BASIC DESIGN STUDY REPORT
ON
POST-HARVEST TECHNOLOGY APPLICATION CENTRE PROJECT
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

JANUARY, 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

BASIC DESIGN STUDY REPORT
ON
POST-HARVEST TECHNOLOGY APPLICATION CENTRE PROJECT
IN
THE SOCIALIST REPUBLIC OF THE UNION OF BURMA

JANUARY, 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

No. 14343

104
84.1
GRB

国際協力事業団	
受入月日 '84.[illegible]9	104
	84.1
登録No. 09395	GRB

P R E F A C E

In response to the request of the Government of the Socialist Republic of the Union of Burma, the Government of Japan decided to conduct the Basic Design Study for Post-harvest Technology Application Centre and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to Burma a Study team headed by Mr. Kazuhisa MATSUOKA, Deputy Head, Basic Design Division, Grant Aid Department, JICA from 8th March for 28 days, 1982.

The team had discussions with the officials concerned of the Government of Burma and conducted a field survey (in Rangoon). After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of Burma for their close cooperation extended to the team.

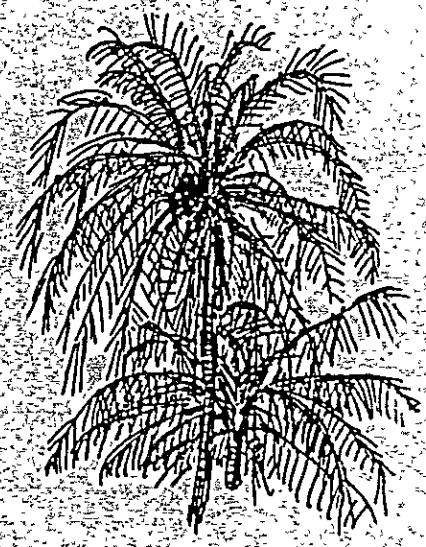
January, 1983

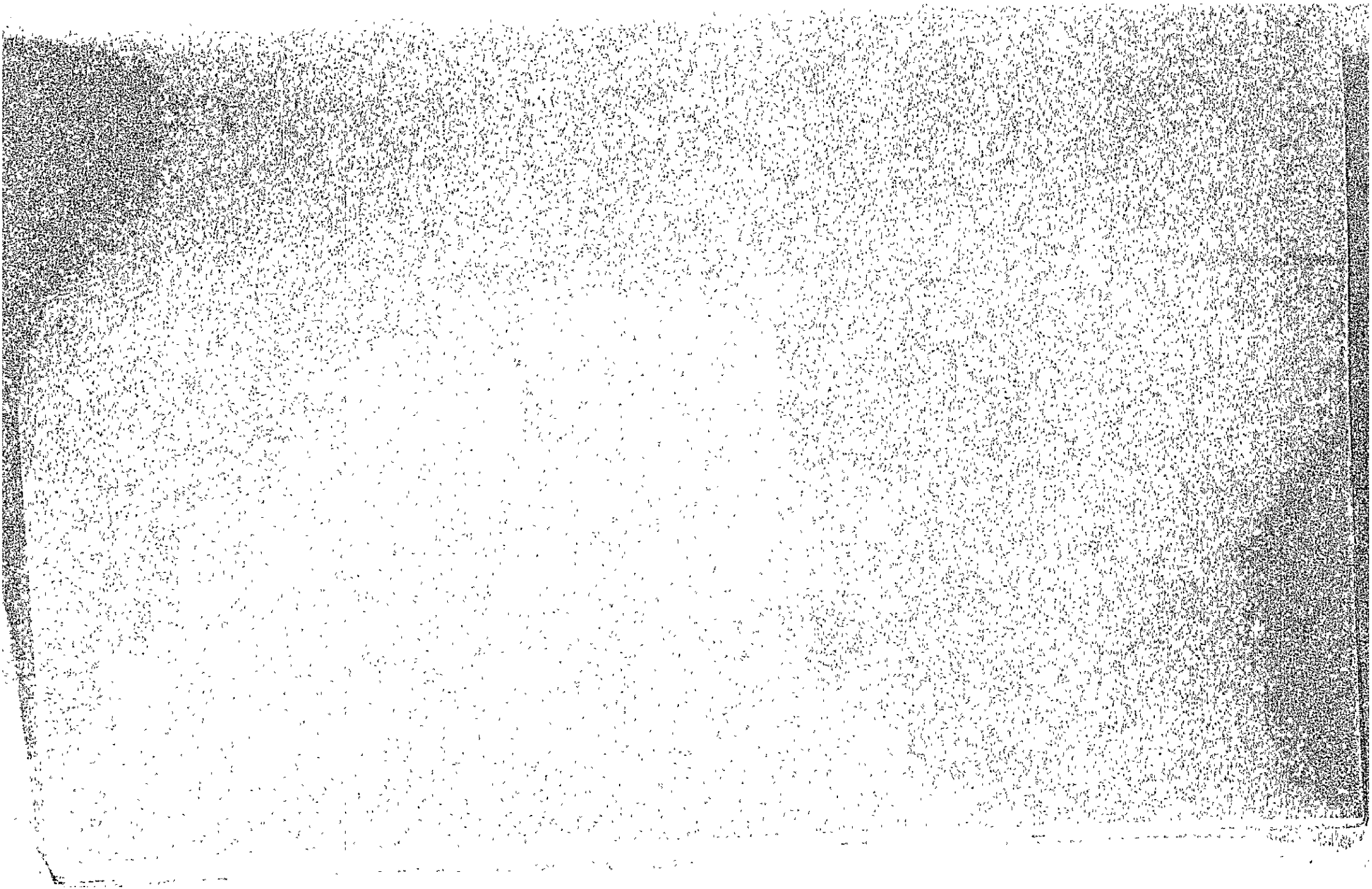
Keisuke Arita

President

Japan International Cooperation Agency

Summary





SUMMARY

The Socialist Republic of the Union of Burma is a agricultural country covering the area of about 680,000 km^2 with 33 million population. From the statistics of 1979, over 67% of the total population is engaged in agriculture and the remaining 32%, most of them are in agriculture related industries or service. At the same time, agricultural products hold 60% of total export earnings. Thus agriculture is the mainstay of Burmese economy, and raising the productivity and expansion of export of grain mainly rice, are put up as a top priority of the national development plan.

Regarding an increase of production of grain, owing to the development and spread of new kind for mass-harvesting productivity expanded for over 30 % comparing from the year before in 1979/80 even the farming area remained the same.

However, volume of export as well as domestic consumption volume of grain including rice and their sub-products are failing to increase recently. One of the biggest reasons is by drop of quality and loss in bulk at the process of treatment after harvesting.

Before the war, Burma has been mainly exporting high class rice, however more than 90 % of recent export rice falls under low grade which includ 25 % over broken rice. Since export markets for low grade rice is becoming smaller, problem of quality control has become an urgent theme to be solved for Burma.

Processes after harvesting can be divided into harvesting, threshing drying, transport and handling, storing, milling, pest-control, grading inspection, sub-product production, domestic distribution and export. However, existing facilities for each process are getting old. Also process technology including software still depends on empirical knowledge basis. Rational scientific technology is not even introduced.

In this connection, total production of 10 to 20 % becomes the loss during the process. At the same time, it brings about a low quality grain and sub-products.

In order to improve such conditions, the government of Burma decided to implement the following plans by the hand of Agricultural Farm and Produce Trade Corporation (AFPTC) which is the executing body of collecting grains to export as well as the production of sub-products such as rice bran oil.

(1) Improvement and construction of post-harvest processing facilities

(2) Education and training of the personnels engaged in post-harvest processing

(3) Research and development of post-harvest processing rational technology

Regarding (1), IDA, ADB, OECF and China are cooperating in funds to establish milling silos and storage warehouse, etc. Those are now under construction.

Regarding (2); training center for up-grading overseas trainings through foreing assistance, with training contents putting stress on operation and administration regarding newly established facilities, is under construction by the assistance of ADB. It will complete by March, 1983.

The government of Burma established PTAC in accordance with the advice of FAO. In 1979 the training by foreign experts, procurement of laboratory equipment, fellowship etc. through ADB grant capital aid of some US$ 150,000 began. In 1980, research and training by placing thirteen staff members in the renovated warehouse initiated.

Therefore, to achieve the original PTAC objectives, the Government of Burma made a request to the Government of Japan for grant aid for the establishment of PTAC in respect of supplying laboratory equipment and construction of buildings, etc.

Outline of PTAC proposed here is as follows:

(1) Activities

1. Survey, research and development on nature and characteristics of paddy and rice.

2. Survey, research and development on storage, pest control transport and handling of paddy and rice.

3. Survey, research and development on drying, milling and parboiling.

4. Survey, research and development on use of rice blan.

5. Survey, research and development on agricultural economy, marketing policy and world rice market.

6. Publication of the above-mentioned findings, and submission of recommendations to the Burmese government for policy making.

These activities are planned to be carried out by 83 staff members.

The construction site of PTAC is located in the paddy field of Parami, Mayangon township, north of Rangoon, the capital. The area covers about 10 ha in where Post-harvest technology Training Centre is now under construction.

Infrastructure such as electricity, water works, sewage and Telephone are possible to install.

The PTAC buildings will comprise of main building, testing rooms (four buildings), workshop, staff quarters, director's residence, canteen, paddy warehouse, etc.

The main building will include administrative, public relations, and service departments (office, rooms for director and deputy director, conference room, meeting room etc.) and research departments (milling test laboratory, grain inspection laboratories, pest control laboratory, oil and fats laboratory, draftmen's room, economy and marketing room, library, etc.). The four buildings for testing will consist of comparative milling and standard mill testing room, dryer testing room and parboil testing room, and oil fats testing room.

The workshop building will carry out prototype production and development of post-harvest processing machinery/instruments, along with related research instruments, etc.

Scales of the buildings are as follows:

Main building	1,725 m^2
Testing room building (comparative milling room and standard mill)	720
" " (dryer and parboil testing room)	720
" " (Two buildings) (oil & fats industry testing room) x2	360
Workshop	540
Power substation and generator room	105
Pump room	25
Boiler room	35
Connecting corridor	453
Paddy storage testing facility	
(1) Concrete-made silo	20
(2) Corrugated steel silo	20
(3) Wooden warehouse *	20
(4) Bamboo-built temporary shed *	20
Paddy warehouse *	231
Canteen *	112
Garage *	60
Guardman's room *	3
Staff quarters * x 3	183
Director's residence *	110
Total	5,462

Others; Paddy drying yard ..... 2 places
Pond 1

Notes: The mark * indicates the facilities to be borne by Burma.

The aggregate cost of constructing and operating the PTAC facilities is estimated as listed below:

(Unit: ¥ 1,000) (US$ 1.00 = K 7.0 = ¥ 235)

	Japanese portion	Burmese portion	Total
Building construction	980,284	922,274	1,902,558
Equipment	540,750	20,400	561,150
Engineering & supervision	111,609	0	111,609
Total	1,632,643	942,674	2,575,317
Operation & maintenance			51,000

The execution organ for implementing the project is AFPTC which is under the administration of the Ministry of Trade.

Meanwhile, the construction schedule of PTAC facilities is assumed as follows: counting from the date of signing the Exchange of Notes by both governments regarding the grant aid for the project, three months for detail design, three months for tender and contract and about 16 months for construction.

Realization of the project is in urgent needs for the economic development, improvement of livings, and up-grading of the farmers's technical level as a whole.

(i) security and expansion of rice export,
(ii) up-grading of farmers' technical level,
(iii) renovation in post-harvest processing technology as a whole,
(iv) substantial reduction in grain loss and waste, and
(v) encouragement of related industries.

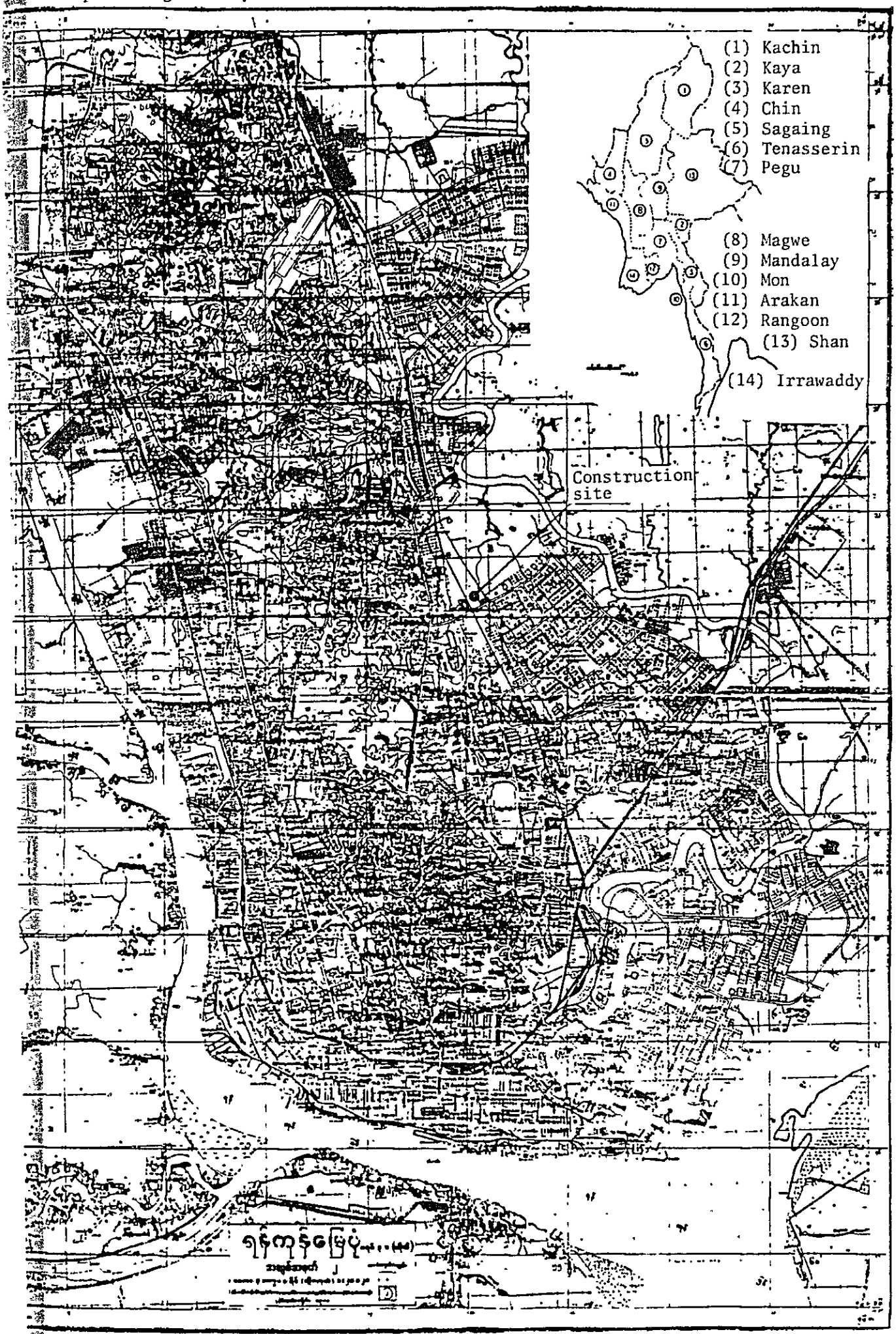
Therefore, the nature of the project meets perfectly to the objective of the grant aid system of Japan, and it will certainly bring about far-reaching benefits by utilizing the limited resources effectively.

