AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

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Batch 49

1. SUBJECT CLASSIFICATION
A. PRIMARY: Food production and nutrition — AN20-0000-GG50
B. SECONDARY: Farm equipment--Tropics

2. TITLE AND SUBTITLE
IRRI small farm machinery industrial extension project (Thailand),mid-term project evaluation

3. AUTHOR(S)
Cowell,P.A.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1977	38p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
IRRI

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT

The IRRI seeks to stimulate production of locally built machinery at a price the mass of small Thai farmers can afford. Where land use allows the harvest of two or three successive crops in one year from the same piece of land, mechanization is the key to increased food production. This project is reviewed in terms of: How new IRRI machines are introduced and manufacturers trained; assistance with host-government policy decisions; the acceptability of machines by small farmers (it should be noted that IRRI machines have not yet found their way to the poorest farmers); collaborations between IRRI core activities and the mechanization project; servicing the expanding demand in small farm mechanization; the desirability of international small farm machinery workshops; and issues unique to local environments. A major future consideration of IRRI will be the social and economic impact of mechanization, and its effect on labor absorption.

10. CONTROL NUMBER	11. PRICE OF DOCUMENT
PN-AAD-301	

12. DESCRIPTORS
Agricultural machinery
Evaluation
Intermediate technology
Thailand
Rice
Utilization

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/ta-C-1208 Res.

15. TYPE OF DOCUMENT

AID 590

INTERNATIONAL RICE RESEARCH INSTITUTE

SMALL FARM MACHINERY INDUSTRIAL EXTENSION PROJECT (THAILAND)

Mid Term Project Evaluation

Submitted to

United States of America

Agency for International Development

April 1977

Contract No. AIT 493-7008

Project No. 931-0066

INTERNATIONAL RICE RESEARCH INSTITUTE

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Mid Term Project Evaluation

Submitted to

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Project No. 931-0066

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I INTRODUCTION

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Thailand has a population of some ~~30~~ million people which is expandin at about 3% per annum.

Her most important export has traditionally been rice which remains her export leader. The increased domestic consumption in the past two or three decades has been met mainly by expanding the area of land under cultivation. The opportunities for such expansion are now limited. Therefore in order to maintain a surplus for export the practice of multicropping is being expanded whereby two and even three successive crops are taken in one year from the same piece of land.

Multicropping techniques demand maximum use of the land for growing the crop; little time is left for land preparation and harvesting between crops. Traditional methods using the water buffalo for cultivation and for threshing are too slow and farmers adopting the new techniques are turning increasingly to the use of machinery. Already this process has gone quite far in Thailand and tractors are rapidly displacing the water buffalo as a power source for cultivation.

Since approximately 70-75% of the population of Thailand is engaged in agriculture the average farm size is small being of the order of 3.5 hectares. As one moves north from the Central Plain of Thailand both farm and field size tend to become smaller.

It should be pointed out that before the IRRI extension project was introduced into Thailand there was already an indigenous, albeit small, local farm machinery industry, producing small power tillers and associated cultivating equipment. Animal drawn equipment has been manufactured for a long time. In addition foreign tractor importers, notably Ford and Massey Ferguson, hav been selling tractors (latterly mainly in the 70-85 HP class) for a couple o

decades. The market has varied between 2000 and 5000 plus per annum since the early 1960s. Farmers purchasing these tractors have tended to operate as contractors offering primary cultivation services particularly in the drier regions of the country, and have gone far in replacing the buffalo for initial ploughing operations.

The IRRI approach to mechanization is directed at the mass of small farmers by seeking to stimulate production of locally built machinery at a price an individual farmer can afford to pay. This approach has been spearheaded by the introduction of an IRRI designed power tiller, and latterly by the introduction of a powered threshing machine. An important question surrounding the introduction of farm machinery in a developing country must always be that of labour substitution. There is a tendency for essentially company controlled estates to develop notably around such industries as the rubber industry and the canning industry. In addition several land consolidation projects are under development in Thailand which tend to bring along with them an increase in mechanization.

