices and evasion culture.
In order to control this disease, the timely planting, after first rainfall in rainy season, is the most important measure as shown on Figure 5.

Besides Downy Mildew, the following diseases are also troublesome, and the application of fungicide as a control method is not economical.

Helminthosporium turcicum	Gibberella zeac.
Paccinia sorgi	Helminthosporium maydis

Appendix 1. SYSTEM AND PERIOD OF SEED PRODUCTION FOR BIMAS/JAGUNG IN THE RAINY SEASON OF 1974/75

In Palawija Development Centre, Bedali-Lawang

I. Target and Location of Bimas in the 1974/1975 Rainy Season

No.	Kabupaten	Variety	Width (Ha)	Total (Ha)
1.	Jombang	Kretek	2,500	
2.	Bojonegoro	"	1,000	
3.	Tuban	"	1,000	
4.	Lamongan	"	1,000	
5.	Kediri	"	11,000	
6.	Nganjuk	"	1,000	
7.	Blitar	"	2,000	
8.	Trenggalek	"	1,000	
9.	Bangkalan	"	2,000	
10.	Sampang	"	8,000	
11.	Pamekasan	"	6,000	
12.	Sumenep	"	14,000	61,000
13.	Lumajang	P.S.42	3,000	
14.	Jember	"	2,000	5,000
15.	Bondowoso	B.C. 2	2,000	2,000
16.	Malang	Harapan	6,000	
17.	Probolinggo	"	1,000	7,000
	Probolinggo	Metro	1,000	
18.	Situbondo	"	2,000	
19.	Banyuwangi	"	2,000	5,000
	T o t a l	-	80,000	80,000

II. FOUNDATION SEED PRODUCTION

No.	Variety	Width (Ha)	Production (Kg)	Remarks
1.	Kretek	0.3177	317.71	June - Sept. '73 at Ketindan
2.	P.S. 42	0.026	26.04	- " -
3.	B.C. 2	-	10.40	From L.P.3
4.	Metro	-	66.04	- " -
5.	Harapan	-	37.08	- " -
T o t a l			417.27	-

The prcduction estimate of the foundation seed cultivation is 1,000 Kg/ha.

III. System and Period of Seed Production

No.	Period	Classification	Location and Method of Production
	June - Sept. '73 (Dry season)	Foundation Seed	
		- Kretek	Sib. crossing at Ketindan
		- P.S.42	- " -
		- B.C. 2	From L.P.3
		- Metro	- " -
		- Harapan	- " -
2.	Oct. '73 - Jan. '74	Stock Seed	
		- B.C. 2	Mass plants and ear corn selection at Ketindan
		- Metro	- " - at Bedali
		- Harapan	- " - at Bedali
3.	Jan. '74 - April '74	Stock Seed	
		- Kretek	- " -
		- P.S. 42	- " -
4.	Apr. '74 - June	Extension Seed	Mass plants and ear corns selection in each Kabupaten, Bimas implementor.
5.	Oct. '74 - Jan. '75	Bimas	Kabupaten, Bimas implementor

IV. Stock Seed Production

No.	Variety	Width (Ha)	Production (Kg)	Remarks
1.	Kretek	12.7083	19,062.50	Jan. - April '74 at Bedali I, II
2.	P.S.42	1,0417	1,562.50	Jan. - April '74 at Bedali I.
3.	B.C. 2	0,4167	625	Oct. '73 - Jan. '74 at Ketindan
4.	Metro	1,0417	1,562.50	- " - at Bedali I.
5.	Harapan	1,4583	2,187.50	- " - at Bedali II.
	T o t a l	16,6667	25,000.--	

The estimate of the production of the stock seed cultivation is 1,500 Kg/Ha.

V. Extension Seed Production, June - October, 1974 in each Kabupaten, Bimas Implementor

No.	Variety	Width (Ha)	Production (Kg)	For Bimas (Ha)
1.	Kretek	762.50	1,525,000	61,000
2.	P.S. 42	62.50	125,000	5,000
3.	B.C. 2	25	50,000	2,003
4.	Metro	62.50	125,000	5,000
5.	Harapan	87.50	175,000	7,000
	T o t a l	1,000,00	2,000,000	80,000

The production estimate of the extension seed cultivation is 2,000 Kg/Ha.

Appendix 2.

ISOLATION REQUIREMENTS FOR THE SEED PRODUCTION OF MAIZE

When the field area (in Ha) growing the affected seed parent is :								
4 or less	4-5.9	6-7.9	8-9.9	10.11.9	12-13.9	14-15.9	16-over	Then at least this number of border rows is required.
And the distance (in meters) of the seed parent from other maize is at least :								
200.0	195.0	190.0	185.0	180.0	175.0	170.0	165.0	1
187.5	182.5	177.5	172.5	167.5	162.5	157.5	152.5	2
175.0	170.0	165.0	160.0	155.0	150.0	145.0	140.0	3
162.5	157.5	152.0	147.5	142.5	137.5	132.5	127.5	4
150.0	145.0	140.0	135.0	130.0	125.0	120.0	115.0	5
137.5	132.5	127.5	122.5	117.5	112.5	107.5	102.5	6
125.0	120.0	115.0	110.0	105.0	100.0	95.0	90.0	7
112.5	107.5	102.5	97.5	92.5	87.5	82.5	77.5	8
100.0	95.0	90.0	85.0	80.0	75.0	70.0	65.0	9
87.5	82.5	77.5	72.5	67.5	62.5	57.5	52.5	10
75.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	11
62.5	57.5	52.5	47.5	42.5	37.5	32.5	27.5	12
50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	13

CHAPTER Ⅳ KERETEK AND KRETEKI-ZATION

By H. SAKAMOTO

PREFACE

I was given an opportunity to stay at the Agricultural Extension Service in Kediri as a maize production expert for a period from March 1971 to July 1974 under Maize Project in East Java.

Kediri is 128 kilometeres distant from Surabaya. Here is one of the most notorious volcanoes of the Indonesian Arthipelago by the name of Gunung Kelut. The notority of the Kelut is due to the many recent catastrophic eroptions which have claimed thousands of victims, and the damage is difficult to express in terms of money. On the contrary, the greater part of the farm-land in Kediri is remarkably fertile, and the soil is exceptionaly productive. This is due to the substances thrown out from this volcano, which spreaded over the whole area of Kediri. The climate is favorable, and there is scarcely any variation in the mean temperature from month to month. With a rainfall that is heavy and sure. Records of recent years show occasional droughts in different parts of the East Java, but Kediri fares better in this respect than most other parts of the East Java. The total area of the up-land and sawah amounted to about 59,000 and 46,000 hectare respectively, while the total of the maize fields is about 40,000 hectare a whole year in Kediri.

Kediri is also well-known as the birth place of Kretek which is the local variety of maize. The Kretek variety has fulfilled every farmer's requirements such as rotational cropping pattern, effective and economical cropping system, and disease control, and in addition, the grain yield is comparatively high since its appearance in this region.

At the present time our provincial government is conducting a compaign to promote the spread of the Kretek variety, generally known as "Kreteki-zation", all over East Java. There has been no such precedent on maize cultivation in Indonesia during the short period when Kretek was adopted by Maize Project in East Java since 1971. The Kretek variety is widely applied nowadays, and is progressing into many regions in East Java.

Although the advantages of Kretek and Kreteki-zation are emphasized, often a few disadvantages are hidden.

I will discuss in this report the necessary care to be taken and problems encountered when using Kretek, and Kreteki-zation although it is still in the formative stage. I will describe its used and appreciate your very frank criticism.

It is my pleasure to acknowledge the hospitality and encouragement of the members of the Agricultural Extension Service in East Java.

Chapter I

Introduction

The seed named Kretek which is a hardy, quick-maturing flint local variety was discovered for the first time in the Kecamatan Kepung, Desa Kepung (present Kecamatan Puncu, Desa Asmorobangun) in 1952 by one of the key farmers in this Desa whose name is Mr. Murido. He bought seed from a certain market at Kecamatan Kepung which was called "Kretek". Where the original Kretek seed came from is still a matter of much speculation. It is considered that the Kretek is native to the sawah area at Pare in Kediri. There still grows a few local varieties such as Goter, Penjalinan, and Tongkol which has characteristics very similar to the Kretek variety. It is likely that Kretek would cross with these varieties and have many common genetic characteristics which are easily observed in Kretek and these other varieties.

In general, the meaning of Kretek is used for early maturing and high production on the crops like "Genjah", therefore we can find many crops using "Kretek" such as Paddy Kretek, Kacangtanah Kretek and even in some kinds of vegetables.

It seems that this special name of Kretek for maize has never been used until this time.

Since then Kretek has spread widely in this region, however, we should not ignore the influence of crossing with some improved varieties such as Metro, Harapan, and Perta which were recommended to farmers after 1957 and 1958, respectively, but now all pure ones have disappeared in Kediri. The Kretek seed was introduced into B.P.M.D. (Agricultural Education Center) at Pare for a trial productivity test in 1962 from farmers in this region by Mr. Noelyosoeprapto who was the chief of Agricultural Extension Service in the Kabupaten Kediri. Its seed had been selected by the method of mass selection until its refined form was introduced into Kabupaten's seed farm at Tugurejo in 1965.

It should be noted that many farmers had already planted the Kretek variety in this region when Kretek was finally introduced into B.P.M.D. in 1962.
The Kretek variety has fulfilled every farmer's requirements such as rotational cropping pattern, effective and economical cropping system, and disease control, and in addition, the grain yield has been comparatively high since its introduction in this region.

The maize project in Kediri has been in effect since 1968, and the participating farmers were given credit in the form of fertilizer and seed.

After harvest, the farmers were required to give part of their production to the project as the repayment of the credit received. We called this form of credit the "in kind system". The project has been carrying out of maize cultivation in Kediri for the past five years, the total extent of the project was an area of 9,190.55 hectare, and the number of the farmers who participated in this project were 15,133.

The maize project adopted Kretek for the recommended variety and prepared foundation and stock seed at the Maize Center Bedali since February 1971, according to the farmers' requirements and according to the experimental results at the Kabupaten's seed farms. After the Kretek variety was adopted for the Maize project in Kediri, the total project extended to an area of 5,465.2 hectare, and the number of the farmers who participated in this project were 9,100. About 60% of the total extended area during the past five years was planted with the Kretek variety.

The seed production should be carried out under the strict isolation field, in order to control the time and uniform selection. So, the extension seed of Kretek has been produced in contract with Primer Koperta (Primary Agricultural Cooperative Association) Bulupasar (present B.U.U.D. Pagu II) as a seed grower cooperative since May 1971 and seed production has been done as a group.
Superior stock seed has been supplied to this extension seed farm by the Maize Center Bedali and by the Kabupaten's seed farm Tugurejo.

Since seed production was set up at Desa Bulupasar in 1971, quite a few agriculture study and survey groups which consisted of government officials, cooperative staffs, and key farmers from East Java, and other provinces came to inspect to the growth of the Kretek variety.

It is evident that the introduction of Kretek variety, on a large scale, into many places is due to these inspectors suggestions after their study tour.

The total production of superior extension seed from Primer Koperta Bulupasar since 1971 to 1973/1974 amounted to 507 tons distributed to East Java included Maize Project area, other provinces, and even to Kalimantan.
In the mean time the total of 616 tons Kretek seeds were also distributed to the same provinces from Kabupaten Kediri.

This seed production and its distribution, on a large scale, has been used to promote the spread of Kretek variety all over East Java uniformally, and it is called in general as "Kreteki-zation". This promotion of Kreteki-zation has been conducted along with BIMAS palawija activity (maize, soy beans, and ground nuts) by our provincial government.

The Kretek and Kreteki-zation is widely used now, and is making great progress in many regions in Indonesia.

Chapter II

The Successful Adaption of Kretek Variety

The Kretek variety, which was introduced into Agricultural Extension Service Kabupaten Kediri from the farmers in this region in 1962, and has been used in carrying out regional varietal tests. This variety was found fairly adaptable to a wide range of soils and climatic conditions. Its average yield per hectare was about 1.7 to 2.6 tons in Kediri. The outstanding characteristics of Kretek veriety are as follows:

1. Early maturing and high yielding ability ;
2. Appreciable resistance to Downy Mildew ;
3. Better resistance to wind than the bigger and late maturing varieties;
4. Good for cereal food and crude protein is considerable high;
5. The inner husks from the ear can be used as cigarette paper;

6. Classification belongs to the flint type and its length is usually 10-12 cm with round deep yellow grains, covering whole ears;

After preliminary observation and regional varietal tests, Kretek variety was found to outyield Tongkok variety which once was recommended to the farmers. The Kretek seed was selected for foundation seed at Maize Center Bedali and used for extension since 1971. The Kretek maize cultivation has been carried out in Kabupaten Kediri by Maize project during the past two years, the total area of the project amounted to 5,465 hectare.
The performance of Kretek variety in the regional varietal tests will be shown in the Table 1.

It could be seen that Kretek variety has not necessarily out yielded the other ones, while it is noted that yielding ability of its variety is comparatively high under the limitations of the growing period.

Kretek is a short maturing variety which matures in 85 days. It is grown in Kediri in rotation with cash crops such as onion, soy beans, chili, and main food stuff such as cassava and especially paddy in sawah area. For many years, farmers in Kabupaten Kediri have been urged to give serious consideration to plant cash crops, which are often more important than maize for farmers, as soon as possible after maize harvest for the purpose of crop rotation. Most of the maize in fields in Kabupaten Kediri is grown in pure stand, while most farmers in other Kabupatens have planted maize with other crops, in order to fulfill the staple food and to increase their income throughout the year under the inferiority soil and climate conditions to the former. In this case, also it is necessary to use short maturing variety adopted in the mixed cropping system, by reason of rapid return of the cash crop and to avoid the competion with another crop for nutrients and sunlight.

Several rotations in Kabupaten Kediri and others are shown diagramatically in Fig. 1. These crop rotations shown that the maturity of maize is much better in less than 90 days and its high yielding ability is the most suitable and profitable for adapting these rotational cropping pattern in these areas under the limitation of these varieties above described in Table 1.

Table 1. Performance of the varieties tested in Kabupaten Kediri. During the period from 1960 to 1972.

Locations	Variety	Time of the trial	Ave. yield kg/ha	Maturity in days	Yielding ability kg/day	Plant Populat	Fertilizer
Seed farm Kencong (1960 - 1972)	Kretek	5	1,762	85	20.7	80x40cm -2(3)	N=69 kg/ha P=24 kg/ha
	Tongkol	6	1,266	85	14.8	80x50cm -2(3)	N=49 kg/ha
	Metro	3	2,031	110	18.4	100x50cm -2(3)	N-35 kg/ha P=32 kg/ha
	Harapan	2	2,041	110	18.5	100x50cm -2(3)	N=35 kg/ha P=32 kg/ha Note: with compos.
Seed farm Tugurejo (1960 - 1970)	Kretek	6	2,627	85	30.9	80x30cm -2(3)	N=115 kg/ha P=24 kg/ha
	Tongkol	10	2,107	85	23.4	80x40cm -2(3)	N=88 kg/ha
		2	3,526	110	32.0	100x50cm -2(3)	N=88 kg/ha
	Bogor-Comp.	2	2,930	100	29.3	90x35cm -2(3)	N=88 kg/ha
Agricultural Education Center PARE (1965 - 1972)	Kretek	8	2,244	85	26.4	80x30cm -2(3)	N=69 kg/ha P=48 kg/ha
	Metro	1	2,118	110	19.2	100x50cm -2(3)	N=119 kg/ha P=27 kg/ha
	Bogor-Comp.	1	2,602	100	26.0	100x40cm -2(3)	N=119 kg/ha P= 27 kg/ha

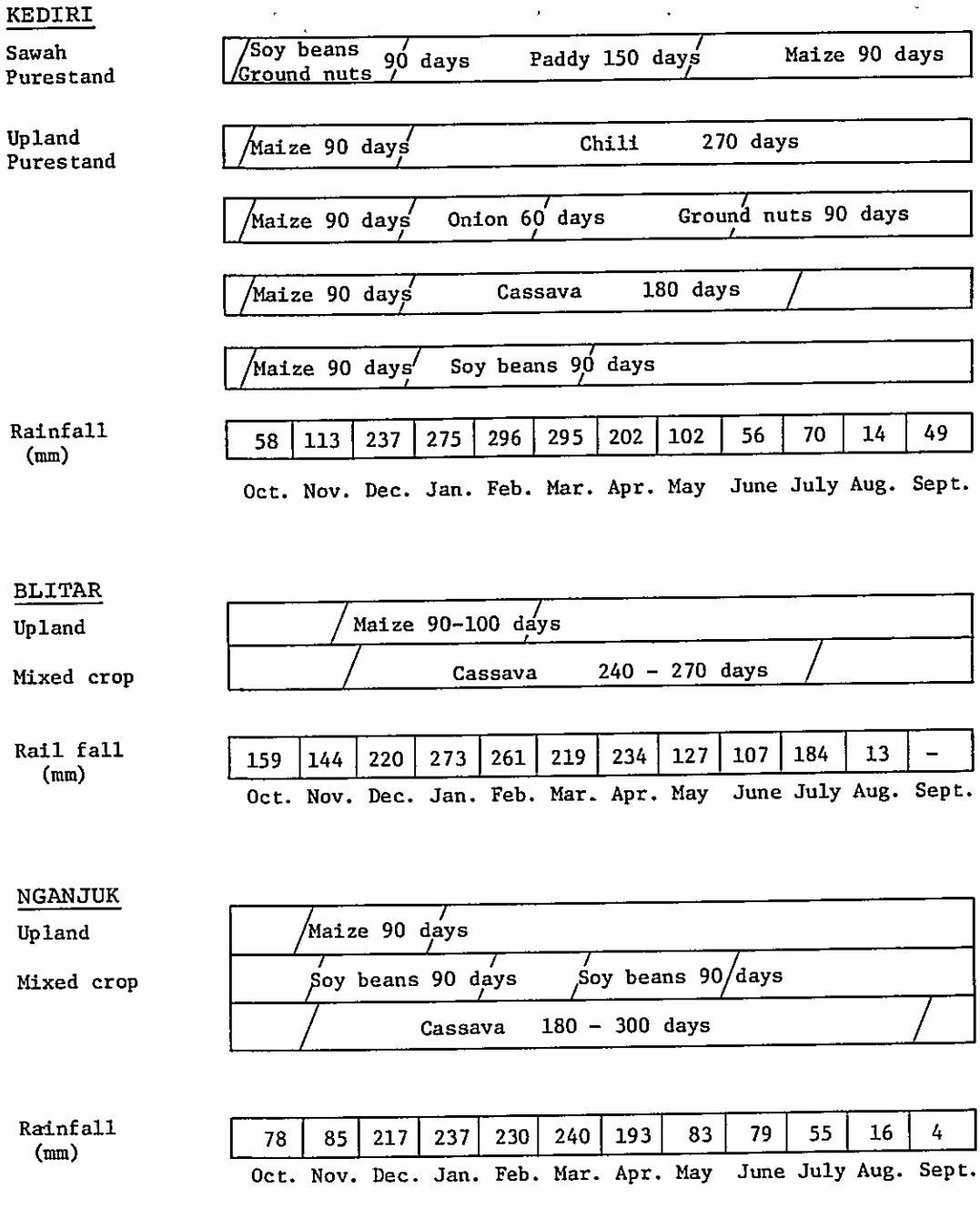


Fig. 1. Several typical rotational cropping pattern in Kabupaten Kediri and others.

Rainfall of the monthly range ; for the year 1960-1969
(From Karesidenan Kediri.)

Before Kretek variety spread in Kediri, Metro and other improved varieties had been recommended to the farmers by Agricultural Extension Service. These varieties have disappeared from Kediri becuase of the damage from Downy Mildew and their late maturing characteristics which made it difficult to carry out rotation in this area. Since their disappearance, the farmers maize fields in Kediri have been planted with local early maturing varieties such as Kretek, Genjah Mas, Genjan Tongkol, Genjah - Warangan, Genjah Kertas and so on. In general, these varieties have an appreciable resistance to Downy Mildew when they are compared with improved varieties in Indonesia, especially Kretek has been well known as a resistant variety to Downy Mildew by the farmers in this region. Dr. Hirose (1972) reports that resistant test against Java Downy Mildew in maize varieties was carried out at Maize Center Bedali in Malang. The results of the test (Table 2) showed that there was only the slightest infection from Java Downy Mildew obtained in the generally known local varieties and improved ones.

Table 2. Degree of resistance against Java Downy Mildew.

No.				No. of plants tested	No. of diseased plants	Infection %
1.	Kretek	(Malang)	Indonesia	51	2	3.9
2.	Genjah Kertas	(Kediri)	"	47	5	10.6
4.	Genjah Warangan	(Kediri)	"	49	8	16.3
5.	PS 42	(Malang)	"	40	6	15.0
6.	Metro	(Malang)	"	39	4	10.2
7.	Harapan	(Malang)	"	41	5	12.1
59.	Genjah Tongko	(Kediri)	"	49	2	4.0
62.	Penjalinan	(Bogor)	"	51	11	21.5
64.	Genjah Kodok	(Bogor)	"	52	3	5.7
67.	Kodok	(Bogor)	"	31	3	9.6

Note: Inoculation source = Harapan variety.

Quoted from: "Progress report in Palawija Center 1971/1972".
Complete figures are not used by this report.

In general, maize fields on high altitude above 300 meters at Kecamatan Kepung in Kabupaten Kediri are often damaged in the growing season from the period of November to December by strong winds. Kretek variety is more resistant to strong winds than late maturing and bigger ones. An example of this will be shown as follows;
The varietal test included two local varieties (Kretek and late maturing variety Bandung which is just like Perta variety) were carried out in a demonstration field on high altitude about 450 meters in 1973.
The experimental design was randomized complete block type with three repetitions.

Its demonstration field was damaged by strong wind in November 17, it was expected that this maize suffered serious damage owing to the wind when the growing stage of maize was after silking.
However, the damage of Kretek variety by stalk lodging was very slight in comparison with that of Bandung variety. The results are shown in Table 3.

Table 3. The influence of the strong wind to grain yield, lodging and other characteristics on the Kretek and another variety.

Variety	Planting pattern	Plant height cm	Ear height cm	Days to 75% tass.	Days to 75% silk.	Maturity in days	Stalk diameter (cm)	Lodging %	Grain yield kg/ha
Kretek	80x30 cm -2 plants /hill	242	104	45	49	87	1.34	2.1	3,177
Bandung	80x40 cm -2 plants /hill	297	152	55	59	111	1.37	26.0	2,935

Notes: (1) The maturity of this maize was delayed due to the high altitude climate, and should be considered.

(2) Grain yield is not significant.

Maize is one of the two most important coreal food crops in Indonesia. Rice is first, and maize is second. In a country where maize is used extensively for food, it is especially important to grow varieties that are rich in the essential food values, protein, carbohydrate and fact. At this time very little information is avilable.

In order to gain some idea of the food value of Kretek, a collectior Kretek and four other well known improved varieties were analyzed for protein and fat content. This maize came from Maize Center Bedali in Malang. It was sent to Zennoh (The National Federation of Agricultural cooperative Association in Japan) for analysis by Mr. Kouchi in 1973. The results of the analysis are shown in Table 4. The data shows that Kretek is considerably lower in fat content which is natural for its locality, however, the protein content is higher than the standard and these four improved varieties.
The taste of the maize in cereal food is also important for farmers and consumers. Many farmers in Kediri even in Sawah area, use maize for cereal food all the year round. Farmers in some up-land regions, use maize and cassava for more than 80% of their total main food crops per year. Kretek is liked more by the farmers than Metro and Tongkol varieties because of its good taste, and can be easily milled with less rubbish.

Table 4. The protein, fat and other nutritious composition of 5 varieties in East Java.

Variety	Moisture content	Crude Protein	Crude fat	Crude Fibre	Crude ash	Calcium
Kretek	13.30	9.59	3.26	1.31	1.34	0.008
Metro	13.20	8.44	4.72	1.67	2.48	0.012
Harapan	13.60	8.71	4.45	1.55	1.45	0.012
Bogor Comp.2	14.93	8.31	4.01	1.65	1.85	0.012
PS 42	14.50	8.61	4.40	1.44	1.04	0.012
Standard	13.80	8.80	4.00	1.90	1.30	0.010

Source: "Report on the nutritious composition of maize and sorgum in Indonesia". (Mr. Kouchi 1973).

There is a unique domestic cigarette, which contains Cengkeh (Eugenia caryophyllata THUNBERG) as a flavor, in Indonesia. Most of these cigarette are rolled in paper, while about 5% of the cigarettes are rolled with inner husk from maize ear. 71.1 tons of maize husk for cigarette were distributed all over the country from Pare in Kabupaten Kediri, in 1973. 100 kgs of the husk for cigarettes can be produced from one hectare of the harvested maize field. The most suitable husk for cigarettes are Kretek and other local variaties, but Tongkol, Penjalinan and Goter are not suitable for it.

We can know that Kretek is widely used for it, because Pare has no other variety except the above mentioned.

It is known that the Kretek is native to the sawah area at Pare in Kediri. They still grow a few local varieties such as Goter, Penjalinan and Tongkol etc. It is likely that Kretek would cross with these varieties which have many common genetic characteristics which are easily observed between Kretek and these varieties. We should not ignore the influence of some improved variety such as Metro, Harapan, and Perta which were once recommended to the farmers after 1957 and 1958, respectively, but now all pure ones have disappeared in Kediri. The Kretek and other three local varieties are compared in its characteristics in Table 5.

Table 5. The characteristics of Kretek and other three local varieties.

Variety	Length of ear	No. of Kernel row	Color	Shape of grain	Period of growth	Further characterictic
Kretek	10 - 12	10	Deep yellow	Pearl	85	Smooth husk. Flint. Short ear tip.
Goter	7 - 8	8 - 10	Deep yellow	Pearl	70	Short smooth-husk. Flint. Short ear tip.
Tongkol	8 - 9	10 - 12	Deep yellow	Pearl	85	Stiff husk. Flint. Long ear tip.
Penjalinan	10 - 12	12 - 14	Yellow	Pearl	90	Stiff husk. Flint. Short ear tip.

Notes: Sample of maize collected from farmers in Pare in 1974.

Chapter III

Performance of the Kretek Cultivation Practices

Cultivation practices of Kretek variety in Kediri and Maize Center Bedali in Malang may be divided into four major items, namely:

1. Seed production.
2. Kretek variety in Maize Project.
3. Techniques of Kretek cultivation.
4. Approaching farmers for extension and guidance.

These four cultivation practices have been carried out with Kretek variety since 1971 to 1972/1973 by Maize Project. The total area of the project extended to 5,465.2 hectare, and the number of the farmer who participated in this project was 9,100. The total production of superior Kretek extension seed from Kediri since 1971 to 1973/1974 amounted to 507 tons distributed to East Java, including the Maize Project area, and other provinces. In the mean time a total of 616 tons of Kretek seeds were also distributed to the same provinces from Kabupaten Kediri. That is, we can say that the Kretek seed was for a total of 45,000 hectare in Indonesia during the past three years.

1. Seed production.

(a) Foundation and stock seed production:

Foundation and stock seed production was carried out at Maize Center Bedali since February 1971. According to the suggestion by Dr. Urano who was a chief of the O.T.C.A. technical advisory team in January 1971. Kretek seed was used originally for foundation seed and was introduced from the Kediri Kabupaten's seed farm at Tugurejo. The stock seed was produced in isolated field at this Maize Center. The results of the stock seed production was as follows;

Planted date	February 15, 1971
Harvested date	May 17, 1971
Field size	0.95 Ha
Grain yield	2,324 kg
grain yield per Ha	2,446 kg

However, this stock seed was not given to the extension seed farm in Kediri, because it was too late for planting.

Production of the foundation seed for the extension of Maize Project in 1972/1973 was done in 1971, its foundation seed was produced by an artificial Sib-crossing in the field at Maize Center Bedali.

The number of fertilized ear and production of the seed are as follows;

No. of fertilized ear	235 peaces
Grain yield	14.0 kg

11.5 kg of this seed was sent to the stock seed farm in Kediri and planted for the extension seed in 1972/1973. The production of the fundation seed for extension in 1973/1974 was done by Sib-crossing in irrigated paddy field at Maize Center Bedali in 1972. The production of the seed was as follows;

Date of planting	July 1 - 7, 1972

Date of harvesting	October 25, 1972
Field size	0.35 Ha
Grain yield	1,485 kg

The production of the stock seed for extension in 1973/1974 was carried out in an isolation field at Maize Center Bedali. The production of the seed was as follows;

Field size	2.572 Ha
Grain yield	3,401 kg

This stock seed was sent to Kediri and Madura for extension seed production 2,125 kg and 500 kg, respectively.

Now, I will introduce a part of the report by Dr. Hirose who worked as an Expert Breeder at the Maize Center Bedali from December 1970 to December 1973. This report will be given to aid in the explanation done so far. He described in the report, "Some problem on second crop culture in East Java (1973)." was as follows;

The local Kretek variety was introduced for the first time in our Center on January 1971, from Kediri.

Then we made an endeavour to improve this variety by using several useful procedures for breeding through 5-6 seasons. As a result, we could produce the improved Kretek variety which is higher in yield and more uniform in its properties than the native one.

In the last season, our Center supplied 2,125 kg and 500 kg of Kretek stock seeds for 85 Ha and 20 Ha of the extension seed production in Kediri and Madura, respectively.

In addition, we have taken up the stock seed production for 1974/1975 seasons of the Bimas Jagung programme according to our systematic seed production scheme as shown on Fig.2. So we may say that all seeds of Kretek variety now growing here have originated from our improved source.

The improved Kretek variety is a comparatively higher in yield for the short mature one, as shown below, but is not always high and short enough, both in yield and maturity, to cover all of the local requirement in East Java.

Table 6. The yield and yield component of the improved Kretek in Ketindan, June - September, 1973.

No. of kernels row	No. of kernels per row	No. of kernels per ear	Cob length (cm)	Ear length (cm)	Ear diamt. (cm)	Dry grain weight per ear (gr)	1,000 kernels weight (gr)
9.76	29.2	284.3	14.3	13.4	3.5	71.2	264

Notes:
1. Average of 50 ears chosen at random.
2. Outline of cultivation; Fertilizer, 200 kg Urea and 100 kg TSP; planting pattern, 80 x 30 cm, 1 - 2 plants/hill.
3. @ moisture free, ±15%.
4. Yield estimation per Ha from this field (0.3 Ha) is 3,466 Kg.

(b) Extension seed production:

The extension seed production should be carried out under the strict isolation field, in order to control the time and uniform selection. So, the extension seed of Kretek has been produced under contract with Primer Koperta Bulupasar in Kediri (present B.U.U.D. Pagu II) as a seed growers Cooperative.

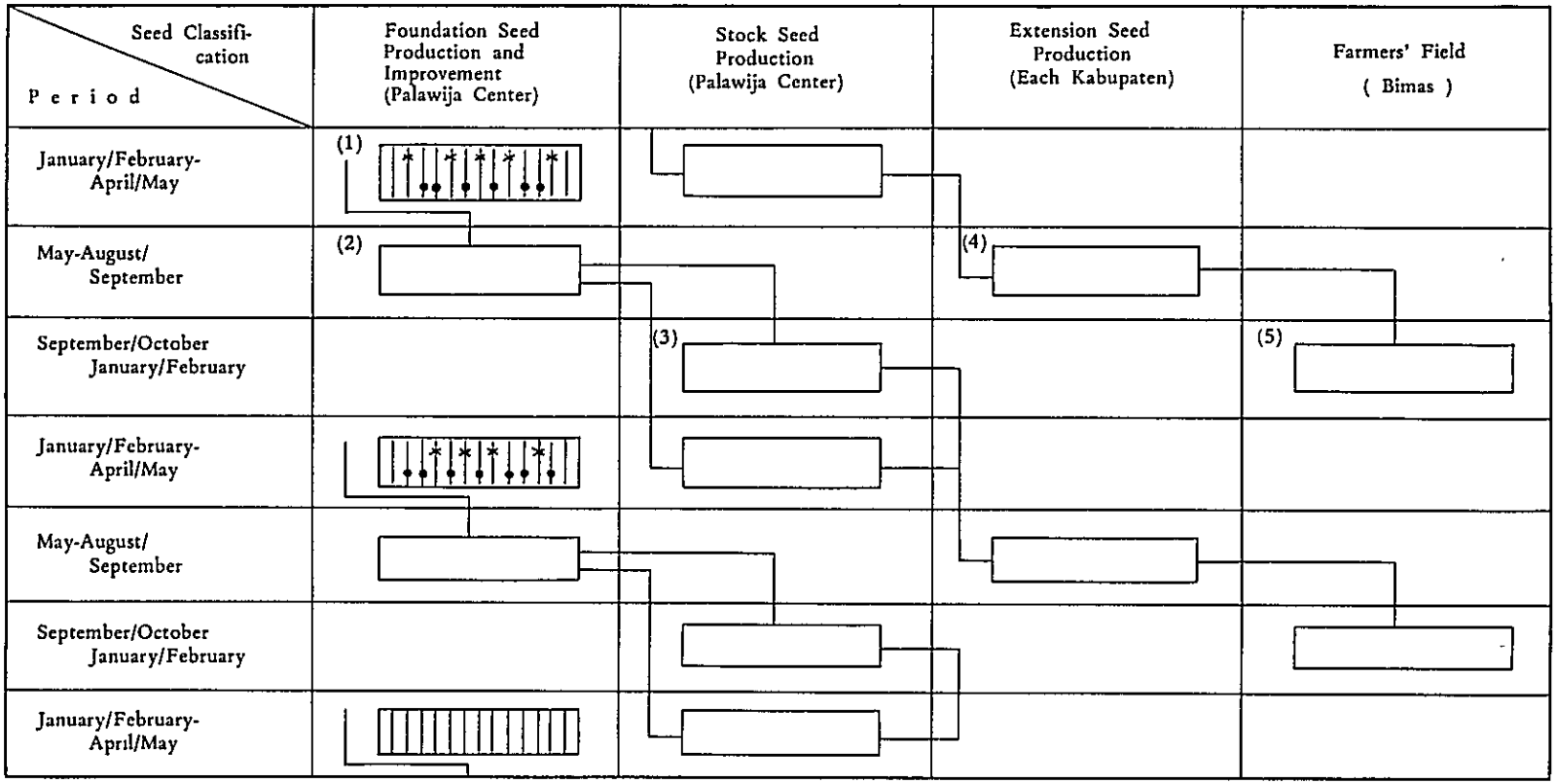
Superior stock seed has been supplied to the extension seed farm by the Bedali Maize Center and by the Kabupaten's own seed farm.

The extension seed production has been carried out collectively under the maize project system. This primer koperta was given credit in the form of fertilizer, superior stock seed, and insecticide.

Field inspection was done on seed farms during growing period by Agricultural Extension officials and this primer koperta.

Extension seed production was introduced into 120 Ha of irrigated paddy field at Desa Bulupasar in May, 1971.

Fig. 2. The Present Seed Production System for Maize



Notes: 1. Improvement of some properties by ear-to-row method or others.
2. Mass selection and seed increasing by sib-crossing (artificial or in isolated field).
3. Seed increasing under isolation field.
4. Seed increasing under isolation field.
5. Common cultivation.

This primer koperta grew not only to be famous as a seed growers cooperative in East Java but also in West Java and even in Kalimantan.

The influence of quite a few visitors such as government officials, cooperative staffs, and key farmers from East Java and other provinces came to inspect the growing Kretek variety and promoted its cooperative business. It is clear that the introduction of Kretek variety, on a large scale, into many places is due to these inspectors' suggestions after their tour of inspection and study. These visitors received by Primer Koperta Bulupassar in last two years are as follows (Table 7);

Table 7. Visitors recei-ed by primer koperta Bulupasar in last 2 years (1973).

From	Government		B.U.U.D.		Key-Farmer	
	Group	Person	Group	Person	Group	Person
1. Central Government	4	60	-	-	1	200
2. West Java.	3	25	-	-	1	80
3. East Java.	11	130	4	110	1	150
4. East Kalimantan	2	12	-	-	-	-
5. South Sumatra	1	40	-	-	-	-
Sub - Total	21	267	4	110	3	430
Total	28 groups		807 persons			

The total production of extension seed since 1971 to 1973/1974 amounted to 507 Tons. The result of the distribution of Kretek seed from Primer Koperta Bulupasar is shown in Table 8.

This primer koperta Bulupasar covers only 120 Ha, while more than 60% of whole maize production at Desa in rainy and dry seasons was handled by them as the repayment of the credit received and deals in seed and consumption maize since set up the seed production. Judging from above mentioned, it is clear that much capital accumulation has stored up in this koperta. Then, this koperta developed into the BUUD which is supported by government in 1973. And when we observe carefully the farmers situation, we find that they have gotten more profit than before, since the Maize Project was set up here. In general, numbers of farmers livestock are shown to be "the farmers riches" in this area.

Table 8. Distribution of the Kretek seed from Primer Koperta Bulupasar. (Tons)

Year \ Receiver	Project	Madura	Jombang	Nganjuk	Blitar	T'galek	M'kerto	West Java	West Kalimantan	Kediri	Other Desa	Total
1971 (dry season)	80.0	-	-	-	-	-	-	-	-	-	-	80.0
1971 - 1972	-	-	-	-	-	-	-	-	-	-	-	-
1972 (dry season)	60.0	7.5	25.0	14.0	4.0	5.0	-	31.0	-	-	2.0	148.5
1972 - 1973	-	-	-	-	-	-	-	-	-	-	-	-
1973 (dry season)	-	148.0	23.0	-	-	-	10.0	12.0	10.0	-	11.0	214.0
1973 - 1974	-	-	-	-	-	-	-	-	64.0	0.6	-	65.0
Total	140.0	155.5	48.0	14.0	4.0	5.0	10.0	43.0	74.0	0.6	13.0	507.5

Note: 616.0 Tons of Kretek seed were also distributed to the above provinces from Kabupaten Kediri in 1973/1974.

Number of cattle at this Desa is compared with 7 neighboring Desas in the past 5 years.

The number of cattle in Desa Bulupasar increased as follows;

$$Y \quad 184.8 + 30.8\ X \qquad (r = 0.883^{**})$$

On the other hand, the average of number of cattle in seven neighboring Desas decreased as follows;

$$Y = 222.2 - 6.0\ X \qquad (r = -0.751).$$

Therefore, it can be said that the Kretek seed production not only has a good influence on agricultural cooperative promotion but also on the farmers economical situation.