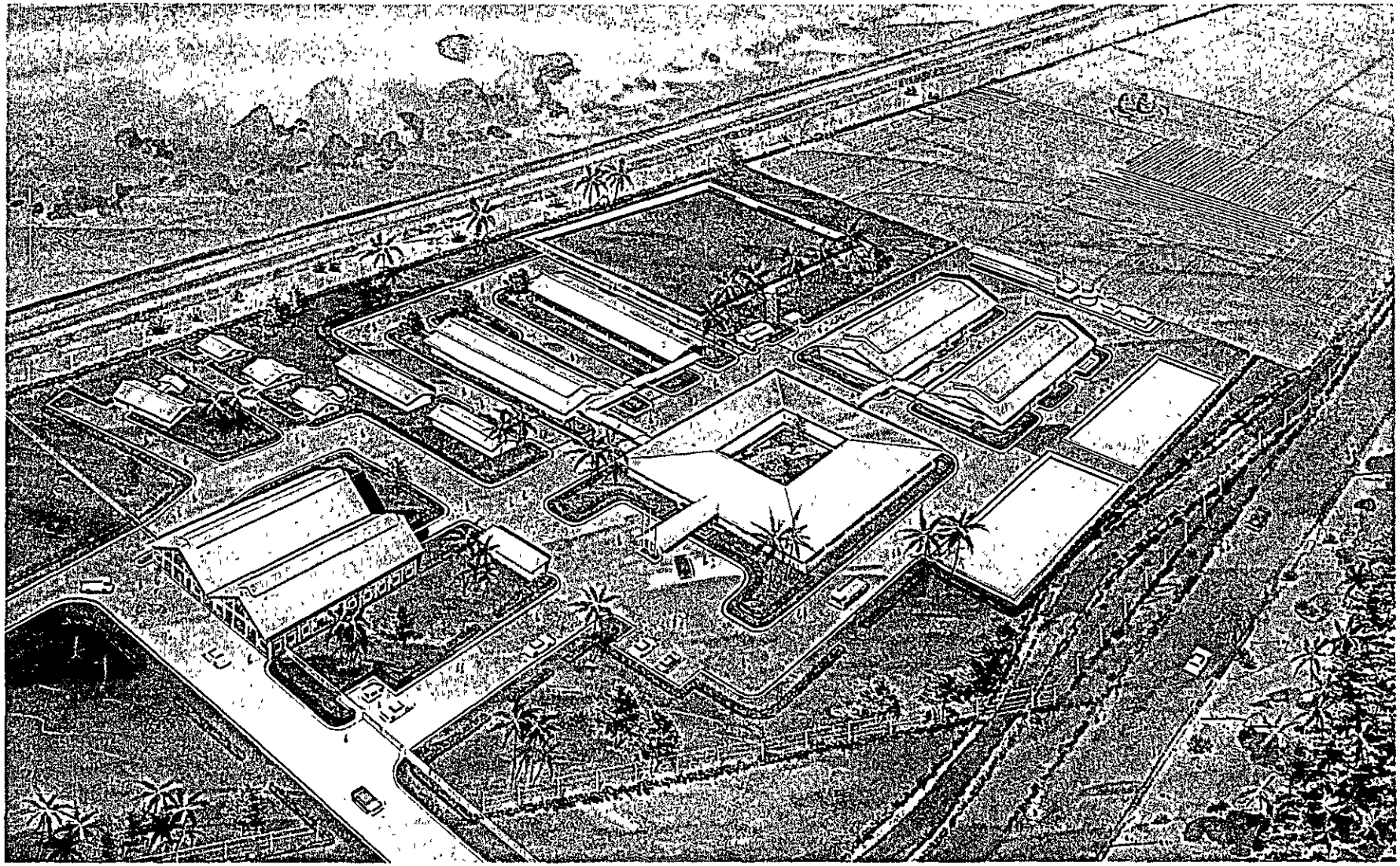
The Government of Burma is placing much emphasis on the realization of the Project. Preparation of the construction works, allocation of

required budget for construction and operation, are already included in the Fourth 4-Year Plan, therefore it is assumed there will be no problem regarding budget.

Whether PTAC could perform the expected function greatly relies on the availability of qualified personnels, rather than that of equipment and facilities. From this view point, it is strongly required that overseas technical cooperation be accompanied with this Project.

Map of Rangoon City





PROSPECTED VIEW

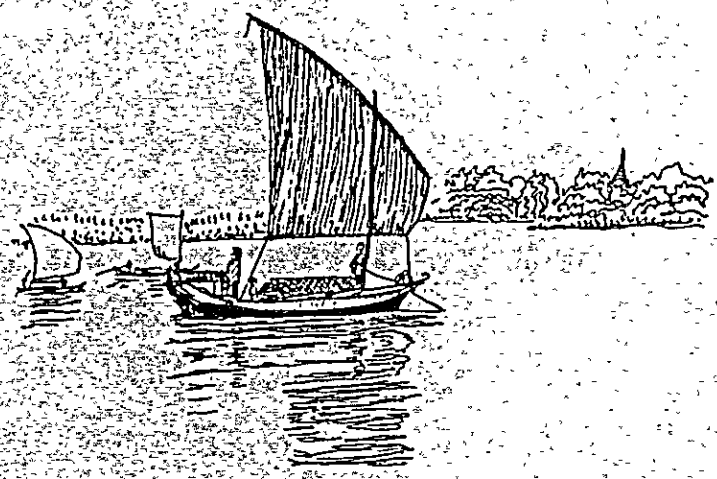
POST-HARVEST TECHNOLOGY APPLICATION CENTRE
SOCIALIST REPUBLIC OF THE UNION OF BURMA

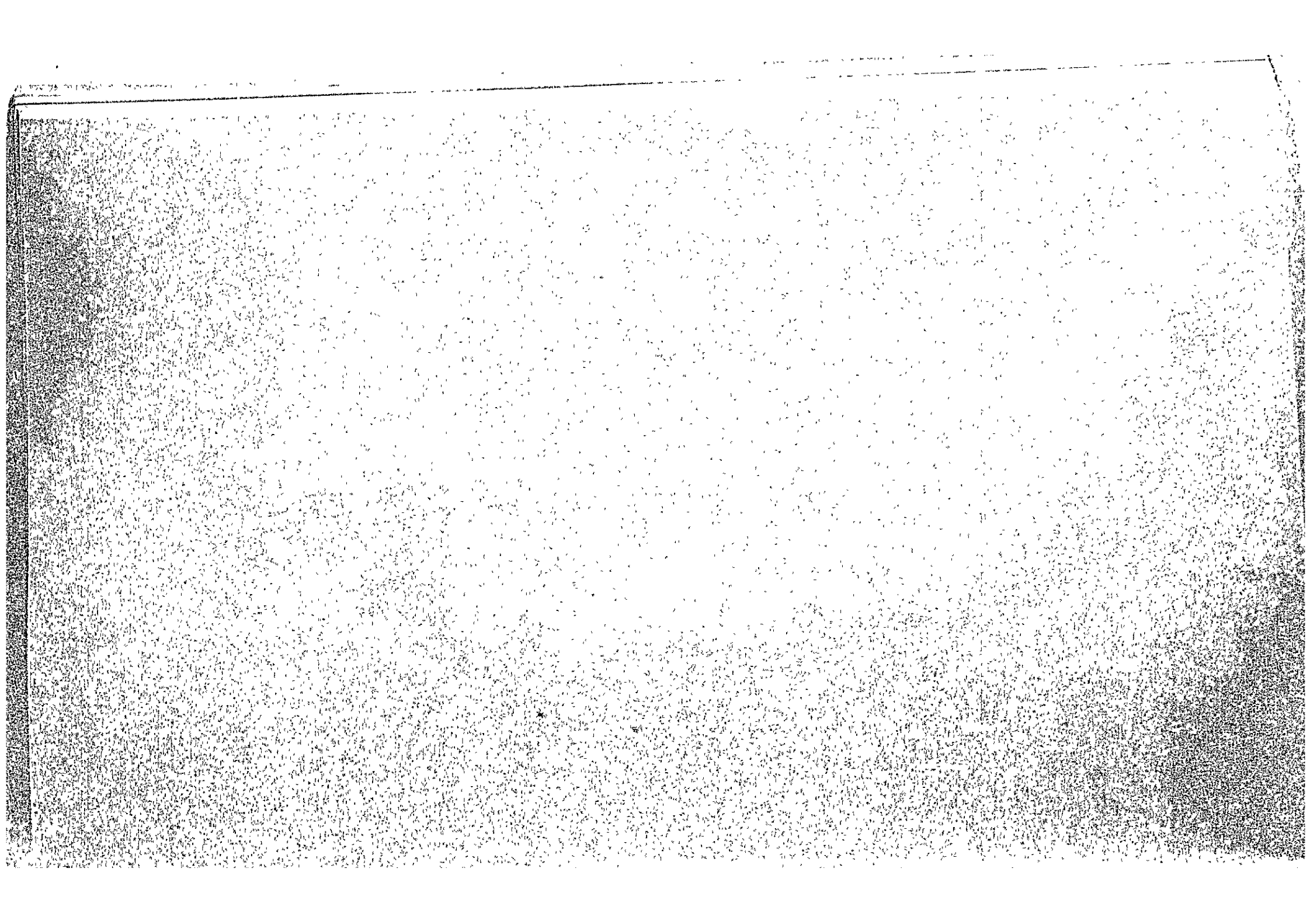
CONTENTS

APPENDIX

2.

Chapter 1 INTRODUCTION





Chapter 1 INTRODUCTION

The Government of Burma made request to the Government of Japan for extending a grant aid and technical cooperation in establishing the post-harvest technology application centre (PTAC), with a view to research and develop the basic and applied technology necessary for the post-harvest processing.

In response to the request, the Government of Japan dispatched a pre-survey mission to Burma for 10 days from November 30th to December 9th 1981, with the object of confirming the intensions of the Government of Burma, surveying the existing post-harvest processing, and judging the viability of the Burmese concept.

Having discussed with the Burmese government officials, and having inspected the present condition of paddy harvesting, rice milling, and storage of paddy and rice etc., in and around Rangoon city, the mission prepared the survey findings with observations about the Burmese concept of PTAC, and reported to the Japanese government.

Following the survey findings and recommendations made by the mission, the Basic Design Survey Mission was despatched to Burma for a period of 28 days from March 8th to April 4th 1982, headed by Mr. Kazuhisa Matsuoka, Assistant Chief of Basic Design Section, Grant Aid Department of the Japan International Cooperation Agency (JICA).

The activities of the mission included discussion, survey and data collection as follows;

1) Discussion and confirmation of the backgrounds, objectives and activities of PTAC.

2) Discussion and confirmation on required facilities for PTAC.

3) Survey of construction site and the present situation of infrastructure there.