It has only recently been realized that the key to the labour substitution problem lies in introducing only that machinery which is appropriate to the local system at the appropriate time. When the introduction of machinery makes it possible to increase production while at the same time employing the same number of people, an overall community gain is achieved.

Multicropping is a good example of this, in that it is largely impossible to complete the field work in sufficient time using traditional animal and human power to enable more than one crop to be grown. In these circumstances mechanization becomes the key to increased food production.

It is against this background that the ultimate desirability of the IRRI program should and will be judged.

EVALUATION TEAM

The evaluation team comprised the following people:

1. Dr. Peter A. Cowell, Professor of Agricultural Engineering, Chairman of the Division of Community and Regional Development, Asian Institute of Technology, Bangkok. (Consultant)

2. Dr. Gajendra Singh, Assistant Professor in Agricultural Systems Engineering, A.I.T., Bangkok

3. Mr. Chanet Kumtong, Economist, Dept. of Social Sciences Mahidol University, Bangkok.

Valuable assistance in discussion and questionnaire preparation was given by

Dr. Shlomo Angel, Associate Professor in Community and Regional Development, A.I.T.

OBJECTIVES OF IRRI PROGRAM

The objectives of the IRRI Program as stated in the IRRI/USAID Contract proposal are as follows.

(1) To conduct economic and market evaluation studies to determine which IRRI or other designs offer the greatest potential for productive and possible agricultural mechanization;

(2) To carry out a comprehensive test and evaluation program to determine the performance characteristics of IRRI equipment under conditions encountered within the host country:

(3) to provide continuous technical and in-country engineering and marketing assistance to manufacturers entering production with IRRI designs;

(4) to perform adaptive design and development work on those IRRI machines which offer potential but lack sufficient compatibility in their original configuration to meet local farm-level needs and/or indigenous manufacturing requirements;

(5) to promote the use of appropriate equipment through demonstration activities involving both farmers and manufacturers;

(6) to conduct research studies related to the mechanization of agriculture and the local production of farm machines; and

(7) to provide information to IRRI on local machinery trends and needs.

SCOPE OF EVALUATION

The terms of reference for this evaluation as prepared by A.I.D, Washington were as follows:

1. Infrastructure for testing prototypes, introducing new machines, training rural area manufacturers and distributors.
2. Capability to assist with Host Government policy decisions on appropriate technology and socioeconomic effect of mechanization.
3. Acceptability of machines by small farmerson basis performance and cost.
4. Collaboration between IRRI core budget activities and subject project on mechanization.
5. Recommendations for activities through life of project and continued activities and relationship following contract expiration in September 1977.
6. Considering increasing current worldwide interest in small farm mechanization, how will expanded demand be serviced?
7. Desirability of international small farm machinery workshop at IRRI.

8. Issues unique to local environment.

9. Issues arising during evaluation process.

METHOD OF EVALUATION:

It was considered that an important part of the evaluation should be to obtain an objective assessment of the IRRI programme in the eyes of the ultimate beneficiaries, the farmers and the manufacturers. Therefore two opinion surveys were carried out - a survey of forty farmers who had purchased IRRI designed machines and a survey of six principal manufacturers of IRRI designed machines and one main distributor.

In addition to this extensive interviews were conducted with IRRI staff in Thailand, and with the host country staff of the Agricultural Engineering Division of the Department of Agriculture (Bangkhen). Opinions were sought from representatives of international agencies having a direct interest in the project such as UNIDO and the Regional Network for Agricultural Machinery (UNDP and UNIDO).

II DETAILED PROJECT REVIEW

In this section the project is reviewed in accordance with the terms of reference as set out under 'Scope of Evaluation'

1. Infrastructure for testing prototypes, introducing new machines, training rural area manufacturers and distributors

The IRRI/USAID contract specifies the following personnel and equipment. Since the contract covers both Pakistan and Thailand only that specified for Thailand is shown.

Personnel:

1 Agricultural or Industrial Engineer (expatriate) 24 Man months.

1 Assistant Agricultural or Industrial Engineer (indigenous) 24 MM.

2 Mechanics (indigenous) 48 MM.

1 Agricultural or Industrial Engineer assigned to IRRI, Pakistan and Philippines with responsibility for liaison. 24 MM. for all three countries

Subcontract with Industrial Dev. Division of Georgia Institute of Technology (IDO/GIT). 24 MM. for both countries including 2 MM. business management consultant.