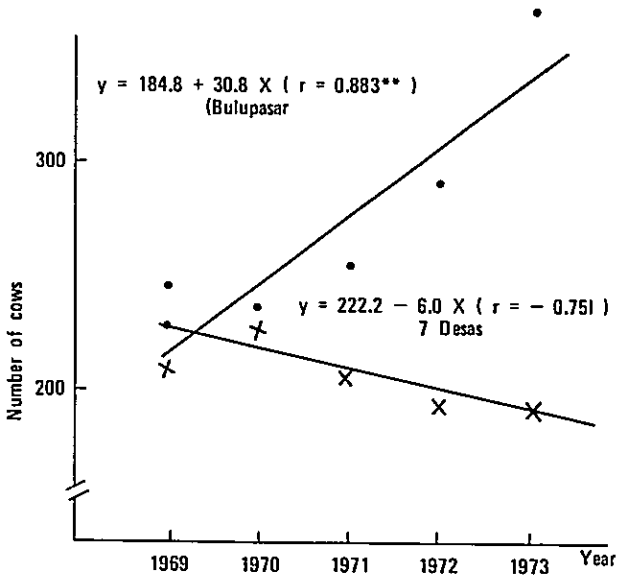


Fig.3. The comparison of the number of cows in Desa Bulupasar and in the 7 neighboring Desas.

Since the Maize Project was set up here the new methods for Kretek seed production described below were considered and accepted.

(1) Improvement of the seed distributor bags;

We substituted used urea bag (25 kgs - 1 Ha) for hemp sack (100 kgs - 4 Ha) when the seed was distributed to the farmers. When we used them, unexpected results were discovered such as prevention of plant pest, reduction of sack cost, and it was more convenient to the farmers. For example when the seed arrived in their villages it was then divided with each farmer on the basis of their field size.

(2) Improvement of the seed selection in processing;

In general, seed is taken from the middle part of an ear of corn, 1/6 of the top and 1/6 of the bottom are cut away by manpower for consumption before shelling.

This method is inefficient, laborious, tedious and expensive for seed selection.

Seed produced by primer koperta Bulupasar is more than 200 tons of seed within a certain period of the time, and demand has a tendency to increase each year. Therefore, we have adopted a new method to sift out seed from all kernel after shelling. It can be produced in simple steps, a large quantity in a short time and with good yield.
The siever measures 90 by 60 cm, the inside diameter of siever opening is 8.5 mm which is most suitable for Kretek seed from the previous results. It is possible to sift out about 300 kgs of seed from kernels per hour by this siever with two labores. We think this siever will be used widely for seed selection in the future.

2. Kretek variety in Maize Project.

The maize project in Kediri has been in effect since 1968, the participating farmers were given credit in the form of fertilizer (200 kg/Ha of Urea) and seed (25 kg/Ha of superior seed). After harvest, the farmers were required to give part of their production to the project as the repayment of the credit received. We called this system by "in kind system". But since the rainy season in 1973, the system has been changed into BIMAS SYSTEM, because the farmers objected to the repayment due to the high price of maize in the market.

The project has been carrying out maize cultivation at Kabupaten Kediri for the past five years, and the total area of the project was extended to 9,190.55 Ha, the number of the farmers who participated in this project was 15,133, and the amount of the maize collected from farmers was 2,780.60 tons as the repayment of the credit. The average of the repayment ratio in the past four years was 64.51%.

Kretek variety adapted into extension area of the maize project in Kediri since 1971/1972. The total of the projects extended area with Kretek variety amounted to 5,465.2 Ha, the number of the farmers who participated in this project were 9,100.
It is indicated that about 60% of the total extended area during the past five years was planted with Kretek variety.

In 1973/1974, the project's extension (using O.T.C.A.'s fertilizer) was carried out by the Bimas credit system. The extended area is 2,375. Ha in 3 Kecamatan, and 32 Desas. This data is shown in Table 9, 10 and 11.

Table 9. Transition in production condition.

Year	Administration		Extended area (Ha)	Farmer participation	Average of land owned	Note
	Kecamatan	Desa				
1968-1969	1	1	200.0	349	0.573	Farmers own seed
1969/1970	5	38	1,688.9	2,735	0.618	Local seed
1970/1971	10	47	1,836.4	2,949	0.623	Local seed
1971/1972	6	31	3,197.0	5,140	0.622	Kretek seed
1972/1973	4	17	2,268.2	3,960	0.572	Kretek seed
Total	26	134	9,190.5	15,133	0.602	

Table 10. Transition of Area and result the maize collection.

Year	Harvest Area (Ha)	Collection Target (Ton)	Actual Collection (Ton)	Average of Collection (%)
1968/1969	200.0	100.0	100.0	100.0
1969/1970	1,688.9	886.7	593.7	66.9
1970/1971	1,817.4	878.0	540.0	61.5
1971/1972	3,197.7	1,438.2	942.0	66.1
1972/1973	2,268.25	1,007.0	604.9	60.0
Total	9,172.25	4,309.9	2,780.6	64.51

Table 11. The extended area of the project and BIMAS JAGUNG in 1973/1974.

Administration		Project's extended area (Ha)	BIMAS JAGUNG area (Ha)
Kecamatan	Desa		
3	32	2,375	11,469

Repayment ratio has not always been satisfactory throughout the project. One of the reasons has been that the farmers did not fully agree with the repayment in kind system. Another reason was the loss in the channel of collecting the maize for repayment.

The farmers who participated in the Project learned the new technique for application of fertilizer, in the use of the superior Kretek seed. By using these methods, they could produce 2.0 to 2.5 tons of maize per Ha, which was bigger than the production of the non-participating farmers, who did not use superior seed and enough fertilizer.

3. Techniques of Kretek Cultivation.

Maize Project adopted Kretek for recommended variety since 1971. Since then, quite, a few demonstrations were carried out in the farmers fields to know the techniques for high-yielding cultivation of Kretek maize. The following is a brief description of the contribution that has been made by demonstration fields since 1971, and some suggestions have been shown for highyielding maize production.

(a) Plant population and number of plants per hill.

The population test was carried out to know the effect of planting-pattern on grain yield of Kretek maize in a demonstration field, where Kretek variety was planted in range from 60,000 to 140,000 plants per Ha (row spacing 80 cm) connecting with number of plants per hill by applying 200 kg Urea per Ha.

The data is shown grafically in Fig.4. One fact is descernible at a glance, decreasing the number of plants per hill increased the plant population required for maximum yields.

The highest yields were obtained at the same population, 120,000 plants per Ha, it was postulated that the maximum yield would be obtained at a higher population on the 1 plant than on the 2 and 3 plants per hill.

In general when higher populations are used the percentage of barren plants are increased. Fig.5 indicates that the amount of barren plants are increased approximately 1.7% with each increase of 20,000 plants per Ha. Barren plants of 3 plants per hill was increased by 6.28% over 1 plant per hill and 5.64% over 2 plants per hill. It could be said that on the 3 plants per hill that more barren plants occured than on the 1 and 2 plants per hill.
This would be due to the fact that in a high population, especially on the 3 plants per hill, plants were highly competitive with one another for nutrients and sunlight.

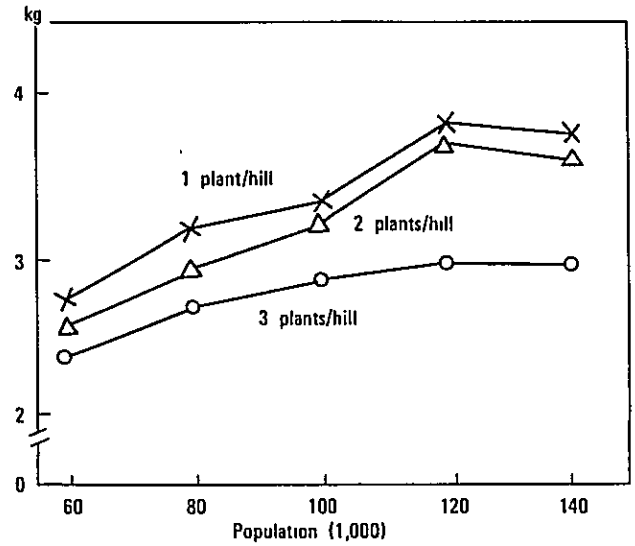


Fig.4. Effect of plant population and number of plants per hill on grain yield of maize.

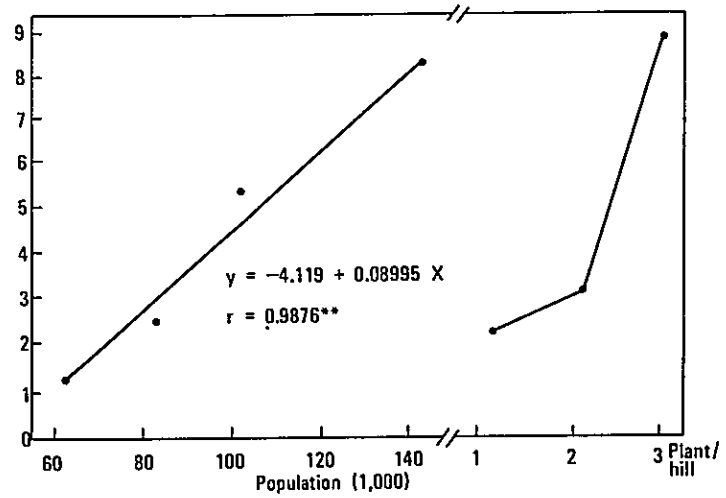


Fig.5. Relationship of plants population and number of plants per hill to barren plants.

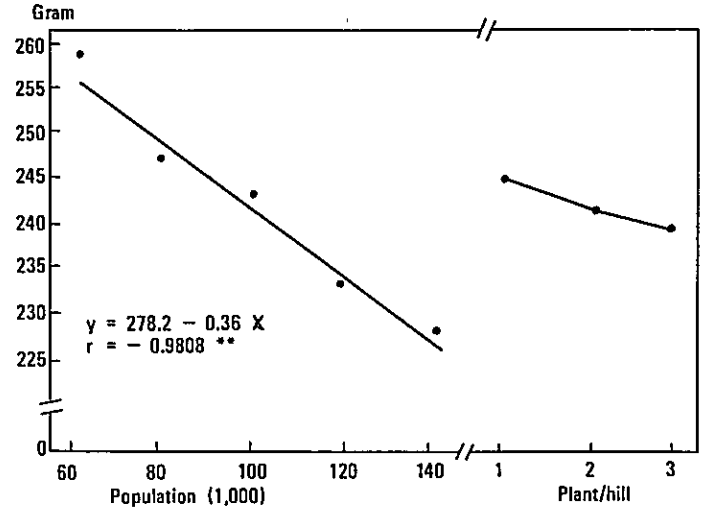


Fig.6. Relationship of plant population and number plants per hill to weight of 1,000 kernels.

The weight of 1,000 kernels showed a linear decrease with increasing population in Fig.6. This indicated that big kernel especially for superior seed can be expected at lower population such as 60,000 and 80,000 plants per Ha on the 1 plant per hill.

The following planting patterns are generally considered advisable, from a judgement on farmers' techniques and on traditional practices in Kediri. Although it is necessary to adjust the planting pattern according to the conditions, such as locality and soil fertility, especially soil fertility, it is significant to note that more yield can be expected at higher plant population when soil fertility is high, but a higher population beyond fertility level can cause yield decrease.

For Extension seed : around 83,000 plants per Ha, 80 x 30 cm, 2 plants per hill after thinning.
For Consumption maize : around 100,000 plants per Ha, 80 x 25 cm, 2 plants per hill after thinning.

(b) Fertilizer and soil improvement.

In general, the early maturing varieties, such as Kretek, is not as responsive to fertilizer as the longer maturing varieties, such as Metro and Harapan. However, according to the results of a few demonstration tests on the Kretek variety, more yield can be expected with higher fertilizer applications, in which more than 90 kg of nitrogen per Ha (195.7 kg of Urea) is used.

Data is given of the results obtained in the study of factors, particularly using fertilizer with éarly maturing variety Kretek and the economic feasibility easily can be seen.

Demonstrational test was conducted on a farmers' field. The field soil texture is sandy loam consisting of volcanic ash which is high in productivity. Population was established at 83,000 plants per Ha spaced 80 x 30 cm with two plants pér hill. Nitrogen application were maintained at six levels from 0 - 180 kg per Ha.
The source of nitrogen was Urea (46% N) fertilizer on all of the treatments. The application procedures were as follows;
apply one-half of the nitrogen in the planting furrow and mix throughly

with the soil at the planting. The remaining one-half of each nitrogen treatment was applied as a side dressing on the soil surface with cultivation at 25 days after planting.

The test was laid out Randomized Complete block design with 4 replications. The value of the increase in yield falls off with the diminishing returns curve. The profit is more for the higher rate, but the return is 818 percent for the smaller rate and 451 percent for the higher rate of fertilizer application. The highest return per Rp. invested may not give the greatest profit per hectare, as indicated by Fig.7 and Table 12.

A schematic diagram showing the relation of fertilizer costs to the value of the increased yields resulting from fertilizer application. The widest point between the cost line and increased yield curve indi cates the point of greatest profit. As a result of the yield differences shown at various nitrogen levels we can conclude that under the limit of these tests, the highest grain yield can be realized when the nitrogen application is 180 kg per hectare, while 150 kg of nitrogen gave the greatest profit when corn valued at Rp.30.- per kg and Urea valued at Rp.40.- per kg.

Table 12. Effect of rates of nitrogen fertilizer on yield of corn.

Rate of N kg/ha	Urea Kg/ha	Cost of ferti. Rp. (1)	Yield kg/ha	Yield Inc. kg/ha	Value of yield Inc.RP. (2)	Return per Rp. (2) + (1)	Profit per Ha Rp. (2) - (1)
0	-	-	1,351	-	-	-	-
30	65.2	2,609	2,063	712	21,360	8.18	18,751
60	130.4	5,217	2,648	1,297	38,910	7.45	33,693
90	195.7	7,826	3,105	1,754	52,620	6.72	44,794
120	260.9	10,435	3,433	2,082	62,460	5.98	52,025
150	326.1	13,043	3,635	2,284	68,520	5.25	55,477
180	391.3	15,652	3,708	2,357	70,710	4.51	55,058

*) Corn Valued at RP.30.- per Kg
Fertilizer (Urea) Valued at RP.40.- per kg
Yield kg/ha is estimated at:

$$Y = - 0.0710\ x^2 + 25.8725\ x + 1351.09$$

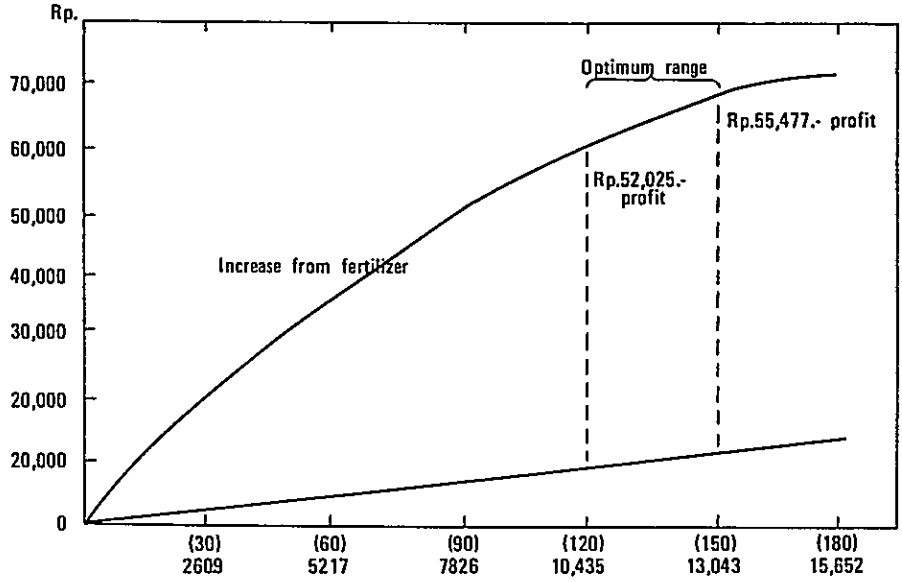


Fig.7. Effect of rates of nitrogen fertilizer on yield of corn.

The above mentioned result is an example of nitrogen application. So it is necessary to carry out more experiments under all kind of fertilizer application such as nitrogen, phosphorus, potassium and even minor elements in many local places.

On the other hand, the deficiency of phosphorus is observed in some areas, so the application of phosphotic fertilizer on a large scale should be taken into consideration.

Divided fertilizing methodes are more effective in preventing the leaching of nutrients, especially during the rainy season. In the first dressing, the total amount of phosphorus and 1/3 to 1/2 of the nitrogen are applied at the planting time, and in top dressing, the remaining nitrogen is applied about 4 weeks after planting for short maturing variety Kretek.

Fertilizer is put into holes in order to prevent it from leaching. Application of organic matters, such as stubbles, is essential to maintain and promote the fertility of upland soil. As a reducing method, mulching or plowing with stubbles is suitable.

Growing annual legumes as green manures in rotation with other crops can be a useful aid for the maintenance of fertility. It is desirable to plough in a green manure crop when it is in the growing stage rather than to allow it to mature and set seed, or to harvest seed and plough in the senescent plants.

Soil improvement for clay soil would be expected by "Guest soil operation". Guest soil is a term translated from Chinese. It means the addition of foreign soil of a different nature to a sick land. The foreign soil may be river sand for heavy soil or clay for sandy soil. It is a common practice among the Chinese farmers and has proven to be very effective.

Application may be broad casting or along the furrows and then incorporated into the soil by plowing and harrowing.

There are many river beds consisting of volcanic ash (sand) in the Kediri and Blitar districts but most of them are still subjected to annual flood during the rainy season.

If the guest soil operation is carried out on a large scale from these rivers for the heavy soil area in the western area of Kediri and Nganjuk approixmately several thousand of hectare, a good yield of crops along with the reduction of flood damage by this river conservation works could be expected.

So, it is necessary to investigate further to obtain fundamental data, such as the influence of the guest soil on yield of crops, the expense, and method of the guest soil, on improvement of heavy soil area.

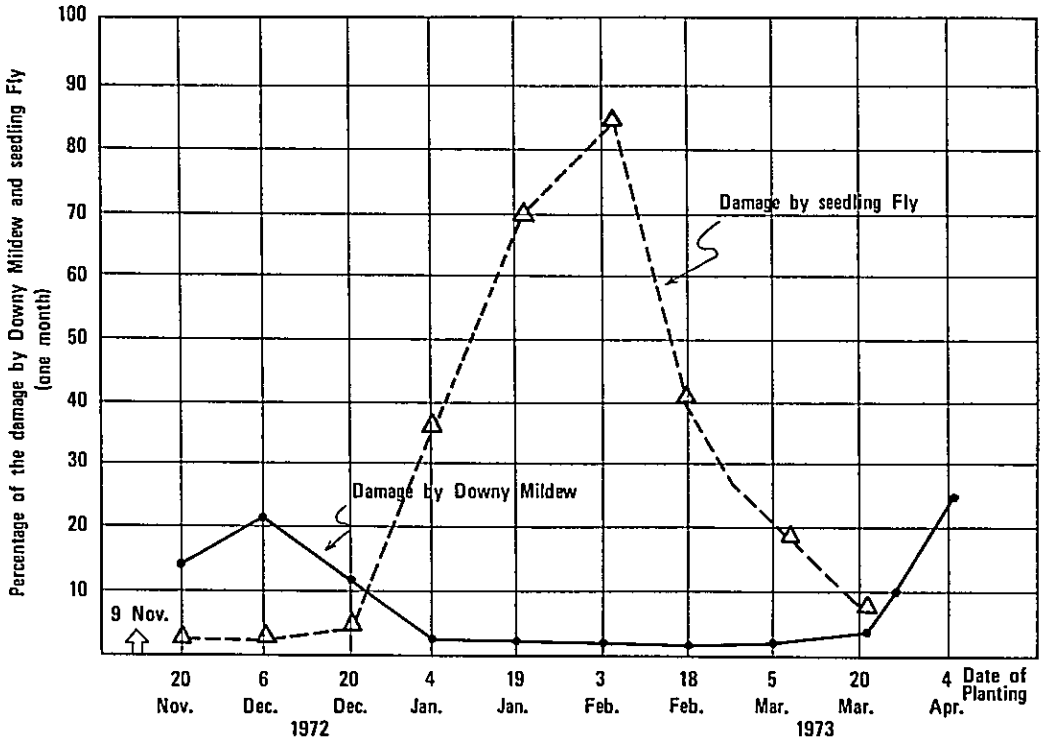
(c) Disease and insect control.

Kretek has an appreciable resistant variety to Downy Mildew, however if it is planted late at the early rainy season, it can be expected to be seriously damaged by this disease. The effective methods to control this disease in field practice have not been found up to the present. The best way to control this disease in the timely planting which is after the first rainfall of the rainy season.

Control of rice seedling fly (Atherigona exigua) during corn age of 3 to 15 days after germination, and stem borer (Ostrinia furnacalis), which attacks corn anytime between one and two months, can be effectively and economically controlled by aldrin, diazinon and thiodan.

The relation between the planting time and the damage percentage by Downy Mildew and seedling fly in Maize Center Bedali is illustrated in Fig.8 by Dr. Hirose (1973).
From this figure, it can be expected that the delay of the planting time of one to two weeks can cause the increase of two to three times as many diseased plants, even though the damage by Downy Mildew decreases at one to two months after the onset of the rain; then the damage by seedling fly increases instead of Downy Mildew.

So, the planting time has an important effect on the maize yield.



Note : It had enough first rainfall to plant maize on November 9, 1972.

Fig.8. Relations between the damage by Downy Mildew and seedling Fly for Kretek, Bedali, 1972/1973.

Note: It had enough first rainfall to plant maize on November 9, 1972.

4. Approaching farmers for agricultural extension and guidance.

To make farmers understand the new knowledge and techniques, we tried to employ an effective extension and guidance method for the whole project area in Kediri during 1972. When the Kretek extension seed had been distributed to farmers, explanation cards were attached to all seed bags, two cards were given with each 25 kgs of seed per hectare supplied to 3960 farmers in Kediri.
This was done to obtain information through these questionares from which 5 Desas were selected out of 19 Desas.

Results are shown as follows;

a. 100% of farmers read the explanation cards.

b. 47% of farmers tried to improve their traditional maize cultivation.

c. 47% of farmers had more grain yield of maize than usual. Numbers of these had an increase of grain maize of 500 up to 800 kgs per hectare when they followed the recommended practice.

d. The guidance of corn plant population (local variety Kretek) had

attracted the attention of many farmers, and the farmers were not interested in fertilizer application because they felt that they already understood it.

e. 100% of farmers had a desire to study and recieve help continuously in the development of these new recommended practices by the project.

This explanation card method is only one of the many in use and it was found to be the most reliable method in this area.
If we repeat the same method continuously, the effect will become even stronger.

Chapter IV

Some Problems on Kretek Variety and Kreteki-zation

The Kretek and Kreteki-zation are widely applied nowadays, and is progressing into many regions in East Java and other provinces. Although the advantages of Kretek and Kreteki-zation are emphasized, often the disadvantages are hidden. I will list the necessary care to be taken and a few problems encountered in using this, each an outline will be described below:

1. Adaptability of Kretek variety as a main crop;

The maize is a most important staple food and cash crop for peasant farmers in many regions where they are not blessed with good climate and soil condition. Generally, the maize variety adapted only by reason of high productivity per hectare and not by rotational cropping pattern in these regions. An example of the benefit of adapting the late maturing variety as compared with early maturing ones is provided by the results of demonstration test carried out on a farmers field at Wongsorejo in Banyuwangi by Mr. Morita (1974) where the maize grown is about 95% of total area in rainy season, while after its maize harvest most fields (about 70%) is cover with Mung-beans which mature in only 90 days. Therefore, farmers have given much consideration to grain yield of maize per hectare. A typical rotational cropping pattern in Wongsorejo is shown in Fig. 9, and the results of demonstration test show (Table 13) that early maturing varieties such as Kretek and Penjalinan gave higher yield per day than late maturing variety Metro; while the latter gave the highest yield per hectare under the unlimited growing period.

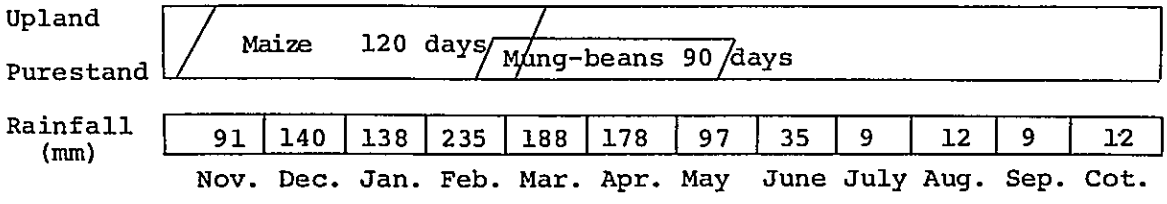


Fig.9. A typical rotational cropping pattern in Wongsorejo.

Table 13. Comparison of grain yield between varieties in a demonstration field at Wongsorejo.

Variety	Ave. yield kg/ha	Maturing in days	Yielding ability kg/day	Planting pattern
Kretek	3,130	85	36.8	100 x 20 cm, 2 plants/hill
Penjalinan	3,600	90	40.0	100 x 20 cm, 2 plants/hill
Metro	3,980	110	36.1	100 x 20 cm, 1 plant /hill

C.V. = 16.8% L.S.D. at 5% = 136.0
1% = 225.0

Notes : Field design = Randomize complete block design with 3 repeatitions.
Fertilizer = 200 kg of Urea per hectare.
Date of planting = November 27, 1973.
Source : "Final report of Maize project in Banyuwangi" (Mr. Morita 1974).

It can be concluded that maize variety with early or late maturing is primarily determined by the rotations and the cultural methods. The early maturing Kretek variety is not suitable in this cropping pattern. It appears to be the strongest proof that the Kretek variety should be adapted in the rotational cropping pattern with cash crops, then the greater effect will be seen. Therefore, further study is necessary for effective rotational cropping method by adapting the Kretek variety.

2. Seed production and breeding;

As already mentioned, Kretek variety has a comparatively high yielding ability and can be adapted in the rotational pattern. The national improved varieties such as Metro, Harapan and Bogor Composit 2, etc., yield better than early maturing variety Kretek, but often they are not desirable for the rotational cropping pattern, economical, and effective cropping system because of their late maturing. Judging from the present economical situation of the farmers, especially the population explosion in most part of Indoensia, the rotational cropping and mixed cropping system with early maturing maize are the most desirable and greater productivity can be expected. It is therefore hoped that the Kretek variety will be adopted as a national variety because of its early maturing and that the systematic seed production by LP3 (National Agricultural Experiment station) should also be taken into consideration.

The maintenance and production seed should be carried out by an artificial sub-crossing and it should also be taken into consideration in order maintain and improve their properties by ear-to-row selection. The stock seed production should be done in an isolation field at Kabupaten own seed farm. The extension seed production would be carried out in isolation fields at Desa Bulupasar in contract with B.U.U.D. Pagu II. It is necessary to give some subsidy and credit package when seed production is carried out in this B.U.U.D. The stock seed and extension seed production must be carried out in isolation field and it is necessary to set up a number of border rows in the field under the seed certification standard of the international crop improvement association. The seed production should be done under reasonable crop rotation to avoid growing the same maize in successive season in order to maintain fertility, disease, and insect control.

The Kretek is the good variety for export as far as the protein content is concerned (Table 4), but the fat content and the kernels of Kretek variety are lower and smaller than these of improved varieties (Table 4 and 14). They are not suitable for export of Kretek.

Therefore, it is better to make an effort to produce fat content and kernels of Kretek as good as possible in an improved variety by breeding without lost of any its characteristics.

Table 14. The 1,000 kernels weight and maturity in five varieties.

Variety	Weight of 1,000 kernels (gr)	Maturity in days
Kretek	210 - 220	85
PS.42	250 - 260	105
Bogor Composit 2	250 - 260	105
Metro	240 - 250	110
Harapan	270 - 280	115

Source : "Some problems on second crop culture in East Java" (Dr. Hirose 1973).

3. What farmers think about Kretek variety and its cultivation;

It is most important and interesting to know the problems that the farmers entertain in their heart after the Kretek variety was recommended to them.

This information was obtained through questionares in which 79 representative farmers were selected from 17 Desas in 4 Kecamatan which had depended on the maize project for the past two years.

(a) Actual transition of Kretek variety in farmers;

60% of farmers in 2 Desas already planted Kretek variety before Maize Project was set up here. The superior Kretek seed was distributed into each Deaas in October 1971. 80.1% of farmers planted these seed, but 19.9% of farmers did not use these seed because their maize fields had been planted with the farmers own se d. It is likely that these seed were used for food.

At the distribution of the seed for 1972/1973 most farmers fields were already planted (88.0%) with their own seed such as Kretek, Penjalinan and Bamdung when the superior seed was distributed to the project area in November 1972. The reason for the delay of seed distribution to the maize project was preferentially its wide use of seed on a large scale in many provinces throughout Indonesia. It should be noted that Kretek is widely applied nowadays by the distribution of the seed positively, but the seed distribution in 1972 was done at the sacrifice of its extension work in the Maize Project. The most of the 88.0% of the seed which was late for planting time in 1972 was likely used for food.

(b) The adaption of Kretek variety in farmers;

72.1% of farmers entertain adopting Kretek variety in their fields under the effective economical cropping pattern, but 27.9% of farmers

still planted local late maturing varieties which have generally a higher yield than Kretek per hectare. It is interesting at this point in our discussion to note that there is a different cropping system if compared with economical cropping system which is usually adopted in Kediri. The first factor of this is not commonly growing in rotation with commercial crops such as chili, onions and ground nuts because of the bad conditions of the transportation.

And therefore, some farmers in this region prefer late maturing varieties to Kretek on account of its productivity per hectare. It was as already mentioned (P - 30).

The second factor which caused obstruction in planting Kretek variety was that the farmers know that large quantities of fertilizer was necessary for early maturing Kretek variety as much as late maturing ones since Maize Project recommended Kretek variety in this region. It is due to the increasing of plant population under the recommended practice. So, it is natural that farmers prefer planting late maturing variety to Kretek because of its productivity under the same quantity of fertilizer. The third factor is, lack of understanding and guidance for Kretek variety.

We tried to employ effective extension and guidance by the explanation cards. This method was successful according to the questionares in 1973 (P - 28).
While, the results of the questionares in 1974 are indicated the different contents;
A small number of farmers (16.0%) did not get these explanation cards, it is likely that there was a lack of cards when it was distributed with seed bags. 1.5% of farmers could not read these explanation cards because they are uneducated. That is, these farmers did not have any knowledge in how to grow Kretek variety.
Therefore, approaching farmers for Agricultural extension and guidance by the methods of Demonstration farm, Meeting, Photograph and so on should be carried out continuously, by Extension workers when the new variety is introduced to the farmers.

The taste of Kretek variety for cereal food is one of the important problems in this regions. 100% of farmers like the taste of this variety and used it for cereal food all the year around with cassava, especially 25.4% of farmers prefer the taste of this rather than other varieties.

In general, the damage of the Downy Mildew is not so serious disease on local varieties in this region, while, 12.0% of farmers confirm that the Kretek has appreciable resistance to Downy Mildew.

Chapter V

Summary

The seed named Kretek was discovered for the first time at a certain market at the Kecamatan Kepung in Kabupaten Kediri in 1952 by one of the farmers. It is considered that the Kretek would cross with a few local varieties such as Goter, Penjalinan and Tongkol. Since then Kretek has spread widely in this region, however, we should not ignor the influence of crossing with some improved varieties such as Metro, Harapan and Perta, after 1957 and 1958, respectively. The Kretek seed was introduced into seed farm in the Kabupaten Kediri in 1962. It's seed had been selected by the method of mass selection until its refined form was introduced into Maize Center Bedali by Maize Project in 1971. The Maize Project adopted Kretek for the recommended variety and prepared foundation and stock seed at the Maize Center Bedali since February 1971. After the Kretek variety was adapted for the Maize Project in Kediri, the total extended project was extended to include an area of 5,465 hectare, and the number of the farmers who participated in this project were 9,100 during the two years period. About 60% of the total area of the Maize project during the past five years was planted with the Kretek variety. The seed production for Kretek was carried out at Maize Center Bedali and the Kediri Kabupaten's seed farm. The foundation seed has been produced by an aritficial sub-crossing in the field at Maize Center Bedali, and the production of the stock seed has been carried out in an isolation field at Maize Center Bedali and Kabupaten's seed farm, respectively. The extension seed of Kretek has been produced in contract with Primer Koperta Bulupasar (present B.U.U.D. Pagu II) as a seed grower cooperative since May 1971, and seed production has been done collectively. The total production of superior extension seed from Primer Koperta Bulupasar since 1971 to 1973 amounted to 507 tons distributed to East Java included Maize Project area, and many provinces in Indonesia. In the mean time the total of 616 tons Kretek seed was also distributed to the same provinces from Kabupaten Kediri. That is, we can say that the Kretek seed was for a total 45,000 hectare in Indonesia during the past three years. This seed production and its distribution, on a large scale, has been used to promote the spread of Kretek variety all over East Java Uniformally, and it is called in general as "Kreteki-zation". The influence of quite a few visitors (28 groups, 807 persons) from whole Indonesia came to inspect the growing Kretek variety and promoted its cooperative business.

It is clear that the introduction of Kretek variety, on a large scale, into many places is due to these inspectors' suggestions after their tour of inspection and study. The Kretek variety is fulfilled every farmer's requirements. These outstanding characteristics of Kretek variety are as follows; (1) Early maturing and high yielding ability; (2) Appreciable resistance to Downy Mildew; (3) Strong resistance to winds; (4) Good for cereal food and high crude protein; (5) The inner husks from the ear be used as cigarette paper: Since Maize project was set up here the new methods for Kretek seed production and Kretek cultivation described below were considered and accepted;

(1) Improvement of the seed distribution bags; (2) Improvement of the seed selection in processing; (3) Improvement of the plant population and number of plants per hill; (4) Improvement of the fertilizer application and soil fertility; (5) Control of the disease and insect; (6) Adoption of the explanation card method for the agricultural extension and guidance: Some problems on Kretek variety and Kreteki-zation are described below; (1) The early maturing Kretek variety is not suitable if the farmers give too much consideration to grain yield of maize per hectare under unlimited growing period. The Kretek variety should be adapted in the rotational cropping pattern with cash crops, then the greatest effect will be seen. Therefore, further study is necessary for effective rotational cropping method by adapting the Kretek variety.

(2) Judging from the present economical situation of the farmers, especially the population explosion in most part of Indonesia, the rotational cropping and mixed cropping system with early maturing maize are the most desirable and greater productivity can be expected. It is therefore hoped that the Kretek variety will be adopted as a national variety because of its early maturing and that the systematic seed production by LP3 should also be taken into consideration.
The maintenance and production seed should be carried out by an artificial sib-crossing and it should be taken into consideration in order to maintain and improve their properties by ear-to-row selection. The stock seed production should be done in an isolation field at Kabupaten own seed farm. The extension seed production would be carried out in isolation fields at Desa Bulupasar in contract with B.U.U.D. Pagu II.

It is necessary to give some subsidy and credit package when seed production is carried out in this B.U.U.D. The seed production should be done under reasonable crop rotation to avoid growing the same maize in successive seasons in order to maintain fertility, disease, and insect control. (3) It is most important and interesting to know the problems that the farmers entertain in their heart after the Kretek variety was recommended to them. This information was obtained through questionares in which 79 representative farmers were selected from 17 Desas in 4 Kecamatan which had depended on the Maize project for the past two years.
According to the questionares (1974) are as follows; 80.1% of farmers planted these seed when superior Kretek seed was distributed into each Desa in Maize project in October 1971. At the distribution of the seed for 1972/1973 most of farmers fields were already planted (88.0%) with their own seed when the superior seed was distributed to the project area in November 1972. The reason for the delay of seed distribution to the Maize project was the wide use and demand of this seed on such a large scale in many provinces throughout Indonesia.
It should be noted that Kretek is widely applied nowadays by the distribution in 1972 was done at the sacrifice of its extension work in the maize project. 72.1% of farmers entertain adopting Kretek variety in their fields under the effective economical cropping patterns, but 27.9% of farmers still planted local late maturing varieties which have generally a higher yield than Kretek per hectare. The first factor of this is not commonly growing in rotation with commercial crops such as chili, onions and ground nuts because of the bad conditions of the transportation. And therefore, some farmers in this region prefer late maturing varieties to Kretek on account of its productivity per hectare. The second factor which caused the obstruction in planting Kretek variety was that the farmers knew that large quantities of fertilizer was necessary for early maturing Kretek variety as much as late maturing ones since Maize project recommended Kretek variety in this region.
It is due to the increasing of plant population under the recommended practices. So, it is natural that farmers prefer planting late maturing variety to Kretek because of its productivity under the same quantity of fertilizer. The third factor is, lack of understanding and guidance for Kretek variety.

These farmers did not have any knowledge in how to grow Kretek variety. Some ways approach the farmers for agricultural extension and guidance by the methods of explanation card, demonstration farm, meeting photograph and so on should be carried out continuously, by extension workers when the new variety is introduced to the farmers. 100% of farmers like the taste of Kretek variety and used it for cereal food all the year around with cassava, especially 25.4% of farmers prefer the taste of this rather than other varieties. The damage of the Downy Mildew is not too serious a disease on local varieties in this region, while, 12% of farmers confirm that the Kretek has appreciable resistance to Downy Mildew.