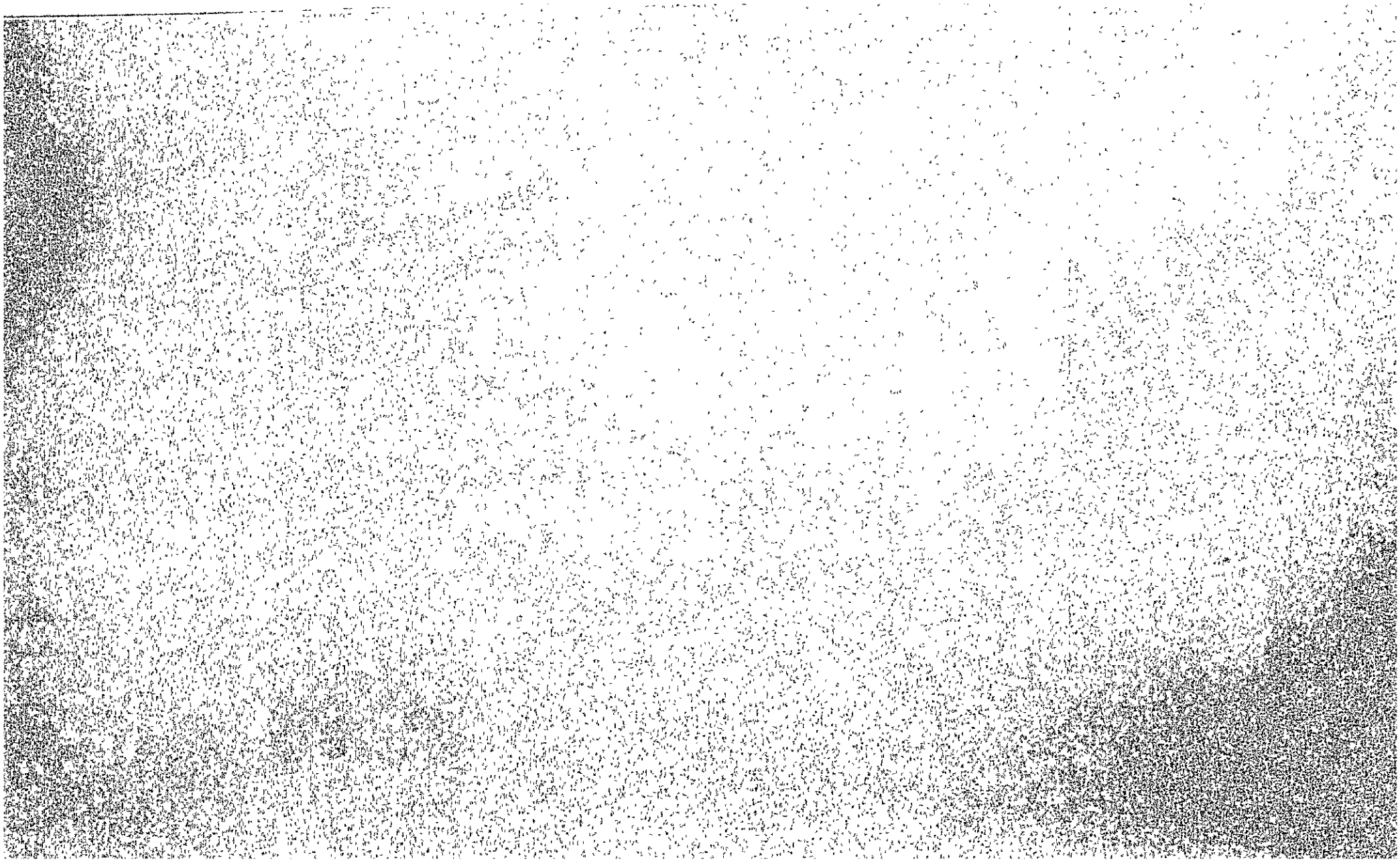
4) Discussion on and confirmation of the construction execution system of the project, and the implementing schedule.

5) Data collection necessary for the estimation of cost for the establishment of PTAC.

6) Data collection necessary for the evaluation of PTAC project.

This basic design report has been prepared after the formulation of basic design for PTAC, based on analysis of data collected in the field survey and discussion with Burmese authorities concerned.

Chapter 2 BACKGROUND OF THE PROJECT



Chapter 2 BACKGROUND OF THE PROJECT

2-1 Production, Distribution and Export of Rice and Others Grains

2-1-1 Production and demand-supply situation

Agriculture is the mainstay of Burma's national economy. About 85% of its total population live in rural areas. Out of the labour force of 13.79 millions, agriculture labours number to 8.85 millions, accounting for around 64%, as of 1981/82. Its gross export earnings are also shared as much as 80% by agricultural products and the processings, with rice and its by-products holding a dominant share. In the pre-war years, the rice export volume exceeded 3 million tons annually, with the peak year of 1938/39 reaching 3.3 million tons.

However, the rice production was forced to remain in a low level during the succeeding long years, as a result of the war-time devastation in rural villages, prolonged political disorders caused by the post-war civil conflicts, disruptions extended by land nationalisation and absence of agricultural credit system etc. Notably in the years of 1970s, the rice production was geared for gradual increase and hitherto has been boosted steadily; the production volume ran to 8.03 million tons (in terms of paddy) in 1970/71, increased remarkably during the 10 years to 13.11 million tons in the 1980/81 and to 13.92 million tons in the 1981/82.

Of particular mention is the 1980/81 production which is very far above the preceeding 1979/80 production of 10.82 million tons and the 1978/79 year of 10.36 million tons.(Fig. 2-1)

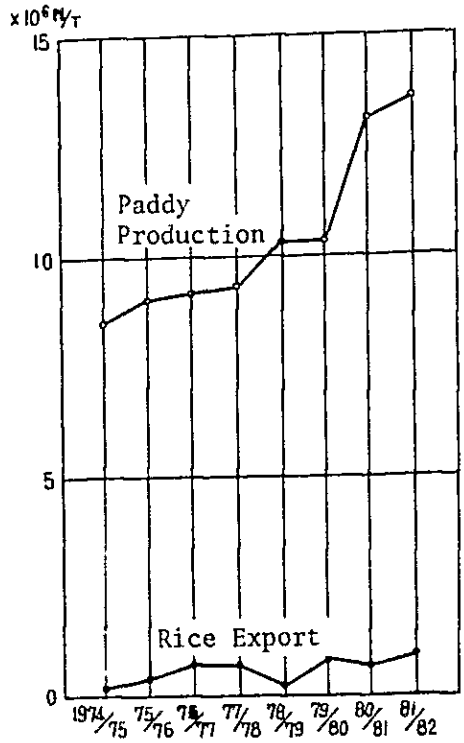


Fig. 2-1 Paddy Production and Rice Export from Burma, 1974-1981

While the aggregate cultivated area remains hardly increased in the range of 12 million acres since 1969/70, the boosted production was effected mainly by enlarged irrigation, increased use of fertilizers and insecticides, development and extensive use of high yielding varieties etc. The per ha production in 1970/71 ran to a meager volume of 1.7 tons, while the estimated 1981/82 production will reach around 3 tons.

Meanwhile, the population increase in Burma has been stabilized at roughly 2.2% per year over the last twenty years. Increase in rice production in the recent years exceeds that of the population.

Beside the rice production, other grains such as maize, pulse and oil seeds have also shown enlarged production volume and export volume on account of increase in their cultivated areas and per hetre yield. Taking the case of matpe, its production of 21,000 tons in 1970/71 was increased to 55,000 tons in 1980/81 (estimated), while the per hectre yield of 0.45 ton in 1970/71 was boosted to 0.75 ton in 1980/81 (estimated).

2-1-2 Distribution

Until 1963, the government controlled only export of rice leaving its domestic distribution to the free market as well as for other grains. However, with the emergence of Revolutionary Government in 1962, export of rice and other important agricultural products for export were placed entirely under the government control, including their domestic distribution. With the successive changes in government controlled items, remaining now under the government control are paddy, white rice, seven kinds of pulses and beans including matpe, sesamum oil cakes and maize.

The quantity of paddy for the farmers to sell to AFPTC are determined by the individual farms and The People's Council located in each Village-tract. The agreed quantity of paddy and other designated agricultural products are purchased by AFPTC, and then transport, store and process, and locally distribute or export by their responsibility.

The paddy farmers are obligated to bring along and sell their paddy at a paddy buying depot of AFPTC as directed by their respective Townships Authority. The paddy transport upto the depot is for the account of farmers who normally carry it by means of animal-cart and small boats (Fig. 2-2).

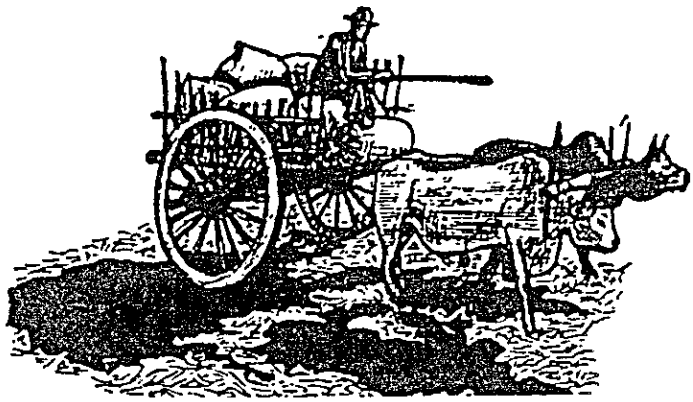


Fig. 2-2 Ox-cart for Paddy Transport
(capacity: 20 - 25 baskets)

At the paddy buying depot, the AFPTC officials inspect the quantity and quality, and make payment. As farmers have got advance payment already in proportion tottheir quota, they will receive the rest at the time of transaction (Fig. 2-3)

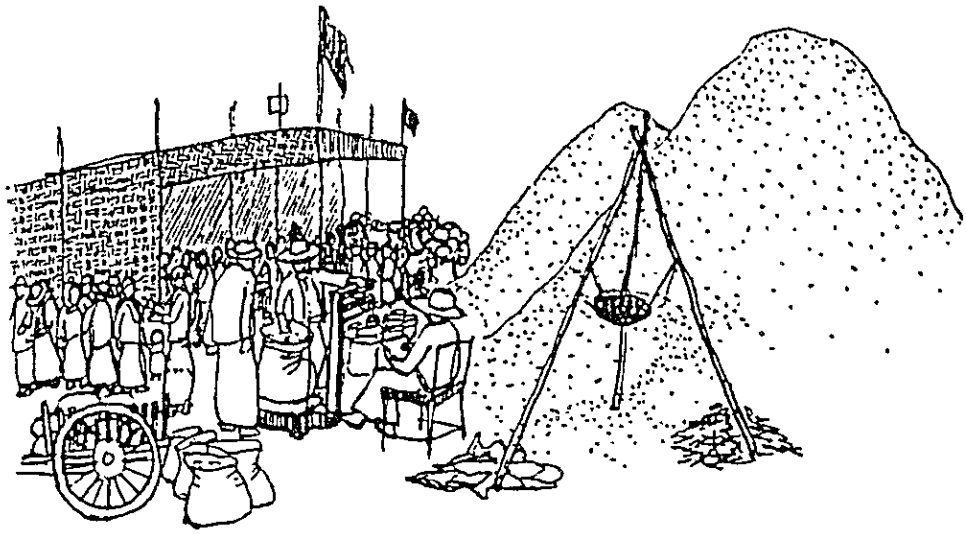


Fig. 2-3 Paddy Buying Depot

The government buying price of paddy differs according to the grouping of paddy and three grades; Grade I, Grade II and Ordinary. There are six paddy groups; Ngasein, Meedone, Emata, Ngakywe, Kaukhnyin, Emata Special.

While the Ngasein group was dominant, accounting almost half of the gross production for long years, the Emata variety has recently held a majority share.

The government collects around a third of the gross production and places them for local consumers and export.

After fulfilling the responsibility to sell paddy to the Government, farmers may sell white rice within their respective Townships, milling their retentive paddy at private-owned mills.

2-1-3 Export

The recent rice export earning is shown in Table 2-1, accounting for some 40% of Burma's aggregate export amount.

Further, Table 2-2 indicates the facts that the paddy volume collected by AFPTC represents around a third of the total paddy production, and that out of the white rice originating from the collection, 8 to 46% (roughly 30% in most years) has been exported.

Table 2-1 Weight of Rice Export in Foreign Currency Earning for Burma (1974-81)

Million Kyat

	Foreign Currency Earning by Export (A)	Export of Rice & Rice Product (B)	B/A (%)
1974/75	925.8	346.0	37
75/76	1,322.6	615.9	47
76/77	1,715.7	729.2	43
77/78	1,756.9	856.9	49
78/79	1,852.7	279.5	15
79/80	2,696.0	1,198 7	44
80/81	3,123.2	1,337.8	43
81/82	3,756.3	1,511.0	40

Source : AFPTC

Table 2-2 Paddy Production, the Procurement by AFPTC and Export of Rice (1974 - 81)

1000 ton

	Paddy Production (A)	Paddy Procurement (B)	B/A (%)	Procured Paddy in Terms of Rice (C) B x 0.65	Export (D)	D/C (%)
1974/75	8,448	2,453	29	1,594	189	12
1975/76	9,062	2,676	30	1,739	419	24
1976/77	9,172	2,813	31	1,828	646	35
1977/78	9,313	2,142	23	1,392	637	46
1978/79	10,362	3,699	36	2,404	190	8
1979/80	10,283	3,423	33	2,225	759	34
1980/81	13,107	4,037	31	2,624	673	26
1981/82	13,558	4,112	30	2,673	934	35

Source : AFPTC

The major export markets are shown in Table 2-3, indicating that the rice exports are concentrated to specific developing countries such as Indonesia, Bangladesh, Sri Lanka, etc.

Table 2-3 Main Destination of Rice Export

Unit: 1,000 ton rice

Ranking	1977/78		1978/79		1979/80		1980/81	
	Country	Quantity	Country	Quantity	Country	Quantity	Country	Quantity
1	Indonesia	157	Sri Lanka	68	Indonesia	179	Indonesia	111
2	Bangladesh	137	Indonesia	65	Bangladesh	142	Sri Lanka	92
3	Sri Lanka	132	Madagascar	10	Ivory Coast	121	Madagascar	80
4	Mouritius	45	Singapore	6	Sri Lanka	83	Brasil	77
5	Singapore	33	Bangladesh	6	Brasil	40	Korea	51
	Other countries	60	Other countries	6	Other countries	171	Other countries	220
	Total	562	Total	160	Total	736	Total	631

Source : AFPTC

With the rice as their major diet, although the massive rice producers by themselves, these countries have been importing it, because the supply was outpaced by demand. Rice they import are of low quality and at cheap price.

Meanwhile, the average price of Burmese exported rice is low as compared to those of other major rice exporters such as U.S.A. and Thailand as shown in Table 2-4. It indicates that the Burmese average price amounts to merely 80% of the Thai rice and 60% of the American rice.

While those countries have been importing large quantities of cheap Burmese rice so far, it is doubtful whether they will continue to do so henceforth. For instance, Indonesia achieved the self-sufficiency in rice in 1982, and will reportedly need no more import in 1983. As for Bangladesh, it is reported that the country will attain the self-support in rice in the years ahead and turn into the exporter. Sri Lanka is also intensifying its efforts aimed at increased rice production with the eventual goal of self-sufficiency. Meanwhile, Korea, Brazil and Madagascar have been rice-exporters, although they became importers temporarily.