1 Assistant Agric. or Indust. Engineer 12 MM.

2 Mechanics (indigenous) 24 MM.

1 Secretary (indigenous) 24 MM.

Equipment:

1 pick-up truck

Minimum of three IRRI prototype machines per year.

Minimum of three prototype machines for the second year.

The actual personnel strength is as follows

1 Industrial Engineer (S. Barton). 18 MM, on Sept. 1, 1977.

1 Assistant Agric. Engineer (Suvit)

1 Agric. Engineer liaising with Philippines and Pakistan. (J. McMenammy)

1 Workshop technician (Charlit)

1 Draughtsman ½ time Engin. Division (Vacharachai)

1 Secretary

The services of the following people are also available on an indirect basis:

Thai Administrative Assistant (Soonton)

Assistant Agr. Engineer, Thai Dept. of Ag. (Chalermchai). Paid by Thai Dept.

Agricultural Engineer - Thai counterpart (Chak Chakkaphand), ¼ time.

Driver (Boonson)

IRRI has several cooperative projects in Thailand of which the farm machinery industrial extension project is one. Administratively these projects are the responsibility of the IRRI Representative in Thailand, known as the Country Representative. As we understand it the administrative responsibilities of the Country Representative include fiscal management and staff recruitment. Specific project development is the primary responsibility of the IRRI core staff, working on the project.

This policy separates authority and responsibility, and is one which appears to have led to some misunderstanding between the Country Representative and the IRRI core staff, particularly on recruitment of staff.

The number of local staff employed on the project is considerably less than the project calls for. We did not investigate why this had happened but make the observation that if the project is to operate satisfactorily the full complement of staff should be engaged.

The working relationship between the IRRI core staff and the Thai Ag. Eng. Division is obviously good. The Ag. Eng. Dept. has quite good workshop facilities and space is available for IRRI engineers to work independently or together with the Ag. Eng. Division staff. Workshop and field tests are conducted jointly mainly on performance, not durability. In this respect the lack of Thai mechanics appears to be a limiting factor.

New machines are introduced by offering designs to manufacturers with little restriction. This freedom of action was welcomed by manufacturers (see Survey). Also a free product engineering service is offerred for IRRI machines, and modifications suggested by manufacturers are discussed.

No training of rural area manufacturers is done in Thailand but one or two we spoke to did attend a two week training program in the Philippines (See Manufacturer Survey). This they found very stimulating and valuable but the language barrier was a problem. It was suggested that one or two Thai engineers should be trained to offer the same course in Thai, in Thailand. We endorse this view and recommend serious thought be given to such a training program in future.

2. Capability of Assisting with Host-Government Policy Decisions on Appropriate Technology and Socio-Economic Effects of Mechanization

In making policy decisions on appropriate technology and the effect of mechanization the host government is in contact with the Thai staff of the Agric. Eng. Division. By virtue of working closely with these people the IRRI team is well placed to assist in policy decisions. On the other hand little if any work has been done on the socio-economic effects of mechanization and appropriate technology. An exception to this is an axial flow thresher survey conducted by the Agri-business management group of the Faculty of Economics, Kasetsart University on behalf of IRRI.

We feel that more of this type of support work is needed by the program. It may well be better for the IRRI team to enlist the cooperation of other Institutes already engaged in similar work such as Kasetsart University and the Asian Institute of Technology both of which have better facilities particularly in terms of manpower.

3. Acceptability of Machines by Small Farmers on the Basis of Performance and Cost.

We conducted an extensive farmer survey to assist in determing the acceptability of IRRI machines (for further details see Farmer Survey).

Of the whole range of IRRI machines available only two have been accepted to any extent by Thai farmers-the power tiller and the axial flow thresher. It is probably too early to determine whether any of the other machines will ultimately be accepted.