CHAPTER V THE PROJECT ACTIVITY IN BANYUWANGI

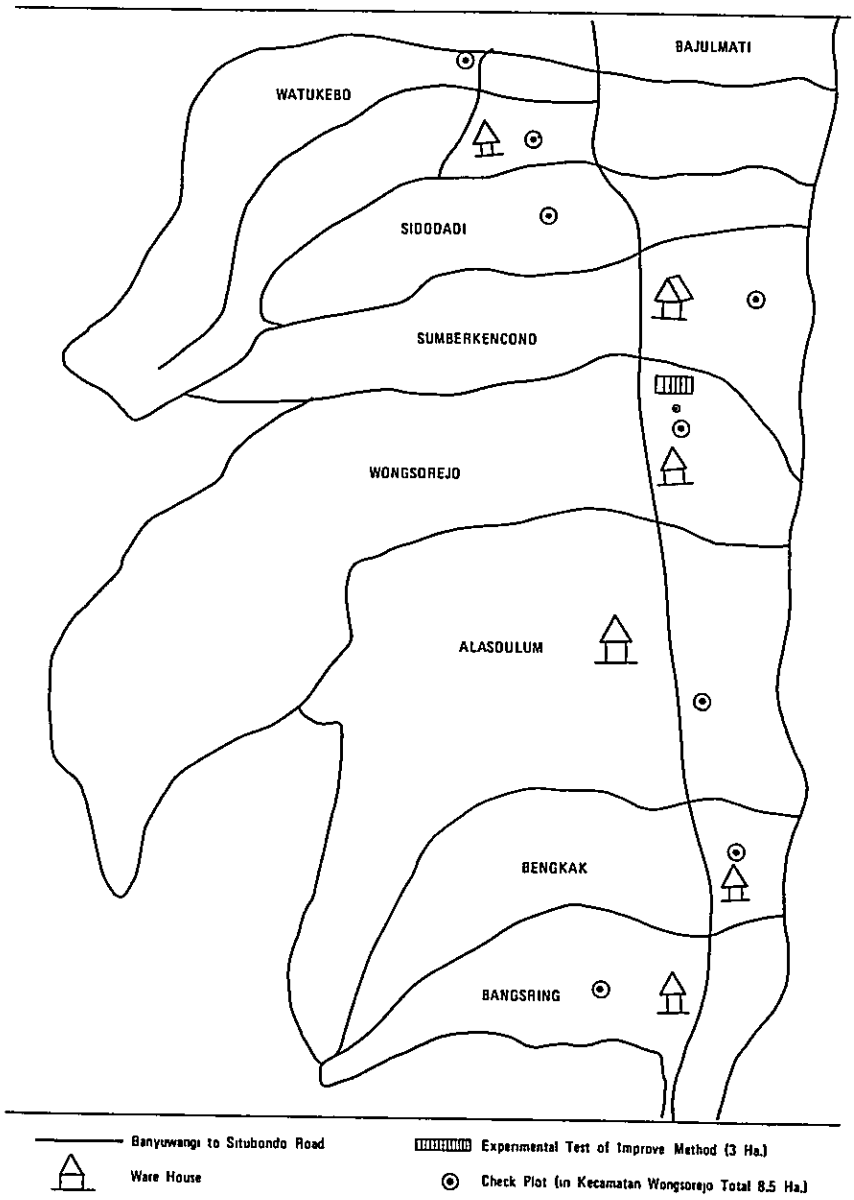
By M. MORITA

1. General condition

The Indonesia country lies on the equator line, so it is the Paradise of the tropics. And Java island has a lot of active volcanoes, since many years before up to now.
The People's livings have been directly or indirectly influenced by those volcanoes.
Banyuwangi is the most eastern town in Java. Until now the smoke of mount Merapi (2660 M) and Raung (3300 M) can be seen from Banyuwangi.
This area is located under the feet of the both mountains, so it has very fertile soil.
Almost the whole area of Banyuwangi is blessed with good rainfall, so that it is best producer of Agricultural crops.
And Banyuwangi also has a good harbour for the sake of exporting or importing some thing to or from foreign countries.
Therefore, compared with agricultural work in 350 years ago the present work has been much improved.
In this fertile land the Developments of Rubber and Coffee estates had been made by the Dutch since 150 years ago.
Although it was hard work, but they enjoyed graceful life here.
Today the estates are managed by State and Private-enterprises.
In recent years the price of Rubber and Coffee is good, so the people are in good condition of living.
And coconut plantation has been run since 90 years ago, that is why Banyuwangi is the best coconut Producer in Java now.
This area is also rich of water which comes from Mountain and the water is used for paddy field. Therefore the product of paddy is in good quantity and quality, so that the paddy can be sold to other places.
But in this very rich land a lot of people are still in poor living, especially there are many tenants in Banyuwangi who have no land of their own, so they are hopeless for tomorrow life. Also many children of the poor people can not obtain enough education and most farmers are poorly fed.
However, after the independence of the country, since 17 August 1945, every thing has been improved year after year.
In Agriculture field new planning has been also made i.e. Bimas Project, Maize Project, Tani Makmur Project etc.
So high production can be expected to improve the standard of living of the farmers. And now in a village some elementary schools can be found, it means that the education has been also improved.
So I think the country will be also developed quickly. Banyuwangi and Surabaya (our head office) is connected by Road and Railway, the distance between the two towns is about 300 Km and it will take 6 - 7 hours by train or car.
Before 1971 the road was narrow, but now it has been widened and on both side of the road there are beautiful rows of trees. Many fishes are found in Banyuwangi and some Food Packers have been established there.
But farmers can not get enough Protein from the fishes because of the high price for them.
Our Maize Project at Wongse-rejo has lasted for 5 years. The Wongsorejo area is different from other areas in Banyuwangi because it is the dryest region. Wongsorejo is 26 Km northward from Banyuwangi Town.

The rainfall in this area is only 1000 mm per year.
The rain usually comes from December to March only, it means that in the other month there is no rain (only few mm), it is Dry season. Therefore Cultivation of Crop is limited, so this region is poor for farmers.
The inhabitants of Wongsorejo comprise of Madurañese and several Chinese Marchants. Paddy fields is only found on low land plain near sea-side and the other larger field is on upland. And this report is only about experience of Wongsorejo upland. And the following tables are as the brief explantation of general condition in Banyuwangi and Wongsorejo.

CHECK PLOT MAP OF MAIZE CULTIVATION
IN KECAMATAN WONSOREJO.



KECAMATAN WONGSOREJO AND KABUPATEN BANYUWANGI

	Population	Number of houses	Area Ha.
Kabupaten Banyuwangi	1,306,640	295.001	393.620
Kecamatan Wongsorejo	52.667	11.635	41.815
Desa Wongsorejo			

Crops / Area	Paddy-field(Ha)	Upland-field(Ha)	Estate (Ha)	Forest (Ha)	Coconut-plants	Kapok-plants	Total (Ha)
Banyuwangi	64.243	47.000	52.324	203.860	312.326	635.432	393.620
Wongsorejo	1.171	7.300	3.542	28.831	45.000	250.000	41.815

RELIGION

	I s l a m	Christian	Catholician	Budist
Banyuwangi	1.197.198	22.204	8.514	13.144
Wongsorejo	50.440	135	1	12

EDUCATION

	Elementary	school	Junior high school	High school
Banyuwangi	Public	423	24	16
	Private	32		
Wongsorejo		8	1	1

DOMESTIC ANIMALS

	Cows	buffalos	Horses	Pigs	Goat	Chickens	Ducks
Banyuwangi	335.809	28.440	5.598	7.287	28.000	590.000	160.000
Wongsorejo	9.218	86	508	0	2.006	13.339	422

CROP PRODUCTION (TON)

	Rice	Maize	Cassava	Soybean	Peanut	Tobacco
Banyuwangi	335.809	25.083	45.257	9.804	2.500	2.300

	Farmer	Public Officer	Fhops	Fishery	Forestry	Labors
Wongsorejo	7.056	56	197	1.370	509	8.431 Men

2. DEVELOPMENT OF THE PROJECT

The Maize Project began in 1967 as the Record of Discussion between Japan and Indonesian Government. The reason why it is Wongsorejo which has been chosen by the Government to be Maize Project Model is because there are found many good Cooperatives and it has 7.000 Ha of Maize cultivation field moreover Wongsorejo is close to Banyuwangi Port. So Maize Project at Wongsorejo should be furnished with fertilizer, Tractor, Dryer and etc., with the local experts in order to advice the farmers about the production Technique to enable them to improve cultivation method.
And apart from that it will grow the existing agriculture Cooperatives well.
Afterwards they should try to increase area gradually. But according to the limited climate and condition of the area it will be difficult to succeed in increasing to larger area. And the repayment of credit by the Farmers is more difficult matter.
So to overcome the problem we must try to reorganize the Cooperative by holding Demonstration of field with the Variety Experimental Test. And the demonstration and variety experiment had been done from may-1971 to march 1974 as the following tables.

2.1. DEMONSTRATION AND VARIETY EXPERIMENT FROM MAY 1971 - MARCH 1974

(1) THE MAIZE

No.	Aim of Test	Location	Area (Ha)	Sowing period	
1.	Variety experimental test	Bajulmati	0.5	May 1971	Used Paddy field
2.	Extension seed production	Kalibendo	2.0	July 1971	Upland
3.	Extension seed production	Kalibendo	30	July 1971	Estate
4.	Extension seed production	Kalibendo	7	July 1972	Estate
5.	Variety, Population test	Wongsorejo	2	Dec 1972	Upland
6.	Plant protection	Alasbuluh	0.5	Jan 1973	Upland
7.	Demonstration	Wongsorejo	3.0	Nov 1973	Upland
8.	Check Plot	8 places	8.5	Nov 1973	Upland

(2) THE SORGHUM

No.	Aim of Test	Location	Area (Ha)	Sowing period	
1.	Variety experiment	Wongsorejo	0.25	May 1971	Used Paddy field
2.	Seed production	Watukebo	1.0	July 1971	Paddy field
3.	Extension	Wongsorejo	5.0	Mar 1972	Upland
4.	Mix Crop with Kacanghijo	Wongsorejo	0.2	Mar 1972	Upland
5.	Extension	Wongsorejo	5.0	Mar 1973	Upland
6.	Mix Crop with Kacanghijo	Wongsorejo	0.2	Mar 1973	Upland
7.	Extension	Wongsorejo	5.0	Mar 1974	Upland
8.	Seed production	Kalibendo	1.0	Aug 1973	Estate

*Mix Crop with Kacanghijo = Tumpang Gilir.

The following tables are the result of evaluation area and used fertilizer and collected maize in Wongsorejo.

(3) RESULT OF EVALUATION AREA IN WONGSOREJO

Year	Estimated Area (Ha)	Evaluation Area (Ha)	No. of farmers	Area of per farmer(Ha)	Repayment %
1968-1969	200	218	145	1.5	100
69- 70	2,500	2,002	2,002	1.2	40.1
70- 71	2,500	2,002	2,200	1.09	41.9
71- 72	2,000	1,310	1,689	0.77	53.9
72- 73	1,200	610	800	0.77	77.0
73- 74	2,000	1,517	1,456	1.04	

(4) USED FERTILIZER AND COLLECTED MAIZE.

Year	Used fertilizer Urea (Ton)	Collected Maize (Ton)	Sold for
1968-1969	43.6	109	Domestically
69- 70	363.02	362.6	Japan
70- 71	359.8	342.7	Japan
71- 72	211.0	256.0	Hongkong
72- 73	123.3	216.5	Domestically
73- 74	303,0		Domestically

2.2. PROGRESS REPORT OF THE MAIZE PROJECT.

1968 - 1969 (The beginning year).-

In the beginning, Project officials came from Surabaya and discussed with the local staffs of Agriculture division about necessary things cooperativefully.
And that time the Project area was only 200 ha., so repayment of the credit was good.

1969 - 1970

This year the Wongsorejo Cooperative Chairman Mr. Husein was suffered from illness then Vice Chairman Mr. Rachmat substituted him. This year four (4) assistants were assigned to render service to Wongsorejo Maize Project. But from this year the repayment of Credit to Project was very bad, because the area was attacked by drought.

1970 - 1971

This year Mr. Rachmat (Maize Project full-time administrator), was assigned from Surabaya to Banyuwangi Maizo Project. At that time the Cooperative Management was very bad, the debt was more than Rp. 9,000,000-

1971 - 1972

Because the situation of Cooperative Management was collapsed, so the Maize Project reestablished New Five (5) Primary Cooperatives at Wongsorejo. The result of the reestablishment was successful, the repayment of Credit was increased than that of the previous years.
Especially Desa Wongsorejo could repay 87% of the Credit to Project and the bad Desa ia Alsbuluh 37% only.

1972 - 1973

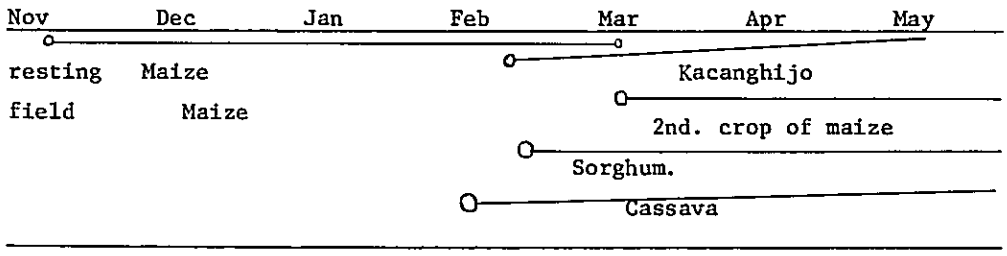
In December 1972, the Maize Project was in cooperation with Bimas Project. Agriculture Cooperative was also changed into BUDD. This year BUUD established in East Java. In Kabupaten Banyuwangi, in 38 places, BUUD were established. All Primary Cooperators in Wongsorejo established one BUUD. Our Project begun to work cooperatively with this BUUD.

1973 - 1974

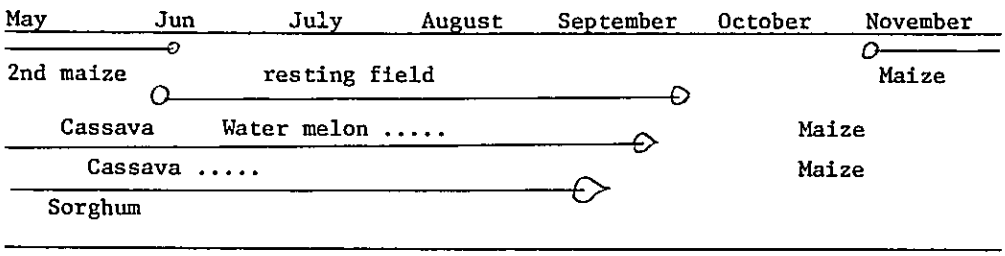
Our East Java Maize Project has cooperated with BUUD. Technical assistance was given by Agriculture Extension Service, credit for the Purchases of fertilizer and seeds was obtained from B.R.I. This year Maize production is very good.

3. Rotation of Crops at Wongsorejo. (Main Crop is Maize). General Crop ratation in year.

Rainy Season (November - April)



Dry season (April - October)



3.1. RAINY SEASON MAIZE

Rainy season at Wongsorejo usually begins in Middle of November. If it begins raining, the farmers all-together sow the maize quickly. This sowing period last one month. About one hundred days after the sowing period the maize has come to the harvesting time, it is around March, 95% of the Area by Maize cultivation. The Maize yield is about 1.5 Ton to 2 Ton per Ha.

3.2. DRY SEASON MAIZE

Soon after the harvest of rainy-season Maize, farmers also begin sowing dry season maize in the same field. Usually the yield of this Dry season Maize is only about 50% of Rainy season Maize, because it does not obtain enough water. Usually, beside Dry season Maize the farmers also grow some others crops in the same field, those are Cassava, Kacanghijo, Peanut. It is known, however, that the dry season Maize decreases today.

3.3 KACANGHIJO

15 days before the harvest of Maize, Kacanghijo is sowed on the Maize field. After 75 days - 80 days from its sowing time Kacanghijo can already be harvested. During the harvesting time of Kacanghijo it is dry season at Wongsorejo (May). 70% of this upland area preduce Kacanghijo. The yield is about 500 kgs. per Ha. This crop is necessary for improving the soil condition in this area.

3.4. CASSAVA

Usually this Kind of Crop is planted in January. But at Wongsorejo it is planted in February in the Maize field. It will be harvested 7 - 8 months after the planting time. This crop covers about 30% of the Upland. Generally Cassava is planted together with the other crops (multi cropping system). This crops is mainly used as the farmers' food and for sale.

3.5. WATERMELONS, SORGHUM, COTTON, CASTOR OIL PLANTS.

The above mentioned plants are also found in this area, but they are only in Minor Part of the area. Those plants only cover 2 - 3% of the area.

3.6. CONCLUSION

At Wongsorejo, maize is very important crop, because it is the main product of the area. So we are sure that maize will be grown continuously year after year. And the main attention that must be drawn is to give good cultivating technique, guidance and to improve the marketing system. Improving Maize Variety is also recommended in order to increase the product of this area, because today the yield product of this area is too low. As the variety of maize is mixed so that the quality is also bad. Such being the case it is recommended that METRO Variety is cultivated in Rainy season and KRETEK in Dry season.
Thus now the most important problem is to increase Seed production of the above mentioned variety (METRO).
Until today the Seed production is only in one Place that is Kalibendo Estate. So it should be tried to run Seed production at Wongsorejo by BUUD or the farmer themselves. Before BUUD was established Primary Cooperators have carried out their activities by themselves, but today after BUUD has been established the activity is done by mutual help, among others Local administration, B.R.I. So it is better than the former organization, if there is not any monetary problem it will be more successful.

4. FIVE YEARS' EFFECTIVES OF PROJECT IN WONGSOREJO

4.1. Firstly the farmers' production technique was improved by the Maize Project. And fertilizer supply system was also improved. From the road side we can see the distinction of growing maize which means that the fertilizer supplied in the fields are different.
The farmers only get fertilizer from Bimas Maize Project now.

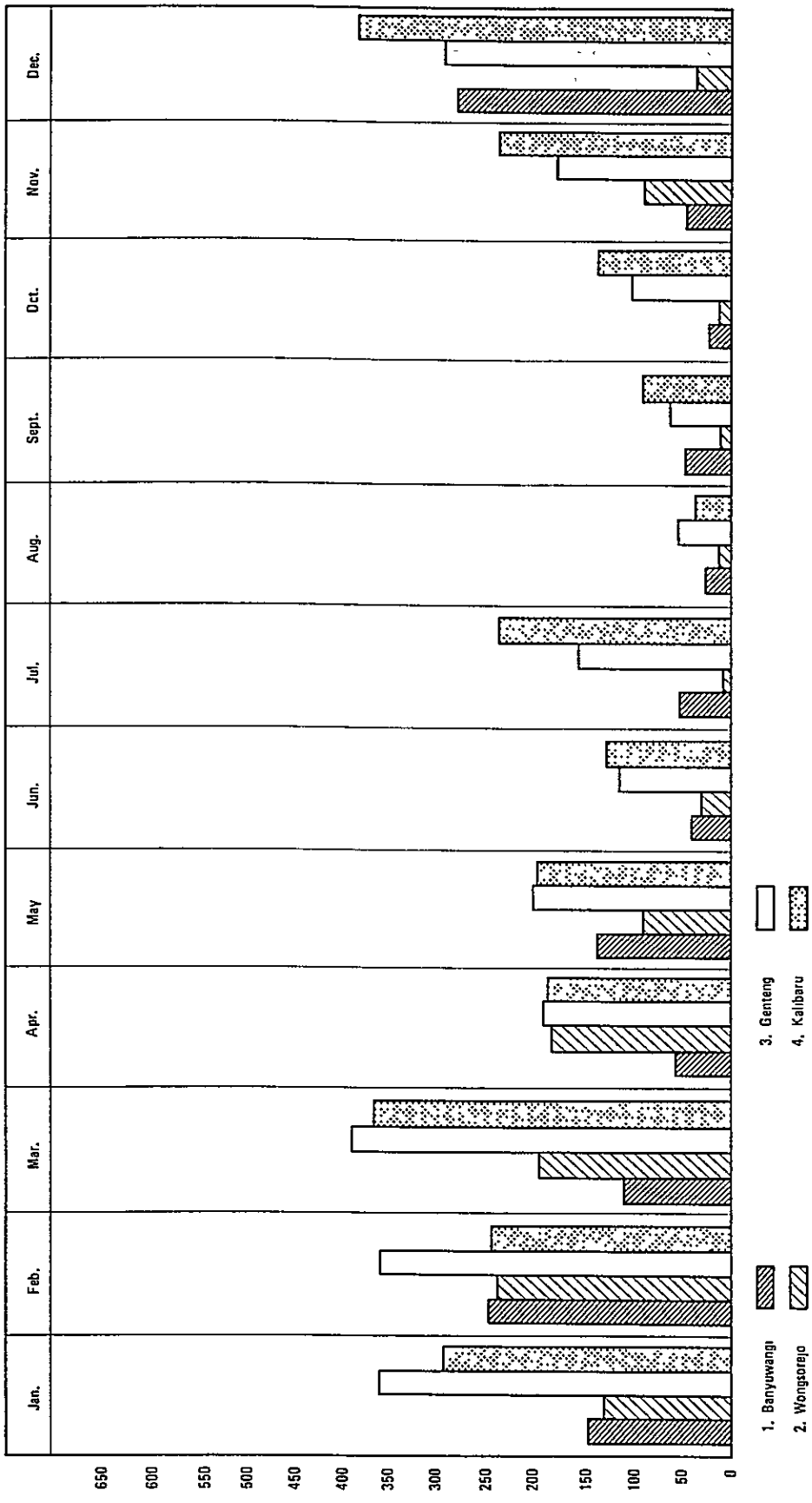
4.2. The improved seed produced and supplied through Maize Project to the farmers. However, before Maize Project established the seed was produced by the farmers themselves, and the seed variety was mixed, so the grain product was in lower quality and lower yield rather than the improved seed variety (METRO).

But new the grain product is in higher quality and higher yield and the farmers also prefer to grow Metro variety. (Up to 1973 the improved seed was only supplied to the farmers who belong to Bimas Maize Project because of the limited quantity).

4.3. Seed productions effort already established in Banyuwangi.

Tractor actively used not only for field plowing but also for agricultural product transportation by BUUD now. Formerly if the tractor was broken, the farmer could not repair it by themselves so the broken tractor was not used at all. But now the tractor drivers have got much experience so that they can repair by themselves if some troubles accur with the tractor (repairing financed by BUUD now). So in this area the farmers in every Desa wish to use tractor if it is possible for them to get it. The progress of agricultural cooperative within 5 years, faced continuous big problems. But since 1973 after BUUD has been established the management was improved.
Now there are 42 BUUD in Banyuwangi and Wongsorejo BUUD is in the 3rd or 4th ranking, it means that the Maize Project here has succeeded in rendering technical service and guidance to the farmers.

The Rate of Raimfall in 5 Years in Kabupaten Banyuwangi



5. MAIZE CULTIVATION AT WONGSOREJO

5.1. Variety of Maize

Since three (3) years before, we have tried many kind of variety of Maize to grow in this area. The purpose of this experimental test is to find out the suitable Variety of Maize for this area. This suitable Variety of Maize is meant to produce high quality and high yield of Maize and also strong maize against any Plant disease.
Especially this area has less rainfall than the other areas in Banyuwangi. But in Middle of March usually rain comes heavily so that inundation often takes place at Wongsorejo and it spoils new harvested Maize.

The second crop beside Maize which the farmers like to grow is Kacanghijo. Kacanghijo sowing is done in the Maize field 15 days before the harvest of Maize.
So in that case the Wongsorejo farmers like to grow late Variety of Maize because they want high yield product.
The experimental test of Variety among PERTA, METRO, PS-42, PENJALINAN, and KRETEK etc., has been made and the result shows that METRO is the suitable Variety for this area. In order to gain good Product, early sowing of maize after the rain fall is recommended to prevent against the insect and other Plant-diseases attack.
The field of the second Maize which grown in dry season depends upon the rainfalls in the time. Usually the yield of dry season maize is approximately 700 Kgs/Ha. only. But if it does not get any rain, the yield will be too low.

5.2. The result of Variety Experimental Test is as follows:

Table - 1. 1971 - 1972

Table - 2. 1972 - 1973

Table - 3. 1973 - 1974

TABLE : 1

RESULT OF EXPERIMENTAL TEST OF 1971 - 1972

PLOWING BY TRACTOR

No.	Variety	Planting distance (cm)	Planting Population	Harvesting time Population %	Growing period (days)	Plant height (cm)	Ear height (cm)	Dry grain weight 10(m) (Kg)	Estimate Yield Kg/Ha	Order of Yield
1.	METRO	80x40x2 plant	62,500	88	101	218.6	108.9	3 062	3828	1
2.	METRO	80x30x2 "	83,300	95	101	203.6	100.5	2 712	3391	2
3.	METRO	75x40x	Local method	Unthinning	102	219.0	98.88	2 200	2750	3
4.	METRO	75x40x	"	"	102	219.8	94.3	2 712	3391	2

Sowing date : 4 November 1971.

Amount of supplied fertilizer - Urea 200 Kgs = 92 Kg.

About the above table it is necessary to inform that all Variety Experimental field
Were spoiled by the Plant-disease, because sowing time was too late,
And the first growing time was attacked by the strong wind and drought.

TABLE : 2

RESULT OF EXPERIMENT TEST OF 1972 - 1973

PLOWING BY TRACTOR

No.	Variety	Planting distance (cm)	Plant height (cm)	Ear height (cm)	No. of ear in 20m harvest time	Dry ear weight (20m)Kg	Dry grain weight (20m)Kg	1000 kernel weight (gr)	Estimate yield Kg/Ha.	Growing period (days)	Order of yield
1	M E T R O	100x20x1 plant	223.5	109.3	76	9.8	7.8	260	3900	102	3
2	M E T R O	80x20x1 "	244.8	124.8	64	6.6	5.2	230	3250	102	8
3	PS - 42	100x20x1 "	219.0	114.0	73	8.6	7.2	260	3600	100	5
4	PS - 42	80x20x1 "	244.0	123.5	71	8.2	6.6	230	2125	100	11
5	KRETEK	80x30x2 "	199.0	104.5	94	6.3	5.1	230	3187	86	10
6	KRETEK	80x20x1 "	197.3	102.3	92	7.0	5.8	245	3625	86	4
1	M E T R O	100x20x1 "	223.0	120.5	79	11.4	9.0	260	4500	102	1
2	M E T R O	80x20x1 "	225.0	109.3	64	6.6	5.4	255	3375	102	7
3	PS - 42	100x20x1 "	226.3	116.3	88	10.2	8.3	260	4150	100	2
4	PS - 42	80x20x1 "	239	103.0	80	8.4	6.6	230	2125	100	11
5	KRETEK	80x30x2 "	189	94.0	86	6.3	5.1	235	3188	86	9
6	KRETEK	80x20x1 "	188	88.3	81	7.0	5.7	245	3562	86	6

Sowing date : 16 December 1972.

Amount of supplied fertilizer 300 Kgs/Ha. Urea N = 138 Kg.

Repetition Plot - 2

TABLE 3

RESULT OF EXPERIMENT TEST OF 1973 - 1974

No.	Variety	Planting distance (cm)	Plant height (cm)	Ear height (cm)	No. of ear in 20m harvest time	Wet ear weight (20m)Kg	Dry grain weight (20m)Kg	1000 kernel weight (20m) Kg	Estimate yield Ton/Ha	Growing period (days)	Order of yield
1	METRO	100x20x1 plant	221	113.5	90	13,9	7,9	270	3.95	103	2
2	METRO	100x20x1 "	217	106	90	14,1	8.3	260	4.15	102	1
3	METRO	100x20x1 "	238	127	93	14,9	7.7	275	3.85	101	3
4	KRETEK	100x20x2 "	207	84.7	146	11,4	6.1	218	3.05	85	11
5	KRETEK	100x20x2 "	199	82.2	135	11.4	6.5	210	3.25	84	9
6	KRETEK	100x20x2 "	188	72.2	161	11.9	6.2	200	3.10	83	10
7	PENJALINAN	100x20x1 "	219.5	112	87	9.9	6.5	240	3.25	93	9
8	PENJALINAN	100x20x1 "	218	111	87	12.9	6.5	240	3.25	92	9
9	PENJALINAN	100x20x1 "	218	113	100	11.9	7.4	240	3.70	91	4
10	PENJALINAN	100x20x2 "	223	105	173	12.4	7.0	220	3.50	93	7
11	PENJALINAN	100x20x2 "	206	106	124	13.9	7.4	245	3.70	92	4
12	PENJALINAN	100x20x2 "	222	108	120	12.4	7.2	210	3,60	91	6
13	METRO	100x40x2 "	233	125.7	81	13.1	7.3	265	3.55	102	6
14	METRO	100x40x2 "	207	102.7	77	11.1	6.6	260	3,30	102	8

Sowing date : 27, 28, 29, November 1973.

Amount of supplied fertilizer 200 Kgs/Ha. Urea N = 92 Kg.

Repetition Plot, 3.

5.3. CONCLUSION

(1) Variety

As the result of experimental test, we would like to recommend-the following varieties to be grown in Wongsorejo.

Rainy season : 1. METRO
2. PS-42
Dry season : 1. KRETEK

While Penjalinan really is Local Variety in Wongsorejo, but it is mixed with many other varieties, therefore we can't make any recommendation about it.

(2) Plant distance

The plant distance which have been tried result as follows:

METRO and PS-42. (late Maturing Variety)
1. 100cm x 20cm x 1 plant 50000/Ha.
2. 100cm x 40cm x 2 plants 50000/Ha.

The result of the above Plant Spacing shows that the yield anyhow depends on the rainfall. So the safe and suitable Population for Wongsorejo is about 50000 plants/Ha. and early maturing Variety of Kretek is needed more than 80000 plants/Ha. to 100000 plants/Ha.

KRETEK 1. 80cm x 30cm x 2 plants —— 83300/Ha.
2. 100cm x 20cm x 2 plants —— 100000/Ha.

(3) Amount of Supplied fertilizer

The big problem in this area is rain fall. If there is enough rain fall, 300 kgs of Urea is good for one hectare. But today fertilizer is expensive and insufficient. So until the farmers realize the fertilizer function it is enough for us to supply them 200 Kgs. per hectare, that is safer than if we supply them 300 Kgs. (Urea only). Fertilizer compound is necessary, but it is more necessary to fertilizer the whole area.
Because Wongsorejo area have 7000 Ha. of Maize Cultivating field, but in reality it is only 1500 Ha. (under the Bimas) which already fertilized (Urea only).

(4) Plant Protection

In Wongsorejo the following Plant diseases and insect are the main problem : 1. Disease (Sclerorpora Maides).
2. Insect (Holectrichia Helleri).

According to the People's report the two above Problems are mainly faced but the result of our experiment is as follows. The plant pretection is done against either Plant disease or insect. Soon after rainy season begins land Preparation is made to enable to do Maize sowing quickly. If we wait for longer time after rainy season begins, the land will be attacked by Plant disease and insect every year. And if some near land attacked by Plant disease it is very dangerous. So if plant disease found out in the land it is recommended to pick up and burn them quickly.

(a) One of the result of our experimental test shows that. In 1971 rainy season began at last week of October, then in

middle of November sowing has been finished. But after that there was no rain until 15 December and it was very hot every day. So the germination of Maize seed was too late and in Month of December the sowed Maize all attacked by Disease (Seleros pora Maides). Our Variety Experimental test also attacked by the disease, as follows:

Date of sowing	29 November 1971
Germination (75%)	18 December 1971
Date of examination 2 January	1972
1. K 305 Japan (from)	80% damaged
2. K 305 Camboja (from)	95% "
3. PS-42	92,5% "
4. PS-42	90% "
5. HARAPAN	92.5% "
6. GENJA KERTAS	87.5% "
7. METRO	87.5% "

The rain fall during Variety experimental test. November 29 mm only (1st November only).
December 62mm only (31 December only).

(b) The Earth Worm (Ulat tanah)

Aldrien is useful to prevent Maize seeds against the Ulat tanah. In order to avoid Maize root from the Ulat tanah attacks 3 Kgs of Adrin should be required to 100 Kgs. of Maize seeds, the similar action should be also taken to Sorghum. The above Particular is as the result of the Alasbuluh Demonstration field (1972).

6. HARVESTING, THRESHING AND PROCESSING

Today harvesting, Threshing and Processing are done by majority of farmers by Contract System. This is very simple system which done traditionally here.
This system is efficient enough.
However quality control is more necessary to be improved.
Especially in this area the harvesting time is in rainy season; So a lot of Maize grain is rotten and quality is also low.
So the existing Dryers at Wongsorejo must be used more efficiently.
OTCA has donated a Dryer to BUUD so it is recommended that Dinas Pertanian should train the farmers of BUUD to operate the Dryer as well as Possible.

Cost of harvesting to Processing in Wongsorejo March 1974

Cost of harvesting ..... Rp. 4500,- ____ Rp.6000,-
(harvested Maize heaped on the Road side)

Cost of harvesting is done as follows:

1. For road side field Product is 1/17 of Product.

2. For 200m field from road is 1/15 of Product.

3. For 400m field from road is 1/13 of Product.

The average yield Per/Ha = 2500 Kgs.
Price of Maize is Rp. 30,-/Kg.

Cost of husking ..... Rp. 2000,-

Per 1000 ears - Rp. 40,-
Per Ha about 50000 ears produced.

Cost of Threshing.....Rp. 3750,-

Wet grain per 20 Kgs. Rp. 25,-

Per Ha about 3000 Kgs.

Cost of drying

Now drying charges which is taken by BUUD Wongsorejo from the farmers is Rp. 1500,-/one Ton.
From the above mentioned report it is known that the harvesting system which has been done traditionally is the suitable system for this area, because there are many workers that can be provided easily.

7. SEED PRODUCTION IN BANYUWANGI

In this area Seed Production has been done since 1968. From that time until now we have used Dry season Paddy field and Upland field for Seed production.
First through Primary Cooperative we contracted 90 Ha. of Paddy field of Wongsorejo and they got success on Maize seed production.
But we were sorry that the farmers did not repay well to Project through the Cooperative.
The Seed quality was not good because the Seed which given by the Project was mixed with the other Local Variety of Maize at the flowering time.

In 1970 the Management of Wongsorejo Cooperatives were not good, so since that time we have tried to run Seed Production on the isolated farm at Kalibendo.
And the result of the above trial was very good because Kalibendo has climate, fertile-soil and the Management of the Estate have good knowledge of Seed Production.
The Seed produced at Kalibendo isolated farm was not supplied to Wongsorejo only, but also to some other places.

But after BUUD has been established we have recommended in order to carry out Seed Production by themselves at Wongsorejo again, because it will be more economical and moreover today many Member of BUUD and farmers wish to make Seed Production by themselves at Wongsorejo, too.

RESULT OF SEED PRODUCTION
ONLY USED BY MAIZE PROJECT

Year	Seed Production area (Ha)	Quantity of bought seed by Project	Unit price 1 kg (Rp.)	Location of seed production	Maize Project area (Ha)
1968	4	5.5 Ton	20	Wongsorejo	218
1969	90	60	25	"	2500
1970	25	45	25	"	2002
1971	15	26	40	Kalibendo	1310
1972	8	15	40	"	618
1973	30	37	45	"	1517
1974		50			2000

Variety Metro.

From the above we can see that Seed Production areas for Maize Project

are up and down, but Seed Production area at Kalibendo is 40 Ha.every year.
We received the Stock Seed from Malang and Surabaya and Foundation Seed is from L.P.3. BOGOR.

8. THE RESULT OF SORGHUM EXPERIMENTAL TEST

8.1. SUMMARY

Since 1969 some experiments have been made for knowing what Kind of Crops that are suitable to be grown after the harvest of rainy season Maize in the drying Upland at Wongsorejo. For the first time we tried HYBRID Sorghum, but the Next Year importing Sorghum Seed of Hybrid Variety faced some difficulties, so we used Synthetic Variety of Sorghum from L.P.3. BOGOR and GENTENG.

The result of the experiment we made shows that Sorghum is the suitable Crop for Wongsorejo Upland after the harvest of rainy season Maize.
We got 2 to 3 tons of yield per hectare/
And the old Sorghum Stump regenerate naturally so that we can get second Product like the first one.
And it is possible to Plant Multi Crop such as Kacang hijo.

The Product of Sorghum usually is for sale in Local Market, to be used for Piq, Chicken and Ducks feed and according to the experiment which is the suitable use of Sorghum in this area.

8.2. THE RESULT OF SORGHUM CULTIVATION SINCE 1971 to NOW

1971. We have tried to cultivate 1.5 Ha. of dry-season Paddy field with Sorghum. From that trial we get 4 - 5 tons of Hybrid-Variety and 2 - 2.5 tons of the Synthetic Variety. And we also tried to run Seed Production for one Ha in the Paddy field and it was success.

1972. We have treid four (4) Upland fields in Wongsorejo. On those field we have made an experiment with 2nd. Crop of maize. Dry season was too long in that year, so the Maize yield was very low, but we could gain Sorghum yield about 2 tons per Ha.

1973. Soil fertility will by down after Sorghum Cultivation, therefore,we tried to do Multi Cropping System made some Demonstration Plot in every Desa and they made success.

1974. We tried Multi Cropping System again with Kacanghijo in Wongsorejo as follows.

THE RESULT OF VARIETY EXPERIMENTAL TEST

(SINCE MARCH TO AUGUST IN WONGSOREJO UPLAND FIELD)

No.	Variety	Planting distance (cm)	Plant height (cm)	Growing period (day)	1000 kernel weight (g)	Grain Color	Harm by Bird	Estimate Yield Kg/Ha.
1	6.C	80x15x1 plant	199	99	32	Chocolate	Few	3200
	6.C	150x25x2 plant	194	99	33	"	"	1900
2.	7.C	150x25x2 plant	182	92	29	"	"	1650
3	UPCA - S2	150x25x2 plant	125	96	31	Yellow	Many	1750
4	UPSA - S1	180x15x1 plant	129	91	30	White	Few	2850
	UPCA - S1	150-25-2 plant	125	91	30	"	"	1750
5	S - 46	80x15x1 plant	193	86	41	Brown	Nill	2600
6	KATENGU	80-x15-1 plant	235			White	Much	
7	Gs - 61	80x25x2 plant	135	104	42	Chocolate	Many	4730
8	Gs - 75	80x25x2 plant	111	104	42	White	Few	4600
9	Gs - 76	80x25x2 plant	130	106	43	"	Few	4990

(Gs-61, 7 , 76) were cultivated in the Paddy field in 1971 and the other Sorgum in Upland field in 1973.

Date of sowing on Upland 18 March 1973.
Date of sowing on Paddy field 25 May 1971.

Fertilizer quantity:

80 cm x 15 cm x 1 plant 200 Kgs/Ha. Urea only
150 cm x 25 cm x 2 plants 150 Kgs/Ha. Urea only
150 cm = Multi Cropping System with Kcanghijo

8.3. PLANT DENSITY:

80 cm x 25 cm x 2 plant 100000/Ha.
80 cm x 15 cm x 1 " 83333/Ha.
80 cm x 35 cm x 1 " 50000/Ha.

With Kacanghijo 150 cm x 25 cm x 2 plant 53300/Ha.

RESULT OF EXPERIMENTAL TEST

For Wongsorejo Upland we can not do close Planting, because it is too dry and Multi Cropping System with Kacanghijo 150 cm x 25 cm - x 2 plants is suitable.

And Single Cropping System 80 cm x 15 cm x 1 plant is recommended. The above mentioned experimental test should be done continually.