Table 2-4 Comparison of Average Unit Value of Exported Rice

	Buram		Thailand		U.S.A.		A/B	A/C
	*1000Ton	⊕(A)$/T	*1000Ton	⊕(B)$/T	*1000Ton	⊕(C)$/T	(%)	(%)
1976	646	161	1,974	218	2,045	264	74	61
1977	637	192	2,967	227	2,270	310	85	62
1978	190	210	1,667	318	2,261	386	66	54
1979	759	226	2,866	274	—	—	82	—
1980	673	284	2,707	351	—	—	81	—

Source: AFPTC & OMIC

* Exported Quantity
⊕ Average Unit Price ($/T)

Therefore, the pressing need faced by Burma is not just to maintain the tool of cheap price, but also to produce higher quality rice for penetration into other export markets, failing which secured and enlarged rice export will become difficult.

The future paddy production, collection and export targets are shown in Table 2-5.

Table 2-5 Targets of Production and Procurement of Paddy and Rice Export (1982 - 85)

	Production (A)	Procurement (B)	* B/A	Export		⊕ C/(B×0.658)	Average Price D/7C
				Quantity (C)	Value (D)		
	1000Ton paddy	1000Ton paddy	(%)	1000Ton rice	Million Kyat	(%)	$/Ton
1982/83	13,455	4,242	32	985	1,594	36	231
1983/84	13,922	4,451	32	1,036	1,678	36	231
1984/85	14,611	4,660	32	1,153	1,871	38	232
1985/86	15,257	4,890	32	1,254	2,037	39	232

Source : AFPTC

* Proportion of Procurement
⊕ Proportion of Export out of Procured Rice

2–2 Outline of Rice Post-harvest Processing

2-2-1 Harvesting and threshing

The irrigated area of paddy field in Burma accounts for some 17% of the total area. Out of the irrigated area, roughly 13% is effecting the double-cropping. The rest of land depends largely on the monsoon rain and the Irrawaddy river water.

The harvesting of rice in Burma commences from November and ends in mid-January. In the lower Burma, rice is cut at 30 - 50 cm higher from the bottom. The reaped paddy is made into small bundles, and placed on top of the stubbles for drying. Then they are transported to threshing field by means of animal-cart. The threshing field is the levelled ground, hardened with mud mixed with cow dung and dried up. The rice bundles are piled up by the threshing field for a few days and then threshed. The rice bundles are placed in the field in 2 - 3 layers with their panicles to form the circular shape, on which ox and buffaloes tread for threshing (Fig. 2-4).

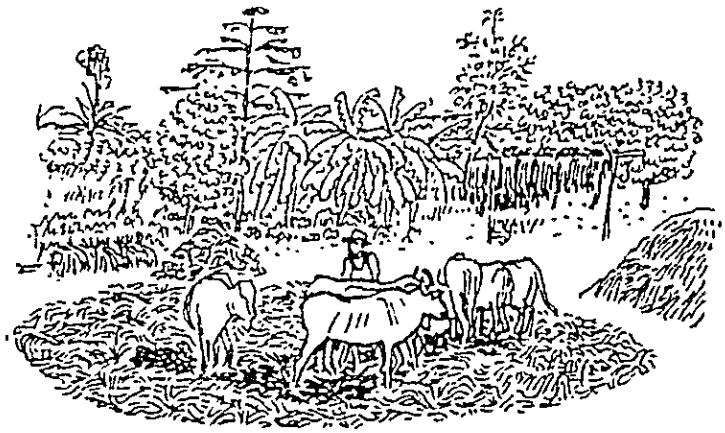


Fig. 2-4 Threshing by Oxen and Buffaloes

Supposing that a farmer holds a rice field of 10 acres (4 ha) where 450 baskets (9.4 tons) of paddy yields, he will take some 15 days for threshing by employing two buffaloes.

Due to such a lengthy threshing operation, the reaped bundles are liable to be left in the field too long, resulting in quantitative loss, checked rice, discoloured kernels, etc. Inefficiency in threshing operation makes the farmers busier and they are likely to lose optimum time of harvest causing delayed reaping. It increases shattering on reaping and checked kernels.
Such prolonged reaping is likely to constrain second cropping, lowering land utilization.
If rice were reaped timely, it is possible to grow another crop in the first half of dry season by availing residual moisture in the soil.

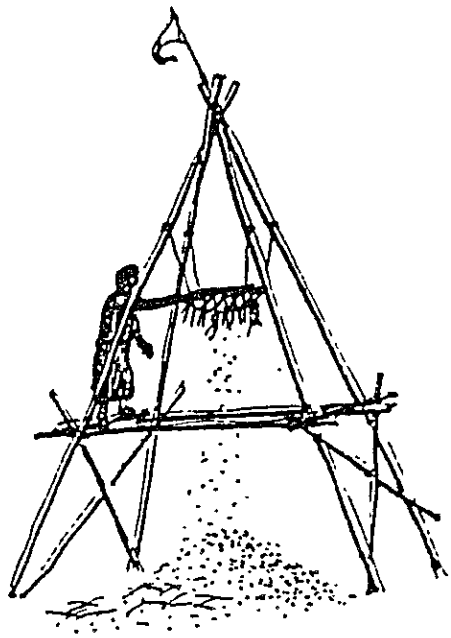


Fig. 2-5 Wind Separation of Threshed Paddy

The threshed paddy is brought onto the bamboo-framed scaffolding to be jolted off. Paddy is segregated from foreign matters such as muds and straws by wind on falling (Fig. 2-5).
It is necessary to use sieve for the separation of muds and sand further.

However, since the quality inspection at the paddy buying depot is not strict enough, farmers often neglect this deliberately.

2-2-2 Drying

As was described earlier, farmers place bundles of reaped paddy onto the stubbles and get them exposed to the sun for drying. In so doing, the bundles being heaped in piles, underlying bundles remain in contact with the soil, resulting in spoiled paddy. As the paddy drying in Burma is effected normally during the dry season, its moisture content can be lowered easily down to 15 - 16% within 3 - 4 days. In spite of the fact that the prolonged leaving of paddy in the field is not desirable, it has been so far tolerated in Burma due to the temporary shortage of labour during the harvesting season. It will be accompanied by spoiling of paddy quality with repetitions of condensation by night or showers and rapid drying in the daytime, thus causing checked kernels which eventually will be crushed during milling operation, lowering milling yield.

Further, the paddy bundles lying in contact with the ground surfaces will result in yellowed rice due to mildew which is one of the heaviest qualitative losses.

As mentioned before, a considerable quantity of over-moisture paddy is bought at discount price at the paddy buying depots. Although such paddy needs to be re-dried after the collection, this has not usually been practised. It is usual that such paddy is being stored mixed with dried paddy.

To obviate such mal-practice, there is necessity either to collect well-dried paddy only or alternatively to re-dry over-moisture paddy at the paddy buying depots, either of which has not been practised at present.

To insure the collection of standard moisture paddy, proper incentive and inducement will have to be provided for farmers through implementing of more realistic collection programs, strictly enforcing the moisture check at the time of collection, and enlarging the discount rate for over-moisture paddy.

Paddy dryers and drying facilities are presently not being pro-produced locally, and shortage of dryers makes paddy drying difficult during the wet season, thus preventing extension of two crops a year despite expanded irrigation system.

While the paddy drying can be done by aerated storage as well, Burma is lacking in such type of storage system. Collected incompletely dried paddy, owing to weather conditions and lack of farm labours, is likely to be spoiled during storage.

As the Burma rice is noted with abundance of red rice, this is due to lack of seed control or storage of incompletely dried paddy. As for the exported rice, over-milling is being performed as a counter-action, thus lowering the milling yield.

There are frequent occurances of toxic and intoxic yellowed rice, owing chiefly to lack of proper drying facilities. This is aggravated with contamination of paddy with soil as a result of threshing by animal tramping.

2-2-3 Paddy inspection on collection

It is reported that the strict grading has not been done so far, due to the shortage of AFPTC staff, lack of training in grading skill and inadequacy of grading instruments. These impediments are compounded by the concentration of paddy collection in a relatively short term.

The government paddy quality standards and the prices are published annually. While the standards stipulate about the permissible limits of quality factors, the actual limits on collection are more generous and allow the sub-standard paddy at discount price. For example, the moisture limit of 15% or less is specified for the

lower Burma paddy until February, but on acutual collection upto 18% is permitted by price reduction.

In so doing, farmers become disposed to feel easy about the importance of paddy drying, while the paddy buying depots are obligated to store a mixture of standard and sub-standard paddy altogether and to cause deterioration even for well-dried paddy, under the circumstances of shortage of drying facilities and adequate storing space.

Further, although there are stipulations about foreign matters, other grains, discoloured rice, immature kernels, yellow kernels etc., they are not being enforced in reality. There is no stipulation whatsoever about checked rice, 1,000 kernel weight, etc. Price incentive is lacking in encouraging the collection of high-quality paddy. Therefore, the collected rice is far inferior in quality to the open-market rice.

To carry out reasonable inspection, it is necessary to provide the training for inspectors and proper inspection instruments. However, this presupposes a collective review about the present paddy buying price, price differentiations by grades, inspection items, inspection system, paddy collection system, etc.

2-2-4 Transport and handling

(1) Transport of paddy

Farmers carry paddy to the buying depots by means of animal carts, small boats or trucks. Paddy is normally loaded in bags onto animal cart and trucks, while loaded in bulk onto small boats.

Delta regions of lower Burma are provided with abundant waterways, and therefore depend much upon small boats.

The collected paddy is then transported by AFPTC from their buying depots to paddy godowns or rice mills as the case may be. The transport by AFPTC is by means of barges, regualr liner vessels, trucks, and railroad etc.

It often happens that the collected paddy is piled and stored in the open field resulting in deteriorated quality on account of seasonal shortage of labourers and transport resulted from the concentrated paddy collection into a relatively short term of the year. Loading, unloading and handling to and from transport, buying depots, godowns and rice mills are usually done manually, after the paddy is filled into bags or baskets (Fig. 2-6 & 2-7). The present inefficiency in handling is one of the causes to lower rotational cycles of transport and is further aggravating the shortage of transport capacity. This indicates that mechanized handling needs to be considered for increasing transport capacity.

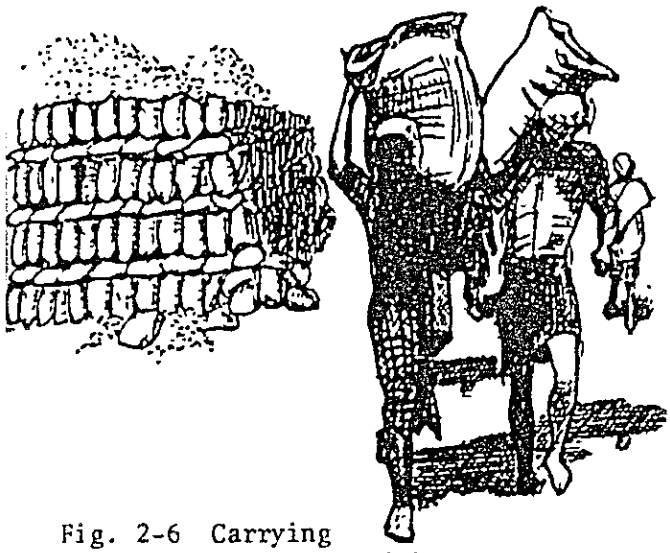


Fig. 2-6 Carrying Paddy Filled into Bags

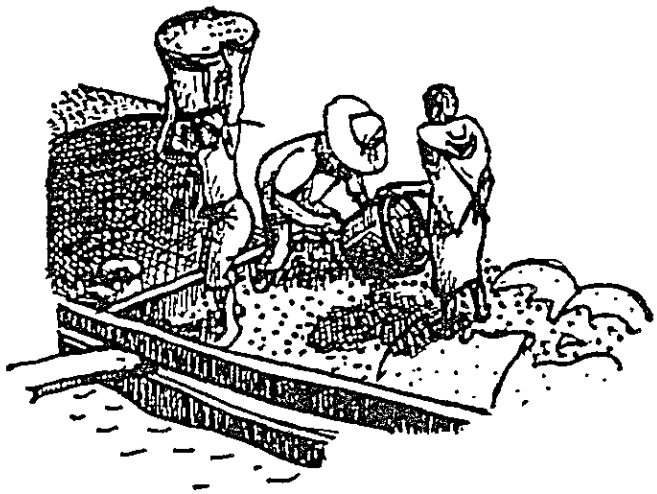


Fig. 2-7 Unloading Paddy from Barges

(2) Transport of white rice

White rice is transported by AFPTC from the mills to urban consumers and port-side warehouses as appropriate.
While the transport is effected by barges, regular liner vessels, trucks etc. as is the case with paddy, waterway transport represents more than 50% of the total transports.
In particular, the Lower Burma delta regions depend almost entirely on waterways. White rice is usually handled packed in bags.

In the face of overall shortage of transport facilities, and in view of export rice to be moved to the harbours in time of regualr shipping schedules, the boost in transport capacity is considered as of the utmost urgency.

Rather encouragingly, the recent purchase of barges from Singapore (38 vessels, 4,560 tons), coupled with the expected delivery of additional 65 vessels, 7,200 tons, from Japan, will be able to augment the waterway transport capacity by a significant extent. Further, due to slackening demand-supply situation this year caused by increased rice production, it is reported that transport difficulty has been rather alleviated.

(3) Relation between transport and other infrastructural facilities

The rice has two distribution channels; in one way, paddy is stored for an average period of two months at the godowns located in the growing areas, then milled at neighbouring rice mills and white rice is transported up to the urban markets or port-side rice warehouses. In the other way, paddy is moved from the growing area to the urban consumer market or port-side warehouses as it is, and then milled and stored there.