8.4. FERTILIZER

The the Sorghum Cultivation in this area usually fertilizer is supplied one week and 35 days after germination.
But this Upland is very dry, so it is impossible to supply in the definite time.
Therefore soon after germination 100 Kgs. of Urea should be supplied quickly and for the 2nd. time 100 kgs. of Urea should be supplied 20 days after germination if there is Water there.

If it is possible for the 3rd. time 100 Kgs. of Urea after ear spacing will be better for increasing Yield Product. So we would like to recommend herewith that for One Ha of field 300 Kgs. of Urea should be supplied.

8.5. HARVESTING, THRESHING AND PROCESSING

Harvesting System in this area is cutting by sickle after the Sorghum has ripped. The ripe Sorghum, that has been cut then dried. About two days after being dried the threshing will be done by the Labours by beating the Sorghum on some woods or stone.
This system is more economical and easier than Mechanized System in Wongsorejo area.
After threshing, sorting of grain is done and then the assorted grain can be sold to the Chicken, Pig, Duck feed.

This harvesting time of Sorghum is dry season and it is really the farmer's leisure because there is not much work to do, so it is easy to provide the labours.

8.6. VARIETY

The result of experiment and if it is exported to Japan high content of Protein, less content of Tannin and high yield of variety should be mostly paid attention to.
And also the Sorghum is not harmed by Birds during the growing time in the field.
Therefore we would like to recommend the following Varieties to be cultivated.

1. 6.C.
2. UPCA-S1
3. 7.C.

If it is easy to import Hybrid Variety from other Countries, Hybrid Variety is recommended to grow in this area.

8.7. PRODUCTION COST OF SORGHUM (PER Ha)

Cost		
a. Field	Used farmer's own field	0
b. plowing	7 labors x Rp.100,-	Rp. 700,-
c. fertilizer Urea	200 Kgs x Rp. 40,-	Rp. 8000,-
d. seed	15 Kgs x Rp. 25,-	Rp. 375,-
e. plant protection, Aldrin		Rp. 200,-
" "	Labors Rp.150,- x 2	Rp. 300,-
f. sowing	16 labors x Rp.100,-	Rp. 1600,-
g. thinning	20 " x Rp.100,-	Rp. 2000,-
h. intertillage	Cow two Pair x 2 days x 2	Rp. 800,-
i. "	15 labors x Rp.100,-	Rp. 1500,-
j. fertilizer supply	20 labors x Rp.100,- x 2 time	Rp. 4000,-
k. harvesting	20 labors x Rp. 100,-	Rp. 2000,-
l. threshing	30 " x Rp. 100,-	Rp. 3000,-
m. processing	5 " x Rp. 100,	Rp. 500,-
n. etc.		Rp. 3000,-
	Total:	Rp.27975,-

Estimated Yield = 2500 Kgs. per Ha.

Price per Kg = Rp. 20,-

Gross income = Rp. ..... Rp. 50000,-

Cost of production ..... Rp. 27975,-

Net income Rp. 22025,-

If 2 tons per one hectare can be produced, it is more profitable to grow Sorgum in this Upland area and I think two tons of Yield is quite possible.

8.8. THE EXPERIMENTAL TEST ON SORGHUM CULTIVATION AND SOIL FERTILITY LOSS

Herewith we would like to report about the result of Sorghum cultivation in Wongsorejo upland field.

Usually soil fertility loss after Sorghum cultivation is different from after the other crops cultivation (Kacanghijo).

Location - Kecamatan Wongsorejo.

Sorghum and Kacanghijo field

1. Desa, Wongsorejo

2. Desa, Alasbuluh.

Other field Desa Bangering
Desa Sidodadi.
Total 4 places.

Date of soil sampling February 14. 1974
Date of Sorghum sowing March 18. 1973
Date of Sorghum harvest 1st June 1973
(regeneration) 2nd September 1, 1973
Yields first 2.8 Ton/Ha.
2nd 2.0 Ton/Ha.

Fertilizer supplied for :	1st crop	200 Kg/Ha	Urea.
	2nd	200 Kg/Ha	Urea
	Total	400 Kg/Ha	Urea

After the regeneration Sorghum harvest some period of rest up to the next rainy season should be given for that upland field. The similar action should be also taken for Kacanghijo cultivation Kacanghijo harvest is first week of May.
Date of Maize sowing is November 28, 1973.
The result of soil test shows that after twice harvest of Sorghum and after the Kacanghijo the Kacanghijo harvest the soil fertility loss of the field is not so different in Wongsorejo up-land and the result soil test is as follows.

CHEMICAL PROPERTIES OF THE SOILS OF KECAMATAN WONGSOREJO IN BANYUWANGI

February 14, 1974

Sample No.	Horizon (cm)	pH		Exchangeable - bases (/100 g)			P_2O_5 absorption Coefficient	Available P_2O_5 mg/100 g	Available K_2O mg/100 g	Nitrogen		Soluable Al_2O_3 mg/100 g
		H_2O	KCl	CaO	MgO	Mn				NH_4 mg/100 g	NO_3 mg/100 g	
BWI - 1	5 - 15	6.5	5.8	0.20% very rich	5 lacking	0.2 lacking	600 normal	1.5 contain	30 very rich	2.0 lacking	- -	5 trace
- 2A	5 - 15	6.5	6.0	0.20% very rich	5 lacking	0.2 lacking	1250 pretty-strong	1.0 contain	30 very rich	1.0 lacking	-	5 trace
- 2B	5 - 15	6.4	6.0	0.15% rich	5 lacking	0.2 lacking	1000 pretty-strong	2.0 contain	30 very rich	1.0 lacking	-	5 trace
- 3A	5 - 15	6.3	5.5	0.15% rich	5 lacking	0.2 lacking	850 normal	1.5 contain	30 very rich	2.0 lacking	-	5 trace
- 3B	5 - 15	6.3	5.5	0.15% rich	5 lacking	0.2 lacking	700 normal	1.5 contain	30 very rich	1.5 lacking	-	5 trace
- 4	5 - 15	6.5	5.8	0.20% very rich	5 lacking	0.2 lacking	850 normal	1.0 contain	30 very rich	1.0 lacking	-	5 trace

*) A : Cropping pattern = sorghum + sorghum + maize
B : Cropping pattern = kacanghijo + maize

Note : Grain yield of maize
No.BWI-1 - 800 kg/ha
-2A- 2500 kg/ha
-2B- 2500 kg/ha
-3A- 2500 kg/ha
-3B- 2500 kg/ha
-4 - 1500 kg/ha

9. COST OF TRACTOR USED IN WONGSOREJO

9.1. SUMMARY

Since this Maize Project begun in 1968 up to now, OTCA has donated many kind of Materials and Machinery to the Maize Project East Java. Tractors were also donated by OTCA. So we wish the effective use of them by the BUUD to develop the farmers economy and Cooperative through higher Production and the improvement of the BUUD management.

Now Wongsorejo has got four (4) tractors for use with good engine condition. (tire was used up).
Here we want to make the Tractor Cost Culculation of tractor used in Wongsorejo. According to the Census results, there are only 25% of the farmers own their own Cows. Other farmers have not any Cows of their own.
And the width of each farm-land is more than one hetare.
So it is suitable to use tractor in Wongsorejo.

(1) The Price of Materials needed for the Tractor and Maintenance Cost In Wongsorejo, March 1974.

a. Gasoline	1 litre	Rp.	45,-
b. Solar (light oil)	1 litre	Rp.	25,-
c. Kerosene	1 litre	Rp.	20,-
d. Grease	1 Kg	Rp.	700,-
e. Engine oil (SAE 30-40)	1 litre	Rp.	300,-
f. SAE 90	1 litre	Rp.	350,-
Driver 1 day (7 hours)		Rp.	350,-
Driver assistant 1 day (7 hours)		Rp.	150,-
Labour 1 day (7 hours)		Rp.	120,-

(2) Price of Tractor (with Rotary):

Mark : KUBOTA L 350 35 HP	Rp.	2,515,000,-
Disk Plow (26" x 3)	Rp.	448,000,-
Disk Harrow (18" x 24)	Rp.	234,000,-
Total:	Rp.	3,197,000,-

(3) Fixed Cost

Used Year - 8 years.
Used Tractor Price 1/10 of New Tractor.

Fixed Cost Per Year

Tractor	Rp.	293,000,-
Disk Plow	Rp.	50,400,-
Disk	Rp.	26,325,-
Garage (7m2)	Rp.	22,500,-
Tax fee	Rp.	15,000,-

Cost of repairing of Tractor is 0.015% of Tractor Price per hour and the Price of Tractor Parts is about three (3) time of that in Japan.
Operation hours per year are about 750 hours in Wongsorejo area.

FIXED COST OF PER HOUR

USING DISK PLOW

Operation hour Per year	Cost of Machines(Rp)	Reparing (Rp)	Garage (Rp)	Tax (Rp)	Total (Rp)
1000	370	377	22.5	15	784.5
700	530	377	32.0	21	960.0
500	740	377	45.0	30	1192.0

Operation hour Per year	Cost of Machines(RP)	Reparing (Rp)	Garage (Rp)	Tax (Rp)	Total (Rp)
1000	344	377	22.5	15	758.5
700	490	377	32.0	21	920.0
500	687	377	45.0	30	1139.0

(4) FLOATING COST (UNFIXED COST) USED PER HOUR

a. Solar 7 litre..... Rp. 175,-
b. Oil 5% of fuels..... Rp. 9,-
c. Driver assistant and Driver (1 Ha) .... Rp. 500,-

USING DISK PLOW (PLOWING)

Operation hour 1 Ha. about 6 hours Fuel used 42 litre ..... Rp. 1050,-
One day about one Ha. of land-Plowing.

USING DISK HARROW (HARROWING)

Operation, 1 Ha (2 time) 3 hours.
Fuel used 21 litre ..... Rp. 525,-

COST OF PLOWING AND HARROWING PER Ha

Operation hour Per year	Disk Plow (Rp)	Disk Harrow (Rp)
1000	6257	3049
700	7310	3535
500	8702	4200

Cost of Cow Plowing in Wongsorejo in (May 1974) one Pair (two Cows, one Man, one Plow).
Per day (5 hours) ---------- Rp. 200,-
Per Ha. for one time Plowing will be needed 6 pairs -- Rp. 1200,- for Maize Planting field it must be done three (3) to four (4) times so the Cost of Land Preparation is Rp. 3600,- -- Rp. 4800,-

The period and days the Tractor used for Plowing in Wongsorejo area.

The Tractor is used particular before sowing, short time is to be concentrated for plowing without rainfalls and holidays, and the only possibility is for about 20 days per month.
In this area, in the rainy season the rain falls on the upland first and on the low land later (about one month later).
So it will be profitable if the interval of rain fall between up and low land is longer then one month in this area.

USED FOR FIRST CROP

	October	10 days	60 hours
	November	20 "	120 "
	December	20 "	120 "
2nd Crop of Maize	March	10 "	60 "
Water melons	April	10 "	60 "
" "	May	20 "	120 "
	Total	90 days	540 hours

9.2. THE RESULT OF USING TRACTOR

From the above, particular it is known that Tractor Plowing-Cost is more expensive than Cow Plowing, Tractor Plowing Cost per hectare is about Rp. 8000,- (Plowing only).
But using Tractor to do deep plowing so together with the supplied fertilizer, the farmers will get high product of maize in Wongsorejo area.

Especially if sowing is late after the rain fall, the Wongsorejo land generally attacked by Plant Disease and Insect (Uret Tanah). So in that case sowing must be affected in suitable time to prevent against Plant Disease and Insects.
Therefore we wish to recommend to use Tractor for plowing in this area and also.
But for the right operation of Tractor technique guidance is required continuously and we also express the hope good management of BUUD. And because the Tractor is expensive enough so it is recommended the Tractor should be operated by BUUD organization only.

9.3. TRANSPORTATION BY TRACTOR

The operation hours of Tractor used for plowing is about 540 hours per year only. So in order to be more offective we want to use Tractor for transportation of fertilizer, Agricultural products and others.
Especially the road condition in rainy season is very bad in Wongsorejo. So transporting Maize from field to processing area is very difficult done by Truck or Cow-cart, but Tractor is stronger than the aforesaid transporters, so we wish them to increase operation hour of Tractor 200 - 250 hours for transportation.

COST OF TRACTOR TRANSPORTATION

Price of Trailler 2 tons capacity .....Rp. 500.000,-
Used 8 years.
Cost of one year .....Rp. 56.250,-

OPERATION HOUR PER YEAR	ONE HOUR COST
100	Rp. 560,-
200	Rp. 281,-
300	Rp. 187,-

The above calculation shows that it is possible to use Tractor for use transportation.

9.4. THE RESULT OF COW AND TRACTOR PLOWING EXPERIMENT

We have made the above experiment at Wongsorejo as follows:

1. Cow Plowing.
2. Tractor Plowing and Harrowing.

The result of the experiments shows that 50% germination of Cow-plowing is two days late then that of Tractor plowing.

Cow plowing field is covered by rough-lumps of soil, so the germination is late.
After germination the condition of both field (Cow plowing and Tractor plowing field) are same.

9.5. RESULT OF GERMINATION

Variety : Metro

Sowing date : 14 December

Method of plowing / Sowing method	Sowing after 4 days	Sowing after 7 days
Tractor plowing with Disk harrow	72%	83%
Cow plowing	45%	75%

9.6. RESULT OF YIELD EXPERIMENTAL TEST

Variety : Metro

Rainy season:

Year	Tractor with Disk harrow (Kg)	Cow plowing and traditionaly sowing	Yield ratio of Tractor plowing
1972	3609.5	3070.5	117.5%
1973	3756.0	3700.0	101.3%
1974	3985.6	3475.0	114.6%

Result of Seed germination test is 97%.
The yield of Tractor plowing field in 1974 was 12.8% higher than that of Cow plowing fields.

9.7. THE TRACTOR PLOWING FEE AT WONGSOREJO

At beginning the fee was Rp.1,500/Ha, but after the farmer have got good experience the tractor plowing fee was revised as follows.

Year	Plowing fee by disk plow	Harrowing fee by disk harrow	Transportation fee Dry season : Rainy season
1968	Rp. 1,000,-	Rp. 500,-	Rp. 300,- Rp. 500,-
1969	1,250,-	500,-	300,- 750,-
1970	1,500,-	750,-	300,- 750,-
1971	1,750,-	750,-	500,- 1,000,-
1972	2,500,-	1,000,-	750,- 1,000,-
1973	3,500,-	1,500,-	1,000,- 1,500,-
1974	4,000,-	2,000,-	1,500,- 2,000,-

(Upland road about 5 Km)

According to the above Table, it is impossible to maintain the tractor.

But all the tractors were donated by OTCA for the sake of improving cultivating method, demonstrating, tractor experience, in order to increase the management fee and mechanical training to the farmers, so high yield product can be obtained. And the tractor is impossible to be used for paddy field in Wongsorejo, because of narrow-ness of the road condition there and the fields are not so large (about 0.05 - 0.2 Ha each). Moreover, usually the tractor for commercial use in this area so it means to be more difficult to use tractor there.

CHAPTER VI QUALITY CONTROL

By Y. YOSHIZUMI

1. QUALITY CONTROL ON PROCESSING

I. Preface

Six years has passed since the East Java Maize Project was established in 1968. Within those 6 (six) years of the quality control, the extension and instruction on processing have been done for 3 (three) years. During those pocessing periods, a progress of corn's quality in the Project areas was done by diffusing and instructing in accordance with the investigated situations as follows.

1. An extension and a demonstration by mechanical processing.
2. A progress of quality by swift progressing.
3. An additional income is obtained by the swift processing and the progress of quality.
4. Combinative utilization of the mechanical processing and the solar drying.
5. Survey on the traditional processing method.

The outlines of the situation of the processing operation in East Java are known well and have been reported so often. So a again, this is an abridged explanation.

II. On Drying Process

In general people say that drying corn by spreading on concrete floor and utilizing the solar energy is much cheaper and more effective in Indonesia, because solar energy is free of charge. However, solar energy is not stable in the rainy season such as, maximally, 5 (five) effective hours per day and 15 to 20 days per month.
The most disadvantaging factor is that the climate cannot be controled. The relative humidity is so high that the equilibrium of moisture content will not reach the final moisture content of corn, and the drying rate solar energy is not high, even if there is enough number of drying floor.
On the present condition, the capacities of the warehouses and drying floors are not satisfactory for the harvested of corn. Even, their capacities are not satisfactory for the amount of the repayment only.
It needs several days until the final moisture content is reached. It means corns have to be stored for several times and, as a matter of course, some workers are needed. For each 200 m^2 of the drying floor, of which drying capacity is 5 to 7 tons ear corn or 4 to 6 shelled corn, 3 to 4 workers are needed.
During the over night storage, the corns will have many problems such as spoiled, mold growth, heat damaged, etc.

Warehouses and drying floors in the Project areas, in East Java, were investigated. This subject has been reported on "Report on the Experiment of Maize Quality Control in 1972/1973" (M.P.E. - 73 - R - 21).
According to that report, the capacity of the drying floors at present is only able to support one fifth of the daily average harvest, as the harvest term is assumed 3 (three) weeks in Kediri. This factor is considered to be more or less the same in other areas.
Consequently, if the drying floors at present are utilized one hundred percent, they cannot process even the total amount of the repayment, which constitutes one fifth of all the production in the Project areas.
In the case of the farmers own processing, by spreading out directly on mats or on the ground with unexpected capacity, it is not effective on quality. In such a situation, to recommend a natural drying will not have so much effect as compared to concentrated mechanical drying.

The difference of cost between mechanical and natural dryings, suppose the weather is continuously fine, is the natural drying is about 15% cheaper than the mechanical one. However, the weather is almost unreasonable during the harvest period, suppose the time needed for drying takes more than 3 (three) days for shelled corns, then the mechanical drying is much cheaper than the natural drying. The experiments on solar drying with the purpose of studying the technical factors have been done and reported on the "Report on Corn Drying by Sunshine".

In case of increasing the concrete drying floors, more than five thousand rupiah are needed per square meter, excluding the land cost. Therefore, introducing mechanical processing is easier rather than increasing the drying floors. Then, it is so difficult to select the location or situation, which is not always recommended by the institutions, of the new established concrete to drying floor.

At present, the drying floors, which have already been instituted, are utilized fully, but on the shortage of capacity, new establishments should be planned. It is considered more effective to adopt mechanical dryers than to establish new establishments.

In the case of increasing the processing capacity, it is recommended to establish warehouses or to add the number of the warehouses already in existence, then to induce the mechanical processing as adapted to the average daiy harvest and peak. For example, for small scale processing, the combination system of drying floor with several number of vertical or horizontal dryers is recommended. This system was reported on "An Experiment on the Operating Process of Quality Control for Maize".
On the other hand, if it is a large scale processsing, it is recommended to utilize "Drying Unit" such as in B.U.U.D. Wongsorejo in Banyuwangi, B.U.U.D. Kepung, Besowo in Kediri where drying box is established in accordance with "Suggestion on the Design of Drying Box for Utilization of Drying Unit", and B.U.U.D. Pagu II. In the case of B.U.U.D. Pagu II, the drying unit was utilized by simple drying system in accordance with "Suggestion for the Effective Utilization of the Drying Unit" (FD - 77, FE - 97B).

This system is considered to be more useful, because the frame duct can beconstructed easily with perforated steel or wire not supplied under - Colombo Plan and it is easy to be carried any-

where. The construction - charge will be less than fifty thousand rupiah (Rp. 50,000.-) per set.

III. On Shelling Process

Two kinds of method can be used for shelling. One of them is by the use of rotary or gear type corn sheller for dried ear corn. The technical data on this shelling is reported on "Report on Corn Sheller". And the other, for fresh ear corns, is by the use of high moisture corn sheller. Concerning this is reported on "A Confirmative Ability Test on High Moisture Corn Sheller". The utilization of both type of corn shellers are depended on the situation and the scale dimension which will be covered. The most profitable thing is that the mechanical shelling is confirmed to be much cheaper and gives better quality than the traditional method.

IV. Finally, the control and the supervision system of the machinery is recommended to be sure on the provincial level until the terminal organization. For example, stuffs for control, supervisors and operators are important to foster at the terminal organization and should be responsible for these matters.

2. THE EXPERIMENT ON CORN DRYING BY SUNSHINE

2.1. Preface

An experiment on corn drying by sunshine had been done in September, 1972, at Sujati Seed Farm. However, the experiment had been done for seed processing during the dry season. Therefore, this time the experiment was done and investigated the corn drying by sunshine in the rainy season.

2.2. Purpose

Heretofore, there was no data, except those which say that corn is able to dry in several days, on corn drying by sunshine which showed the drying time, the weather condition and the thickness of the heaping.
This experiment was done for the purpose of investigating corn drying by sunshine in the rainy season.

2.3. Experiment Method

The experiment was investigating on each drying process of fresh shelled corn (Test No.I), fresh ear corn (Test No.II) and half dried shelled corn (Test No.III).

For fresh ear corn and shelled corn, the heaping thickness was the same as the thickness of one ear corn. The check and observe the sameness of the sample's thickness, a wooden frame, 1 (one) meter in width and length and 3 cm in thickness, was used.
The rest of the shelled corn was spread to dry, about 10 (ten) times the width of the wooden frame, and the sample observated was only those within the wooden frame, which was put at the centre of the drying shelled corn.

The shelled corn, after being spread with 3 cm thickness, was waved at intervals of about 15 (fifteen) cm. This action was repeated once each half of an hour at the right angle direction together with agitation. The windmill type anmometer was set on the middle of the drying floor to measure the velocity of the wind, within a minute, once each quarter of an hour.

2.4. Result of Investigation

(1) Results concerning weather conditions. These results are shown on Table 1 and Table 2. Table 1 is adopted to Test No. I and No. II, while Table 2 is adopted to Test No. III.

Table 1. WEATHER CONDITIONS

No.	Time	Temperature °C	R.H. %	Wind Velocity m/min.	No.	Time	Temperature °C	R.H. %	Wind Velocity m/min.
1.	8:30	24.4	82.5	60	11.	9:15	26.4	69	268
2.	9:30	25.2	77.5	80	12.	10:15	27.8	63	284
3.	10:30	25.4	77.5	80	13.	11:15	28.6	55	215
4.	11:30	25.2	77.0	180	14.	12:15	28.4	59	198
5.	12:30	24.4	81.0	120	15.	7:30	25.4	67	260
6.	8:30	23.6	87.0	270	16.	8:30	27.2	61	318
7.	9:30	25.4	77.0	327	17.	9:30	27.6	65	324
8.	10:30	27.8	-	99	18.	10:30	27.6	67	336
9.	11:30	25.8	77.5	180	19.	11:30	28.4	66	240
10.	8:15	26.4	69.0	268	20.	12:30	27.4	71	280

TABLE 2. WEATHER CONDITIONS

No.	Time	Temperature °C	R.H. %	Wind Velocity m/min.
1.	7:45	22.5	87	-
2.	8:45	23.7	83	52.
3.	9:45	25.4	69	32
4.	10:45	27.4	62	72
5.	11:45	24.9	84	84
6.	7:30	24.6	76	144
7.	8:30	26.0	70	280
8.	9:30	27.7	60	260
9.	10:30	27.0	62	136
10.	11:30	26.8	74	308
11.	12:30	27.4	66	272

(2) Result about drying

The data observated are shown on Table 3, 4 and 5, while the switch to drying curve is shown on Figure 1.

Table 3. Drying result on fresh kernel.

No.	Time	Temperature on floor °C	Moisture Content %	Weight of kernel per m2 Kg.
1.	8:30	28.2	27.0	22.4
2.	9:30	33.2	-	-
3.	10:30	39.5	26.6	
4.	11:30	36.4	-	
5.	12:30	32.0	21.9	
6.	8:30	28.7	20.3	
7.	9:30	36.5	19.5	20.5
8.	10:30	41.5	17.4	
9.	11:30	39.5	16.8	
10.	8:15	35.5	16.3	
11.	9:15	38.7	16.1	19.5
12.	10:15	44.0	15.4	
13.	11:15	44.0	14.8	
14.	12:15	45.0	14.5	
15.	7:30	30.8	14.6	
16.	8:30	39.5	14.5	
17.	9:30	41.0	14.5	
18.	10:30	46.5	14.4	
19.	11:30	49.5	14.3	
20.	12:30	47.0	13.9	19.0

(Test No. I)

Table 4. Drying result on ear corn.

No.	Time	Temperature on floor °C	Moisture Content %	Weight of kernel per m2 Kg.
1.	8:30	28.0	28.0	-
2.	9:30	33.0	28.5	
3.	10:30	38.0	28.0	
4.	11:30	32.0	-	
5.	12:30	30.5	27.7	
6.	8:30	26.5	28.0	24.0
7.	9:30	31.5	26.7	
8.	10:30	36.0	25.4	
9.	11:30	38.0	23.8	
10.	8:15	32.5	23.6	21.5
11.	9:15	35.2	22.9	
12.	10:15	39.5	22.8	
13.	11:15	39.0	21.6	
14.	12:15	38.0	20.6	
15.	7:30	29.3	21.7	19.5
16.	8:30	35.5	21.4	
17.	9:30	38.0	20.4	
18.	10:30	39.5	20.3	
19.	11:30	41.5	20.3	

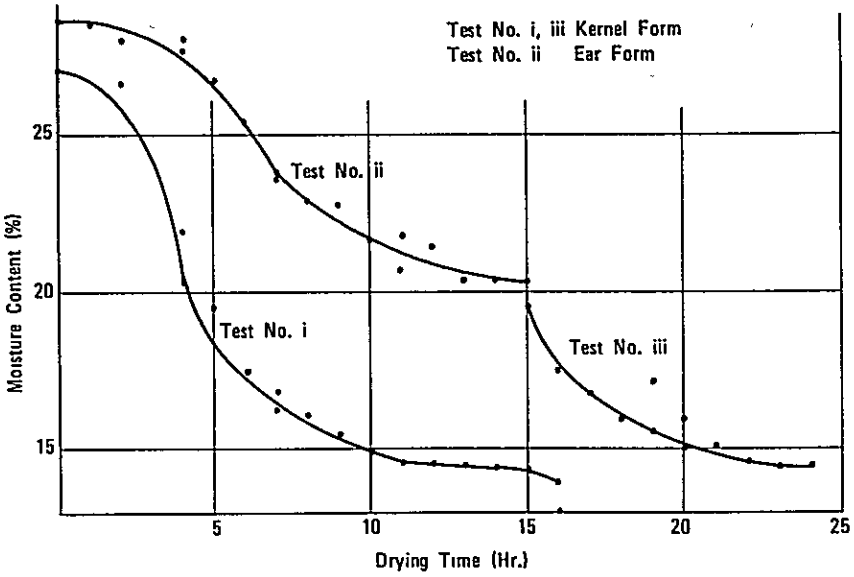
(Test No. II)

Table 5. Drying result on kernels (shelled with 20% of moisture content)

No.	Time	Temperature on floor °C	Moisture Content %	Weight kernels per m2 Kg.
1.	7:45	25.8	19.5	14.0
2.	8:45	36.5	17.5	
3.	9:45	36.0	16.7	
4.	10:45	38.5	15.9	
5.	11:45	35.0	15.6	
6.	7:30	28.0	17.1	13.7
7.	8:30	33.5	15.9	
8.	9:30	37.5	15.1	
9.	10:30	41.5	14.6	
10.	11:30	40.0	14.4	
11.	12:30	39.5	14.4	13.2

(Test No. III)

Figure 1. Drying Curve on Corn During Rainy Season (December, 1973)



2.5. Consideration

(1) During the experiment term, it was very windy. Therefore, the drying result obtained was comparatively in good condition. And the experiment was the first experiment, so such results should be corrected by the results of other experiments in different weather conditions. However, the result on corn drying can be considered to be in good conditions.

1.1. It takes 15 hours or more to dry the fresh ear corn until their moisture content is 20%, in which they can be shelled by mechanical corn sheller, such as the rotary and gear type corn sheller.
Therefore, it is considered that it will take more than three days for drying the fresh ear corn, because the effective average time for drying of the sunshine is only about 5 hours a day.

1.2. It takes 13 hours for fresh shelled corn to dry until it reaches the final moisture content of 14.5%. So, it is considered that to dry the fresh shelled corn will take 3 days or more.
(It has been observed that, in general, it takes about 3 to 5 days to dry fresh shelled corn at spot buyers).

1.3. The half dried shelled corn needed for 9 (nine) hours to dry, so it takes 2 days more. The drying system in Kediri areas, for example, is as follows. Firstly, the ear corns are dried until they reached 20% of moisture content. Secondly, the ear corns mentioned are shelled, and finally, the shelled corns are dried again until the final moisture content is reached. In general, it takes about 5 to 7 days to dry corn in Kediri areas.

(2) The fresh shelled corn can be spread to dry, about 22.4 Kg./m2, with 3 cm thickness. After it was dry, the w of the kernels is reduced until about 19 Kg.

If a B.U.U.D. covered the area of, minimally, 600 Ha., the production amount will be 1,200 tons, because the average production is 2 tons/Ha. of dried grains and the processing term will be for about 30 days. Therefore, minimally, 24 drying floors will be needed, of which size is 500 m^2 each. In the present situation, it is almost impossible to establish such number of new drying floors and the number of the already established drying floors is also insufficient.
Considering the location, the utilization rate and the expensive cost of the establishment, it is too difficult to establish such amount of drying floors.

(3) In both cases of drying curve on Test No. I and No. II, the final of the drying curve is nearly parallel with the horizontal line.
Therefore, the fact of the result is considerable that the equilibrium moisture content with air is nearly 14 - 14.5% for such good weather conditions. Namely, in normal condition the relative humidity is known to be more than 70%, so the equilibrium moisture content will be much higher than that. It will be difficult to dry corn by exposing to the sunshine, even until the second grade of the U.S.A. standard, and also on local consumption, it will be rather difficult to store it for several term.

(4) In this investigation, the weather condition was very good. The result of the sundrying investigation is considered to be better than in the normal condition as explained on consideration (1). Therefore, it is not desirable to take conclusions based on this result only. It still needs several investigations again done by the Indonesian staffs.

3. THE EXPERIMENT OF THE VERTICAL DRIVER

3.1. At present, there are 30 "Colica" vertical driers, originally designed for drying paddy, supplied under the Colombo Plan and another batch of 30 vertical driers supplied by Kennedy Round for East Java. The purpose is to help drying corn grains when the harvest time is in the rainy season. But when the drier was tried to dry corn grains, in normal conditions as presented in the instruction, many broken corn grains, more than 30%, were obtained. After investigating, it was found that the problem was in the drying system, which was caused by some mechanical troubles. So it was not caused by drying conditions mentioned in the instruction.

Some possibilities were tried to find out a way to utilize those driers for drying corn grains. Then, by some reconstruction that have been tried and studied for about one year, it was confirmed that "Colica" driers could also be utilized for drying corn grains.
There are three problems which must be considered, namely;

a. The screw conveyor for carrying out the circulation of the grains will break the grains.

b. The thrower wheels crush the grains between the extreme point of blade and casing.

c. The grains are broken by the shock of the grains and circulation pipes as they are thrown up by the thrower wheels.

The grains are rather strong to endure shock but they are easily broken by crushing. According to the investigation, the clearance between screw conveyer and the tray is still suffi cient to pass corn through without breaking any grain and the third problem is not necessarily to be worried about.
The biggest problem which causes the existence of so many broken grains, after being investigated, is the second problem, namely, the thrower blade crushes grains between the extreme point of the thrower blade and casing as the circulated grains are thrown up to the top part of the drying chamber.

Since "Colica" driers are originally designed for drying paddy, the clearance between the extreme point of thrower blade and casing is too small for corn grains to pass through. So, the extreme points of the thrower blade were cut by 6 mm each and then the rubber tips were readjusted in their normal position as before. The rubber tips fill up the clearance between the inside of the thrower casing and the extreme points. In this way, the thrower can throw up the circulated grains in the way and efficiency as in the normal conditions.

3.2. After getting the result on the reduction of the broken kernels, the experiments were done several times by using other drier which have been reconstructed. The circulatwon is used for feeding, projection and circulation when it is needed to circulate the grains in accordance with the moisture content and the difference of moisture between the inside and the outside of the drying chamber.
The subject of the experiment and the test number related to the subject-mentioned are shown on Table 1. Other factors are shown on Table 2.

Table 1. Subject of the Experiment

Test No.	Subject of the Experiments
1.	Drying fresh shelled corn - be able to give confirmation
2.	Drying fresh shelled corn
3.	Drying shelled corn which has been dried in ear corn form
4.	Drying shelled corn for seed

Table 2. Other Factors

Test No.	1	2	3	4
Feeding Weight	2,000 Kg	2,000 Kg.	±1,900 Kg	2,000 Kg.
Fan R.P.M.	1,900 rpm	1,900 rpm	1,950 rpm	1,850 rpm
Pro/Over Blowing	30/30/min	30/30 min	30/30 min	/20/20 min.
Weather Condition	-	Rain, Cloudy lator	Cloudy	Fine, Cloudy lator

The result of the drying experiment is shown on Table 3 according to the test number as the following.

Table 3 Result os the Drying Experiment

Test No. 1

Drying Time (Hour)	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mm WG)	Fuel Consumption Gasoline (lit.)	Fuel Consumption Karosine (lit.)	Moisture Content. (%)	
0	25.6	69	50	23	-	-	26.7	
1	27.8	72	50	-	0.9	2.7	23.5	
2	28.6	67	50	-	1.0	2.5	20.3	
3	29.4	58	50	-	1.0	3.1	18.5	circulate
4		60	50	-	1.0	3.1	17.9	
5	27.2	68	50	-	1.0	3.0	17.1	
6	26.4	66	48-50	-	1.0	2.6	16.2	circulate
7	24.8	67	50	-	1.0	3.4	15.1	
8	24.4	75	49-50	-	1.0	3.0	13.6	
8					7.9	23.6		

Test No. 2

Drying Time (Hour)	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mm Wg)	Fuel Consumption Gasoline (lit.)	Fuel Consumption Karosine (lit.)	Moisture Content. (%)	
0	24.6	88	50	27	-	-	26.6	
1	25.0	83	50	28	1.0	3.39	-	
2	27.0	76	50	22	1.0	2.80	-	
3	26.7	78	50	22	1.0	4.03	22.6	circulate
4	27.1	77	50	9	1.0	3.83	-	
5	27.3	76	50-45	14	0.8	3.60	19.1	circulate
6	25.4	83	45	32	0.8	2.80	18.6	
6.5	24.1	85	45	30	0.4	1.50	16.4	
6.5					6.0	21.95		

Test No. 3

Drying Time (Hour)	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mmWG)	Fuel Consumption Gasoline (lit.)	Fuel Consumption Karosine (lit.)	Moisture Content (%)	
0	26.6	79	50	30	-	-	19.7	
1	27.5	76	50	20	1.0	3.8	17.7	
2	27.6	76	50	19	0.8	3.8	15.8	circulate
3	27.6	74	50	15	0.8	3.8	15.1	
3					2.5			

Test No. 4

Drying Time (Hour)	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mmWG)	Fuel Consumption		Moisture Content. (%)	
					Gasoline (lit.)	Kerosine (lit.)		
0	29.8	64	40	30.5	-	-	18.1	
1	33.2	58	40	21.0	0.7	1.8	16.8	
2	29.2	70	40	11.0	0.8	2.0	15.7	circulate
3	29.6	67	40	11.0	0.6	1.2	14.3	
3.5	30.0	64	40	12.0	0.4	1.0	13.3	
3.5					2.5	6.0		

The result of the analyses is shown on Table 4. In the case of Test No. 4 only the germination rate is shown.

Table 4. Rest of the Analyses and Germination Rate

Test Number	Broken Kernel		
	Large	Small	Total
1	1.67%	1.87%	3.54%
2	1.8 %	1.3 %	3.1 %
3	0.30%	2.42%	2.73%
4	Germination rate	93.4 %	

The analyses was done by hand picked method following the U.S. standard system.

2.3. Consideration

The growth of the broken kernel rate was supposed sucessfully, so that its percentage is approximately the same as the export standard. The result of the experiments at Desa Dengkol, Malang has confirmed the reconstruction of other "Colica" driers. The result of the experiments mentioned had also confirmed that the total of the broken kernels was only 3.1%, fresh corn grains, of which moisture content was 26.6%, were dried to reach the moisture content of 16.4% within four times circulations, including feeding and projection.

The shelled corns, which were dried in the form of ear corns until the moisture content was 20%, and then the ear corns were shelled by mechanical corn shellers, were dried to reach the moisture content of 15% within three times circulations, including feeding projection. The broken kernel rate was reduced to reach 2.7% only.

In the case of seed drying, according to Test No. 4 on Table 4, the germination rate is 93.4%. In accordance with the seed inspection standard in Indonesia, this rate is rather sufficient to grow the seed.

The operation and control of the "Colica" vertical driers are much easier than other type of driers such as the horizontal

drier. It is easy to put fire, in burning up the burner, and to control the temperature of the heated air. The mixing operation can also be done by mechanical circulation system. Of course it is a little dusty the circular operation, but it is easy too.

2.4. The driers of which thrower blades are reconstructed are, of course, also useful to dry paddy. An experiment about this matter has done and the result is shown on Table 5. (The result of an experiment to dry paddy seed at LP3 Seed Farm, Malang).

Table 5 Result of Paddy Drying

Drying Time (Hour)	Temperature (°C)	R.H. (%)	Temp. of heated	Ps (mmWC)	Fuel Consumption		Moisture Content	
					Gasoline (lit.)	Kerosine (lit.)		
0	27.0		40	28	-	-	24.3	
1	29.0		40	27	0.8	1.75	24.1	
2	30.2		40	24	0.9	2.0	22.4	circulate
3	30.2		41-40	26	1.0	2.0	21.1	
4	29.2		40	24	0.8	2.25	20.0	circulate
5	28.6		39-40	27	0.7	1.5	18.1	
6	25.0		39-40	25	0.8	2.25	17.1	circulate
7	22.0		40	26	0.8	2.5	15.9	
8	22.4		40	26	0.9	2.5	14.4	
8					6.7	16.75		

Besides the result on Table 5, two (2) litters of gasoline were added to be used in pre- and over blowing and in circulation. So the total of the gasoline consumption was 8.7 litters. The feeding capacity was 1,515 Kg. for fresh paddy and 1,283 Kg. for dried paddy.

The analyses on crushed grains and germination rate still are under investigation, but it can be said that the crucked grains are very less and the germination rate is much better than solar drying.

Paddy, which is consumpted for food, is also recommended to be dried by the use of vertical driers. The temperature of the heated air must not be allowed to increase higher, because paddy should be dried carefully. That is to save the crucked brown rice, so that it produce high yield in milling it.

In either case, the ut-lization of vertical driers are recommended to be used in drying shelled corn and paddy, because they are much trustworthy.

4. THE DRYING EXPERIMENT OF THE HORIZONTAL DRIYER

4.1. Preface

In addition to the 23 horizontal driers which have been prepared already under the Kennedy Round and Indonesia own budgets. O.T.C.A., under the Colombo Plan Program, will donate

30 (thirty) horizontal driers to East Java. The Result of the drying experiment which had been done during the first 3 (three) years of the Project's implementation shows some data concerning the drying cost, but it does not show any result on technical matters.

The drying experiments at this time were intended to know the technical factors before extending it to farmers. The horizontal drier can be utilized for many purposes. It can be used to dry any grain and also, even ear corns. Of course, it is designed to dry grains such as paddy, wheat, shelled corn, but it can also be utilized to dry ear corn, peanut, soy-bean and others, even the cassava chips.

In those experiments, we tried to dry several materials such as shelled corn, fresh ear corns, cassava and peanuts.

4.2. Result on the drying of shelled corns and ear corns.

The experiments done are three kinds, namely;

a. Drying the fresh shelled corn,

b. drying half dried shelled corns which were shelled by a rotary type corn sheller of which moisture content was 20%, and

c. drying fresh ear corn which was intended to know the basic factors on the drying technique of the Drying Units and as FE - 97B and FD - 77.

The drying experiments are classified as shown on Table 1.

Table 1. Classification of Experiments

Test Number	Material Dried	Table No. of Result
1	Fresh shelled corn	2
2	Half dried shelled corn	3
3	Fresh ear corn	4
4	Fresh ear corn	5

The result of the drying experiments are shown on Table 2, 3, 4, and 5, as follows:

Table 2. Drying Result on Fresh Shelled Corn (Test No. 1)

Time	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mmWG)	Fuel Consumption		Moisture Content (%)	
					Gasoline (lit.)	Kerosine (lit.)		
0	24.8	45		37			23.9	
1	24.0	47	50	-	0.70		23.0	
2	23.0	47	50	-	0.75		21.7	
3	22.8	52	50	-	0.75		20.2	
4	22.4	59	50	29	0.75		19.1	(mixed)
5	22.0	60.5	50	-	0.75		17.1	
6	22.0	62	50	-	0.75		16.3	
7	21.9	64	50	34	0.70		15.3	
8	21.6	75.5	50	35	0.70	14.05	14.4	
8					5.85	14.05		

Table 3. Drying Result on Half Dfied Shelled Corn (Test No.2)

Time	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mmWG)	Fuel Consumption		Moisture Content (%)	
					Gasoline (lit.)	Kerosine (lit.)		
0	28.0	72	50	39			20.0	
1	-	-	50	40	0.75	1.84	-	
2	27.4	76	50	30	0.70	1.67	18.5	
3	28.0	79	50	28	0.75	1.73	17.9	(mixed)
4	25.6	81	50	36	0.70	1.67	-	
5	24.6	90	50	38	0.75	1.73	14.6	
5					3.65	8.64		

Table 4. Drying Results on Fresh Ear Corn (Test No. 3)

Time	Temperature (°C)	R.H. (%)	Temp. of heated air (°C)	Ps (mmWG)	Fuel Consumption		Moisture Content (%)	
					Gasoline (lit.)	Kerosine (lit.)		
0	23.6	86	60	14			32.9	
1	27.4	79.5	60	12.5	0.8	4.25	30.4	
2	28.2	76	60	14	0.8	3.75	-	
3	26.8	78	58-60	13.5	0.8	3.75	28.8	
4	26.9	82	60	10.5	0.9	4.0	-	
5	27.0	81	60	10.5	1.0	3.5	25.8	
6	27.4	79	58-60	9.5	0.75	3.8	-	
7	27.0	83	60	12.5	0.75	3.9	22.3	(Tempering)
8	27.8	74	57-60	11.5	1.0	3.5	-	
9	28.4	75	60	11.5	0.8	3.75	-	
10	29.4	77	59-60	11.5	0.8	3.5	19.7	
10					8.4	37.2		

Table 5. Drying Result on Fresh Ear Corn (Test No. 4)

Time	Temperature (°C)	R.H. (%)	Temp. of heated °C)	Ps (mmWG)	Fuel Consumption		Moisture Content (%)
					Gasoline (lit.)	Kerosine (lit.)	
0	26.7	79	50	15.0			27.0
1	28.8	67	50	15.5	0.70	2.34	-
2	29.6	68	50	15.5	0.75	2.45	-
3	30.4	63	50	12.0	0.70	2.50	26.0
4	31.4	63	50	12.5	0.70	2.30	-
5	31.7	63	50	12.0	2.75	2.70	-
6	30.2	68	50	10.5	0.75	2.40	-
7	28.5	71	50	10.5	0.75	2.34	24.5
8	28.7	70	50	10.0	0.70	3.10	-
9	26.0	88	50	12.0	0.70	3.10	-
10	25.3	79	50	12.0	0.75	2.40	(Tempering)
	27.5	74	50	10.0	-	-	23.7
11	27.9	70	50	14.0	0.80	3.38	-
12	28.6	68	50	14.0	0.70	2.61	-
13	29.1	62	50	14.5	0.75	2.56	-
14	31.4	54	50	14.0	0.75	2.56	19.6
14					10.25	36.09	

Table 6. Other Factors Shown in the Experiments

Test Number	Unity	1	2	3	4
Weather		Fine, Cloudy later	Fine, Rain later	Cloudy, Fine later	Fine, Rain later
Type of Drier		H. Drier Kanebo	H. Drier Kanebo	H. Drier Kanebo	H. Drier Kanebo
Box Size	m^2	180 x 180	180 x 180	180 x 180	180 x 180
Heaping	cm	45	45	100	105
Fan R.P.M.	rpm	1700	1800	1600	1600
Feeded Weight	Kg.	1050	1143	1787	2050
Pre/Over Blowing	min.	30/15	30/30	30/30	30/30

Figure 1 illustrates Test No. 1 and Test No. 2 on the figure, the drying rate of the shelled corn shows almost an approximate curve, but the efficiency of the drying is a little lower than the circulation type drier. The static pressure is considered rather sufficient for fan ability, so, on these conditions, the fuel consumption can be considered to be in the proper values.

Figure 2 illustrates Test No. 3 and Test No. 4. The drying rate of the ear corn shows different curves with each other.

This is due to the difference of the initial conditions of the ear corn and Temperature of heated air. On Test No. 3, the material was harvested 2 days before the experiment. The moisture content of the cob was so high, about 75%, so that the moisture moved to kernels through germs. Therefore, the appearance of moisture content within kernel, practical moisture content was not considered to contain so much. On Test No. 4 of which material was harvested 1 or 2 weeks before the drying experiment, the drying rate shows an approximate curve. The drying rate on Test No. 3 is considered as the characteristics of ear corn on the heed of harvest. These differences of the drying rates are also influenced by the temperature of the heated air for drying. It is much suitable if the temperature of the heated air is low such as 45°C to 50°C. The heated air of temperature causes unequal dryness between the upper and the parts of the drying box, because it is so difficult to mix the upper and the lower parts of the ear corns, in order to keep the static pressure sufficient, the heaping height must be more than 110 cm.

The heaping height of the ear corn, which desired to feed the drier, is more than 110 cm, until 150 cm maximally, depends on the static pressure.

Figure 1.

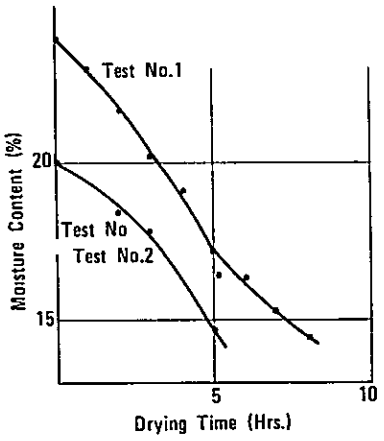
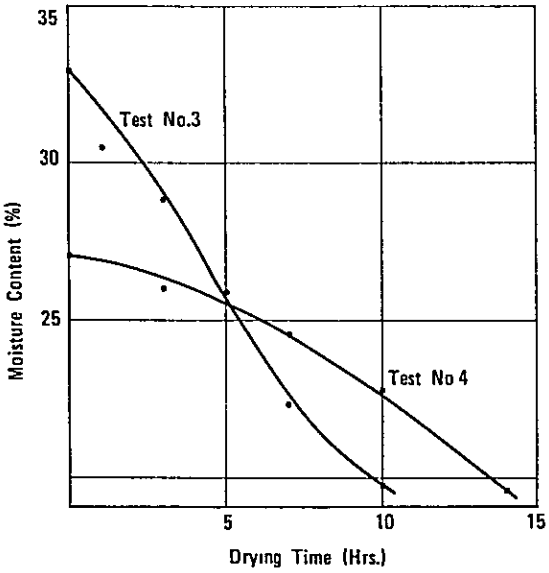


Figure 2.



And this was the main point for the experiment. The effective static pressure, in accordance with the fan character, is so important because it influences the consumption of the fuel and the uniformity of the ear corn dryness.

On comparison with the fan character itself, the static pressure is supposed to be very low, it is derived over blowing, then the fuel consumption will be larger. Suppose the static pressure is very high, the dryness uniformity cannot be obtained because the heated air is resisted by the drying material so that it is not easy to pass off. So, if different materials are dried by the horizontal drier which is equipped with a fixed fan for some materials, the static pressure should be adjusted to the heaping height, so that the drier can be utilized effectively and economically.

Finally, tempering operation is very important on drying ear corn. It is also important in drying cassava and peanuts as mentioned in the later report. The operational method is not difficult, just stop all operations and store the drying material in the same drying box.
During this term/period, the moisture in the cob is moved outside by a force which appears as the result of the difference in dryness between the outside and the inside parts. Later the moisture content in the material is approximately in equilibrium. The drying operation is started again until the next stop. The tempering operation is repeated until the final moisture content is reached. According to the experiments, the tempering terms, which are desirable, are confirmed to be more than 5 hours.

4.3. Result on Drying Cassava

The experiment on drying cassava was requested by Mr. Soepadrijono, Chief of Agricultural Extension Service Kabupaten Malang, because cassava production, which is harvested during the rainy season, is very difficult to dry and easily perishable with black colour. The harvest time of cassava is almost in the dry season. But, some areas south of Malang where the people plant cassava only on the dry field in all seasons, still need to dry cassava in the rainy season. According to the survey, after harvest, cassava generally is cut horizontally or vertically, such as to be cut into round slices after being skinned, and then it is driered, by exposing to the sunshine, on the drying floor.
If it always obtains enough sunshine, such as in fine days, the cassava chip will be dried in 5 to 7 days. But if the weather is unfavourable, the cassava chip will be perishable and become discoloured (black) on the first day of the drying term as mentioned proviously.

The dried cassava chip has white colour. Generally, it is called gaplek in Indonesia. A large amount of dried cassava chip is exported to West Germany. But, of course, the dried discoloured cassava chip cannot be exported anywhere.
According to a book issued by the Minister of Agriculture, we can know the following matters. (Table 7).

Table 7 The Matters of Cassava

Ketela Pohon	100% Root Cassava
Ketala Pohon Kupasan	80% Skinned Root Cassava
Gaplek	45% Dried Chips
Tepung Kanji	30% Powder (Tapioca)

However, there is no description concerning the moisture content.

The drying experiment was done by using the horizontal drier. The material for this experiment, 920 Kg. of skinned cassava root, was supplied by Kebun P2 Pagak, which is under the control of the Agricultural Extension Service Malang. The skinned cassava roots were out into round slices by a hatchet and then the round slices are fed into the drier's box. The drying matters are shown on Table 8.

Table 8. Drying Matters

1. Material	
Skinned cassava roots	920 Kg.
Moisture Content (Checked by Kett Infrared ray Moisture Tester)	49.2%
Average size of chips: Diameter	55 ϕmm
Length	46 mm
2. Specification of the drier	
Horizontal drier with heated air	
Fan R.P.M. (Initial)	1.600 rpm
Static Pressure (Initial)	16 mmWG
Air Quantity (Initial)	
Heaping height (Initial)	45 cm

The results of drying experiment are shown on Table 9.

Considerations

According to the results on Table 3, the following matters and problems are to be considered:

(1) The static pressure is not satisfactory because of the limited volume of the rough material. Therefore, it is desirable that the heaping height should be added to reach about 80 to 90 cm. The maximum heaping height, of course, can be obtained by heaping one more step on the side boards of the box (drier box).
The gaining enough static pressure will suppress over blowing and restrict the fuel consumption for heating. Thus, we use the drier economically.

(2) The skinned cassava roots were cut into round slices of which length was about 4 to 5 cm, but it is better to dry

those of which length is abour 1.5 to 2 cm, such as sliced chips. The cutting is not a problem on slice method.

(3) The heaping height is decreased by the dried material.

Table 9 Result of Drying Experiment on Cassava

Drying Time (Hour)	Tempera-ture (°C)	R.H. (%)	Fan RPM (rpm)	Temperature of heated air (°C)	Fuel Consumption		PS mmWG	Heaping Height (cm)	Moisture Content (%)
					Gasoline (lit.)	Kerosine (lit.)			
1	-	-	1600	60	1.4	6.0	11	45	49.2
2	-	-	1400	60	0.9	5.0	7.5	40	-
3	32.3	66	1380	60	0.8	3.5	8	-	-
4	34.6	60	1390	60	0.85	4.25	7	35	-
5	34.1	60	1400	60	0.9	4.2	7.5	-	-
6	35.8	51	1400	60	0.9	4.3	5	30	27.3
	Misture								
7	28.8	68	1300	60	0.82	4.5	8	30	-
8	29.0	67	1300	60	0.8	4.5	9	30	-
	Tempering								
9	32.8	57	1250	60	0.9	4.75	7.5	28	-
10	34.2	52	1260	60	0.9	5.0	8	-	22.4
10.5	-	-	1250	60	0.3	1.5	7.5	-	-
	Tempering								
11.5	30.0	73	1100	60	0.84	4.75	-	28	-
12.5	30.2	79	1150	60	0.85	4.9	-	-	-
	Mixture								
13.5	38.0	75	1150	60	0.82	4.15	-	-	-
14.5	37.2	80	1130	60	0.8	4.4	-	25	-
	Tempering								15.6
15.5	34.0	59	1020	60	0.8	4.5	-	-	-
16.5	32.2	54	1230	60	0.8	4.25	7.5	-	12.5
17.5	34.2	48	1230	60	0.8	4.35	-	25	-
									12.4
17.5					15.18	80.80			

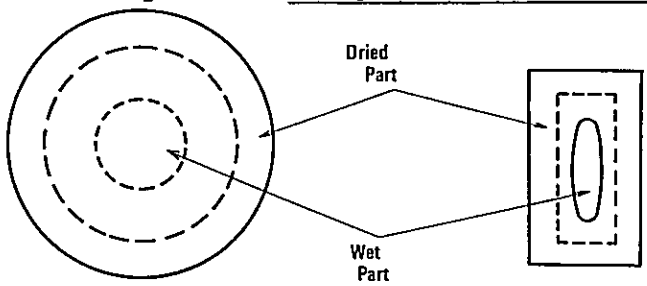
Blowing air quantity should be decreased by the operation of the fan depending on the decrease of the heaping height, namely, the operation of the fan should be reduce to de-crease the air quantity step by step. However, it is difficult to discuss the pattern of the decreasing operation on a one experiment only. Therefore, at present skilled operation is needed for drying.

(4) The temperature of the heated air was constant, 60°C, for this experiment. As has been previously mentioned, the temperature of the heated air is increased following the

decrease of the fan's R.P.M. So, the drying system is considered to leave an increasing air temperature in itself, but it cannot be decide because of the fuel consumption.

(5) As has been previously mentioned in the cassava drying, the most important factor is tempering operation. The distribution of the moisture, after being dried for 4 to 5 hours, is considered that the parts which are close to the surface are dried already and those which are close to the inside are still held moisture as much as the origin as shown on Figure 3.

Figure 3 The condition of the moisture distribution on chips after being dried for several hours.



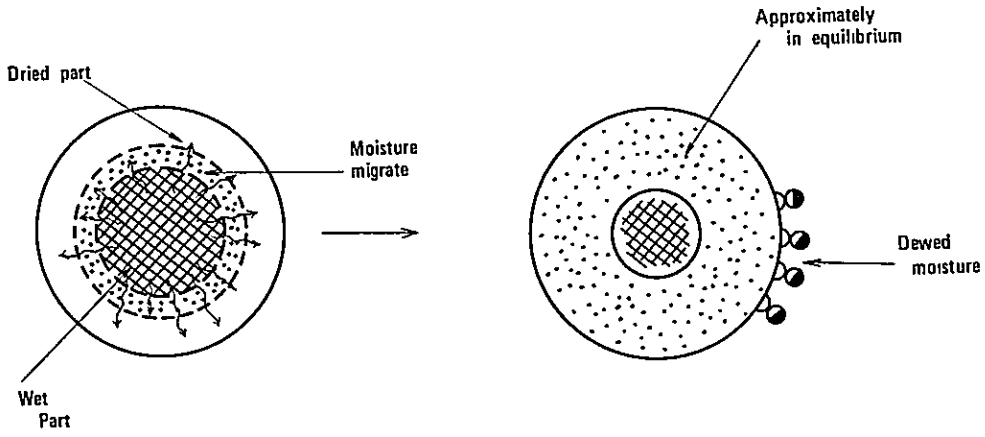
Continual drying in this conditions will only improve the lowerness of the efficiency. So, at this time the blowing of the heated air is stopped, then the heated chips are left alone until the moisture distribution is approximately in equilibrium inside the chip itself. This operation is called tempering operation. Then, in accordance with the observation, it takes 5 hours or more to dry the chips.

Figure 4

Tempering in facsimile

After dried

After tempering



(6) The moisture content of the dried chips was 12.4%. On calculation, as has been previously mentioned on Table 7, the moisture content of the dried chips will be 11.1%. So, the dried chips was to be less dry than the calculation. However, there is no problem on quality after the chips are stored for a month in cotton bags.

(7) The total expense of the drying operation was Rp. 34,838, which consist of Rp. 2,238.38 for fuel and Rp. 1,200.- for the labourers. This means that the drying cost of 1 Kg. dried cassava chips is Rp. 6.47. It is rather expensive, because the price of the dried cassava chips per Kg. is only Rp. 10,- to Rp. 11.- So, the mechanical drying for cassava is recommended in emergency only, such as in the rainy season. Some more experiments are desired in order to get opportunities to consider the results in connection with the drying pattern.

4.4. Result of Peanut Drying

One of the effective utilizations of the horizontal drier is for drying peanut. The price of peanut is generally about Rp. 250,- to Rp. 340,-/Kg. for shelled peanut and the unit price is expensive enough.

According to the pre-experiment, where the fresh peanut with 37.1% moisture content was dried until its moisture content was 12.6%, the 475.2 Kg. of fresh peanut was reduced into 283.5 Kg. of dried peanut. The time needed was 14 hours and the fuel consumption was 13 litters of gasoline for drive engine and 24 litters of kerosine for air heating. The static pressure was 25 mmWG on initial. This is a little lower than stated in the specification because the heaping height was only 30 cm. The important factor was to confirm the tempering operation once at every 4 to 5 hours. The drying matter is shown on Table 10.

Table 10 Drying Matter

1. Material	
Fresh peanut with shell	750 Kg.
Moisture Content	44.3%
2. Specification of the drier	
Horizontal drier with heated air	
Fan R.P.M.	1750 rpm
Static Pressure (Initial)	34 mmWG
Air Quantity (Initial)	11.07 m^3/min-qw.
Heaping height (Initial)	55 cm

The result of the drying experiment is shown on Table 11 and the result of other factors is shown on Table 12.

Table 11 Drying Results on Peanut

Time Equipped (Hour)	Tempera-ture (°C)	R.H. (%)	Temperature of heated air (°C)	PS mmWG	Fuel Consumption Gasoline (lit.)	Fuel Consumption Kerosine (lit.)	Moisture Content. (%)
0	29.0	72.5	45	34	0.4	-	44.3
1	27.6	72.	45	29	0.8	2.0	41.5
2	28.4	69.	44-45	29	0.9	2.2	40.6
3	28.4	67	42-45	30	0.8	2.3	38.4
4	28.8	64	45	27	0.9	2.5	37.4
			Mixed and Tempering				
	25.4	80	45	25	0.5	-	40.1
5	27.4	58	45	29	0.8	2.6	39.6
6	28.8	55.5	44-45	28	0.8	2.6	36.6
7	29.6	55	45	26	0.9	2.5	33.5
8	31.0	45	45	25	1.0	2.5	30.1
9	30.4	48.5	45	26	0.9	2.6	29.8
			Mixed and Tempering				
	27.0	65	45	28.5	0.4	-	30.9
10	28.3	52.5	45	25	0.9	2.5	27.7
11	28.8	51.5	45	22	1.0	2.7	26.3
12	27.0	63	45	22	1.0	2.5	21.6
13	29.0	62	45	25	0.9	2.5	20.6
14	33.0	45	45	25	0.95	2.5	20.1
			Mixed and tempering				
	25.4	71.5	45	22	0.8	-	21.7
15	29.5	66	45	25	0.9	2.4	20.7
16	30.4	69	46-45	27.5	0.8	2.4	17.5
17	32.1	62	46-45	25	0.9	2.5	14.9
18	31.6	48	45	27	0.9	2.5	13.9
19	32.5	51.5	45	26	0.9	2.5	12.4
19					19.05	46.8	

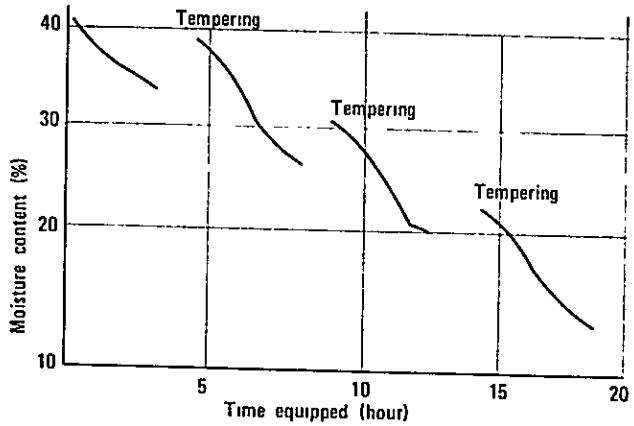
Table 12 Result of Other Factors

(1)	Weight of dried peanut	385.3 Kg.
	Weight of other materials (dust, soil)	65.7 Kg.
(2)	Final Moisture Content of dried peanut	12.8 %
(3)	Rate of seed	68.1 %
	Rate of shell	30.4 %
(4)	Rate of immature grains	3.6 %
(5)	Germination rate	92.7 %
(6)	Germination rate by solar dry	86.7 %

The experiment at that time was done for seed production, that is why the temperature of the heated air was up to 45°C only. Generally, the drying of seed grains should not be done by using high temperature, such as drying by the use of horizontal dryer where the temperature of the grain is up to 40°C. Seeds are difficult to germinate when dried by the use of high temperature. If the seeds are covered by thick shells, the temperature is allowed to make little high, not much. Grains for consumption are allowed to dry in high temperature in accordance with the grains conditions, such as whether covered by shell or not. (bare).

The static pressure was not satisfactory in the pre-experiment due to the lessness of the material amount. So, the heaping height was set to reach 55 cm, then the initial static pressure got was 34 mmWG, that is quite enough.
In using the horizontal drier, for peanut dry it is desired that the heaping height is set around 50 to 55 cm, so that the drying can be considered as effective on the feeded amount and economic on the drying expense.
In the case of peanut drying, tempering is important operation. The drying result is able to switch as shown on Figure 5.

Figure 5 Drying Curve of Peanut



It is known that after every 5 (five) hours, there is a tempering time, because the rate of drying reduction is found out to be slow on every period of drying curve, and the time equipped of the tempering is considered to be 5 hours more. The drying of the grains for consumption are allowed to dry more quicker, because of the reason that it will not easy to be destructed by germs. The drying cost was about Rp. 8.26/Kg. for dried unshelled peanut on rough calculation. So, the drying cost of the shelled peanut will be about Rp. 12.86 on calculation.

Finally, more experiment are desired to continue this experiment in order to know more factors on drying of peanut grains for consumption and to be sure of the tempering pattern.

5. AN EXPERIMENT ON THE OPERATING PROCESS OF QUALITY CONTROL FOR MAIZE

During the harvest time of season in 1973, we had an experiment on small scale concentrated processing operation at Desa Dengkol in Malang area. The purpose of the experiment by concentrated processing operation is:

1) The reduction of the processing costs.

2) The progress of the quality.

The operating process in related as follows:

5.1. The collecting of maize

Fresh ear-corns are carried directly from the fields into the processing warehouse by the farmers themselves and then weighed by the Agricultural Cooperative officers together with farmers.

The average field dimension that joins the Project is 0.2 Ha, so the repayment is about 89 Kg of dried kernels or equals to 180 Kg of fresh ear-corn. It is not so difficult for the farmers to carry the ear-corn into the processing warehouse by themselves.

5.2. The First stage of drying

The fresh ear-corns mentioned are dried for one day by spreading them on the drying floor. According to the last experiment at Sujati, the drying reduction is only 0.9% per day. But, considering the shifted moisture from cobs, because the cobs are dried and the moisture in the cobs shift to kernels on equilibrated moisture method, the moisture content of the kernels is not reduced much on initial moisture content. However the joint points of the kernels and cobs are brittle on this process, so that the kernels can be shelled easily. The first drying is repeated every day in accordance with the capacity of the drying floor. In case of Dengkol Agricultural Cooperative, its drying floor daily capacity is about 3.5 tons of ear-corn.

5.3. Shelling

The ear-corns that have been dried for one day are shelled by rotary type corn sheller. The growth of the broken kernels is very less although the moisture content is high. The capacity decreased a little. However, if we compare it with hand shelling, the rotary type corn sheller's capacity is more effective and the growth of the broken kernels is smaller.
In using hand sheller, the maximum broken kernels of 37 is got, because the kernels are easily damaged by knife or sickle as used in the traditional method.

Table 1 Comparison between mechanical and hand shellings

	Broken Rate	Capacity	Cost
1. Rotary type corn sheller	1.8%	640 Kg/Hr.	Rp.0.19/Kg
2. Hand shelling	4.9%	150 Kg/Hr.	Rp./0.60/Kg/Person

Note:
The moisture content of the kernels was 26.7% after being dried for one day.

Shelling operation is done out-of-doors, and after shelled corns are spread directly on any space of the drying floor because of complementary dry.

5.4. The Second Stage of Drying

The shelled corns are dried by using a horizontal or a vertical drier, depends on the daily shelling amount, until the final moisture content is reached. It takes about 6 to 8 hours to reach the final moisture content, which is 14.5%. However, since all the amount of the corn repayment should be sold in the local market as ordered by the Government, the shelled corns were dried until its moisture content was 16%, which took about 5 to 7 hours of drying.

5.5. Selection

The selection of the corn is done by the use of winnower such as the one produced by OHYA, which can winnow broken kernels. According to the trial, the winnowed corn kernels are supposed to contain 20% of broken kernels, the broken kernels which remain within the selection (selected corns) was only 1.4%.

5.6. This process in operated on one unit for two days. The cost of the operation, as compared with the traditional processing (5 days dried), is shown on Table 2.

Table 2 Processing Cost

		1st Stage Drying (Rp.)	Shelling (Rp.)	2nd Stage Drying (Rp.)	Selection (Rp.)	Total (Rp.)	Days Needed
Experimental Processing	Operation Cost	-	115,-	690,-	60.-	1,465	3
	Labour's Cost	300.-	Contain 1st & 2nd drying	300,-	Contain 2nd drying		
Traditional Processing 1)	Labour's Cost	300.-	1,560.-	450.-	Contain 2nd drying	2,310	6
Traditional	Labour's Cost	-	5,200 13,000	600.-	Contain 2nd drying	5,800	8

Note:

i: The dispose amount is 2,600 Kg. each.

ii: Labourers for hand shelling are presumed to be available about 15-20 per day.

5.7. Consideration

The processing cost, for drying corn, is calculated as Rp.0.86/Kg. In the experimental processing, Rp.0.89/kg. in the traditional processing (1), and Rp. 2.23 - Rp. 5.23/Kg. in the traditional processing (2). Therefore, the experimental processing is much cheaper than the cost of the traditional method. And also, in order to reach the final processing, the traditional methods take more than 6 (six) days, even if the labourers are available for shelling such amount per day. On the traditional processing (2), it takes 4 (four) days more as excluding the time needed for hand shelling in the night time.

And then, both traditional method are too difficult to avoid quality deterioration. On the other side, if the shelled corns are dried by mechanical method, the machine can process a certain corn amount in accordance with the capacity of the drying floor.
Table 3 shows the comparison of the processed corn quality in using the traditional method and the mechanical method.

Table 3 Comparison of the processed corn quality

	Moisture Content (%)	Broken Kernel (%)	Damaged Kernel (%)	Foreign Material (%)
Experimental Processing	16.4	1.9	2.5	0.7
Tradition Processing	16.2	2.6	18.7	1.4

That production was sold in the local market and the price of the production by the experimental processing was 1.25 - 5% higher than others.

The trial was prepared on a small scale concentrated processing as Desa unit. It needs to be estimated and confirmed in the future. The experimental concentrated processing is considered to have an effect on carrying out processing on a small scale cooperation such as the primary agricultural cooperative and B.U.U.D.

6. THE EXPERIMENT ON MECHANICAL CORN SHELLER AND THE INVESTIGATION ON THE RESULT OF HAND SHELLING

6.1. Many kinds of shelling method are done in the Project areas. On general, the fresh ear corn is shelled by hands and the dried ear-corn is shelled by hands by using simple tools such as knife, sickles and "pasrah", a traditional tool.

In the mechanical method, the fresh ear-corn is shelled by the high moisture corn sheller and the dried one is shelled by the rotary type corn sheller or the gear type corn sheller which is well known as corn separators.
The experiments and the investigations are intended to know technical factors. On the other side, the shelling of dried ear corn for seed is done by hands as well as by mechanical shelling. For example, the dried ear corn is shelled by corn separator in the Agricultural Development Center, Bedali, and at B.U.U.D. Pagu II, in Kediri, it is shelled by the rotary type corn sheller.
Anyway, for seed production, the shelling must be done carefully. Only at Sujati Seed Farm, Malang, the fresh ear corn is shelled by hands by the use of sickles (for seed). After investigating, it was found out that the germination rate was only about 74 to 77%.

The experiments and investigations at this time are done on maize for consumption only.

6.2. The investigation on the traditional shelling method shows that shelling by using simple tools is able to shell 150 Kg./day/person with about 7 to 8 hours working time. The broken kernel is found as showed on Table 1 below.

Table 1 Analyses Result on Hand Shelling with "Pasrah"

No.	Fine Kernels	Broken Kernels		Immature Kernels
		Large	Small	
1	96.8	2.2	0.5	0.5
2	96.7	2.5	0.4	0.4
3	96.8	2.3	0.3	0.6
Average	96.8	2.3	0.4	0.5

In the case of the dried ear corn which is shelled by hands by using knives, the broken kernels are not found so much, only a little damaged or scratched. However, this method can only shell about 50 Kg./day/person with 7 to 8 hours working time.
Shelling ability by hands, which was done by the workers on fresh ear corns, was observated and the result, averagely, is shown on Table 2 Figure 1.

Table 2 Shelling Ability by Hands

Time (Hours)	1st	2nd	3rd	4th	5th	5 Hours Average
Average weight of kernels (Kg.)	5.13	4.00	3.70	3.30	3.84	3.99

Shelling ability decreases following the working time because of fatigue. The average ability is considered to be about 4 Kg./Hour for fresh ear corn. This result confirms that fresh ear corn is able to be shelled about 25 to 30 Kg. per day with 7 to 8 hours of working time.

When the hand shelling is done by the use of simple tools such as spatulate steel, which is able to husk too, the shelling ability is increased from 5.25 Kg./Hour, by hands only, to 7.58 Kg in the first one hour.

But, the broken kernels found are so much as shown on Table 3 below (for shelling fresh ear corn).

Fig. 1. Shelling Ability by Hands

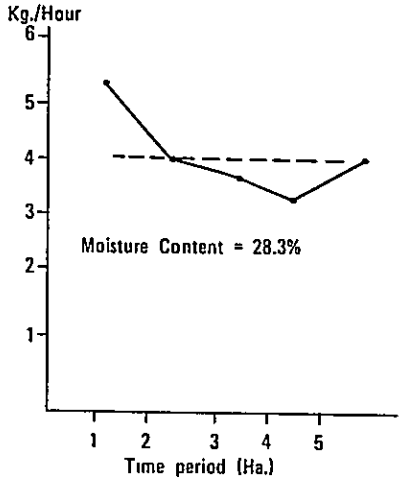


Table 3 Analyses on Hand Shelling with Simple Tool (knife, sickle)

on Fresh Ear Corn

No.	Fine Kernels (%)	Broken Kernels		Immature Kernels (%)
		Large (%)	Small (%)	
1.	57.6	37.6	4.5	0.3
2.	62.2	35.8	1.9	0.1
3.	60.0	37.6	1.9	0.5
Average	59.9	37.0	2.8	0.3

In any case, the shelling is not effective and uneconomical, because the shelling cost is about Rp. 75.- per day with-out any connection to capacity. Suppose the shelling of fresh ear corn is paid Rp. 5.-/Kg., of dried ear corn is paid Rp. 1.- to Rp. 2.-/Kg. and the shelling with the use of traditional tools is paid Rp. 0.50/Kg., the workers, who are almost women and children, want to be able to get the total payment of Rp. 75.- per day.

6.3. The mechanical shelling was tried in order to know the ability, capacity and economy of the two kinds of corn shellers, namely, the rotary type corn sheller and the gear type corn sheller, which are usually called corn separators. The two kinds of corn shellers are able to shell dried ear corns of which moisture content is around 18 to 21%.
The result of the experiment on the rotary type corn sheller is shown on Table 4 and the result on gear type corn separator is shown on Table 5.

Table 4 The Result of the Experiment on Rotary Type Corn Sheller

Test No.	Fed Weight (Kg)	RPM (rpm)	Time Equipped (min)	Weight of kernel (Kg.)	Weight of cob (Kg.)	Moisture Content (%)	Fuel Consumption (cc)	Capacity (Ton/Hour)
1.	500	400	29	421.5	77	19.4	600	1.03
2.	547	400	30	466.0	79.5	19.5	650	1.09
Aver.	523.5	400	29.5	443.8	78.3	19.5	625	1.06

Table 5 The Result of the Experiment on the Ability of Corn Separator

Test No.	Fed Weight (Kg)	RPM (rpm)	Time Equipped (min)	Weight of kernel (Kg)	Weight of cob (Kg)	Moisture Content (%)	Fuel Consumption (cc)	Capacity (Ton/Hour)
3.	100	300	13	81	18.6	20.8	125	0.462
4.	100	400	12	82.1	17.8	20.5	95	0.500
5.	100	500	7	81.6	18.1	20.6	80	0.857

The analyses result is shown on Table 6 below.

Table 6 Analyses Result (%)

Test No.	Fine Kernels (%)	Broken Kernels		Foreign Materials (%)	Immature Kernel (%)
		Large (%)	Small (%)		
Aver.1 & 2	98.2	0.5	0.9	0.2	0.2
3	97.8	0.6	1.0	0.4	0.2
4	98.2	0.5	0.4	0.8	0.1
5	98.5	0.0	0.2	0.1	0.2

In another side, the corn shelling were also tried on their operating ability. 2,000 Kg. of dried ear corn, of which moisture content was 18.7%, was shelled within 92 minutes and the fuel consummed was 0.9 lit./hour. The broken kernels found was consisted of 0.3% of large broken kernels and less than 0.1% of small broken kernels.

The ability of the corn shellers is influenced by the ear corn conditions and the moisture content, especially on broken kernels. In any case, compared with the hand shelling, the broken kernels found is very less. The capacity is considered to be about 1 ton/hour of shelled grains. Suppose 4 laborers are needed for the operation and 5% of fuel expense is charged for maintenance, the shelling cost will be about Rp. 0.13/Kg. This expense is only 26% of the shelling cost by using "pasrah" and 7 to 13% of the usual hand shelling cost.

Test No. 5 of tables 5 and 6 shows that the ability of the corn separator is the best at.500 rpm of gear revolution. The

capacity is about 700 Kg/hour of shelled grains. The fuel consumption is about 0.69 lit./hour. Two workers are needed for the operation. So, the shelling cost is about Rp. 0.11 per Kg.

The germination rate obtained was about 98% on both corn shellers in shelling dried ear corns.
From the result of the experiments and investigation, we come to the conclusion that the mechanical shelling is more effective, economical and is able to give better germination.

The rotary type corn sheller, which is equipped with gasoline and dieselengines is recommended to be utilized for consumptive corn shelling, and the gear type corn separator, which is equipped with diesel engine, is recommended to be utilized for seed production as well as consumptive corn shelling.

7. A CONFIRMATIVE ABILITY TEST ON HIGH MOISTURE CORN SHELLER

7.1. The ability test is done in order to confirm the ability of the high moisture corn sheller, that was developed for shelling fresh ear corn on the spot of East Java, Indonesia.

The main object of the test is confirmation on broken kernels as it is shelled a spot ear corn, Materials, fresh ear corn, was supplied locally such as Genja Sila variety that passed two days after harvest.

(1) Specifications

High Moisture Corn Sheller; Model CS - 400 B manufactured by Kanebo Agricultural Machine Co., Ltd.

Size:	Total length:	2180 mm
	Total width:	1040 mm
	Total height:	1490 mm
	Total weight:	600 kg
Feeding:	Feed table	Reciprocating motion
Shelling:	Drum diameter x width	330 x 385 mm
	Drum revolution	500 rpm
Cleaning:	Fan blade, diameter	400 mm
	Fan revolution	1000 rpm
	Sieve area	0.64 m^2
	Sieve amplitude	65 mm
	Sieve vibration	250 cpm

(2) Material

Local variety fresh ear (Genja Sila) harvested on first raining season in 1973, at Malang area.
Moisture content 25.9 - 30.0% and 20.4% (Dried ear corn).

7.2. Testing Method

The material, fresh ear corn, is prepared, each 50 Kg., and is fed into the feed table from a bag which is held by the labour's hands. The revolution per minute of the drum shaft was run at 500 rpm in accordance with the instruction book.