The transport plays the roles to move goods smoothly in accordance with ever-changing supply-demand situation, but also to adjust storing capacity of godowns located at growing areas, urban consumer markets and harbours. This means that in the event the transport capacity is adequately available and utilized efficiently, such situations as to store the paddy in the open fields due to the shortage of storing capacity of godowns in the growing area during the paddy collection season will hardly arise.

However, in reality, in spite of the vacancy of godowns located at urban areas and harbours during such season, paddy is unable to be moved smoothly upto the urban consumer market, in the face of shortage in milling capacity, transport means and handling capacity in the growing areas.

Therefore, it is important to realize the balance and harmony in the intersection of transport and other related facilities, in the course of administrative steps for the improvement of post-harvest processing and marketing.

It will be necessary to input such factors as storage capacity of godowns in rural and urban areas, transportation capacity, milling capacity, etc. into a computer and to plan the optimum schedule for the utilization of facilities and maintenance of grain quality.

2-2-5 Storage

Farmers store paddy for self-consumption and seed, in bulk, in the baskets called as "Poke" (Fig. 2-8) The poke is a bamboo-woven basket, overlayed with mixture of mud and cow dung and dried up. The big farmers sometimes store the paddy in partitioned compartment in their own houses, or in temporary shed made of bamboo-mats. Side walls and floors of the compartments and sheds are overlayed with mixture of mud and cow dung as is the case with the poke. In both cases, the container is placed as high as 3 - 4 feet above the ground surface to prevent moisture.
In order to ensure the collection of well-dried paddy, it is necessary to increase the storing capacity in the farmhouseholds so that they need not sell all at once.

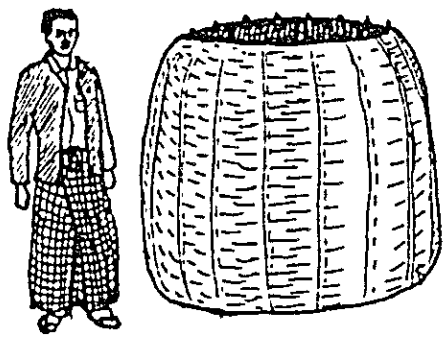
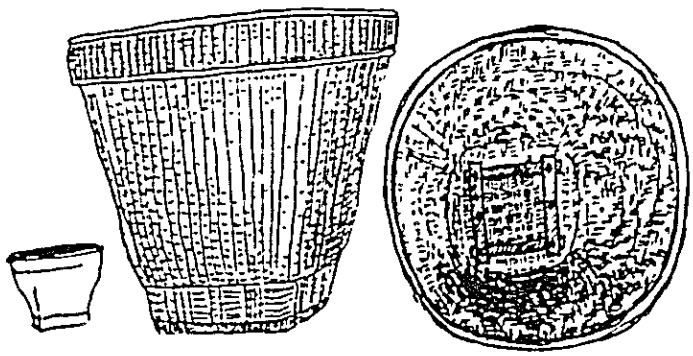


Fig. 2-8 Poke



$\frac{1}{16}$ basket

Fig. 2-9 Basket

The paddy collected by AFPTC is usually stored in bulk for an average period of two months in their godowns.
However, due to the shortage of storing capacity, the paddy is often piled and stored in the open fields, leading to degradation of the quality. Increase in storing capacity henceforth is considered essential. Storing in the open fields is sometimes by simply heaping bulk paddy as in the buying depots and sometimes by enclosing a heap of bulk paddy with bags of paddy (See Fig. 2-6).

The paddy godown is of varied construction: permanent type of wooden structure with galvanized iron sheet roofing: temporary type (bamboo-structure with thatched or corrugated galvanized iron sheet roofing); Pasfield type (wooden structure with galvanized iron sheet roofing, and partitioned into 24 compartments with central aisle), with a majority of buildings built of wood (Fig. 2-10).

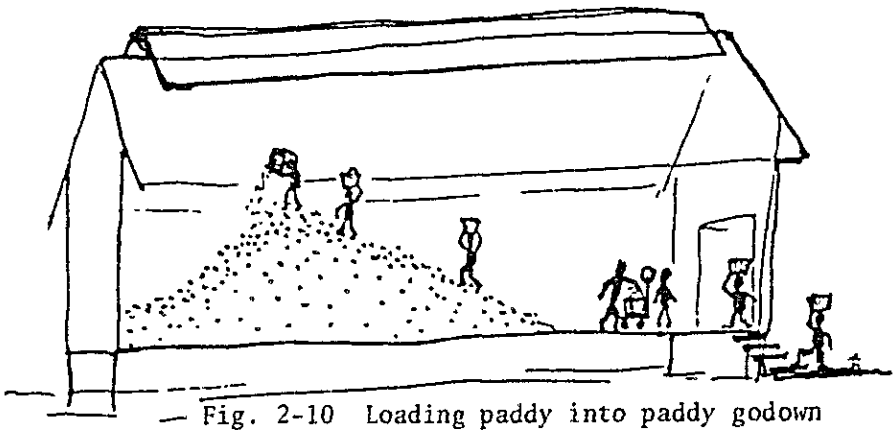


Fig. 2-10 Loading paddy into paddy godown

The godowns for storing white rice include Porland type (steel structure and asbestos slated), Butler type (steel frame, brick structure with galvanized iron sheet roofing) etc. These are used for storing pulse and paddy also.

Regarding the management of storage, there appears a lack of qualified storekeepers with the self-determination and credibility. Further, in the face of the shortage of the minimum necessary maintenance instruments such as thermometers, hygrometers, grain thermometers, anti-rat devices, etc., coupled with the lack of pest control, there has occured repeated events of in-store deterioration and quantitative loss.

As Burma is situated in the tropics with high temperature and humidity, biological damages due to pest, mildew etc. is liable to happen in grain storage. To counter against such damages, pest control must be done efficiently and sufficiently.

Although fumigation, insecticide spraying, rodent control, etc are practised in Burma, these are on a limited scale, due to the acute shortage of supplies and staff. There is necessity to provide the training of staff and to secure supply of fumigants and insecticides. More important would be the emvironment reforms such as the strict enforcement of "first-in and first-out" basis and the cleaning in and out of storage facilities.

2-2-6 Rice milling

The rice mills in Burma comprise the three types; (1) AFPTC-owned mills, (2) Private-owned mills under contract with AFPTC and (3) Private-owned custom mills, called Wunza mill (Fig. 2-15)
The collected paddy is milled by those under item (1) and (2) above, while farmers' retained paddy is milled by (2) and (3).

The number of rice mills with individual milling capacity is as follows (Table 2-6):

Table 2-6 Number and Capacity of Rice Mills

Kinds of rice mills	Number	Total capacity white rice ton/8H	Average capacity white rice ton/8H
(1) AFPTC mills	45	757	17
(2) AFPTC contracted mills	892	8,812	10
(3) Wunza mills	950	4,443	5
Total	1,887	14,012	(7)

Source: AFPTC

In addition, there are some 1,200 mills called "Huller mills", composed of Engelberg type hullers with smaller milling capacity than Wunza mills. Availability of around 3,000 mills altogether is considered as extremely scarce, in the face of enormouse rice growing are a and massive number of farmers. (For example, Thailand has 30,000 mills, on similar rice production, growing area and farmers'

population, while Java island of Indonesia has 20,000 mills, despite its far smaller area.)

Therefore, a fairly large number of farmers are obligated to resort to manual pounding; husking by use of clay mill inlayed with bamboo-teeth, while whitening normally by means of foot-operated wooden mortar and pestle (Fig. 2-11)

The rice mills are generally in dilapilated state both buildings and machinery alike, coupled with neglect of their maintenance, leading to low product quality and milling yield.

Custom-hire milling by contract with AFPTC is paid on the fixed rate regardless of milling yield, with the lack of inducement for technical improvement.

Wunza mills are in dire scarcity for the needs, with the prevalance of hardly any competition among mills to absorb customers, leading to the absence of incentive for technical betterment.

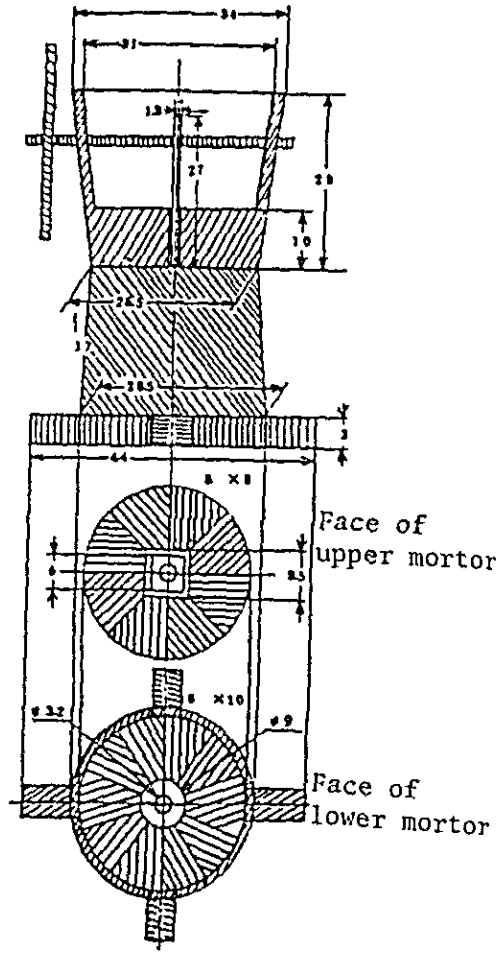


Fig. 2-11 Clay Mill for Husking ("Kyeiksone")

Unit: cm

Shortage of rice mills, along with lack of their maintainance, results from short number of licence issue for establishing of rice mills and under-developed state of rice milling machinery and component manufacturing industry. The government-owned rice milling machinery manufacturing factory is presently operating far below its capacity, due to lack of raw material and some other reasons. (Refer to Appendix 2-22).

Small scale private manufacturers are in the low technical level

and are lacking in availing raw material.

Regarding issuance of licence, in a three-year period of between 1979 - 1981, only 139 new rice mills were approved to be built. (See Appendix 2-24).

As regards the present technical level of rice mills, the AFPTC-owned are generally the highest, followed by the order of AFPTC-contracted and Wunza mills.

The paddy collected by AFPTC represents only a third of the total production volume, while the remaining two third is milled mostly by Wunza mills, huller mills and hand pounding resulting in extremely heavey milling loss.

Therefore, the milling condition of AFPTC-collected paddy cannot be generalized to present a whole picture.

Meanwhile, although Burmese domestic market has no demand for parboiled rice, the nation has hitherto produced parboiled rice for export for long years. The number of rice mills with parboiling facility as of 1977/78 is shown in Table 2-7.

Table 2-7 Rice Mill with Parboiling Facility (1977/78)

Division/State	Usable		Need of Repair	
	Number	Capacity ton/8hrs.	Number	Capacity ton/8hrs.
Irrawaddy	30	580	31	512
Pegu	3	56	38	578
Arakan	6	75	-	-
Total	39	711	69	1,090

Source: AFPTC

The present parboiling system employed in Lower Burma (Irrawaddy, Pegu and Rangoon) is such as follows: paddy is soaked into cold water in the concrete-made water tank of 6' x 20' x 20' for 2 to 3 days, and then put into cylindrical type vessels with conical bottom made of mild steel (capacity of 25 - 30 baskets equal to some 0.5 tons) and steamed there for around 15 minutes.

For steaming, exhaust of steam engine used as the prime mover for rice mills, or direct steam from the boiler, is used (Fig. 2-12).

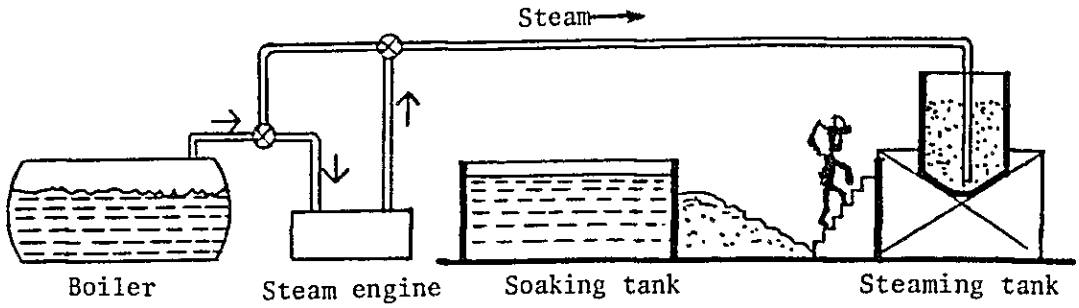


Fig. 2-12 Parboiling System in Lower Burma

Parboiling system employed in Arakan state is to use soaking cum-steaming tank of 250 basket capacity (around 5 tons). The paddy is soaked therein at 180 - 200 deg.F (80 - 90 deg. C) for about 8 hours, and thereafter steamed for 30 - 45 minutes. The water used is recycled two times and thereafter drained off (Fig. 2-13).