According to the pre-test, the clearance between the drum and the corncave got the best result on maximum clearance. So

the ability test is also done by the same clearance.
The time is counted during the ear corn is passed into the corn-cave and drum.
A sample for analysis is caught by a tray on the out let divided several times during kernels are coming out. The analysis is done by hand picked method, because there is no grading sieve.
After the analysis, the fine kernels are prepared for germination test.

7.3. Result of the Test

No.	Time Required	Moisture Content	Weight of Projected Kernel	R P M	Capacity	
	Second	%	Kg.	rpm	Ton/Hour	
1.	90	27.5	38	485	2.00	
II.	85	27.5	38.5	490	2.12	
III.	31	27.5	38.5	490	5.81	Max Test
IV.	32	27.5	38	495	5.63	Max Test
V.	-	29.0	-	495	-	
VI.	86	20.4	39.5	485	2.09	
VII.	84	20.4	39.0	485	2.14	
VIII	85	20.4	39.5	485	2.12	

(Table 1)

Size of Ear Corn

No.	Longth	Diameter			Weight	
		L1	L2	L3		
	mm	ϕmm	ϕmm	ϕmm	g.	
1.	121.0	29.0	36.0	24.0	77.9	Average
2.	159.5	37.3	38.3	31.4	138.9	Maximum
3.	65.0	24.0	31.4	29.0	27.0	minimum

(Table 2)

7.4. Result of Analysis

No.	Moisture Content	Fine Kernel	Large Broken	Small Broken
1.	27.5	94.9	4.4	0.7
III.	27.5	94.4	4.8	0.8
Aver.	27.5	94.7	4.6	0.7
V.	29.0	93.8	5.7	0.5
VI.	20.4	94.7	4.7	0.4
VII.	20.4	96.4	2.9	0.7
VIII.	20.4	95.5	4.3	0.4
Aver.	20.4	95.5	4.0	0.5

(Table 3)

7.5. Result of Germination Test

No.	I	II	III	Average	
1.	84	92	88	88	Test No. I on Table 1
2.	92	89	95	92	Test No.VI-VII on Table 1
3.	100	98	99	99	Shelled by hands

7.6. Consideration

(1) The capacity was contented with the result of the ability test in Japan. It was about 2 tons Hour more for fresh ear corn.

(2) The rate of the unshelled was not inspected on the data, but it seemed very less.

(3) Fuel consumption was not available exactly because of the limited amount of the material.

(4) There is no inspection on grain grading in Indonesia at present; people inspect the grain just by looking with their eyes.
On the result of analysis, the ratio of the large broken kernel was averagely 4.6% at 27.5% of moisture content, and 5.7% at 29.0% of moisture content.
Of course this ratio is allowed to be counted as kernel on export standard, but such a large rate of broken is considered to be undesirable on agricultural extension because the rate of the broken kernel is so conspicious that the people is anxious so much as they see it when they take it on their hands.
Suppose the inspection standard will be established in Indonesia, this will be recognized in the near future.

(5) On germination test, the germination's rate was so less (little). That is why, this corn sheller is not allowed to be utilized for seed production as at Desa Bulupasar, in

kediri area.

(6) We suppose extend the high moisture content, we must consider and operation system that is consolidated to drying, transportation, operation space and labourers.

So, it is recommended that the equipments will be utilized in Kediri and Banyuwangi areas.

8. ABILITY TEST OF WINNOWER

8.1. Purpose

There are so many winnowers that were supplied under the Colombo Plan programme. According to the instruction paper, it is shown the capacity is 1,000 Kg./Hr. and the main shaft revolution is 250 - 270 rpm, for paddy. However, it is not suitable for maize. So, a test on the ability of the winnower is carried out to know its capacity and main shaft revolution for maize grains.

8.2. Trial Method

The material prepared was maize grains which content 15.8% of large broken kernels and 10.6% of small broken kernels. For pre-test, we feeded some of the material into inlet hopper and observed selected on the outlet with variant main shaft revolution. The result of the pre-test is that we could get fine selection for about 800 - 1,200 Kg./Hr. capacity and about 400 - 500 rpm of shaft revolution.

Therefore, the trial was done on 400, 450, and 500 rpm of main shaft revolution with some flouring about 1,000 Kg./Hr., and also on 600, 800 and 1,000 and 1,200 Kg./Hr. Capacity with 450 rpm.

The test of the fuel consumption was done by 450 rpm of main shaft revolution with some flouring about 1,000 Kg./Hr., and also on 600, 800 and 1,000 and 1,200 Kg./Hr. capacity with 450 rpm.

The test of the fuel consumption was done by 450 rpm of main shaft recolution and about 1,000 Kg./Hr. capacity using 375 Kg. of material.
Analysis was selected by hand picked method.

8.3. Result

The result is shown on Table 1 below.

Table 1. RESULT OF THE TEST

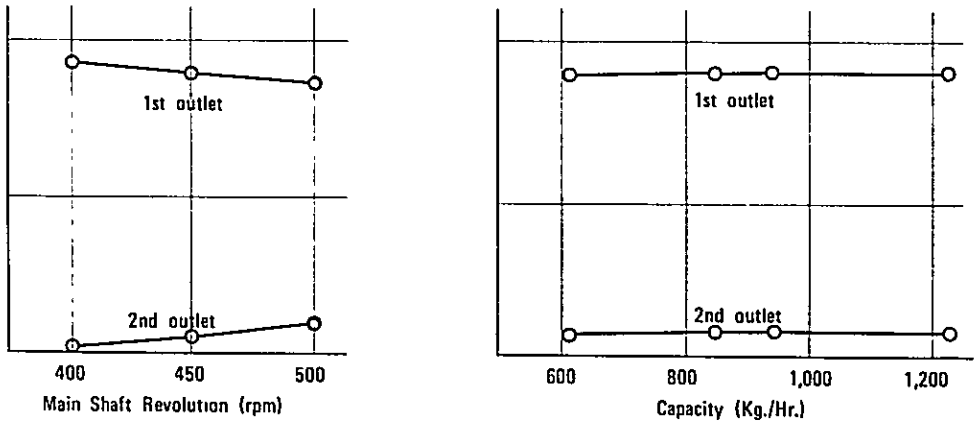
No.	Revolution of Main Shaft (rpm)	Capacity (%)	Separation Percentage (%)		** Analytic Result of fine Grain (%)	Large Broken (%)	Small Broken (%)	Foreign Material (%)	Imma ture (%) **
1.	500	1,137	I	88.2	83.3	2.1	8.7	0.3	5.6
			II	10.9	0.6	5.4	88.6	3.7	1.7
2.	450	1,114	I	92.2	94.4	1.7	3.0	-	1.9
			II	6.0	5.6	15.7	73.7	2.4	3.6
3.	400	1,102	I	94.5	90.7	2.4	2.3	-	4.5
			II	4.3	35.5	7.5	49.8	1.6	5.6
4.	450	610	I	90.5	90.2	2.5	6.5	-	0.8
			II	7.2	6.6	9.6	79.7	1.9	2.2
		844.5	I	90.4	93.4	1.9	3.3	-	1.4
			II	8.3	8.6	8.8	80.4	0.9	1.3
		935	I	91.3	93.1	1.4	4.3	-	1.2
			II	7.2	8.2	8.1	81.1	1.0	1.6
			I	91.5	93.3	2.4	3.0	0	1.3
			II	6.8	7.8	6.9	82.6	0.8	1.9

The difference of the separation percentage between the 1st and the 2nd outlet was blown out from the exhaust outlet as foreign material, husk and crashed cob.

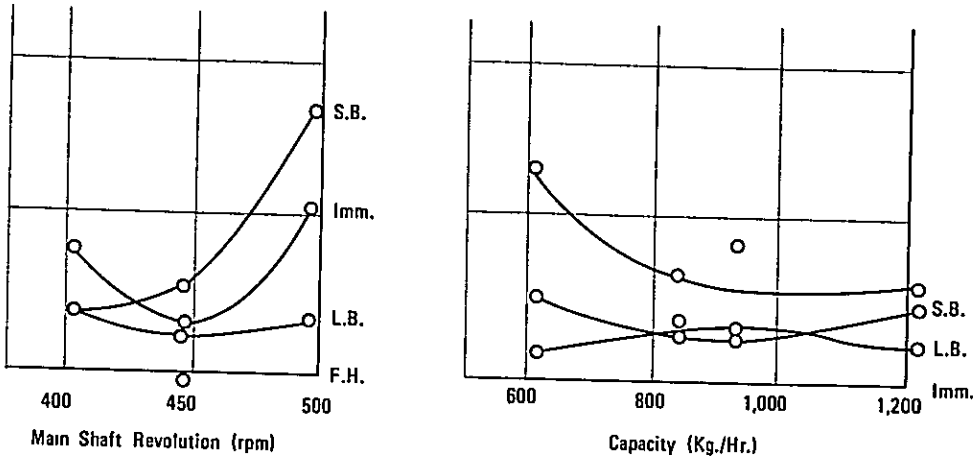
8.4. Consideration

(1) The winnower can be utilized effectively at 450 rpm of main shaft revolution and 900 - 1,000 Kg./Hr. capacity as shown on Table 1.
The results on table 1 are drawn on Figure 1.

Separated Rate on the First and the Second Outlets



Rate of Analytic Result



(Figure 1). Rate of Separation on the 1st and 2nd outlet and Rate of Analytic Result.

(2) The consumption of the fuel was only 0.78 lit./Hr averagely, and it was not so influenced by the revolution and the capacity but by the characteristics of the farm itself.

(3) Only 2 (two) labourers were needed, one for feeding the winnower and the other one for collecting and packing into bags.

**********Mha**********

CHAPTER Ⅶ MARKETING IMPROVEMENT

By E. KOCHI

I. INTRODUCTION

Maize Project East Java started in April, 1968 on the basis of the Record of Discussion between the Government of the Republic of Indonesia and the Government of Japan which was signed on the 16th of December in 1967. After three years, the Project was extended for another three years on the basis of the new Record of Discussion between both Governments, signed on the 2nd of April in 1971.

During 6 years, the Project was implemented 6 times during rainy season in five Kabupatens such as Kediri, Malang, Lumajang, Bondowoso and Banyuwangi. The total planting area, the number of participating farmers and the export and local sale amount of the maize are as follows:

Planting area	: 20,777.310	Ha.
Participating farmers	: 30,782	persons
Export amount	: 3,436.660	tons
Local sale	: 2,277.3	tons

The above number don't include the sixth year, because the sixth year was implemented by the method of Bimas. In the sixth year, the Project was implemented by the Bimas method, but the fertilizer and seed were provided by the Project. The Project areas were limited in five Model B.U.U.D.s areas such as B.U.U.D. Kepung, Pagu II, Puncu, Dengkol and Wongsorejo.

In the first term, the marketing expert of the Project was Mr. TOSHIO SHIMIZU, in the second term EIICHI KOCHI took over his job. Both experts originally belong to ZENNOH in Japan (The National Federation of Agricultural Cooperative Associations) which is the buyer of Project maize.

In this report, I would like to write about our activities and experiences in the implementation of the Project. I am very pleased if this report will be useful for the implementation of the other development projects.

1.1. The Role of the Marketing Activities in the Purpose of the Project

According to the Record of Discussions, the purpose of the Project is mentioned as follows:

(1) Increasing production of maize in the Province of East Java, through improved techniques and their extension.

(2) Improving quality of maize for export produced in the Province.

(3) Rationalizing marketing system of maize for export.

(4) Facilitating business transaction of maize between the two countries.

These four purposes are not in the same level, we understand that the fourth purpose will be achieved through the accomplishment of the first to the third purposes. So, to facilitate the export of maize it is necessary to increase the production of maize, to improve its quality and to rationalize its marketing system. That is, rationalizing marketing system of maize for export is the necessary conditions to attain the fourth purpose.

1.2. The Duty of Marketing Expert

According to the Record of Discussion, marketing expert has to work for marketing improvement of maize. The experts were expected to give technical managerial guidance and advice to the Indonesian authorities concerned. According to the report on feasibility survey of Maize Project East Java, the duty of the marketing expert is stipulated as follows: "Term of Reference of the Experts in Marketing Improvement" Assists the Indonesian authorities in improving and rationalizing the marketing system, mainly in the following activities:

(1) The improve and rationalize the maize marketing system in accordance with the demand in the world market.

(2) To recommend the best organization of the marketing from the production area up to the export harbours.

(3) To recommend and organize the best system of maize farmers cooperation.

(4) To solve the problems and way of all the matters concerning credit, price and farm management.

(5) To train the Indonesian staff in the above activities.

Mr. T. Shimizu had made the greatest efforts to promote maize export from the Project, to establish credit system of the Project and marketing system of maize for export.

To rationalize the established marketing system of maize for export, I (E. Kochi) did my best to reorganize agricultural cooperative organizations (GAKOPERTA, PUSKOPERTA AND PRIMEKOPERTA) in the framework of B.U.U.D. movement (Village Unit of Enterprise Body). The method to reorganize them is to promote "MODEL COOPERATIVES" which have developed into "MODEL B.U.U.D.s".

The activities of both experts are as follows:

A. Suggestions and Reports submitted to the Government concerned:

T. SHIMIZU:

1970 :	April	Trial Analysis of Maize Cost and Price 1. Production Cost. 2. Comparison between Domestic and International Prices.
	April	Agricultural Cooperatives and the Present Agricultural Situation in Japan.
	September	Marketing Suggestion for the Maize Project East Java.
	September	Trial Analysis for Maize Production Cost.

E. KOCHI :

1971 :	August	Milo Production for Export.
1972 :	January	Recommendation (on price support system of maize)
	February	Report on World Marketing of Milo.
	February	Suggestion on Model Primary Cooperative.
	April	Suggestions for the Promotion of Agricultural Cooperative Association.
	June	Report on Correlation between Price and Export Amount of Maize in East Java.
	July	Suggestion for Training of Cooperative Staff and Members.
	August	Report on Net Income of Farmer and the Project.
	November	Suggestion on the Cooperation Agreement of the Implementation of Maize Project East Java with GAKOPERTA "GAJAH MADA".
1973 :	February	Report on Marketing of Milo.
	May	Report and Suggestion on BUUD Promotion.
	October	Report on the Nutritious Composition of Maize and Sorghum in Indonesia.
	November	Tentative Report on the Condition of Maize Exports in East Java (in English and Indonesian).
1974 :	February	Report on the Marketing Condition of Milo (Sorghum) in Japan (English and Indonesian).
	May	Report on the Marketing Condition of Maize in Japan.

B. Lectures for Meetings and Trainings:

T. SHIMIZU:

1970 : April — Lecture at the Upgrading Course of the Co-operative Members at Ketindan, Lawang:

I. Short History of Agricultural Cooperative in Japan.

II. Implementation System of the Agricultural Cooperative in Japan.

III. Suggestion for the Promotion and Maturing Agricultural Cooperatives in East Java.

E. KOCHI :

1971 : October — General meeting of GAKOPERTA delivering an Address.

1972 : April — General Meeting of GAKOPERTA delivering an Address.

September — Cooperative Training at Maize Development Center at Bedali, Lawang : "Concerning the Prosperity of Agricultural Cooperative in Japan".

September — Palawija Workshop, held by the East Java Government : "The Correlation between the Export Amount and price of Maize"

1973 : June — Palawija Meeting at Cipayung, held by the Department of Agriculture

1974 : February — Evaluation Meeting of the Maize Project East Java held by the Agricultural Extension Service of East Java Province at Murnajati, Lawang. Commentator on BUUD promotion and the Marketing of maize.

February — Quality Control Training held by the Central Government at Bedali Center, Lawang. Lecture on Marketing of Maize and the Agricultural Cooperative Movement in Japan.

April — The Seminar on the Production and Marketing of Sorghum, held by the Ministry of Agriculture and the Institute for the Development of National Export.

May — Course of Experts' Knowledge and Technique Transfering, held by the Agricultural Extension Service at Bedali Center, Lawang. Lecturing on the field of Marketing:

(1) Marketing of Maize in Project area in East Java.

(2) Marketing conditions of Sorghum in Japan.

(3) Marketing conditions of Maize in Japan.

(4) Export promotion of Palawija.

(5) Promotion of BUUD in Project area.

(6) Agricultural Cooperative Activities in Japan.

(7) Information on ZENNOH.

(8) Information on UNICOOPJAPAN.

C. Informations & Reference Distributed to the persons concerned:

E. KOCHI :

1972 to 1974 : (1) Price of Maize and Sorghum.

(2) Agriculture and Agricultural Cooperative Movement in Japan.

(3) ZENNOH in Japan.

(4) UNICOOPJAPAN in Japan.

2. THE TARGET OF MARKETING IMPROVEMENT OF THE PROJECT.

2.1. Marketing Conditions of Maize in East Java before the Project:

(1) No active organization to help the farmers' economic activities. Farmers in Indonesia were economically weak, but there were no active organization to strengthen the farmers economic power. At that time, there were many Agricultural Cooperative Associations which didn't work well, some of which were idle organizations.

(2) Maize marketing was monopolized by Chinese merchants (means of Chinese origin Indonesian). Almost all maize marketing was handled by Chinese merchants, such as Tengkulak, Makelar and so on. Almost all exporters of maize were Chinese origin exporters. In districts (Desas), there are many Indonesian tengkulak and merchants, but they only could do business with the aid of advance money from big exporters of merchants staying at big cities such as Surabaya and Semarang.

(3) No competitive marketing of maize in regions and districts. Tengkulak and middlemen refrained from competition on maize marketing to protect themselves. They adopted regional monopoly system, not to compete with one another in dealing in maize and other agricultural products. So often farmers are exploited by tengkulaks and middlemen. The way of tengkulak was the jion system, which was the characteristic of tengkulak system.

Farmers were obliged to have close connection with tengkulak because they had no other financing facilities except tengkulak to lend money to them. They received advance money and were bound and exploited by tengkulaks, but they appreciated tengkulak's activities because only they could help them at need. So they had to get along with the tengkulaks.

(4) Low producers' price of maize without processing. Farmers sell maize without processing except maize for food. So producers' price of maize is low. That is added value of maize is very small because of no processing and no grading. Even if they wanted to process, they had no facilities such as godowns and drying floors and no

equipments such as dryer, moisture tester, scale, corn sheller and so on.

(5) Extension activities for maize were not so intensive because of limited budget. Government extension in agriculture were concentrated into paddy field through Bimas and Inmas Paddy. At that time the Government could not afford to take actions in the Palawija field. To improve the above marketing conditions for maize, the Project adopted the system to give credit of inputs in the form of tertilizer and superior seed, and to collect repayment of maize in kind equivalent to the credit amount. Through credit distribution and collection of maize, agricultural, cooperative organizations were expected to be promoted in order to increase farmers income. So, the greatest strategics of the Project were credit system and promotion of agricultural cooperatives in the field of marketing improvement.

2.2. Target of the Project in Marketing Improvement

To rationalize marketing of maize is not an easy task, and takes a long time. To increase farmers income through rationalizing marketing of maize is also difficult problems. These problems are social, economical, and political problems. So, the effect of the Project is also limited. The target of the Project in promoting maize export was not mentioned clearly at the beginning of the Project. But both T. SHIMIZU and I had a target in our mind, we thought economical export of maize by tramper.

If we could collect 3,000 ton - 4,000 tons of maize at one time, we can hire a tramper, and that we load and unload in bulk. This is the cheapest and best way of maize exportation.

Since the beginning of the Project, T. Shimizu also had the idea to rationalize marketing of maize through the promotion of the agricultural cooperatives in East Java, but his plan was to mobilize the existing organizations into the implementation system of the Project. There was the Project meeting in Jakarta in which Mr. A. Wazir, Director of Production Development of the Department of Agriculture proposed to the Japanese experts to promote agricultural cooperatives in Project area to increase farmers income. I proposed to promote "Model Cooperatives". Then the promotion of "Model Cooperatives" in the Project area was decided at the meeting.

Mr. Wazir's target of Model Cooperatives was to let the cooperatives "bankable". After the meeting, we had discussions among the Japanese experts. We suggested that Model Cooperatives should do all year round business and handle not only maize, but also other agricultural products.

So if we sum up the target to promote "Model Cooperatives", they are as follows:

(a) Model Cooperatives must be bankable.

(b) Model Cooperatives can do all year round business.

(c) Model Cooperatives can handle all kinds of agricultural products.

The target means that Model Cooperatives can stand on their own feet. In the framework of the B.U.U.D. (Badan Usaha Unit

Desa = Enterprise of Village Unit), we found that if a model cooperative developed into a model BUUD, we would fulfill our target.

After the BUUD movement was lunched, Model Cooperative failed to receive credit for purchasing from the B.R.I. (Bank Rakyat Indonesia), because they were not BUUDs. So in the stage of Model Cooperative promotion, the target to promote agricultrual cooperatives got to make model cooperatives into Model BUUDs. The five Model Cooperatives became Model BUUDs in the upland area until November 27th, 1973.

These Model BUUDs are handling not only maize but also paddy. They received purchasing credit from B.R.I. during harvest time, of maize for 1973/1974 rainy season. Gradually the business of Model BUUD became all year round business in producing and handling seed and in dealing in Bimas/Inmas paddy. In the future, their business will be strengthened and diversified. But future development of BUUDs depend on the ability of their management. What is most important is how to improve and train managers of these BUUDs. Anyway, we might say the Project fulfilled the target as Pilot Project.

3. IMPLEMENTATION OF THE PROJECT.

According to the monthly report of Japanese written by Mr. Komuro, the leader of the Japanese expert team in the first period, this Project had been implemented by the way of trial and error, because there was no masterplan of the Project. So, it was in the third year that the credit system was established.

The credit system of the Project has the following characteristics:

(a) Credit is done in kind both in giving inputs of production and collecting the repayment of the Project.

(b) Maize as the repayment of the credit was collected, processed and exported by the three storied agricultural cooperative organizations namely, Primekoperta, Puskoperta and Gakoperta.

(c) Through collecting, processing and exporting, agricultural cooperative organization was expected to be promoted.

Then, I'd like to explain the credit system which has both sides, that is, giving credit and collecting the repayment for credit amount. In other sense, the credit system of the Project is the greatest strategic of the Project and also the expression of the Policy of the Project. You may understand all activities of the Project from both sides of the credit system.

3.1. Credit given to the Farmers.

The credit given to the participating farmers is the inputs of production which consist of fertilizer and superior seed. Such inputs were given to the farmers together with the technical and managerial guidance of Japanese experts of production technique. The amount of inputs should be the expression of technical guidance by Japanese experts.

But to my regret, in the first year, the amount of input was decided not on the basis of scientific result, but by the custom in East Java. For, experts were experimenting but had not yet got any result available in deciding input amount. The

first year amount of inputs were 25 kg/ha of superior seed and 250 kg of urea per ha. Since the second until the fifth year, the inputs were 25 kg per ha of seed and 200 kg per ha of urea. In case of using compound, 140 kg/ha of Urea and 100 kg per ha of compound.

Superior seed for the Project extension, has been produced by the Project in cooperation with primary cooperatives. But sometimes, the distribution of the seed were late for planting maize. So, participating farmers used their own seed which were not yet improved.

Fertilizer was granted by the Japanese Government. The Project has the responsibility to distribute fertilizer to the farmers in cooperation with Primary cooperatives and desa officials. So, giving credit was done in kind. Credit of imputs of production was expected to prevent farmers from being given inputs from tengkulak, and also to give the chance to use it effectively, then increase of production of maize would be realized. Table 1 (next page) shows the transition of the contents of given credit.

3.2. Repayment of the Credit

The repayment of the credit was decied to be in kind (maize kernels) in order to promote agricultural cooperative societies and to promote maize export to Japan. But to export maize collected as repayment was only done in cause of being more profitable than selling locally. The repayment ratio of the credit was decided by the ratio between fertilizer and maize in the first to the third year. The ratio was as follows:

The first year	:	1 : 2
The second year	:	1 : 2.5
The third year	:	1 : 2.25

In the first and second year, the compulsory saving for primary cooperatives was added in addition to the repayment for the Project to promote primary cooperatives. In the first year, the amount of the compulsory saving for primary cooperatives was decided as follow :

> Yield per ha -- average production in five years --repayment for the Project = compulsory saving for cooperatives.

For example : 2.5 ton — 1.0 ton — 0.6 ton = 0.9 ton

In the end the target of repayment for the first year was decided to be 500 Kg of maize/ha, except 400 kg/ha of maize in Lumajang. Compulsory saving was only done in Kabupaten Kediri and Banyuwangi. Repayment of the Project was 100%, but compulsory saving for primary cooperatives didn't reach 100%. The actual contents of the decided repayment ratio in each Kabupaten are shown in Table 2 (next page).

TABLE 1.: TRANSITION OF THE CONTENTS OF GIVEN CREDIT

Name of Kabupaten	1968/69 Ha	1969/70 Ha	1970/71 Ha	1971 Ha	1971/72 Ha	1972/73 Ha	1973/74 Ha
KEDIRI	SD 25 Kg, T.G. 250 Kg Urea	SD 25 Kg, T.G. 200 Kg Urea = 14 Kg T.S.	SD 25 Kg SD 0 T.G. 200 Kg Urea 140 Kg Urea + 100 Kg Compound		SD 25 Kg 200 Kg Urea 140 Kg Urea + 100 Kg Compound	SD 25 Kg 140 Kg Urea+ 100 Kg Compound	SD 0 200 Kg Urea
MALANG	250 Kg Urea +75 Kg. T.S.	SD 25 Kg, T.G. 200 Kg Urea	SD 0 SD 25 Kg T.G. 200 Kg. Urea		SD 0 SD 25 Kg 200 Kg Urea	SD 25 Kg 200 Kg. Urea	SD 0 200 Kg. Urea
LUMAJANG	200 Kg. Urea + 20 Kg. Z.K.		SD 25 Kg. T.G. 200 Kg Urea	SD 25 Kg. T.G 200 Kg. Urea	SD 25 Kg. 200 Kg. Urea	SD 25 Kg 200 Kg Urea 150 Kg Urea 100 Kg Urea	SD 0 200 Kg. Urea
BONDOWOSO			SD 25 Kg. T.G. 140 Kg Urea + 100 Kg Compound	SD 25 Kg T.G. 200 Kg Urea 140 Kg Urea + 100 Kg Compound	SD 25 Kg 200 Kg. Urea	SD 25 Kg 200 Kg. Urea	SD 0 200 Kg. Urea
BANYUWANGI	250 Kg Urea	SD 25 Kg T.G. 200 Kg Urea	SD 25 Kg T.G. 200 Kg Urea		SD 25 Kg. 200 Kg Urea	SD 25 Kg. 200 Kg Urea	SD 25 Kg. 200 Kg Urea

TABLE 2.: TRASITION OF REPAYMENT AMOUNT OF THE CREDIT (Unit Kg. per Ha.)

SD = Seed
TG = Technical guidance

KEDIRI	500 Kg Maize 415 Kg Com Sv	525 Kg Maize 150 Com Sv	500 Kg Maize		450 Kg Maize	444 Kg Maize	IN CASH
MALANG	500 Kg Maize	525 Kg Maize	450 Kg Maize 475 Kg Maize		425 Kg Maize 450 Kg Maize	444 Kg Maize	IN CASH
LUMAJANG	400 Kg Maize		475 Kg Maize	450 Kg Maize	450 Kg Maizw	444 Kg Maize 63 ha 333 Kg " 34 " 222 Kg " 228 "	IN CASH
BONDOWOSO			500 Kg Maize	450 Kg Maize	450 Kg Maize	444 Kg Maize	IN CASH
BANYUWANGI	500 Kg Maize 312 Com Sv.	500 Kg Maize	440 Kg Maize		450 Kg Maize	444 Kg Maize	IN CASH

Com Sv = Compulsory Saving

In the fourth year, we decided the repayment ratio on the basis of the following formula, just before the harvest time.

REPAYMENT FORMULA OF CREDIT IN PROJECT

$$\text{REPAYMENT AMOUNT KG/Ha.} = \frac{\text{FERTILIZER AMOUNT KG/HA.} \times \text{PRICE OF FERTILIZER Rp/KG.} + \text{SEED AMOUNT KG/HA} \times \text{PRICE OF SEED Rp/KG}}{\text{PRESUMED PRICE OF MAIZE IN DESA JUST AFTER THE HARVEST}}$$

Then we decided 450 Kg of maize per ha as the repayment for the Project. In the fourth year, the repayment ratio of the project was decided economically. This formula is also rational not only for the participating farmers but also the Project, including agricultural cooperative organizations.

The repayment ratio in the first to the fourth year, were not rational. For the compulsory saving should not be decided by the Project, even if the Project conducted with officials of Primary cooperative or the farmers. It should be decided in the General Meeting of Primary Cooperatives between the officials and the members of the Primary cooperatives.

If the repayment exceeds the amount equivalent to the credited amount, it gives disadvantage to the farmers, in opposite case the Project would be disadvantageous. The Project has no right to say anything about the amount exceeding the amount equivalent to the input prices. So in the first stage, the repayment ratio had contradictions, I might say.

On the other hand, the compulsory saving of the Project gave a big incentive for primary cooperatives to develop their business. I appreciated the idea of the compulsory savings, but its introduction was neither economical nor rational. We should have contrived a better way of the introduction of that idea. So in the third year, compulsory saving system disappeared. The compulsory saving in some Model Cooperatives and BUUDs continues until now.

In the fourth year, the repayment ratio was decided just before the harvest time in taking maize price in village (desas) into consideration.

In the fifth year, it was decided before the planting of maize in taking into consideration the request that repayment should be informed before the planting. But after the harvest maize price in the villages increases higher than that of maize applied in calculating the repayment ratio. So, repayment ratio became disadvantageous to the farmers which had caused the worst repayment realization.

In deciding repayment ratio, we had to forecast the price of maize in villages, which was very difficult, especially during inflation time. So, sometimes the repayment ratio would facilitate the repayment, sometimes be the obstacle of repayment promotion. The above is the demerit of the repayment system in kind. But farmers are very weak in their marketing activities, repayment system in kind helps farmers marketing.

In case that agricultural cooperatives can help farmers marketing of maize, repayment on cash in better for creditors and creditees.

In the sixth year, the credit system was consolidated with the Bimas system. So, the repayment was changed into in cash system. Table 3 on the next pages shows the actual repayment of the farmers in each desa during the five years.

TABLE 3.: Transaction of Planting Area and Repayment Realization of the Project

Kabupaten/Kecamatan/Desa	1968/69		1969/70		1970/71		1971/72		1972/73		1973/74	
Kabupaten KEDIRI :												
Kecamatan KEPUNG :			410.00	97.9	866.17	88.9	1,490.00	80.1	1,274.75	66.3	775.00	95.0
1) Kepung			200	94.0	242.25		400.00	90.3	335.62	62.9	300.00	
2) Siman	200	100	60	102.3	200.00		220.00	77.4	181.62	67.5	200	
3) Besowo			75		60.00		192.50	67.1	100.00	77.1	75.00	
4) Kebonrejo			75)	101.3	50.00		100.00	79.8	93.00	86.2		
5) Brumbung							52.50	93.7	41.50	87.4	50.00	
6) Kampung Baru							525.00	78.4	523.00	60.8	150.00	
Kecamatan PUNCU :							633.50	76.3	466.37	69.5	1,442,83	63.0
1) Puncu							100.00	72.2	141.50	48.4		
2) Asmorobangun					303.42		346.00	79.1	290.50	81.1		
3) Wonorejo					10.00		65.00	83.2				
4) Manggis							82.50	69.3	34.37	69.5		
5) Satak							7.00	83.5				
6) Gadungan							33.00	61.3				
Kecamatan PLOSOKLATEN			458.10	61.2	294.57	56.3	267.50	41.2	405.00	30.0		
1) Pranggang			167.25	49.6	125.00		60.00	49.9	50.00			
2) Sumberragung					40.00		150.00	30.7	170.00			
3) Trisulo					115.39		57.50	58.0	30.00			
4) Dungati			16.06	82.7	4.18							
5) Jarak			44.75	65.4	10.00				50.00			
6) Brenggolo			82.25	69.1								
7) Punjul			15.00	57.6					50.00			
8) Kawedusan			15.50	52.8					30.00			
9) Bayem			15.00	87.5								

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
10) Ploso		20.25 87.3				
11) Klanderan		55.75 61.8			25.00	
12) Gondang		16.29 46.4				
Kecamatan WATES		115.00 58.1	296.00 30.3	225.75 25.4		
1) Pojok		25.00 37.1	20.00	65.75 15.7		
2) Gadungan			10.00	25.00 84.3		
3) Wonorejo			15.00	56.00 39.6		
4) Wates		25.00 65.1	6.00			
5) Babadan		40.00 87.3	20.00			
6) Kunjang		25.00 24.8	20.00			
7) Sugihwaras			40.00	Duwet		
8) Sempu			40.00	Taman 75.00 49.4		
9) Manggis			25.00	4.00 0		
10) Margourip			40.00			
11) Bedali			30.00			
12) Pandantoyo			15.00			
13) Jagul			10.00			
14) Silir			5.00			
Kecamatan GURAH		310.85 56.8	35.00 8.9			
1) Besuk		50.00 39.8	20.00			
2) Banyuanyar		20.00 64.4	5.00			
3) Cangkring		15.00 34.6				
4) Turus		25.00 82.8				
5) Wonojeyo		25.00 80.2				
6) Gabru		20.00 90.1				
7) Bangkok		25.85 64.4				
8) Bogem		30.00 66.1				

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
9) Nagsem		25.00 68.6				
10) Blimbing		50.00 21.0				
11) Nglumbang		25.00 62.9				
12) Kranggan			10.00			
Kecamatan NGANCAR				397.00 26.3		
1) Kunjang				66.50 21.7		
2) Bedali				58.25 60.3		
3) Jagul				20.25 94.0		
4) Pandatoyo				27.50 0		
5) Margourip				27.00 5.4		
6) Manggis				75.00 21.2		
7) Sampu				33.00 84.2		
8) Babadan				25.00 53.4		
9) Ngancar				64.50 3.4		
Kecamatan PARE		395.00 52.9	30.00 46.5			
1) Bendo		62.50 63.50	30.00 46.5			
2) Pelem		82.50 78.4				
3) Telungrejo		75.00 32.5				
4) Canggan		50.00 68.1				
5) Jumlur		35.00 18.8				
6) Bringin		35.00 29.6				
7) Tertek		20.00 35.0				
8) Idameng		15.00 87.5				
9) Sekoto		20.00 44.6				
Kecamatan PAGU			135.50 25.9	184.00 75.4		700.00 67.1
1) Bulupasar				109.00 82.6	121.75 58.7	100.00
2) Kambingan			20.00	75.00 65.0		20.00

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
3) Tangjung			15.00			30.00
4) Menang			30.50			40.00
5) Kayen			8.00			5.00
6) Sukoharjo			50.00			25.00
7) Jamon			5.00			50.00
8) Pagu			7.00			20.00
9) Pandangan						70.00
10) Sandan						50.00
11) Kayun kidul						20.00
12) Wonosari						60.00
13) Sjmberagung						40.00
14) Mukuh						30.00
15) Sekaran						20.00
16) Setimarto						5.00
17) Tenggerkidul						20.00
18) Semanding						20.00
19) Bendo						10.00
20) Wates						10.00
21) Semen						30.00
22) Nanggungan						20.00
23) Semambung						5.00
Kecamatan PLEMAHAN, Bogenkidul			5.00 71.0			
Kecamatan KANDAT, Karangrejo			110.00 52.3			
Kecamatan PESANTREN			113.125 22.7			
1) Ketami			3.125			
2) Bawang			50.00			

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
3) Betet			20.00			
4) Blabak			30.00			
5) Tinalan			10.00			
Kecamatan GAMPENGREJO			50.62 23.6			
1) Paron			7.62			
2) Ngasem			13.00			
3) Sumberejo			10.00			
4) Sukorejo			40.00			
TOTAL KABUPATEN KEDIRI	200.00 100	1,688.95 67.2	1,836.985 61.7	3,197.75 65.5	2,268.25 60.1	
Kabupaten MALANG						
Kecamatan SINGOSAPI	82.00 100.0	118.150 116.6	417.75 62.5	343.376 88.1	600.000 73.2	611.550
1) Baturetno	40.00 100.0	25.000 133.3	194.40 64.9	122.625 77.9	117.000 68.0	151.600
2) Dengkol	22.00 100.0	84.675 112.1	109.23 90.5	150.00 100.0	208.000 65.5	309.950
3) Wonorejo	20.00 100.0		18.415 -		100.000 80.4	150.000
4) Toyomarto			43.705 97.5	25.750 59.4		
5) Others		8.525 -	52.00 21.4	45.00 77.4		
Kecamatan PAKIS, Tirtomoyo		69.075 81.3			61.000 94.1	75.000
Kecamatan LAWANG				178.500 90.5		127.000
1) Sidoluhur				84.500 100.9	64.000 73.7	75.000
2) Srigading				50.000 46.5	50.000 73.0	52.000
3) Others				44.000 91.3		
Kecamatan JABUNG			197.620 59.8	188.000 66.5		182.000
1) Jabung			40.000			
2) Sukolilo			89.120	98.000 46.8		
3) Argosari			9.750			

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
4) Slamparejo			20.000	50.000 78.1		
5) Gunungjati			20.000			
6) Kemantren			18.750	40.000 100.0		
Kecamatan TOMPANG		15.000 97.0	119.380 81.0	126.500 14.3		147.000
1) Kambingan		Tumpang	59.380	85.000 10.9		
2) Duwet		Jeru	60.000	41.500 20.8		
Kecamatan DAMPIT			350.000 83.1	207.000 85.6	503.125	999.500
1) Jabangan			15.000			
2) Dampit			30.000	20.000 83.6		
3) Baturetno			35.000			
4) Bumirejo			75.000	139.500 87.5		
5) Srimulyo			120.000	32.500 72.4		
6) Sumbersuko			75.000	15.000 100.0		
Kecamatan TUREN 3 desas	80.00 100.0					
Kecamatan PONOCOKUSUMO 3	desa	156.500 41.6				150.000
Kecamatan NGAJUM 1 desa		35.000 91.4	144.250 40.3	55.875 85.1		75.000
Sub Total Kabupaten MALANG	162.00 100.0	393.725 78.0	1,229.00 67.5	1,099.250 77.6	600.00 73.2	813.550
Kabupaten LUMAJANG						
Kecamatan TEMPEH, Lempeni	100.00 100.0				50.00 90.9	
Kecamatan KLAKAH						
1) Sruni			100.00 100.0	45.000 76.5	190.00 83.4	
2) Sawahan lor				45.000 79.0	50.00 80.4	
3) Kebonan				72.000 86.5	35.00 53.7	
4) Grobogan				100.000 25.6		

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
5) Kedungjagung				50.000 55.6		
Sub Total Kabupaten LUMAJANG	100.00 100.0		100.00 100.0	312.000 59.5	325.00 82.4	
Kabupaten BONDOWOSO						
Kecamatan TEGALAMPEL						
1) Tegalampel			16.00	0		
2) Terbungan			20.00	12.00 0		
3) Sumberkakap			65.00			
4) Taman			100.00 75.4	40.00 44.9	125.00 77.0	
5) Tanggulengin			30.00			
6) Klabang			70.00 14.2			
Kecamatan TAMANAN						
1) Wonosuko				75.00 46.0		
2) Kalianyar				27.50 21.5		
3) Tamanan				35.00 35.89		
Sub Total Kab. BONDOWOSO			301.00 52.0	189.50 39.5	125.00 77.0	
Kabupaten BANYUWANGI						
Kecamatan WONSOREJO		2,500.000 41.8	2,007.30 40.1	1,310.00 53.9	616.50 77.0	1,460.500
1) Watukebo		137,000 28.1	100.00)	200.00 64.0)	70.50 61.0	218.750
2) Bajulmati		52.00 -	82.00			
3) Sidodedi		133.000 67.0	164.5000)	150.000 53.0	67.500 92.0	155.750
4) Sumber kencono		250.00 30.8	106.500			167.550
5) Wongsorejo	218.500 100.0	998.000 53.6	757.500	360.000 80.0	390.000 80.0	539.500
6) Alasbulu		450.000 32.7	652.800	350.000 32.0	40.000 67.0	188.500
7) Bengkak		300.000 28.0	89.000)	50.000 53.0)	50.000 68.0	118.000
8) Bangsring		200.000 3.4	50.000			9.250

	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74
Kecamatan GLAGAH						100.000
Sub Total Kab. BANYUWANGI	218.500 100.00	2,500.000 40.1	2,007.300 40.1	1,310.000 53.9	617.500 77.0	1,560.500
GRAND TOTAL	680.500 100.00	4,582.675	5,469.285	6,108.500	3,935.750	

3.3. The Operation of Collection, Processing and Reprocessing of Project Maize:

Credit system of Project is in kind, so the farmers have to repay maize to the Project equivalent to the credited amount. The Project had to collect, process and export the repayed maize. These operations were done mainly by the agricultural cooperative organizations which consist of three storied organizations.

Collection of repayment of maize were done by the primary cooperatives, if not so, by desa officials since the beginning. But the processing and reprocessing was done by other persons. Because almost all of the primary cooperatives had no godowns and drying floors and that no equipments such as dryers, winnowers, corn shellers and so on. Even if the primary cooperatives wanted to do processing they couldn't do it. After they got godowns and drying floors, some of which were bought by themselves, some of which were built by the Project for their use, then they could do maize processing well. Reprocessing of Project maize was done by P.N. (now P.T.) CIPTA NIAGA in the first and second year. Since the third year, processing or reprocessing should be done by the agricultural cooperative organizations. On the other hand we thought that the processing and reprocessing should be done in primary cooperatives, that is, primary cooperative could process maize suitable for export quality. This targets were fulfilled in the fourth or fifth years with the completion of Project's godowns and drying floors. Table 4 on the following page, shows the transition of processors in the Project.

If we had promoted the above idea of processing and reprocessing, by primary cooperatives, the role of puskoperta would have disappeared. In case of Kediri, the Puskoperta was well facilitated, so it was very difficult to transfer the operations of processing from Puskoperta including processor to primary cooperatives (B.U.U.D.).

Through our experience in the field of collection, processing and reprocessing, it turned out that the role of Puskoperta could be transfered to PRIMEKOPERTA. But when Puskoperta was still active, we were faced with the problem of how to devide the operation of the Project, such as collection, processing and reprocessing. The result that the primary cooperatives could do processing and reprocessing of maize in the villages channel of maize.

I am sure that these operation had contributed to the development of the Primary cooperatives to a great extent. These operations should not be the job of Agricultural Extension Service of East Java.

TABLE 4.: CREDIT CONTRACT CONCERNED AND THE IMPLEMENTATION OF THE PROJECT OPERATION

YEAR	CONTRACTOR of CREDIT	SECOND PARTY OF CREDIT CONTRACT	COLLECTOR OF MAIZE REPAYMENT	DRYING & PROCESSING OF REPAYMENT MAIZE	REPROCESSING & DRYING OF PROJECT MAIZE	EXPORTER OF REPAYMENT MAIZE	CONDITION OF REPAYMENT	DISTRIBUTOR OF FERTILIZER AND SEED
1968/69	PROJECT (Mr. SOEJOEDI)	PRIME KOPERTA	PRIME KOPERTA	KOPERTA AND PROJECT'S STAFF	PT. CIPTA NIGA	GAKOPERTA	FRESH EAR CORN/WET	KABUPATEN OF PROJECT
1969/70	PROJECT (MR. SOEJOEDI)	PRIME KOPERTA	PUS KOPERTA PRIME KOPERTA KADES MALANG	PUSKOPERTA (Processor) PRIME KOPERTA (KADES, FARMER)	PT. CIPTA NIAGA	GAKOPERTA	Ditto	KABUPATEN OF PROJECT
1970/71	PROJECT (MR. SOEJOEDI)	GAKOPERTA (MR. RIDWAN HARJONO)	G A K O P E R T A PRIME KOPERTA	PUSKOPERTA (PROC) PRIME KOPERTA	PUSKOPERTA PRIME KOPERTA	GAKOPERTA	Ditto	KABUPATEN PROJECT FERTILIZER = P.N. PERTANI.
1971/72	PROJECT (MR. SOEPOJO)	PRIME KOPERTA	G A K O P E R T A PRIME KOPERTA	PUSKOPERTA (PROC) PRIME KOPERTA	GAKOPERTA PUSKOPERTA PRIME KOPERTA	GAKOPERTA	Ditto	KABUPATEN OF PROJECT
1972/73	PROJECT (MR. MARTONO)	PRIME KOPERTA	PRIME KOPERTA	PRIME KOPERTA	PRIME KOPERTA	GAKOPERTA	Ditto	KABUPATEN OF PROJECT
1973/74	BIMAS	B.U.U.D. FARMERS BY WAY OF B.U.U.D.	B.U.U.D.	PURCHASING MAIZE B.U.U.D.	B.U.U.D.	GAKOPERTA	Ditto	KABUPATEN OF PROJECT

So the Project made a contract with GAKOPERTA on these operations. GAKOPERTA took leadership in such operations. After two years experience it turned out that the communications between GAKOPERTA and Puskoperta or Puskoperta and Primakoperta was not so good, because of weak organization which was one of the reasons of worse repayment.

When Gakoperta took the leadership of the operations, repayment of the Project decreased drastically, which shows deficiency of its leadership and weakness of the organization. The weakest point of the organization was Puskoperta which turned out to be the idle organization.

In the framework of B.U.U.D. Puskoperta are disappearing. All function of Puskoperta should be transfered to B.U.U.D. or PUSKUD in the Province in depending on the function. Table 5 showed the Organization bodies of implementation business of Maize Project.

3.4. Realization of Maize Export and its Quality.

3.4.1. Maize export through coop to coop trade.

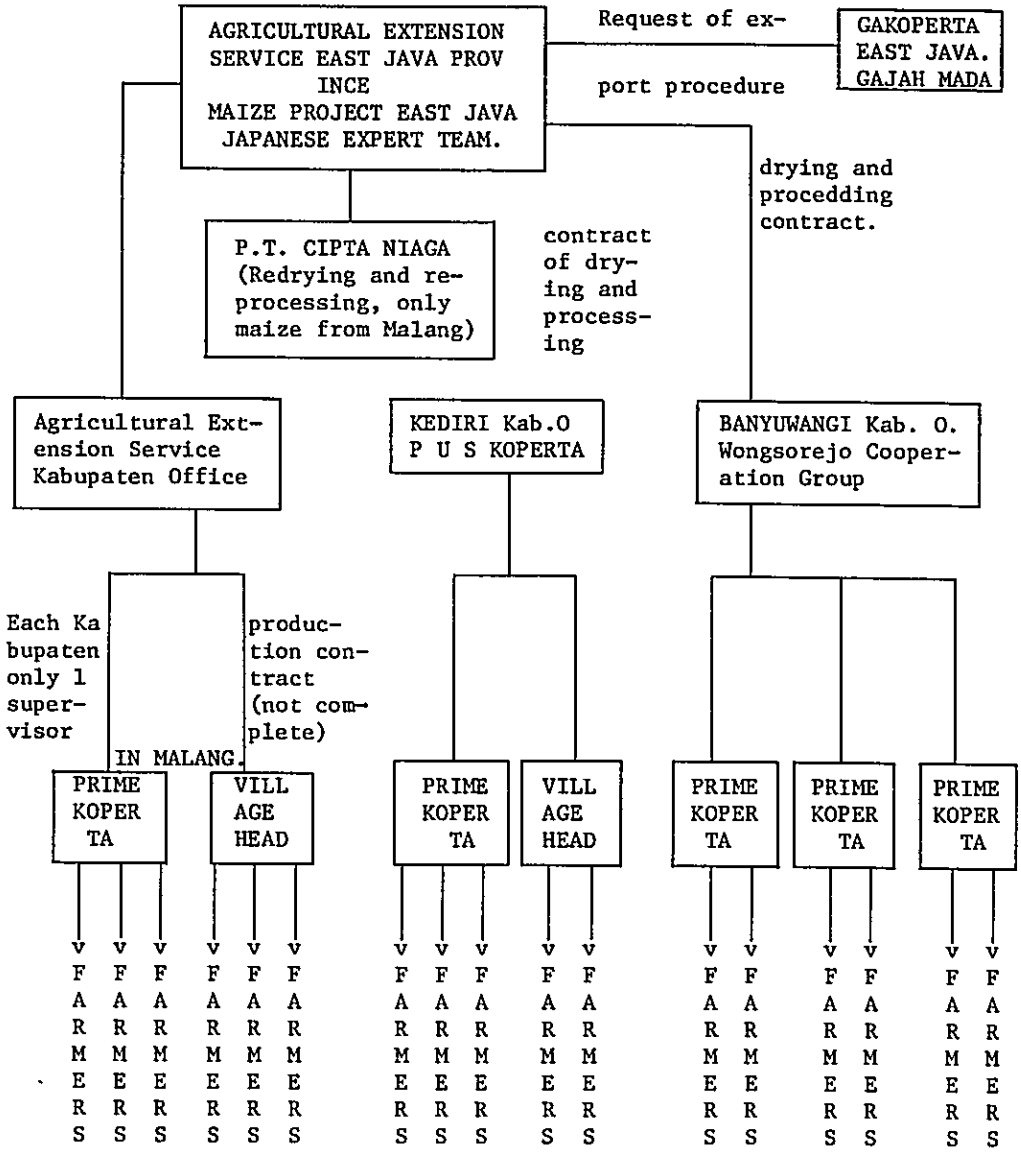
Project Exporter was GAKOPERTA "GAJAH MADA" (Provincial Federation of Agricultural Cooperative Organization), since the first to the fifth year. GAKOPERTA exported maize to Japan on behalf of Maize Project on the basis of operation contract between GAKOPERTA and Maize Project.
Importer of Project Maize was UNICOOPJAPAN (Cooperative Export and Import company invested by ZENNOH). Buyer of Project Maize is ZENNOH in Japan (The National Federation of Agricultural Cooperative Associations), ZENKOREN was the former name of ZENNOH.
Before the Project, GAKOPERTA had never exported maize to other countries. As soon as the Project began, Gakoperta got an export licence, but there were no expert of maize export in Gakoperta before the Project. The Japanese Experts had given the managerial technical guidance of export business of maize. Simultaneously, Indonesian experts who were in charge of fumigation or grading were also brought up.
In the fourth year, all export business had been done by Indonesian experts, who were Mr. Wagijono in charge of export business, Mr. Iskamar for fumigation and Mr. Djazuli for grading. Especially, the GRADE CERTIFICATE written by Mr. Djazuli were reliable and highly evacuated by ZENNOH.
In the fifth year, GAKOPERTA made contract with ZENNOH to export 150 tons of maize, and was waiting for the ship. Before the ship's arrival, the ban of maize export was launched by the Government. Then the maize for export was sold at local market. In the sixth year, the prohibition of maize export is still effective.
The ideal way of trade is coop to coop trade without middleman between seller and buyer. Ideal trade connection was established between Gakoperta and ZENNOH, to my great regret, GAKOPERTA has been weaker and weaker in the framework of the B.U.U.D. movement. I hope GAKOPERTA should be reformed as soon as possible.

3.4.2. Export conditions of the Project.

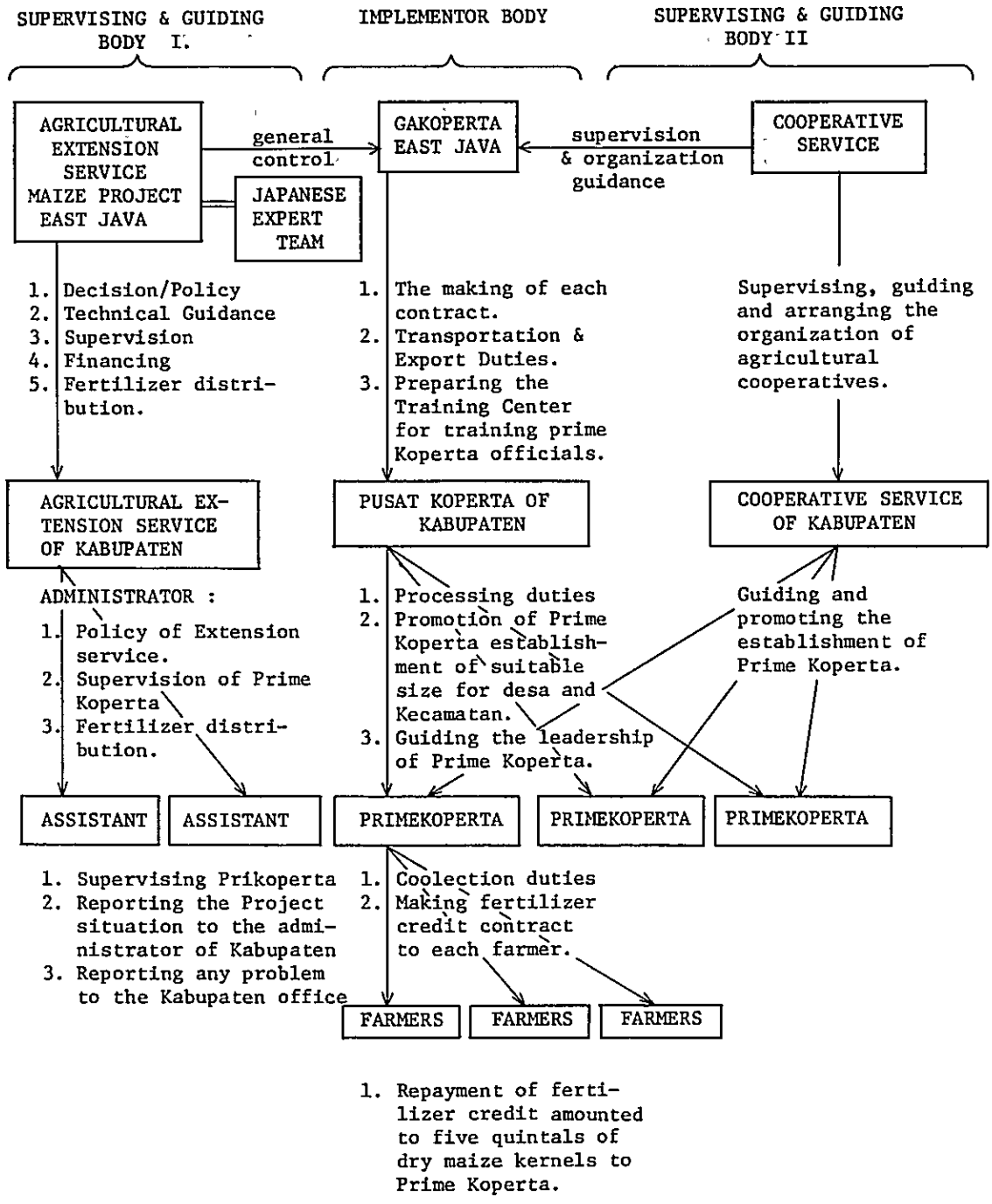
Maize export in Indonesia is usually done by the condition of C & F (Cost and Freight) basis. Project

TABLE 5. : ORGANIZATION BODIES OF IMPLEMENTATION BUSINESS OF MAIZE PROJECT

1. PROJECT ORGANIZATION IN THE FIRST AND SECOND YEAR



2. PROJECT'S ORGANIZATION SINCE THIRD YEAR



adopted the FOB (Free On Board) contract, that is, shipped final or loading final. Prices were decided on the basis of international prices fixed at Chicago market.
In the first stage, ZENNOH bought Project maize at 5 - 10 dollars higher price than the international ones to promote agricultural cooperatives in Indonesia.
It is necessary for GAKOPERTA to become competitive in the world market, which means Gakoperta can export at the international price, Project made efforts to export maize with the quality of U.S. GRADE 2 because there is no quality standard in Indonesia. Grade certificates were written by Mr. KOMURO in the first term and Mr. DJAZULI in the second term. Fumigation was done by Mr. ISKAMAR guided by Mr. KOMURO former leader of the Project.
ZENNOH opened the L/C (Irrevocable Credit) every time, and term of payment was "available against drafts at rights for 100% invoice cost". Mr. SHIMIZU tried to export Project maize in bulk, but it could not be realized due to the deficiency of collected maize.

3.4.3. Realized Exportation of Maize and its Quality.

Table 6 on the next page shows the realized export amount of maize done by the Project. And table 7 shows the quality of maize exported by the Project. In the first to the third year, international prices of maize were available for the Project because they were in high level. In the fourth year, international price of maize made a record of the lowest level in history. So, the decrease of export amount in the fourth year depended on the lack of fund as well as due to the disadvantageous price of maize in the world market.

3.5. The Promotion of Model Cooperatives (Model B.U.U.D.).

In the first three years, the Agricultural Cooperatives had been promoted through the operation of collection, processing, reprocessing and export. But promotion of the Agricultural Cooperatives was not the final target. As the agricultural policy of Indonesia changed, the policy of the Project was also changed. In the second term, we paid much attention for the promotion of agricultural cooperatives to increase farmer's income in the circumstances of export prohibition of maize. I think the promotion of agricultural cooperatives in the first term was different in its quality from that of the second term.

On the other hand, we might say that in the first term we made greatest efforts to make the existing agricultural cooperatives work well and actively. In the process of the above, we recognized that agricultural cooperative organization had to be reformed rationally, and that the Primary Cooperative which covered 300 - 400 ha of maize area were not enough to stand on their own feet.

In the framework of B.U.U.D. promotion, we did our best to develop the model cooperatives into model BUUDs which covers 600 - 1000 ha and can stand on their own feet. On the other hand, in the second term, we decided the promotion policy of "Model Cooperatives", but in the first term we didn't find any special policy to promote agricultural cooperatives, of course, the Project policy was intended to promote the agricultural

TABLE 6. : REALIZATION OF MAIZE EXPORT DONE BY THE PROJECT

No.	YEAR	EXPORT AMOUNT	PRICE	EXPORT DATE	EXPORTER	BUYER (NOW ZENNOH) ZENNOH
1.	1968/69	260,000	FOB SURABAYA US $ 49.00/MT	March 1969	GAKOPERTA	ZENKOREN
II.	1969/70	500,000	FOB SURABAYA US $ 54.00/MT	May 1970	"	"
III.	1969/70	601,060	FOB BANYUWANGI US $ 56.00/MT	August "	"	"
IV.	1970/71	900,600	FOB SURABAYA US $ 66.00/MT	March 1971	"	"
V.	1970/71	350,000	FOB SURABAYA US $ 61.00/MT	July "	"	"
VI.	1971/72	600,000	FOB SURABAYA US $ 51.500/MT	March 1972	"	"
VII.	1971/72	225,000	FOB SURABAYA US $ 51.50/MT	May 1973	"	"
	TOTAL	3,436,660	Kg.			

Remarks : The above were all exported in bags by liners.

TABLE 7. : EXPORT AMOUNT AND ITS QUALITY OF PROJECT'S MAIZE.

No.	Export Amount (Kg)	Moisture Contents (%)	Damaged kernels (%)	Broken kernels' and Foreign Materials (%)	Others Classes (%)
I.	260,000	13.7	0.4	0.2	0.1
II.	500,000	14.5	4.6	1.9	1.9
III.	601,060	14.3	4.6	1.0	1.9
IV.	900,600	13.7	3.8	0.9	1.4
V.	350,000	14.5	11.0	2.0	2.0
VI.	600,000	14.5	6.0	2.0	2.0
VII.	225,000	14.5	14.0	3.0	2.0

Remarks : Other classes were always less than 2% in spite of the more or less damaged kernels. I think, this is the good result of the seed production by the Project.

cooperatives. If we dared to pick up the policy, there was compulsory saving for primary cooperatives in the Project area. The purpose of compulsory saving was not only for the development of the agricultural cooperatives but also for the sake of further development of the Project area.

Then I want to mention about the policy and the result of the promotion of the model cooperatives. After we decided the policy for promoting the "Model Cooperatives", in consultation with Mr. Ir. Wazir. The Director of Production Development, the Japanese Expert Team decided and proposed how to select model cooperatives and what kind of guidance should be given to them, what kind of policy we should take in each model cooperative.

3.5.1. The Standard to Select Model Cooperatives.

a) The cooperative has more than 300 ha of the Project area, or now only 100 ha but having the possibility to expand into more than 300 ha in the near future.

b) The cooperative is really active and has a man of talent as its chairman.

c) The cooperative is under the condition of better repayment and surrounded by wide maize production areas.

At first, the areas which the model cooperative covered, should be regarded as the Project area in connection with Bimas Jagung in East Java. So, we selected model cooperatives in three Kabupatens respectfully. At last we decided that the following cooperatives were the model cooperatives.

3.5.2. Selected Model Cooperatives.

Name of Model Cooperatives	Kabupaten
a) Primkop SIMAN	Kediri
b) " KEPUNG	Kediri
c) " BULUPASAR	Kediri
d) " DENGKOL	Malang
e) " WONGSOREJO	Banyuwangi

In the fifth year, we extended the Project only in Model cooperatives' areas, except for Kabupaten Lumajang and Bondowoso, where we didn't select any model cooperatives.

3.5.3. Policies to promote Model Cooperatives in 1972.

The main policies to promote model Primkop were as follows:

a) The Project helps Model Primkop to carry out all year round business in utilizing the fasilities and equipments given by the Project.

b) The Project produces extension seed through model Primkop.

c) The Project gives the credit of production requisite to model Primkop in Marongan season to promote the capital accumulation in addition to the credit Labuhan season.

d) The Project is extended through model primkop, for example, the fertilizer and superior seed are distributed through Primpkops who also collect and process the maize as repayment.

e) The officials of the Primkops should be trained not only in East Java, but also in Japan.

f) The Model Primkop should be developed into Model B.U.U.D. The following policies were applied to each Model Primkop :

Name of Primkop :	Main Policies :
A. Koperta SIMAN	Project's Activities
B. Koperta KEPUNG....	Project's Act vities
C. Koperta BULUPASAR.	Project's Activities, Seed production for Project and Bimas Jagung.
D. Koperta DENGKOL...	Project Activities, Marengan Project, and other Koperta's own activities such as creditting, processing, and producing rattan ware.
E. Koperta WONGSOREJO..	Project Activities and effective use of tractors.

3.5.4. Result of the Policies in 1972

A. Good result.

(1) We have succeeded in setting up 4 B.U.U.D. in the Project area.

(2) The repayment ratio of the Project has become much better than the previous year. The ratio of each area expect Kediri has reached more than 70%. I think the new collection system contributed to increasing the repayment ratio in spite of heavy burden for farmers.

(3) The training for officials of B.U.U.D. was successfully carried out. 40 trainees attended.

(4) In the B.U.U.D. Dengkol, the godown given by the Project in always used for Koperta office, the place for storage of fortilizer and maize, and processing activities. The Project godown enables Dongkol society to carry out all-year-round business.

(5) P.P.L. who are stationed at each B.U.U.D. have contributed to better result of repayment.

B. Problems:

(1) B.U.U.D. has been set up in three Kabupatens. B.U.U.D. has to meet several conditions. In this sense, B.U.U.D. Dengkol and B.U.U.D. Wongsorejo you may call real B.U.U.D. But two B.U.U.D.s have weakness in their organizations to develop more. For B.U.U.D. Siman, Kepung is one BUUD which covers more than 2,000 ha, ranges two kecamatan and controls 13 Primkops. This is wory big, and that it may be rather difficult to supervise so many cooperatives. This might cause the lack of communication between officials of B.U.U.D. and member farmers. On the other hand, B.U.U.D. Bulupasar covers only 121 Ha. and one Primkop. This is too small to stand on its feet. So, B.U.U.D. Siman, Kepung should be devided into the B.U.U.D.s which respectively covers the area easy to control, or this B. B.U.U.D. should set up branches to keep close connection with farmers. That is, B.U.U.D. Kepung and B.U.U.D. Puncu. B.U.U.D. Bulupasar should include other surrounding cooperatives (desas) so as to cover more than 600 ha. If possible, B.U.U.D. Bulupasar should be B.U.U.D. Pagu.

(2) The facilities and equipments which B.U.U.D.s own are almost none. The data I shows how lack they are.

(3) The half of the Project godowns, except godown Dengkol, are not used. This is due to two reasons. First, several godowns are broken or construction are not completed yet. Second, B.U.U.D. has no money to carry out their own business, that is, they are still underdeveloping.

(4) Marengan Project was scheduled to be implemented in B.U.U.D. Dengkol, but we could not extend it because of unusual long drought.

(5) In Kediri, the repayment ratio of the Project is not so good as compared with the provious year. In B.U.U.D. Bulupasar, I have heard from the P.P.L. there, the repayment from farmers to the processors are about 70%, but the repayment to the Project is only about 60%. I think about 10% of difference might disappear in the process from processor (Primkop) to the Project. So, it is necessary to eliminate the processors who are the officials (pengurus) of B.U.U.D. Processing activities should be done by B.U.U.D. itself, but to my regret, B.U.U.D. Bulupasar has not any facilities such as office, godown and drying floors. Generally speaking, the bad repayment in Kediri attributes to the lack of communication between officials (pongurus) and members of B.U.U.D.
This is the resson why the official of the B.U.U.D. are not the real representatives of the member farmers. For they might be recommended or appointed by "camat" or "Kepala Desa" not by farmers, to educate farmers for the time

being. Sometimes, they are Government officials. So, the officials of B.U.U.D. have to make effort to keep close connection with farmers and make up their opinions.
To keep communication with farmers, it is essential for B.U.U.D. to make farmers group which consist of 15 - 20 farmers. The B.U.U.D. should be supported by farmers' group (kelompok).
They should promote their education to farmers through farmers' group. After the education period is finished, it is better for the officials of B.U.U.D. to be selected among member farmers.

(6) In Bulupasar, the almost profit of B.U.U.D. was used for construction of school and private houses. These facilities will not directly produce any profit. In B.U.U.D. business investment should be poured into facilities of B.U.U.D.

(7) The repayment of Koperta Dengkol, remains about 65%, because of heavy repayment burden. For the past four years, it was 100% there. If the Project gives B.U.U.D. facilities in the compensation of heavy repayment burden, there still remains farmers complaints.

(8) The Kabupaten Banyuwangi is expecting cash return as well as facilities as the expenses of collection, processing and the management of the B.U.U.D.

C. The Process of B.U.U.D. Establishment :

In each Project areas, there are Model Koperta Primairs which have already gotten "BADAN H " according to the guidance of DIPERTA, these PIMKOPS took leadership and they cooperated with surrounding Primkops and desas, in preparing the setting up of B.U.U.D. Then, they made preparatory committee which consisted of bodies concerned to establish B.U.U.D. in the Project area. After they took the ordinary procedure, at the end of year 1972, 4 MODEL B.U.U.D.s were established where PPLs were stationed.

3.5.5. Suggestion on Policies of B.U.U.D. Promotion in Fiscal Year 1973.

A. Premises :

1. Purpose of B.U.U.D. :

a) To increase member farmers' income through B.U.U.D. activities.

b) To shorten the marketing channels of maize, paddy and other agricultural crops.

2. Function of B.U.U.D.

(1) B.U.U.D. should be the extension unit in the region which consists of farmers's group.

(2) Crediting unit.

(3) Production unit of seed.

(4) Distribution unit of seed, fertilizer, credit and so on.

(5) Processing unit.

(6) Marketing unit.

(7) Miscellaneous business unit.

3. Business strategies of B.U.U.D.

(a) B.U.U.D. should make great effort to create all-year-round business in utilizing the facilities and equipments given by the Project, or in dealing with other crops except maize.

(b) The large part of gross profit from the business should be invested in the facilities and equipments which will produce another profit.

(c) At least 20% of net profit of B.U.U.D. must be provided against rainy days, to stabilize the management.

(d) The management of B.U.U.D. should be open to the members.

(e) B.U.U.D. should introduce basic marketing formula such as "mass and planned collection and marketing" to do better marketing business.

B. Policies of B.U.U.D.'s Promotion.

1. Target of B.U.U.D.

1) BUUD have to become self propelling enterprise bodies which is bank able and can carry out all-year-round Business by itself.

2) The real B.U.U.D. should be provided with equipments and complete facilities such as office, godown, drying floor and so on.

3) There should be the sense of reliance between members and officials of B.U.U.D.

4) B.U.U.D. must play an assistant role of the Agricultural Extension service (Farm management guidance helper).

5) B.U.U.D. will be the price leader of maize and other agricultural products in the regions.

2. Project Policies to Promote B.U.U.D.

(a) Project will be extended through B.U.U.D. (as key station of Project).

(b) Seed production for the Project and Bimas is also carried out through B.U.U.D.

(c) In Kabupaten Kediri, existing the B.U.U.D.s should be reorganized into three qualified B.U.U.D.s (B.U.U.D. Kepung, Puncu and Pagu).

(d) B.U.U.D. should be provided with facilities and equipments by the assistance of the Project.

(1) To provide the existing B.U.U.D. with complete facilities the following facilities are necessary which are showed on data I attached. Data II shows that it will cost about 14 million rupiahs. The priority which data I shows should be given to each B.U.U.D.

(2) As data I shows, the necessary equipments which have just arrive from Japan should be distributed to the BUUDs as soon as possible.

(e) The training for the officials and the leaders of BUUD will be held in Bedali.

(f) P.P.L. (Junior Extension Workers) should be stationed at each B.U.U.D.

(g) These promotion policies which were implemented will be continued :
(1) Marengan Project will be carried out in B.U.U.D. Dengkol.
(2) One more tractor will be lent in the B.U.U.D. Wongsorejo.

(h) The Project will spread marketing information of maize through GAKOPERTA (vertical cooperative channel). These informations will help B.U.U.D. to utilize vertical cooperative marketing channel to do better marketing.

(i) The Project will give guidance so as that under the condition of the marketing certainty of maize with ZENNOH (The National Federation of Agricultural Cooperative Association), GAKOPERTA will help B.U.U.D. to carry out better marketing of maize in giving B.U.U.D. the marketing certainty of maize (BUUD promotion through coop to coop trade).

(j) The Project will give technical guidance on production and processing technique and management.

THE LIST OF FACILITIES AND EQUIPMENT NECESSARY FOR B.U.U.D.

DATA I

	B.U.U.D. KEPUNG 6 Desa (Siman)	B.U.U.D. PUNCU 4 Desa (Asmorobangun)	B.U.U.D. BULUPASAR Desa (Bulupasar)	B.U.U.D. DENGKOL 6 Desa (Dengkol)	B.U.U.D. WONGSOREJO 5 Desa (Wongsorejo)
Materials and equipments owned by B.U.U.D.	A. Office 1 B. Godown with Drying floor 1 C. Scala 2 D. Winnower 1 E. Sprayer 1 F. Desk and chair 14 G. Land (0.15 Ha) 1			A. Scale 1 B. Typewriter 1 C. Desk and chair several	A. Typewriter 1 B. Desk and Chair several
Materials and equipments lent by Project	A. Godown with drying floor 3 B. Lister dryer 1 C. Dryer (KORIKA) 1 D. Corn Sheller 2 E. Winnower 3 F. Small dryer 1 G. Scale 1	A. Godown with drying floor 1	A. Corn sheller 1 B. Winnower 1 C. Scale 1	A. Godown with drying floor 2 B. Corn sheller 1 C. Dryer (Holizontal) 1 D. Dryer (KORIKA) 1	A. Godown with drying floor 4 B. Godown only 4 C. Tractor (KUBOTA) 1 D. Dryer (HORIZONTAL) 2 E. Godown Sheller 4
Materials and Equipments lent by Project are not used	A. Dryer vertical (KORIKA) 1			A. Dryer vertical (KORIKA) 1	
Materials which should be lent in 1972 budget	A. 1 Ton type truck (Pick up) 1 B. Corn Sheller with engine 3 C. Winnower 4 D. Scale 7 E. Kett moisture meter 5 F. Two wheel car 2 G. One wheel car 2 H. Motor cycle 1 I. New Corn sheller 1	A. Corn sheller with engine 2 B. Winnower 2 C. Scale 5 D. Kett Moisture meter 3 E. Two wheel car 1 F. One wheel car 1 G. Motor cycle 1	A. Corn sheller with engine 1 B. Winnower 2 C. Scale 6 D. Kett Moisture meter 5 E. Two wheel car 1 F. One wheel car 1 G. Motor cycle 1	A. Dryer (Horizontal) (existing) 1 B. 1 Ton type truck 1 C. Corn sheller, with engine 2 D. Winnower 4 E. Scale 6 F. Kett Moisture meter 6 G. Two wheel car 1 H. One wheel car 1 I. Motor cycle 1 J. New corn sheller 1	A. Tractor KUBOTA with attachment 1 B. 1 Ton Truck (Pick Up) 1 C. Corn sheller with engine 2 D. Winnower 7 E. Scale 7 F. Kett Moisture meter 6 G. Two wheel car 2 H. One wheel car 2 I. Motor cycle 1 J. New corn sheller 1

	B.U.U.D. KEPUNG 6 Desa (Siman)	B.U.U.D. PUNCU 4 Desa (Asmorobangun)	B.U.U.D. BULUPASAR Desa (Bulupasar)	B.U.U.D. DENGKOL 6 Desa (Dengkol)	B.U.U.D. WONGSOREJO 5 Desa (Wongsorejo)
Facilities should be lent by Project and Equipment	A. Fertilizer godown 1	A. Office 1 B. Godown with drying floor 1	ONE COMPLEK A. Office and garage 1 B. Godown with drying floor 1 C. Fertilizer godown 1 D. Processing place 1	A. Office and Garage 1 B. Small godown and small drying floor (for processing each desa) 4	A. Office and Garage 1 B. Fertilizer godown 1
In requesting equipments to OTCA following commodities necessary for BUUD should be taken into consideration	A. New Cron Sheller B. Bicycle C. Book Case D. Safe E. Calculating machine F. Typewriter G. Two wheel car H. One wheel car I. Corn separator				

FACILITIES CONSTRUCTION ESTIMATE FOR B.U.U.D. PROMOTION

DATE II.

B.U.U.D. PAGU :			
1) Office and Garage	22m x 5m x 3.5m	Rp.	1,500,000.-
2) Godown with drying floor :			
a. Godown	22m x 10m x 3.5m	"	1,500,000.-
b. Drying floor	20m x 15m	"	300,000.-
3) Fertilizer Godown	10m x 7.5m x 4m	"	1,000,000.-
4) Processing Godown with tool shed	25m x 5m x 3.5m	"	700,000.-
There is a piece of land which desa Bulupasar owns.			
	Sub-Total		Rp. 5,000,000.-
B.U.U.D. KEPUNG :			
1) Fertilizer Godown	20m x 10m x 4m	Rp.	2,000,000.-
			Rp. 2,000,000.-
B.U.U.D. PENCU :			
1) Office	10m x 5m	Rp.	750,000.-
2) Godown	15m x 10m x 3.5m	R"	1,000,000.-
3) Godown with drying floor	20m x 10m	"	250,000.-
	Sub-Total		Rp. 2,000,000.-
B.U.U.D. DENGKOL :			
1) Office	10m x 5m	Rp.	750,000.-
2) 4 Small Godown	10m x 5m x 3.5m (Rp.350,000 x 4)	Rp.	1,200,000.-
3) 4 Small drying floor	20m x 10m x 4m (Rp.250,000 x 4)	Rp.	1,000,000.-
	Sub-Total		Rp. 2,950,000.-
B.U.U.D. WONGSOREJO :			
1) Office	15m x 7m)	Rp.	2,000,000.-
2) Garage and tool shed	7.5m x 3m)		Rp. 2,000,000.-
	GRAND TOTAL :		Rp.13,950,000.-

In Kediri, the first priority should be given to the facility for B.U.U.D. PAGU (Bulupasar). In Malang the first priority should be given to 4 drying floor for BUUD DENGKOL.
In Banyuwangi the first priority should be given to the office for B.U.U.D. WONGSOREJO.

3.5.6. Promotion Activities of BUUDs in Fiscal Year 1973.

In the sixth year (1973/74) in Labuhan season, the Project was extended in the Bimas method with the Project fertilizer and superior seed. Before the extension of the Project for the rainy season 1973/74, we confirmed to strengthen to bring up Model BUUD. Then we set up the target to make model BUUDs formal (legal), then we decided the supervisor in charge of five model BUUDs. And we also did BUUDs training of manager from five model BUUDs.

Model BUUDs were regarded as formal (legal) since the following date through the guidance of the Project:

Name of B.U.U.D.:	Date of formal establishment:
(i) BUUD DENGKOL.....	11th of November, 1973
(ii) BUUD PAGU II.....	27th of November, 1973
(iii) BUUD KEPUNG.....	1st of January, 1973
(iv) BUUD PUNCU.....	1st of September, 1973
(v) BUUDE WONGSOREJO...	26th of December, 1972

In 1972/73 season, we wanted to develop MODEL Co-operative into Model BUUDs, but actually the formal eatablishment of BUUD were BUUD Wongsorejo and BUUD Kepung. Then in 1973/74 season, BUUD Dengkol and BUUD Pagu II and BUUD Puncu were established formally. BUUD Puncu was separated from BUUD Kepung. That is four primary cooperatives which had belong to BUUD Kepung set up now BUUD together with other four primary cooperatives.

In case of BUUD Bulupasar, Bulupasar area has many desas and primary cooperatives in one Kecamasan, so it was very difficult to establish it. At the end, we succeeded in establishing BUUD Pagu II. But we established two BUUDs in one Kecamatan, namely BUUD Pagu I and BUUD Pagu II.