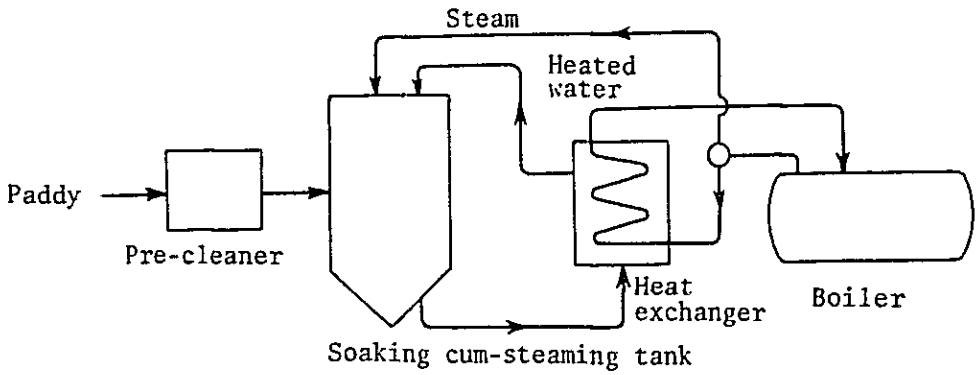
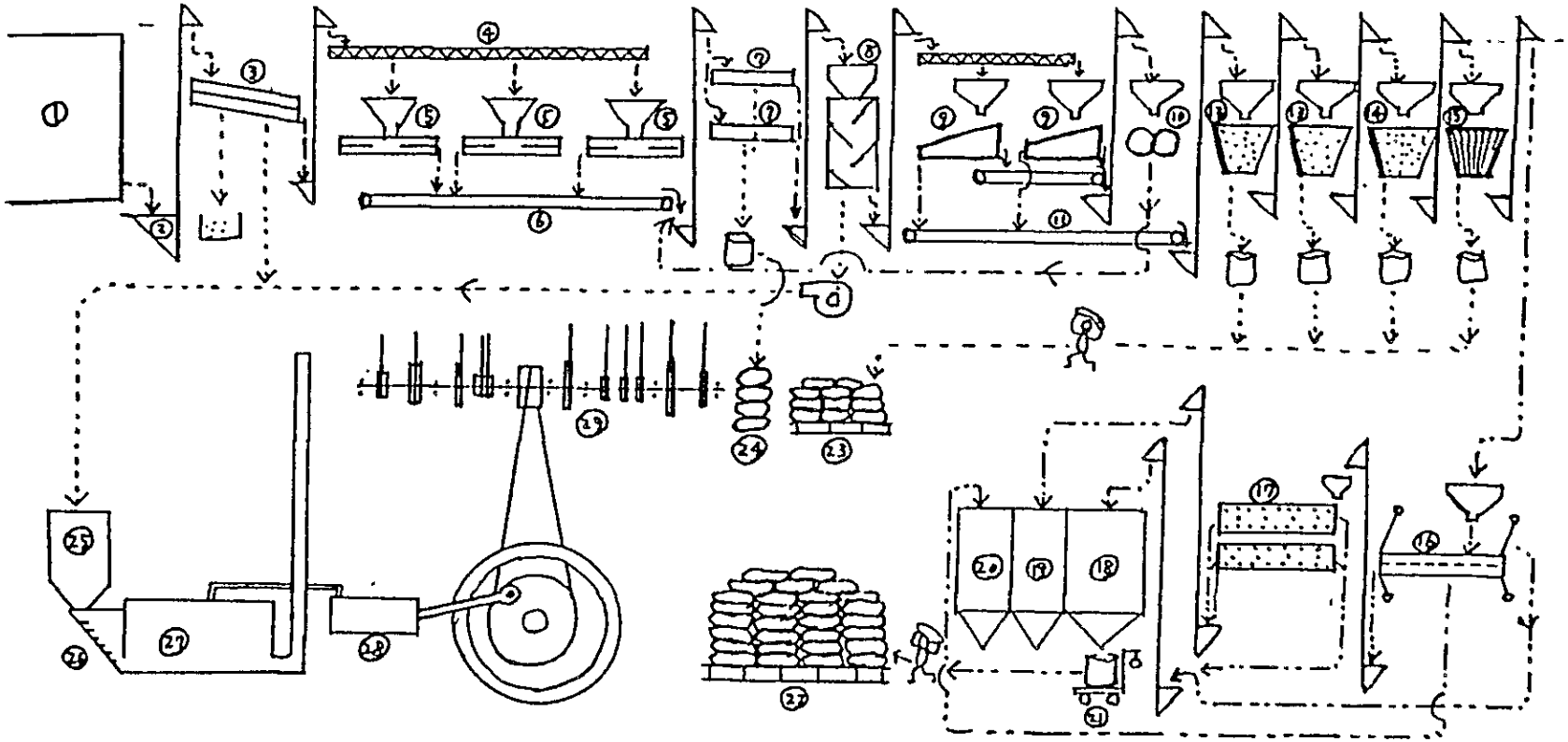


Fig. 2-13 Parboiling System in Arakan

It is said that the parboiled rice processed in Lower Burma is generally of better quality than that of Arakan.

While inquiries are being received for exporting parboiled rice, the current products are of low quality and hard to sell except some specific cases.

Fig. 2-15 Flow-chart of Rice Mill in Burma



(1) Paddy warehouse
(2) Paddy intake
(3) Paddy separator
(4) Conveyer
(5) Disc type paddy husker
(6) Conveyer
(7) Vibrating sieves
(8) Winnower
(9) Paddy separator
(10) Rubber role type paddy husker
(11) Conveyer
(12) Cone type rice whitener 1
(13) " 2
(14) " 3
(15) Rice brusher
(16) Vibrating sieves
(17) Indent rotating cylinder
(18) White rice of some brand
(19) Large broken rice
(20) Small broken rice
(21) Weighing scale
(22) Bagging polished rice
(23) Bran
(24) Coarse bran
(25) Husk
(26) Husk furnace
(27) Boiler
(28) Steam engine
(29) Power transmission

— — Flow of paddy —·— Flow of brown rice (mainly) —···— Flow of white rice

----- Flow of bran, coarse bran, husk and dust

Because of cheap buying price, the rice mills with parboil facilities are discouraged in producing and selling parboiled rice along with lack of renovative approaches.

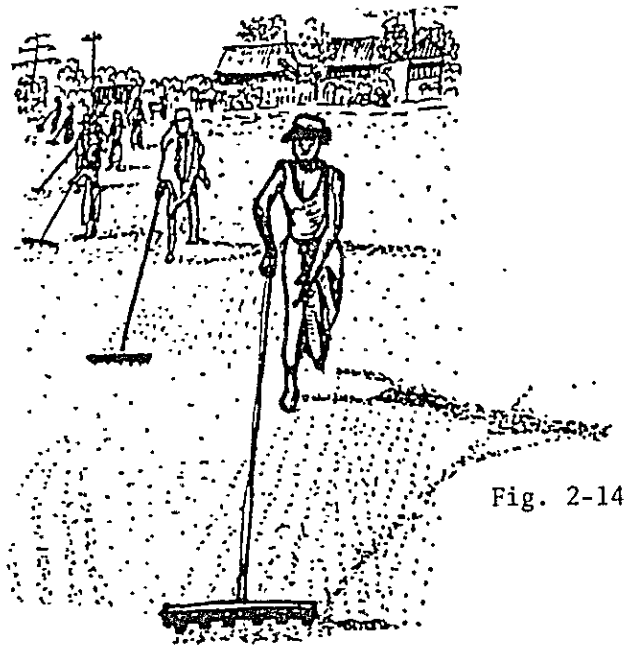


Fig. 2-14 Drying Parboiled Paddy in Rice Mill

The prime mover for rice mills is generally reciprocating steam engine by means of husk-fired boiler, and the power is transmitted to various machinery via counter shafts.

However, antiquated boilers and steam engines are difficult to repair and maintain. Often they are operated with under capacity. Some of rice mills, powered by electric motors with the public electricity, are operating under unstable conditions, due to frequent voltage drop and power failure.

2-2-7 Rice bran utilization

The rice bran used for oil extraction amounts to 40 - 70,000 tons annually, from which crude bran oil of 5,000 - 7,000 tons and edible oil of 400 - 700 tons are produced. (See Table 2-8).

Table 2-8 Bran Oil Extraction

(ton)

	Bran Extracted (A)	Production		C/A (%)	Refinery		E/C (%)
		Bran Cake (B)	Crude Oil (C)		Crude Oil Refined (D)	Edible Oil (E)	
1974/75	43,627	35,992	4,397	10	1,153	399	9
1975/76	55,163	46,765	4,779	9	1,859	553	12
1976/77	65,705	54,655	5,832	9	2,348	777	13
1977/78	66,270	54,167	6,346	10	3,846	1,356	21
1978/79	61,072	49,718	5,944	10	1,947	570	10
1979/80	69,177	58,118	6,858	10	3,280	1,592	23
1980/81	68,909	55,453	6,643	10	4,273	1,738	27

Source: A F P T C

Assuming that the rice bran production accounts for six percent of the total paddy production, bran production amounting to 600,000 - 800,000 tons per year is expected. If bran from the AFPTC-collected paddy only is used for oil extraction some 200,000 tons annually is available. It follows that proportion of bran utilization for oil extraction remains still low, although far superior to those attained by other South-east Asian countries.

The existing rice bran oil factories are capable of processing 500 tons of bran daily (Appendix 2-26), but they are mostly operating far below the capacity, on account of lack of management, shortage of operating staff, dislocated transport and lack of machinery maintenance, etc. Additionally, occasional disorder in power supply, along with shortage of steam engines, are aggravating the situation of bran oil factories, as well as of rice mill.

The current edible oil production is Burma is around 150,000 tons annually (Appendix 2-27).

Rice bran oil represents only less than 1% of this.

34 units of bran stabilizers introduced under the ADB-financed first-phase rice mill industry modernization program, have reportedly contributed significantly in quality improvement of rice bran.

2-2-8 Post-harvest processing machinery manufacturing industry

A local manufacturer of milling machinery and components is the government-owned Peoples Engineering Industry II, with rather insignificant activities and meager production volume (Appendix 2-22).

Meanwhile, private manufacturers are very small scale with low technical level, and are in a position that are hard to get raw materials, although they are presumably catering for majority of spare parts needed by rice mills (Appendix 2-23).

2-2-9 Rice inspection on export

The recent international rice market is quality-oriented, and the quality need to be in conformity with customers' demand. To maintain the quality of export product, quality standards have to be adhered to strictly and these themselves need to be internationally acceptable. However, the export rice standards now employed in Burma have several drawbacks: the present grades of export rice are too many; milling degree defined with residual red streaks on white rice appears unrealistic, in the face of fact that rice containing much red rice should not be exported, and also in view of the recent remarkable reduction of red rice due to introduction of high yield varieties and variety improvements.

In particular, there is hardly any red streaks in Meedon group. Therefore, current definition of milling degree based on remaining red streaks should be replaced with internationally practised method i. e. the one based upon the amount of residual bran layer.

Meanwhile, though the sub-standard rice having been exported at discount price as is the case with the domestic paddy collection, this appears to lower the credibility of Burma rice and disadvantageous in the long run.

It is strongly desired that quality-oriented standards of white rice in comformity with the latest international situations be formulated and the inspection system be improved as early as practicable.

2–3 Government Administration Policy and Development Programs Relating to Post-harvest Processing

2-3-1 Government Administration on Post-harvest Processing

The government administration relating to post-harvest processing is shared by two corporations, with the paddy collection process as their boundary; on-farm operations such as harvesting, threshing, drying and transport upto the paddy buying depots are supervised by Agriculture Corporation, while the succeeding processes such as paddy drying after collection, transport, handling, storing, pest control, milling, domestic marketing of white rice, export of rice products, by-product processing and sale etc., are managed by AFPTC.

The private-owned rice mills are licenced by AFPTC, including any of mills for custom-hire operations for farmers' retained paddy. Although the government is trying to encourage the farmers' retained paddy to be milled at Wunza mills rather than by hand pounding, the latter appears to have been permitted tacitly due to the prevailing shortage of rice mills and the fact that farmers are obliged to wait for a few days until their turns come.

2-3-2 Development programs relating to post-harvest processing

Since the emergence of socialistic regime in Burmese way in 1962, its economic growth remained stagnant for the succeeding long years due to the nationalization of private firms etc.

To counter-act against such stagnation, the government contemplated the long-term 20-year development plan in 1973, initiating to implement the 2nd 4-year plan (1974/75 - 1977/78). The plan aimed at the growth rate of gross national products at 4.5% annually and was succeeded by the 3rd 4-year plan (1977/78 - 1981/82). The 3rd plan aimed mainly at substantial increase in agricultural production, efficient utilization of indigenous resources etc., where by introduction of high yielding varieties and expansion of cultivated area have been implemented. Rice export of 885,000 tons, as a final goal of the plan, has been achieved.

In the wake of the 3rd 4-year plan, with emphasis on increased rice production, reinforcement programs of storing and milling facilities are now under way with overseas aids, with AFPTC acting as the executing agency.

However, facing the acute drawbacks in rice quality improvements as well as heavy quantitative and qualitative losses during the post-harvest operations, the 4th 4-year plan (1982/83 - 1985/86) aimed at post-harvest technical improvements, coupled with substantial increase in processing capacity.

2-3-3 Foreign aids relating to post-harvest processing

Since initiating the 2nd 4-year plan, the AFPTC-related foreign aids have been extended as listed below;

(1) Japan (OECF) [Rice mills construction credit program]

This relates to the construction of two rice mills, each of 150 ton per day capacity, six rice mills, each of 100 ton daily capacity, and one spareparts manufacturing factory. A feasibility study was carried out by JICA in 1978, and the tender for the supply held in the end of 1981. The completion of construction is scheduled in 1984.

(2) ADB:

[1st phase rice mill construction program]

This relates to construction of three rice mills, each of daily 50 ton, 35 paddy godowns of 1,000 ton capacity each, one rice bran oil refinery and 34 rice bran stabilizers and rehabilitation of 135 existing rice mills by credit. The construction was commenced in 1974 and completed in 1979.

[2nd phase rice mill construction program]

This relates to the construction of 12 rice mills of daily 100 ton capacity each, rehabilitation of 12 existing rice mills, construction of export rice godowns (19,800 ton capacity) in Rangoon (these are by loan), office modernization program of

AFPTC, through introduction of data processing devices and construction of a rice milling technology training center. The construction is now under way. This program includes technical aid to PTAC.

[Paddy warehouse construction program]

This is to construct 20 paddy godowns (a total capacity of 100,000 ton) by loan, and is scheduled to start implementing in 1982.

(3) IDA: [Paddy godown construction program]

This is to construct 20 paddy godowns, with a total capacity of 100,000 ton by use of loan. The implementation was initiated in 1981, and the contractor is now being selected.

(4) China-aided rice mill construction program

This is to construct one rice mill of daily 100-ton capacity by use of loan, which is now nearing completion.

Further, within the framework of the 3rd 4-year plan, the construction program with Japan's OECF loan is expected to be implemented.

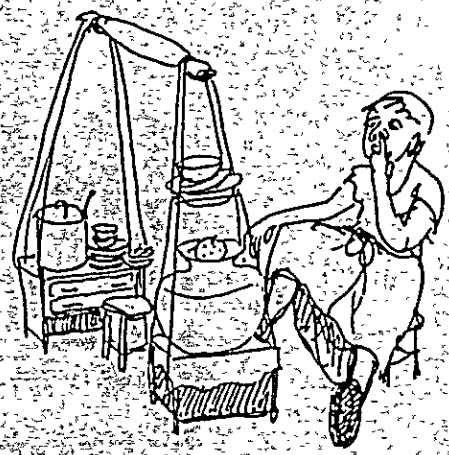
(a) Three rice mills of daily 250-ton milling capacity each

(b) One rice bran oil extraction and refinery plant, with rice bran processing capacity of 150 ton/24 hrs.

The construction period of these plants is scheduled for three years.

For reference, existing post-harvest processing research/ training facilities in the South-east Asian countries are shown in Appendix 1-5.

Chapter 3 BASIC PLAN OF PTAC



Chapter 3 BASIC PLAN OF PTAC

3–1 Objectives and Functions

PTAC is an organization to formulate practical solutions to problems involved in rice post-harvest processing through necessary surveys, researches and development and to promote them for ready application.

It executes basic and applied studies in solving accute problems now Burma is facing in a practical way, rather than remaining a theoretical and academic research institute.

The post-harvest processes comprise of technical processes of biologica, physico-chemical and engineering aspects and marketing processes which include socio-economic and administrative factors, and which restricts the former processes considerably. Renovation in post-harvest processing, therefore, calls for making research, survey and development into the existing marketing system to a great extent not to mention of those of technical aspects.

Considering overwhelming importance of rice for Burmese economy and urgency of the problems relating to it, PTAC had better concentrated for the study of post-harvest processing of rice only for the time being. However, in parallel with accumulation of activities and fulfillment of staff, it might be expanded to other kinds of important cereal grains also.

3–2 Basic Principles of Activities

1) PTAC is to survey the present situation of post-harvest processing in Burma, identify the most urgent problems to be solved and compiles a series of objectives.

   Then, the strategy and tactics of how to achieve such objectives will be worked out, along with responsibilities assigned to respective departments in making survey, researches and development.

2) Respective departments will in turn formulate the practical procedures and methods necessary for carrying out their own assigned objectives. Staffing and equipment program, along with the time schedule, will also be made and coordinated among the departments. Errors in choosing the targets are likely to be found in the course of study, or as a result of such research work,

thus corrective actions would be required.

3) In the event when some of the achievements have been realized through research and/or development work, or when the situation clarified, PTAC will formulate the practical application plan, publicise, and make recommendations to the higher authorities. Obviously, the research subjects will be reviewed and amended if necessary, in the course of such publication, propagation, recommendation.

3-2-1 Information Collection

In order to recognize the present situation of post-harvest processing to the full extent, it is necessary to have the full knowledge of existing situations in those area under AC, MIC, MEIC, CRO, CC etc., not to mention that of AFPTC. Therefore, there is an immediate need for PTAC to clarify the sort and scope of information to be collected, and to make collection of such information in a systematic way, without any serious omissions, through concreted efforts together with associated authorities and private sector bodies.

Correct objectives can be determined only by collecting accurate informations, and by considering and analysing them minutely. In fact, many of research institutes ignore such task, thus determining misplaced targets based on inaccurate fact appraisal and spending major efforts toward such wrong targets.
The conclusions thus obtained are likely to be of no use.

In doing so, not only the material and efforts are used in vain, but also the morale and ability of the participants are lowered, leading finally to a strong suspicion about the need for such research activities themselves.

Since the post-harvest processing technology is most likely to be developed in association with the peculiar socio-economic circumstances, it is necessary to collect substantive facts and figures in large quantities, along with technical informations and backgrounds circumstances.

Only by doing so, it is possible to exploit efficient examples of known technical potentiality under varying conditions, thus increasing efficiency of the research and development activities to

a great extent. It will not be wise to repeat some work ignoring that similar ones have already been carried out elsewhere.

Meanwhile, it is necessary for PTAC to pay much effort for assurance of circulation of the informations collected by its respective departments and personnel, and for enabling such informations to be referred readily and freely. This will increase the efficiency of research considerably, make possible the mutual cooperation and discussion among departments and staffs and activate participation of each staff in the whole management of PTAC.

Obviously, the library is to play the role for organizing such information collection, circulation and reference, as well as to be "the antenna" to the outside circle. It may be compared with the nervous system of human body, which convey informations collected by sensing organs of body to brain and vise versa.

3-2-2 Research Activity

The features of PTAC activities are not to present purely academic solutions to the problem like what are being done by technical institutes of university etc., but to study the practical ways to realize them for solving the problems from technical, practical, systematic and administrative points of view, and to propose necessary measures to related authorities, private firms, individuals, etc., organizing cooperation with and among them.

PTAC is in a capable position to carry out such operations because it is responsible for carrying out the collective activities from analysis of grain quality upto development of post-harvest processing machinery and analysis of socio-economic factors lying behind the local situation.

Suppose to take up renovating the paddy inspection system, for example, necessary survey and research should be done in respect of the following items with close association among them, keeping in mind the general scope of the subject.

1) The present state of inspection, along with the kinds and quantity of paddy under such inspection.

2) The surrounding economical, political, institutional, distributional and social problems.

3) The technical level of inspectors, in relation to testing instruments and methods employed.

4) The improved system of paddy collection, in order to reduce or minimize the present constraints in time, labour and material for the practice of paddy inspection.

5) Renovation of testing instruments, standard samples and inspection procedures.

6) Encouragement of the local manufacturing industry of testing instruments etc.: Improved supply of raw material and production facilities, healthy co-existance of government-owned enterprises and private firms, technical guidance, etc.

7) Institutional measures for intensified training of inspectors and educational work for farmers.

8) Technical guidelines of how and which quality factor of the collected paddy to improve.

9) Priorities of improvement in the succeeding processes such as drying, transport and storage etc. based upon above.

10) Recommendation of the improved milling system under contract, so as to maintain thus improved paddy quality.

11) Further review about the most practical way of improving paddy inspection, through feedback of achievements thus realized under the above-mentioned measures.

It is therefore necessary to carry out study in the individual fields such as grain quality control, inspection equipment development, paddy procurement system improvement, etc., by taking into account such collective scale of projections.

In contrast, if individual research work is to be pursued independently without relation to other related objectives, such research work is likely to be proceeded standing upon arbitrary assumptions, thus producing hardly any realistic solution after all the toil. This is the very basic reason why in the past years, a large number of research institutes have failed to present practical

solutions to their problems, despite occasional development of apparent "revolutionary" machinery and the like.

The raison d'etre of PTAC lies in such fact that is able to make collective approaches toward the targets from a general point of view. Therefore, while respective research department are responsible for their own specific technical fields, their achievements would be realized only through their cooperation and supplement each other.

Such being the case, not only the director and deputy director but staff of respective research department also should have in their mind the nature of objectives being pursued by PTAC from time to time, understand their respective role in the work as a whole and pay their attentions to the progress of activities undertaken by other departments.

In this connection, the staff of respective research departments are required to make frequent exchange of information and views, as well as periodical reporting about the progress of their own research programs.

In the event any obstacles are to come up in the course of research work in some specific field, so much that such work program need to be changed or abandoned or by-passed, such situation should be recorded in details for future reference. Regarding the subject having an important bearing with other research departments, such matter should be fully discussed and well coordinated among the departments concerned.

Meanwhile, in case the research subject that need to be continued over a long period of time for the collection of basic data and/or accumulation of research works on its own initiative, it is necessary that such subject be allowed to continue independently, without being disturbed by the shifting accents of the targets aimed at by PTAC from time to time.

3-2-3 Publication and Promotion of Research Achievements

Research objectives, program, achievements and other practical activities need to be published annually with a concrete description, in the form of PTAC activity report.

Additionally, research achievements must be made public in a clear-cut and conspicous way, along with their underlying background, realistic application and expected effects, for onward penetration into related authorities and private sector from time to time.

Furthermore, the research report of more detailed description should be presented to the related government bodies which have assisted in the research work through providing informations and other aspects of cooperation, so as to encourage their further cooperation, advices and guidances in future also.

Such publication activity needs to be participated by AFPTC headquarters and regional offices, as well as by TAC-member authorities, which should further be intensified by means of mass-communication media, such as newspaper, radio, TV, and movies, etc., as required.

In addition, international publicity activity must also be intensified so as to facilitate the inflow of useful information and cooperation from overseas. The communication with those agencies and research staff relating to post-harvest processing in overseas is extremely important in strengthening PTAC activity, while such interchange is likely to develop in proportion to the progress of overseas publicity activity from the side of PTAC.

3–3 Scope of Activities

Regarding the post-harvest processing, surveys will be made, information collected and problems clarified and analized, about the current situation.

To solve the problems, the PTAC will make necessary activities in respect of the following items, for example, initially;

1) The quality of paddy and rice in each stage of production and marketing.

2) Improvement in the existing methods of paddy collection and marketing, as well as those of grade inspection and standardization of paddy and rice.

3) On-farm harvest and post-harvest processing technology.

4) Paddy and rice storage, pest control, transport and handling.

5) Paddy drying, parboil, and milling.

6) Rice bran and other by-product utilization in various ways.

7) Local manufacture and procurement of post-harvest processing machinery, equipment, facilities, prime movers, etc.

8) Policies on paddy and rice collection and marketing system, along with their price controls.

9) Rice export policy and overseas market.

10) Other items relating to rice post-harvest processing.

To apply and put into practice the findings achieved through such activities, PTAC will take active steps in making guidelines, recommendations, publication and campaings etc.

For details, see Chapter 5 and Appendix 1-3-5 "Activities and targets of individual departments of PTAC".

3–4 Organization and Staffing

3-4-1 Organization

PTAC is set up under the authority of AFPTC, and is directly responsible to the managing director of AFPTC.

However, until the time when it will become fully operational, PTAC is supervised by Planning, Budget and Promotion Department of AFPTC. (See Appendix 1-2-2)

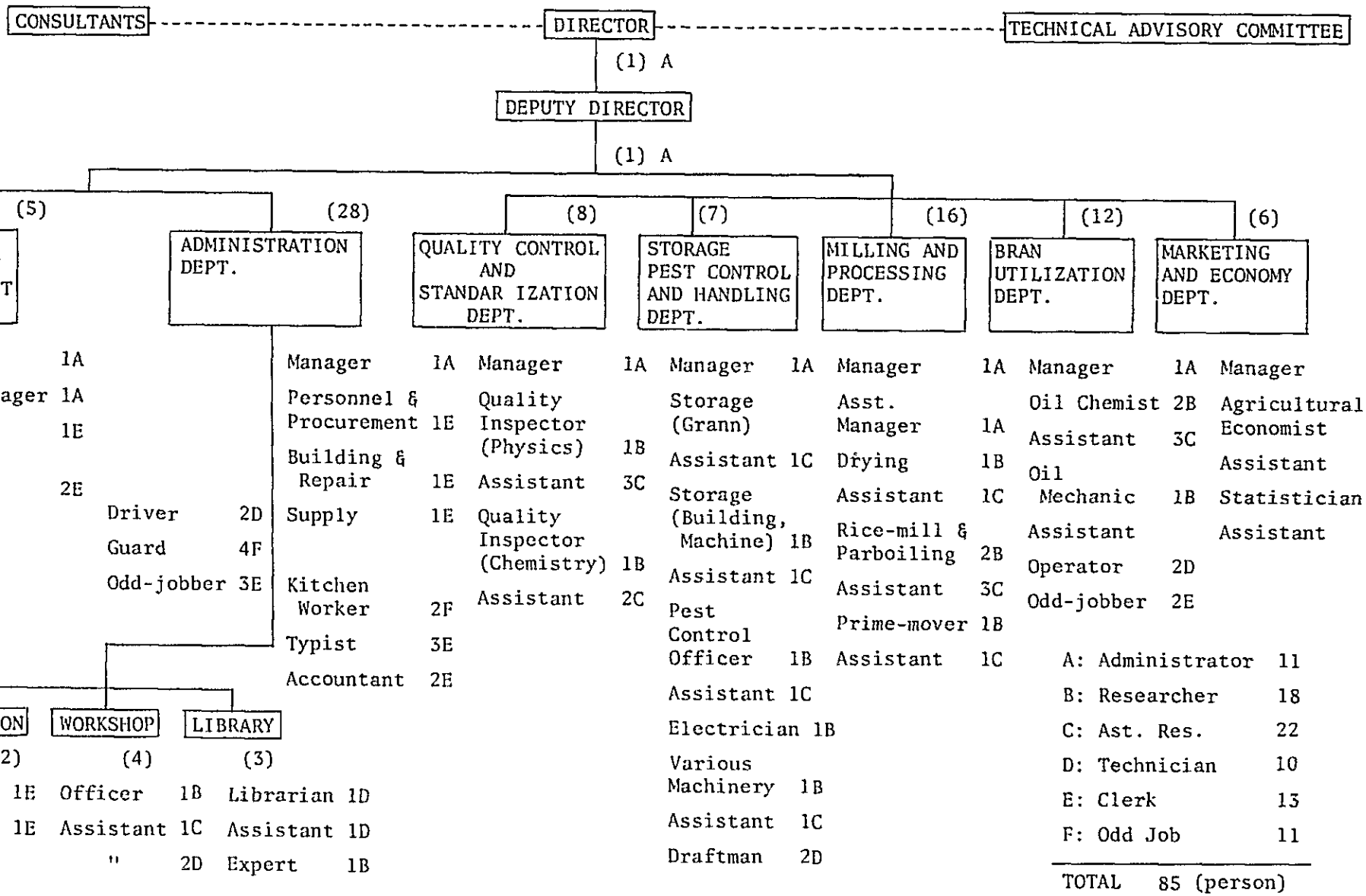
PTAC should be initiated with a simple and efficient set-up, along with the minimum possible number of qualified staff members.