In case of Dengkol, it was a very unique case, for this BUUD was established on the basis of production area of maize, not by the Kecamatan. So, BUUD Dengkol covers three Kecamatans which include six desas (Primkop). We might call BUUD Dengkol a functional BUUD, different from the administrative BUUD. Which is more effective, administrarive BUUD or functional BUUD ?.

In rainy season 1973/74, Model BUUDs enjoyed their privilege as formal BUUDs. They could receive the credit to buy seed and purchasing credit for maize buying. The following is the amount of credit and date of permission:

Name of BUUD :	Credit for seed :	Comment :
BUUD WONGSOREJO	Rp. 2 million	
BUUD BULUPASAR	Rp. 2 million	Not used, because credit came late

The following is the purchasing credit from B.R.I.

Name of BUUD	Credit amount	Date of obtaining	Purchased maize
KEPUNG	Rp. 5,000,000.-	Dec. 27th, 1973	220 tons
PUNCU	" 2,000,000.-	Jan. 9th, 1974	61 "
PAGU II	" 1,500,000.-	Dec. 27th, 1973	85 "
DENGKOL	" 5,000,000.-	Jan. 10th, 1974	450 "
WONGSOREJO	" 1,000,000.-	Mar. 27th, 1974	120 "

Every BUUDs got purchasing credit of maize, but it was too late for them in getting the credit. Purchasing credit should be given to BUUD one month before the harvest of maize. But this year the credit was given after the harvest, moreover, more than one month after the harvest. The turnover of the credited fund was not so good and not so effective.

Since 1973/74 season, each BUUD started to handle Bimas Paddy except BUUD Wongsorejo and BUUD Kepung which already started handling paddy in 1972/73 season. IN BUUD Dengkol, Bimas Jagung in Marengan season is extending now in addition to the Bimas Jagung in Labuhan season. So, the business of BUUD is gradually becoming all year round. BUUD Pagu II is now building a godown by itself. After becoming formal, every model BUUD got an office.

I think the target of Model cooperatives were fulfilled. The future development of BUUDs depending on the ability of their management.

In the sixth year, we had a planto export maize from model BUUD, but we could not realize it. The exporter of the Project, Gakoperta "Gajah Mada" has been faced with the organization problems. In the framework of the BUUD Promotion, Prime Koperta disappeared, Puskoperta and Gakoperta become idle organizations. There was not any suggestion from the Government of how to arrange the upper organization of BUUDs. Due to the weakness of Gakoperta, maize handled by the model BUUDs could not be exported but was bought by P.T. INDOCORN (Corn oil factory) in Kediri.

In 1973, season, BUUD Dengkol handled half of the amount of maize which was marketed in the region. Anyway we expect the future development of BUUD, in the upland area as well as in the low land.

The further development of BUUDs depend on the ability of the management. I'd like to suggest that special attention should be paid in giving training of management. Table 8 - 12 shows the development process of model agricultural Cooperatives.

TABLE 8. DEVELOPMENT PROCESS OF SIMAN MODEL COOPERATIVES (B.U.U.D. KEPUNG) KEDIRI AREA

ACTIVITIES OF THE PROJECT

YEAR	Cooperative Development	Project's Planting Area (Ha)	Participating Farmer (Person)	Distributed Fertilizer g)	Distributed Seeds (kg)	Target of Maize Repayment (kg)	Realization of Maize Repayment (kg)	Repayment Ratio (%)	Purchased of Unhulled Rice (ton)	B.R.I. Credit Obtained (Rp.)
1968/69	Unit Coop.	200	347	50,000	5,000	100,000	100,000	100		
1969/70	Unit Coop.	60	120	TSP. 800		31,500	33,224	105.5		
				11,160	1,250	62,500	68,299	109.3		
1970/71	Legal Unit Coop.	200	368	Com 20,000						
				28,000	5,000	94,859	87,300	92.0		
1971/72	-"-	220	349	44,000	5,500	93,500	67,425	65.7		
1972/73	BUUD 16 Desas	1,738.375	3,572	347,675	43,459.375	Rp. 10,805.749	Rp. 10,805.739	(in cash)	5	8,104,171.-
						771,838.5	476,413.75	100	35	
1973/74	BUUD 10 Desas	2,100.870	4,800	419,005	Cost of living					5,000,000.-
					Rp. 4,121,000	Rp. 20,881.200		100		

COOPERATIVE OWN ACTIVITIES

YEAR	Cooperative Own Project Planting Area (Ha)	Purchased fertilizer Amount (Kg)	Collecting & Selling of Maize (Kg)	Given Credit Balance	Received Deposito Balance	Borrowed Money (Rp.)	Number of Members	Land & Building
1968/69			44,000				20	
1969/70	130	26,000	20,000		Rp.675,000,-	1,000,000	25	Rp.1,300,000,-
1970/71	15	3,000	13,50		Maize 51,000 ton		58 (404)	
1971/72	30		25,000				60 (404)	
1972/73								
1973/74			220,000					

TABLE 9 : DEVELOPMENT PROCESS OF BULUPASAR MODEL COOPERATIVES (B.U.U.D. PAGU II)

ACTIVES OF THE PROJECT										
YEAR	Cooperative Development	Project planting areas (ha)	Participating farmer (persons)	Distributed Fertilizer kg Urea	Distributed Seeds (kg)	Cost of living compound Rp./Kg.	Maize repayment target (kg)	Repayment realization (kg)	Repayment Ratio (%)	BRI credit obtained (Rp.)
1971	Unit Coop.	80	182	11.200	2.000	Comp. 8.000	80.000	80.000	100	
1971/72	Unit Coop	109	205	12.263	2.725	" 10.500	82.800	62.445	82.6	
1972	Legal Unit Coop	120	225	16.800	3.000	" 12.000	120.000	120.000	100	
1972/73	-"-	121.75	235	21.000	3.043,25		54.057	31.750	58.7	
1973	BUUD 12 Desas	120	245	16.002	3.000	" 11.649	120.000	120.000	100	1,500,000
1973/74	" 12	700		140.000	17.500	C.1. 1,750,000				

COOPERATIVES OWN ACTIVITIES

	Cooperative Own project planting Area (Ha)	Purchased fertilizer amount (kg)	Collecting & selling maize (kg)	Number of Directors (person)	Number of members (person)	Invested amount by member (Rp.)	Compulsory savings
1971			59.000	6	182		
1971/72		4.500	98.000	6	205		
1972	8	4.500	114.950	7	225	130,000.-	
1972/73			90.000	7	235		
1973	25	10.000	243.000	7	245		
1973/74			31.750	16			

TABLE 10. DEVELOPMENT PROCESS OF ASMOROBANGUN MODEL COOPERATIVES (B.U.U.D. PUNCU) · Kediri Area

ACTIVITIES OF THE PROJECT

Year	Cooperative development	Project planting area Ha	Participating farmer (persons)	Distributed fertilizer (kg)	Distributed seeds (kg)	Compound & cost of living (kg/Rp.)	Maize repayment target (kg)	Repayment realization (kg)	Repayment ratio (%)	Bimas paddy		B.R.I. credit obtained (Rp.)
										Area	Member	
1968/69												
1969/70												
1970/71	Unit Coop.	303,420		Urea 43.478	2.000	Com. 30.000						
1971/72	Unit Coop.	346.000		Urea 49.314	8.650	Com. 34.620	155.700	123.232	79.1			
1972/73	16 Desas	466.375		Urea 93.275	11.659		207.070.5	144.053	69.6			
1973/74	8 desas	1,441.000	818	Urea 288.200		2,882,000	14,383,000			120	170	2,000,000.-

COOPERATIVE OWN ACTIVITIES

Year	Cooperative's own project planting Area (Ha)	Purchased fertitilizer amount (kg)	Collecting & selling Maize (kg)	Number of Directors (person)	Invested amount by members (Rp.)	Compulsory avings
1968/69						
1969/70						
1970/71						
1971/72						
1972/73						
1973/74			61.000 (Rp.39.75/kg)			

TABLE 11. DEVELOPMENT PROCESS OF DENGKOL MODEL COOPERATIVES (B.U.U.D. DENGKOL)

ACTIVITIES OF THE PROJECT									
YEAR	Project's Planting Areas(Ha)	Participating Farmers (person)	Distributed Fertilizer (kg)	Distributed Seed (kg)	Realization of Maize Repayment (kg)	Repayment Ratio (%)	Bimas Paddy Planted Area (Ha)	Bimas Paddy Participating Farmer (person)	B.R.I. – Credit obtained (Rp.)
1968/69	20	37	4,000	500	4,000	100			
1969/70	84.50 85	105	17,000	2,125	49,800 42,500	112.1 100			
1970/71	109	162	21,800		44,675	100			500,000.-
1971/72	150	196	30,000		63,750	100			
1972/73	(240) 600	923	(60,000) 120,000	17,000	196,500	73			
1973/74	(339,950) 611.550	(240) 719	122,310	Rp. 4,892,400			300.900	493	5,000,000.-
1974 Marongan	(135) 500	829							

COOPERATIVE OWN ACTIVITIES

YEAR	Cooperative Own Project Planting Area (Ha)	Purchased Fertilizer Among (kg)	Collecting & Selling of Maize (kg)	Number of Directors (person)	Number of Members (person)	Invested amount by Members/ Rp.	Compulsory Saving (Rp.)	Assets at the end of the year (Rp.)	Amount of Equipments	Land & Buildings
1968				9	37					
1969				9	109		105,000			
1970	20	7,000	13,500	9	145		175,000	175,000		
1971	50	12,000	22,000	9	265	300,000	215,000	330,000	22,500	Rp. 62,500
1972	110	22,000	35,000	8	932	550,000	268,000	780,000	22,500	Rp. 170,000
1973	75	15,000	20,000	8		400,000	325,000	1,330,000	222,500	Rp. 170,000

TABLE 12. DEVELOPMENT PROCESS OF WONGSOREJO MODEL COOPERATIVE (B.U.U.D. WONGSOREJO)

Year	Cooperative developments	Project planting area (Ha)	Participating farmer (Persons)	Distributed fertilizer (Kg)	Distributed Seeds (Kg)	Cost of living Rp.	Maize repayment target (Kg)	Repayment Realization (Kg)	Repayment Ratio (%)	BIMAS PADDY Area Ha	BIMAS PADDY Member Pr.	B.R.I. CREDIT OBTAINED (Rp.)
1968/69	1 agcoop	218	145	43,600	5,450		114,000	114,000	100			
1969/70	1 agcoop	1.815	1,249	363,000	45,375		904,768	525.521	56			
1970/71	5 agcoop	2.022	2,200	404,400	50,550		1,017,645	347.700	35			
1971/72	5 agcoop	1,318	1,689	263,600	32,950		593,100	322.000	54			
1972/73	(8 Desas B.U.U.D.	619.5	800	123,900	15,487,5		291,620	227.680	80			2,000,000.-
1973/74	(8 Desas BUUD	1,460,5	1,453	292,100	36,275	2,920,000	1,460,50 (Insecticide)					1,000,000.-
				ACTIVITIES OF THE PROJECT								

COOPERATIVE OWN ACTIVITIES

Year	Cooperative's own Project Planting Area (Ha.)	Purshased fertilizer amount (Kg.)	Collecting & Selling Maize (Kg)	Number of Directors (Persons)	Invested amount by members (Rp.)	Compulsory Savings	
1968/69							
1969/70							
1970/71							
1971/72							
1972/73							
1973/74			120,000 (ton)				

4. WHAT HAVE BEEN ACHIEVED IN THE FIELD OF MARKETING IMPROVEMENT.

There are many good results of the Project. There are also many good results on marketing improvement. But it is very difficult to pick up the good result which has especially attributed to the activities of marketing improvement. For, generally speaking, the good result of the Project is not the result of single activities in its special field, but the result of overall activities of the Project. If I dare to mention the good results in the field of marketing improvement, there are as follows:

(1) The establishment of marketing system of maize and its improvement.

(2) The establishment of credit and system and its influence to otherers.

(3) The establishment of processing business by B.U.U.Ds.

(4) The realization of more than three thousand tons of maize export under the condition of export prohibition by the new Federation of Agricultural Cooperatives.

(5) The development from Model Cooperatives into Model Formal B.U.U.Ds.

(6) Rationalizing the existing marketing channel of maize.

4.1. The Establishment of Marketing System of Maize and Its Improvement.

More than 3,400 tons of maize have been exported through three storied Agricultural Cooperative Organizations (Primkop, Puskop, Gakop). These three storied organization had not been active and had no work before the Project was established. Together with the expansion of the Project, these organizations developed and could manage to export maize to Japan.

Before the Project, Gakoperta has neither exported maize nor export permission. In the first year, Gakoperta exported 260 tons of maize; in the second year, 1,100 tons and in the third year, 1,250 tons and in the fourth year, 825 tons. The prompt increase of maize export by Gakoperta depended mainly on planting area expansion, repayment system (in kind) of the credit and favourable price of maize in the world market. Anyway, I think, it was a good result.

In B.U.U.D. Pagu II, most maize for marketing have been handled by B.U.U.D. The table below shows the transitional handling amount of maize seed by B.U.U.D.

	Maize for seed Handled (A)	Presumed Production of seed Maize (B)	A/B
1971	80 tons	240 tons	33.3
1972	148.5 tons	360 tons	41.3
1973	214 tons	360 tons	59.4

Comment: All produced maize for sale because of lowland taken from Mr. Sakamoto's monthly report.

B.U.U.D. Pagu II (Before PRIMKOPERTA Bulupasar) has been handling maize consumption as well as for seed. So if we add maize for consumption ha handled, handling ratio by B.U.U.D. increase, but I don't have accurate data.
In B.U.U.D. Dengkol, (Before PRIMKOPERTA Dengkol) handling amount of maize is as follows.,

Year	Collected Amount (A)	Selling Amount (B)	Total (A + B)	Presumed Marketing Amount (C)	A + B
1969	4 tons	tons	4 tons	520 tons	0.8 %
1970	42,5	13,5	56	560 tons	10 %
1971	44,7	22	66,7	592	11,3
1972	63,8	35	98,8	640	15,4
1973	196,5	20	216,5	2,485	8,7
1974	450 (sold amount)	not yet	450	2,950	15,3

Comment : about 50 % of maize production is sold.

A is done after the harvest of labuhan maize
B means marengan maize handled. So in 1974 if me get into consideration marengan maize, A+B shall he much bigger.
C
In B.U.U.D. Wongsorejo, the rpives of maize were influenced by the purchase by B.U.U.D.

B.U.U.D. bought maize at the price of Rp. 30.-/Kg., Tengkulak bought maize Rp. 31.-/Kg., then B.U.U.D. bought at the price of Rp. 31.-/Kg., and Tengkulak bade a higher price again. Maize price increased like this is better for maize farmers. However, in the framework of B.U.U.D. movement, Pushoperta and Gakoperta became weak and weak. In the first term, Puskoperta and Gakoperta played great roles in the marketing of maize in East Java. Gakoperta had bought maize from ordinary market and exported them to Japan.
But in the second term, Puskoperta and Gakoperta were left behind and became weaker and weaker, because the connection between Puskoperta and Primerkoperta was out by B.U.U.Ds.
The Government did not give any suggestion on how to reorganize the upper organizations of B.U.U.Ds, Gakoperta was almost dead now.

In the end of March, 1974, the Government decided to reform the four storied organizations of agricultural cooperatives into a three storied organization of agricultural cooperatives based on the B.U.U.Ds. or K.U.Ds. I think, B.U.U.D. movement is the movement of rationalizing agricultural cooperative organizations. So, the fact that Gakoperta and Puskoperta became weak and weak does not mean the retrogression of agricultural movement, it was the rationalizing process of agricultural cooperative movements. It was the process of perfection of Agricultural cooperative organizations.
Now, the established marketing organizations of agricultural cooperatives have been reformed to strengthen its function. New organization will be strengthened in its business.

4.2. The Establishment of Credit System and Its Influence to Others.

In the fourth eyar, the credit system of the Project was completed. According to our survey in the regions, the repayment ratio of the Project influenced the repayment ratio of Tengkulak.
Before the Project, the ratio between fertilizer and maize was 1:40, the ratio of the Project is 1:2. Tengkulak followed the ration of the Project.

The repayment system of the Project was in kind, but we should have changed the system in kind into in cash when the Project was extended 3 years more. This point shall be discussed later in another chapter.

4.3. The Processing Business by B.U.U.D.

The processing business by B.U.U.Ds. go to be done in the fourth year. The construction of godowns and drying floors had contributed to the promotion of processing by Primary Cooperatives or B.U.U.Ds. These godowns and drying floors were built by the Project's budget for the use of Primary Cooperatives in the Project areas.
The construction had contributed not only to the promotion of the Processing business but also to the development of the Primary Cooperatives. On the other hand, the all-year-round business was also promoted very much with the existence of godowns and drying floors. Without these, it would not.

The managerial and technical guidance by Japanese Expert's and the equipments, such as dryers, corn shellers, had contributed to the extension of business by Primary Cooperatives or B.U.U.Ds.
But still some equipments granted from O.T.C.A. were not used effectively yet. To promote effective use of equipments, we should systematize the utilization of processing equipments from corn sheller to dryers. Processing equipments are experimented in utilization system to know whether they are economical or not.

4.4. Realization of more than 3,400 tons of maize export, by New Federation of Agricultural Cooperative Association under the conditions of Export Prohibition.

In the fourth year, we could manage to export only 825 tons of Project's maize, because of the lack of fund for handling cost. And worst repayment ratio for the credit. The decrease of the export amount in the fourth year did not depending only on the above reasons, but also ban of revolving utilization of the fund.
The money which was gotten by the maize export had been used for the development of the Project as revolving fund. In collecting, Processing and exportation, revolving fund was lent to Gakoperta or other cooperative organizations. But in the fourth year, Gakoperta was obliged to borrow money from the national bank of which amount was limited. So, the Export amount of the Project was also limited. The ban of maize export attributed to the deficiency of food, due to long drought and heavy downpour.

Indonesia is not yet reached the level of self sufficient food. The real promotion of maize export hould have been strengthened after Indonesia's food supply becomes self-sufficient.

4.5. The Development of 5 Model Cooperatives into 5 Model Formal B.U.U.Ds.

If we had not promoted Model Cooperatives in the Project, it would have taken much more time to set up formal B.U.U.Ds. in upland area. So, the fast development of Model Cooperatives into Model Formal B.U.U.Ds. relied on the promotion of the Project to a great extent.
To become Model Formal B.U.U.Ds. gave the Model Cooperatives the chance to develop in receiving credit from B.R.I., and handling BIMAS paddy and so on. The target to promote Model Cooperatives was achieved by the fact that Model Cooperatives developed into Model B.U.U.Ds., I think.

4.6. Rationalizing the existing Marketing Channel of Maize

The marketing channel which consists of Agricultural Co-operative Organizations has been giving stimulus and competitive conditions to the Tengkulak and merchants, which contributed to the improvement or rationalizing of maize marketing channel.

In the near future, B.U.U.Ds. will take price-leadership of maize in the districts. Among model B.U.U.Ds., some are already taking leadership of maize price in the districts. The rationalizing of agricultural cooperative organizations are not enough. I think, there is still much possibilities to be rationalized.

5. HOW HAVE THE ATTITUDES OF THE FARMERS AND THE AGRICULTURAL COOPERATIVES CHANGED ?.

The change of attitude of the farmers and the Agricultural Cooperatives seems to be great, but it is very difficult to know how they have changed. The change of attitude was based on the change of consciousness. Through various activities of the Project, the change of attitude and consciousness has occurred to a great extent. The followings are those outstanding ones.

5.1. The Farmers Became Cooperative Minded.

In the first term, the credit of the Project had been distributed and collected mainly through a primary agricultural cooperative. In extending the planting area of maize, we did not mind so much, whether agricultural cooperatives existed or not. But in the second term, especially since the fifth year, we concentrated our planting areas into the area where good agricultural cooperatives existed. On the one hand, the selection based on the existence of good primary cooperatives curved the expansion of the planting area, but on the other hand, it promoted the cooperative minded activities and better repayment.

In these areas, most of maize for marketing are handled by B.U.U.Ds. The farmers began to recognize the necessity of agricultural cooperatives.

5.2. The Consciousness of the Rational Repayment for the Credit and Farmers'.

Request to Improve Repayment Ratio.

Through the experiences of the Project, farmers got to request Tengkulaks and merchants to change their repayment ratio equivalent to the Project's one. Then, the repayment ratio of Tengkulaks also came near to the Project.

In the fifth eyar, we decided the repayment ratio before planting. After it, the price of maize increase drastically. The repayment ratio became disadvantageous to the participating farmers. Even the farmers who had repaid 100% for 4 years did not repay 100% in opposing the disadvantageous repayment ratio. This happened in Dengkol area. Through repayment for the credit in kind system, the farmers recognized the merits and demerits of the in kind system. Then, the farmers requested the Project to change the credit system in kind into in cash.

In the sixth year, the Project adopted the BIMAS system (in cash). The merit and demerit of in kind system would be treated later.

5.3. The Request to Process Maize in Primary Cooperatives or B.U.U.Ds

The officials of B.U.U.Ds. requested the Project to process maize for the repayment in the B.U.U.D.'s level (or Primekopreta). Then, in the fourth or fifth year, Primary Cooperatives or B.U.U.Ds could process maize by themselves through the technical guidance of how to use equipments and the free use of equipments granted by Japan.

6. PROBLEMS ON THE PROJECT SYSTEM

There are many problems on the system adopted by the Project, but the Project systems also have many merits. So, I herewith want to discuss about the merit and demerit of the system from the point of view that Project system contributed to the accomplishment of the purpose of the Project or not.

6.1. The Credit System of Giving Input in Kind and Repayment Maize in Kind.

The credit system adopted by the Project was credit in kind which is different from credit system in cash, adopted by BIMAS Paddy and BIMAS Palawija. Here I call them in kind system or in cash system.
In giving credit of inputs to the farmers, both the Project and BIMAS take in kind system. On the other hand in repayment for the credit, the Project collected maize kernels equivalent to the credit amount, while the BIMAS collected money equivalent to the credit amount.
So, the main difference lies in the repayment system. First of all, I'd like to write about the credit system repayment in kind.

6.1.1. The Merits and Demerits of Credit System Repayment in Kind

The Project decided the repayment amount of maize on the basis of the following formula.

$$\frac{\text{Price of Urea}}{\text{Price of maize in Desa just after harvest}} = \frac{200\ \text{Kg} \times \text{Rp. } 26.60 \ + \ 25\ \text{Kg} \times \text{Rp. } 24.00}{\text{Price of maize in Desa just after harvest}} = 444\ \text{Kg.}$$

1) The demerits of the system are as follows:

   a. It is very difficult to forecast the price of maize in Desa after harvest. After deciding the repayment amount of maize, if the price of maize in Desa rises, the repayment would be disadvantageous to the farmers. If the price of maize decreases, it would be advantageous for the farmers. The former would be an obstacle to promote better repayment and the latter would promote better repayment.
   This kind of repayment system makes farmers unsatisfied and also this was not a good education. To improve the demerits, we should have liquidated the profit and loss coming from the above formula. But, as a matter of fact, it was impossible because of limited time and budget.

   b. Some farmers repaid low quality maize to the Project and sold the better quality maize to others at higher price. The quality of maize for repayment was also decided between the Project and the Primary Cooperatives. As a matter of fact, the quality of the repayment was left to the farmers' good sense.
   In this sense, it turned out that the Project system did not contribute to the promotion of quality improvement. In case of in cash repayment, if the farmers process maize into maize of high quality, they can sell maize of high quality at higher price. So, if we give technical guidances on quality control and processing, they will follow and they will make more Profit.

2) The Merits of the system are as follows.

   a. The Project asked the agricultural cooperative organizations, which had not been active, to collect, process and export maize as the credit repayment. The agricultural cooperatives were very weak. At that time only organizations existed.
   If the Project did not take in kind system, the agricultural cooperative organizations would not have worked in cooperation with the Project. The agricultural cooperatives, which have no capital, no facilities and which have organizations only, could not have done anything without in kind system.

   So, I think, the in kind system has contributed to the development of the agricultural cooperatives to a great extent.
   If the agricultural cooperatives could not borrow money from the Bank, because of no capital and no facilities, the in kind system would contribute to the development of the agircultural cooperatives.

But, if the agricultural cooperatives could borrow money from the Bank, we should have switched our system of in kind into in cash system, which has no contradictions. For in cash system introduce the competition into the maize market, so this is very hard for the agricultural cooperatives which contribute to the further developments of the agricultural cooperatives. The introduction of competitive conditions will be beneficial to the farmers.

b. Agricultural cooperatives could handle big amount of maize with small fund because of in kind repayment system. Otherwise, I think, the handling am amount of maize by agricultural cooperatives would be limited.

c. Agricultural cooperatives got the chance to work in collecting, processing and so on. This system contributed to the increase of working opportunities which means to increase of farmers' income. Agricultural cooperatives organizations have appreciated in kind system and welcomed it.
But, the Project would not last forever, so it is necessary to switch before the end of the Project. In the sixth year, we combined our system with the system of Bimas.

6.1.2. The Consignment Contract of Collection. Processing and Exportation. Between the Project and Three Storied Agricultural Cooperative Organization.

The Project had let Agricultural Cooperative Organizations (Gakoperta - Puskop - Primkop) do such business by contract to develop the Agricultural Cooperatives. The Primary Koperta worked for collecting, drying, processing and temporary storing of maize. Puskop was in charge of processing or reprocessing, storage and transportation. Gakoperta was engaged in reprocessing, transportation, storage and exportation.
The Project made the contract on the tariffs based on the operation. The Agricultural Cooperative Organizations should have 10% of commission on the basis of the handling amount. In addition to the commission, Agricultural Cooperatives could draw profit which came from the reduction of the operation expenses. The decrease of the operation expenses must be attributed to the rationalization of operations. But, it may come from the negligence of duties which cause the low repayment for the credit.

As the Project areas expanded, the negligence of operation duties happened. Sometimes, they did not pay the commission to the lower organizations (Gakop to Puskop or Puskop to Primkop). It often happened that Puskop did not pay commission to Primkop though Puskop had received commission from Gakoperta. Then, the Primkop get commission in selling a part of the collected maize which also cause the low repayment for credit.

In making contract, Gakoperta, the representative of the Agricultural Cooperative Organizations, would request higher tariffs every year to make more profits.

Even, if they expected to lower the operation expenses, they would request higher tariffs. It was impossible to decrease the tariffs lower than that of last year. So, the Project could not rationalize the marketing of maize. Actually, the marketing of maize in the project areas had been rationalized, because the processing could be done by the organization itself or lower organizations, especially Primary Cooperatives.

If we adopted repayment system in cash, and let the Agricultural Cooperative Organization handle maize for export in giving or helping them give purchasing credit, the system would have contributed to the rationalization and improvement of the maize marketing.
The consignment contract let Agricultural Cooperative Organizationa became passive in their business activities. I think, the system which gives incentive of doing better by themselves is better.

6.2. Low Repayment Ratio for the Credit.

There are many reasons why the credit repayment for the Project was not so good. They are as follows:

(1) The collection of repayment was done by the Project in Cooperation with Agricultural Cooperative Organizations. The duties of officials or counterparts of the Project was not to collect money but to extent agricultural crops. This was one of the weak point of the Project.

(2) In extending the Project areas, sometimes we neglected the principle to extend areas. We should have extended our areas based on the Agricultural Cooperatives. According to the analysis, it turned out that we could have expected better repayment and continuous planting of maize if we ha have extended our area based on the Agricultural Cooperatives. Table - 3 shows the transitional planting area and repayment ratio of the Project in each desa. The drastical expansion of the Project area also caused the low repayment for the credit.

(3) As I wrote in the previous chapter, in kind system has difficulties and contradiction. That is, sometimes the repayment ratio is advantageous to the farmers and sometimes disadvantageous to the farmers. So, in case of the disadvantageousness to the farmers, it caused low repayment of the credit.

(4) Assignment contract with three-storied Agricultural Cooperative Organizations had not work well and also the organization itself had many unrationalized points. So the organization was not strong enough to control the lower organization of cooperatives. I think, the weak organization, consisted of three-storied agricultural cooperative organizations, was one of the reasons of low repayment ratio.

(5) The punishment for unrepaid farmers and continuous collection of credit.

Six months after the harvest of maize, the collection of maize was stopped. There were some farmers, who had not repaid the credit yet, could receive credit from the Project in another or next yéar. The Project had no punishment

to the unrepaid farmers. This was not a good education for the farmers and also induced to low repayment ratio of the credit.
Of course, we made great efforts to select farmers with better repayment in extending the maize planting area.

6.3. Extension of the Project Areas.

According to Table 3, the extended area of the Project where Primkoperta existed had been under better repayment conditions, continuous and developing very well. So, since the beginning, we should have extended the Project area on the basis of the existance of Primlopertas. This policy would have contributed to the development of Primkopertas. Now, B.U.U.Ds. are set up by the administrative borders. In Dengkol area in Mala Malang, we established the B.U.U.D. on the basis of maize production area. That is, B.U.U.D. Dengkol is the functional B.U.U.D. I think we should promote not only administrative B.U.U.Ds. but also functional B.U.U.Ds.

If we established B.U.U.Ds based on the administrative area, some of B.U.U.Ds. are not so advantageous in handling agricultural products. Some B.U.U.Ds. are advantageous in dealing with maize or paddy. If we set up B.U.U.Ds. hased on functional area, these B.U.U.Ds. are very easy to handle agricultural products. I think, we should not insist on the administrative areas.

6.4. Export Promotion.

Since 1972, the Government the prohibited maize export because of the unstable food conditions. In Indonesia, the staple food of the people consists of rice, maize and cassava. If the price of rice increases, people shift rice to maize or cassava. If we produce more rice, maize and cassava must be exported to foreign countries. So, what is most important is the increase of rice production in order to promote the export of maize. That is the increase of maize production not necessarily bring about the increase of maize export.

The increase of maize export depends on not only the maize production but also rice production.
If rice production is not enough, maize export would not increase in spite of big crop of maize.

6.5. Model Cooperative Promotion.

We have been promoting model cooperatives which have developed into model B.U.U.Ds in Project areas. The godown and drying floor built by Project budget contributed to the great developments of model cooperative business. Some of model B.U.U.Ds. are constructing godowns and drying floors by themselves. The Government should help B.U.U.Ds. by giving a soft loan to build such facilities as godowns and drying floors. For "opkoop" purchasing credit is also available to rpomote business of B.U.U.Ds. which is not enough to enlarge scale of business.

7. SUGGESTIONS TO PROMOTE PRODUCTION AND EXPORT OF BIMAS PALAWIJA (SECOND-CROP).

7.1. Role of each palawija crop should be clear.

People in Indonesia eat rice, maise and cassava as staple food. Presumed consumption amount per capital annum in Indonesia is as follows:

	Rice	Maize	Cassava
1961	90.0 Kg.	22.6 Kg.	33.6 Kg.
1968	92.9 Kg.	27.0 Kg.	28.8 Kg.
1971	108. Kg.	19.5 Kg.	21.2 Kg.

The presumed consumption amount per capital in East Java is as follows:

	Rice	Maize	Cassava
1961	86.6 Kg.	43.8 Kg.	38.4 Kg.
1968	93.7 Kg.	40.1 Kg.	35.4 Kg.
1971	103.6 Kg.	25.5 Kg.	25.2 Kg.

Every year Indonesia has been developing and people's income is increasing. Industrialization is starting. So people is moving to cities such as Jakarta, Surabaya and Semarang. People in rural areas eat maize and cassava, but they eat only rice in urban areas after moving there.
In the future people eat more rice and less maize or cassava. As Indonesian economy develops, income per capital shall increase and many people become laborers in urban areas.

Population in Indonesia still increases at the rate of about 2.4% annually. Population increase in big cities such as Jakarta and Surabaya is more than 3% annually. So, consumption amount of rice shall increase and than of maize and cassava decrease.
In the future even if we have enough supply of maize and cassava, people do not eat them and they want to eat more rice. If rice production increases highly, export of maize and cassava shall increase under the conditions of less production. On the contrary, if rice production does not increase so much, export of maize and cassava shall decrease in spite of their production increase.

Rice is the best food among palawija. But maize is better than cassava it its nutritious content. For example, the protein of maize is about 8.7% and cassava at the most is only 3%. So, if the people can afford to buy rice, the consumption shall increase. Cassava consumption will decrease more than maize. I think, cassava shall be an export production prior to maize. Some amount of maize shall be supplementary food in case of deficiency in rice. Cassava should be produced as an export product.

Sorghum is not staple food in Indonesia. So it is not necessary to promote the production of sorghum as food. Sorghum also should be produced as an export product. Of course, in need, cassava and sorghum shall be used as food. I think, the production of palawija crops should be increased by BIMAS Palawija based on the following roles.

Crops	Role of crops
Rice	consumption
Maize	1. consumption
	2. raw material for industry.
	3. export
Sorghum	1. Export
	2. consumption
Cassava	1. export
	2. consumption

7.2. Variety Improvement of Palawija. According to the experience in Maize Project, it is not difficult to increase maize production from 1 ton per Ha. to 2 tons per Ha., in applying fertilizer and superior seed. If enough fertilizer can be attained, expansion of BIMAS and INMAS of maize would enable to increase maize production to a certain level. In East Java, the Agricultural Extension Service has been promoting Kretekization, which means to expand the use of Kretek seed of maize in BIMAS and INMAS.

Kretek variety was a local variety, but it has been purified by Dr. HIROSE, an expert of the Project. Then, Kretek variety has been expanding not only in East Java, but also in other provinces. The merits of Kretek variety is as follows:

1) Short maturity (85 days), so it does not disturb farmers' crop rotation.

2) Kretek is comparatively strong to the disease of Downy Mildew than Harapan, Metro, Bogor Composite 2 and so on.

3) The yield of Kretek is stable and better.

The demerits of Kretek are as follows:

1) Fertilizer ability is low because of local variety, but we expect 3.0 - 3.5 tons per Ha. of yield in good cultivation conditions with enough fertilizer.

2) Kretek is a flint type which suitable for food, because its protein content is high and it is small size. To increase the yield is a demerit. In Japan, small size of flint type maize is suitable for pigeon feed. The amount of pigeon feed are limited at the most 10,000 - 12,000 tons per annum. This is a very small demand as compared with other demands. Other improved varieties such as Harapan, Metro, P.S. 42 and Bogor Composite 2 are less resistant than Kretek. Moreover, they are long maturity which interferes much the crop rotation of the farmers. In case of Harapan and Metro, we can expect high yield. Harapan and Metro did not expand in its planting area so much because of long maturity.

In the future what is most important is to create a new variety which has the following characteristics:

a) Short maturity (85 days), like Kretek.

b) Resistant to Downey Mildew.

c) High yielding variety such as Harapan and Metro.

First of all, variety improvement should be done before vast extension of maize intensification. We can increase maize production in using existing varieties such as Harapan, Metro in BIMAS and INMAS Programe, but they are weak to Downey Mildew, so it is not effective. The farmers do not like to plant them. So, vast expansion would be difficult without finding other better varieties like Kretek in East Java.

7.3. B.U.U.D/K.U.D. should be the center of Palawija Extension.

According to our experience in the Project, Project extending areas where good agricultural cooperatives existed are continuous and have development much better than those areas without them. We should expand maize planting area around B.U.U.D./K.U.D., which should be the center of maize production area. For B.U.U.D./K.U.D. can help farmers in marketing and processing of maize and in purchasing production requisites. (See Table).
Collective farm should be development around B.U.U.D./K.U.D.

7.4. Maize Production Areas Should be divided into 2 (two) purposes.

Maize production area for consumption and for export should be divided.
Maize area for export has to be within 150 Km. from harbours. In export areas, farmers should plant maize varieties suitable for export. In consumption areas, maize varieties suitable for food might be planted. If we fiend better varieties for export and consumption, extension of maize shall be much easier.

7.5. How to Promote Exportation of Palawija.

Maize can be used multi purposely. The use of cassava pellets is not many. The use of milo is between maize and cassava. In the future, the demand for maize, milo and cassava shall continue to increase. Among them, the demand for maize shall increase bigger than the others. Milo shall be next to maize. In this sense, cassava shall be smallest. In producing compound feed, maize, milo and cassava are alternative to one another.

According to F.A.O. (Food and Agricultural Organization of the U.N.), the deficiency of food still continue in 1970/3. Under such conditions the demand of cassava shall increase continually. There is about 10 million tons of cassava production in Indonesia. The export amount of cassava was about 460,000 ton in 1971, all of which were for the European countries such as West Germany, Netherlands Belgium. In the harbours such as Semarang, Surabaya, Cirebon and Panjang, there are several cassava pelloting factories.

As I mentioned before, the eating amount of rice is increasing and those of maize and cassava are decreasing, as rice production increasing. The eating amount of assava is decreasing bigger than that of maize. Cassava is an inferior good compared to rice and maize.
Thus, as long as the rice supply increase more than the population increase and the income of the farmers rises, the eating amount of cassava shall continue to decrease. On the other hand cassava is the best crop during the rainy season, so farmers will continue to plant it.

If people eat 1 Kg. of cassava less than before, there will be 120,000 tons of cassava (gaplek) remainder annually which can be exported. The demand of European countries for cassav shall continue to increase. The countries that produce maize and milo are many and prevailing all over the world. U.S.A. has the right to control the price of maize and milo. But in case of cassava, the producing countries are not so many and are limited in tropical zone only. Cassava exporting countries are Thailand, Indonesia, African countries and South American countries. At present the biggest exporter is Thailand and the second is Indonesia. So far Japan has never used cassava for compound feed. But now, people in Japan has been experimenting how to use cassava pellets for compound feed. Japan will be a buyer of cassava pellets soon.
Among second-crops, cassava pellets is most advantageous crop, I think. to my regret, the Government of Indonesia does not pay much attention to the increase of cassava production.
First of all, we should promote export of cassava pellets as export products, because cassava exporters in Indonesia already has marketing channel with European countries and cassava markets are small and limited in tropical countries such as Thailand and Indonesia. Moreover, Indonesia is a second biggest exporter of cassava. Cassava export is stable and increasing. Maize export should be promoted next to cassava. Some exporters have markets in Asian countries. We have already had experience in the export of maize.

In case of sorghum, we have no experience to export sorghum and the marketing channel is also not established yet. The exporters' knowledge about sorghum is not enough. It takes time to promote it. Price of maize and sorghum are uncontrollable. So, Indonesian exporters have to make efforts to reduce the production and the handling costs to take competitive power in the world market.