Though each of all the staff members takes up respective assignment, he is obliged to and has the right to participate in activities of

the department positively in which he is assigned, and eventually in whole operations of PTAC. Therefore, rather than perform the instruction and orders directed by the higher officials passively, each staff of PTAC and PTAC itself needs to be kept vitalized through maintaining constant inter-staff/inter-office communications and motivation for renovation on the part of staff members.

The proposed PTAC organization and staffing is shown on the next page.

PROPOSED ORGANIZATION



PTAC is largely divided into two parts i.e. for administration and for research. The former comprises the two departments : one being Planning, Promotion and Budget department and the other Administration department. The latter consists of the five departments: Quality Control and Standardization Department, Storage, Pest Control and Handling Department, Milling and Processing Department, Bran Unilization Department and Marketing and Economy Department.

PTAC staff now assigned are 13 members. They are charged to respective field as shown in Appendix 1-2-3. They will be supplemented with those shown in Appendix 1-3-1 in near future. Full member of staff are supposed to be stationed by 1985.

3-4-2 Planning, Promotion and Budget Department

The Department makes planning, summarizing, budgets allocation and auditing of the whole operation of PTAC, as well as publishing and promotion of the achievements of research and development, and editing the PTAC journals.

To have the research findings reflected on government policy-making, publicity must be made in plain and readable words.

Strong presentation of PTAC recommendations to the authorities is also considered as essential as well as wide range of public relations activity.

3-4-3 Administration Department

The Department is in charge of upkeep and maintenance of PTAC office equipment inventory, accounting, typing, copying and printing etc., as well as rendering necessary services common to respective departments. Operations of the library and the workshop are of most important service to be taken care.

The library makes aggressive efforts for collecting the books, magazines, pamphlets and reports regarding the post-harvest processing, as well as establishing and developing information retrieving system.

The library staff should be trained intensively in terms of information management system, not to mention its own motivation

for progressive up-grading. Meanwhile, other than library facilities respective laboratory and testing rooms may own reference materials they frequently refer to.

The workshop should be staffed by qualified personel so as to make possible design and manufacturing of testing equipment necessary in respective laboratory rooms and prototype machinery and equipment and also maintaining and modifying the whole facilities of PTAC as well. For that purpose mechanical, metal and wood-working, electric and other related technicians are required. Meanwhile, workshops of research institutes are often likely to transform into the small-scale manufacturing factories, which should be avoided in the project under review.

The important responsibility of the workshop staff is to have the designs of laboratory-developed equipment modified into those of suitable for commercial production.

The periodicals and reports edited by the Planning, Promotion and Budgeting Department are to be processed for publishing through this department, while the printing work may be sub-contracted to the private firms, if it is feasible.

3-4-4 Quality Control and Standardization Department

The Department is in charge of making surveys and researches about the biological and physico-chemical properties of paddy and rice, along with quality grading and inspection system employed in the existing marketing. It includes problems of impurities/foreign matters arising on various stages of processing and distribution.

As for the testing equipment, the Department will cooperate with the Milling and Processing Department, and as to grain damaged by pests, with the Storage, Pest Control and Handling Department.

3-4-5 Storage, Pest Control and Handling Department

The Department is to make approaches in respect of storage, pest control, microbes, handling and transport, from view points of biological and physico-chemical, as well as engineering.

These subject items are closely inter-related with each other; for example, storage capacities, if abundantly available, are likely

to reduce the transport burden largely, or vice versa. Storage conditions also affects handling system and problems of microbe and insect pests etc. As the grain moisture has a significant bearing

As the grain moisture has a significant bearing with the Department's subject items, research findings by Milling and Processing Department about paddy drying should be taken into due consideration.

3-4-6 Milling and Processing Department

The department is responsible for drying, milling, parboiling, along with the prime mover and electricity, as well as on-farm post-harvest machinery/instrument through cooperation with AC, CADT, etc. Research and development by the Department might mainly be approached from engineering aspects.

Since the responsibilities assigned are relatively on the wide range, the Department requires to be staffed by a substantial strength of qualified people.

3-4-7 Bran Utilization Department

The department is in charge of oil and fat chemistry on rice bran and bran oil utilization, as well as oil extraction system and machinery of industrial scale, utilization of oil seeds and oil cakes. Management and control of the existing bran oil factories must also be analyzed and corrected for betterment.

As husk is being utilized chiefly as fuel at the moment, utilization of husk and conversion of agricultural waste into energy is considered as more appropriate to be taken by Milling and Processing Department, rather than by this Department. Therefore, naming of this Department as By-product Utilization Department is not appropriate.

3-4-8 Marketing and Economy Department

The department is in charge of making surveys, research and planning in respect of marketing, pricing, collection system, export policy, and overseas market situations. Management and control

of AFPTC and their rice mills and bran oil factories must be looked into by the Department. Necessary advice to inspire and improve the management of the local post-harvest machinery manufacturing industry should also be contemplated by cooperating with Milling and Processing Department, etc.

As the Department is obligated to review the post-harvest processes from general point of view, it should cooperate with, and contribute to, the Planning Promotion and Budget Department. Although the Department may well be staffed by non-technical personel, each of the staff member needs to study technical matters on his own, so much as become able to understand the peculiarity of individual technical themes.

3-4-9 Director and Deputy Director

They are to be separated from respective departments, so as to pay their incessant attention to heightening the morale of PTAC as a whole. They should try not to overestimate their own abilities and judgements and dictate over all, but should take the lead in such way that all staff members of PTAC become willing to propose positive opinions about the management and activities of PTAC and that their capability be manifested to the fullest extent.

3-4-10 Technical Advisory Committee

The committee is tentatively scheduled to comprise representatives selected from respective departments of AFPTC, Ministry of Trade, MEIC, CC, EPC, AC, MIC, AMD, CRO, RIT, PEI-II etc. Communications with these authorities, therefore, will be done officially through members of TAC, dispensing with otherwise necessary lengthy path of AFPTC - Ministry of Trade - other related ministry - associated statutory body. This set-up is considered as essential in collecting the information and also having the research findings suitably reflected on administrative policy-making.

3-4-11 Technical experts

The experts refer to those selected in and out of Burma. The experts dispatched from overseas are to be classified in this

category.

Existence of a group of capable technical experts is essential for improving ability of staff, keeping in mind that PTAC activities more rely on the man power than any of the equipment or facilities.

3–5 Budget

3-5-1 Construction budget

(Unit: ¥ 1,000) (US$ 1.00 = K 7.0 = ¥ 235)

	Japanese portion	Burmese portion	Total
Building	980,284	922,274	1,902,558
Equipment & supplies	540,750	20,400	561,150
Other facilities	111,609	0	111,609
Total	1,632,643	942,674	2,575,317

3-5-2 Operation Budget

The operation and maintenance expenses of PTAC are to be borne by the Government of Burma. The required amounts will be estimated by the Government of Burma for budget appropriation and disbursement, in the event when the execution of the Project is agreed upon between both government of Japan and Burma. Refer to 7-2 for detail.

[Supplement] Relation between the on going ADV assisted project and this project

The ADB-assisted project is summarized as below:

(1) Technical assistance in the initial stage of PTAC.

(2) Financial loan for the construction of Post-harvest Technology Training Center.

Regarding the item under (1) above, the technical assistance amounting to US dollars 150,000 has been decided upon, with particulars as below:

(a) Dispatching of a technical consultant for a period of 12 months (US dollars 77,000.).

The technical consultant (Tropical Products Institute, U.K.) stayed for a month in October 1980 and for three months from October to December 1981, to give technical advices about establishing the training center and to train PTAC staff. The consultant made advisory activities in recruiting the PTAC staff, fellowship, site planning, procuring material and literatures, organizing training program, etc. Henceforth, the British consultant is scheduled to stay for four months altogether in 1982 and 1983.

(b) Procurement of laboratory equipment (US$ 15,000)

* Testing equipment

* Storage and pest control equipment

* Workshop tools

These items are now under way of procurement.

(c) Overseas training/fellowship (US$ 28,000)

Fellowship is for staff training as follows:

* On Storage and handling ..... One member for 2 months

* On Rice Milling ..... " 3 months

* Rice mill and warehouse management — One member for 3 months

* Bran oil production — " "

The trainees have already completed the programs in Japan, India, Philippines and U.K.

(d) Contingency (US$ 30,000)

(e) The Government of Burma has already disbursed as follows in connection with establishment of PTAC;

1981/82

Building construction	1,748,000 K
Laboratory equipment	50,000
Chemical and reagents	53,000
Total	1,851,000 K

1982/83

Facility construction	1,289,000 K
Grain quality monitoring equipment	20,000 K
Laboratory equipment, chemicals, literature, reports, etc.	655,000 K
Total	1,964,000 K

Regarding the item under (2) above, financial aid of US$99,000 was decided in 1979, as a part of the loan for the second rice milling industry assistance project, concurrently with the item under (1), with particulars as below;

(a) Dispatch of a training expert for 12 man/month

(b) Procurement of a jeep, a bus and audio-visual equipment

(c) Construction cost of the training center through convering the grain warehouse.

The training there is to commence from April 1982.

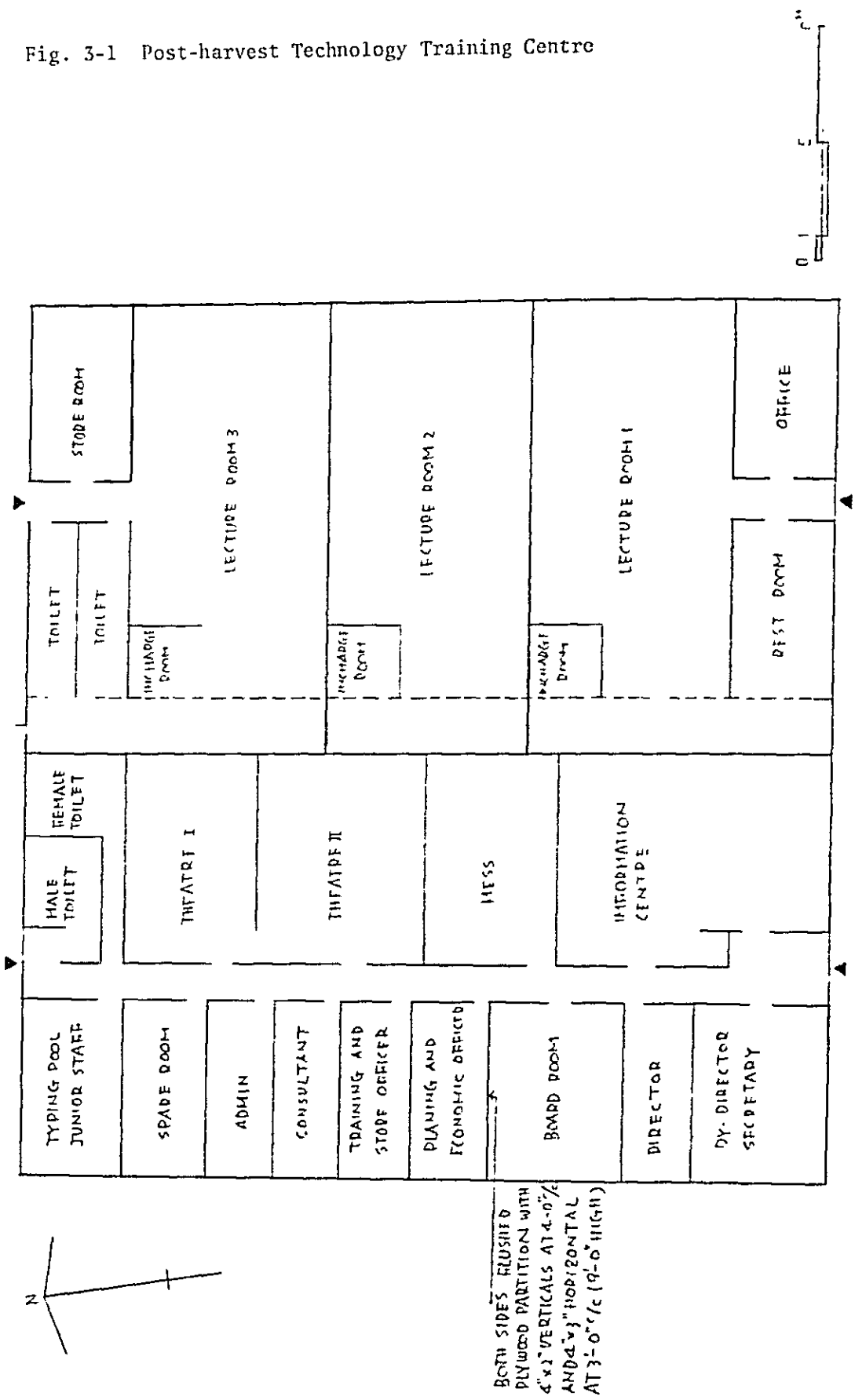
The ADB assistance toward training center for PTAC is to be completed by December 1983. ADB has no plan to continue the present assistance thereafter, and is aware that the Government of Burma

is contemplating to seek further assistance from other aiding agencies.

In the event that the Government of Japan agree to extend the aid for the proposed project, the Government of Burma is planning to shift the present PTAC activities in the training center to the new building, and to utilize the existing building in Parami quarters for training purpose exclusively.

It may be contemplated to expand the function of PTAC in future and to set up an enlarged training center belong to PTAC.

Fig. 3-1 Post-harvest Technology Training Centre



Chapter 4 CONSTRUCTION SITE