The IRRI power tiller is accepted largely because of its low price in comparison with Japanese power tillers, and because it is technically sound. There is evidence (see J. Charoenchai, manufacturer survey) that the appearance of the tractor is less than desired by many farmers. This arises because the tractor is not produced in such large quantities as to justify on a cost basis the use of pressings which go far to make the Japanese machines attactive.

However, the power tiller is probably only an intermediate step in mechanization in Thailand and there is a growing demand for small four wheel tractors. In this regard manufacturers are keenly awaiting the release of an IRRI designed 4 wheel tractor.

The emphasis on double cropping has brought with it the need for a threshing machine. Up to the present time only the more wealthy farmers have purchased

axial flow threshers but the IRRI design has been quite well received. It has a problem in not being able to produce a clean sample with some varieties but IRRI engineers are modifying the design to improve it. The IRRI weeder has been tried but found unsatisfactory. There appear to be two problems, one that Thai farmers do not produce a very level seedbed and secondly that often the plants are not grown in straight lines.

4. Collaboration between IRRI Core Budget Activities and Subject Project on Mechanization

This appears to be satisfactory in that there have been a number of visits by John McMenammy, the Liaison engineer based in the Philippines, and through relaying of periodic reports from Thailand to the Engineering Department at Los Baños.

A recurring complaint at the Thai end was the non-availability of vehicles for a long time which apparently was due to an administrative hold up. Similar comments were made with regard to recruitment of personnel for the project.

5. Recommendations for Activities through Life of Project and Continued Activities and Relationship Following Contract Expiration in September 1977

This aspect is dealt with separately under Summary and Recommendations.

6. Considering Increasing Current World wide Interest in Small Farm Mechanization How will Expanded Demand be Serviced?

As far as the manufacturers are concerned they are optimistic (Pramoulkolkit, Manufacturer Survey) that they can get Thai government financial support if their business and work looks successful. The problem rather lies with credit facilities for the farmer, facilities which would enable him to purchase machines for a low down payment and at low interest rates.

Khun Wachara, the main dealer in Chieng Mai, was of the opinion that such assistance should be given to the dealer (himself!) rather than the manufacturer. In this way the manufacturer is relieved of the problem of doing his own marketing.

One of the besetting problems of Thailand however, is that farmers can often only obtain credit from middlemen and suppliers who usually charge high interest rates. Inevitably, through debt accumulation, farmers are in danger of losing their land to private individuals and support of dealers would seem to accentuate the problem. The answer would seem to be in extending government supported cheap lending facilities for farmers for the purchase of farm machinery.

7 Desirability of International Small Farm Machinery Workshop at IRRI

Over the past decade there has been much discussion about the desirability of agricultural mechanization in developing countries. This discussion was healthy and has led to a much better understanding of how to harness the obvious benefits of farm machinery while avoiding its antisocial effects. A number of studies on the social effects of mechanization have been carried out in the region but they are comparatively few. More up to date and more precise information is required. An international small farm machinery workshop would provide a valuable forum for exchange of ideas and experiences at a time when governments in Asia are taking a fresh look at this agricultural mechanization policies.

8 Issues Unique to Local Environment

In comparison with some countries in the region Thailand is not short of food, and while there is much rural poverty, people for the most part are not too hungry.

There is much concern that employment opportunities for people in the rural areas must be increased, and it is against this background that mechanization of agriculture is often regarded with suspicion and rightly so. On the other hand

field work falls to women who already have the burden of looking after the family. From a simple humanitarian point of view, appropriate mechanization has much merit. Manual farm work is seen as glamorous only by onlookers who never need to do it or who never have done it.

At the present time the government is planning considerable emphasis on rural development and rural industry. Workshops making farm machinery also engage in the manufacture of other goods and so form the nucleus for the development of local engineering enterprises, which in turn provide greater opportunities for employment. The availability of materials in Thailand is good.

Finally there is a great deal of enthusiasm for mechanization in Thailand. Farm mechanization is happening and will happen whether or not the IRRI program exists, but it should help to direct development along appropriate lines.

9. Issues Arising During the Evaluation Process

No serious problems arose during the evaluation process and most issues of importance have been dealt with in the foregoing.

One factor however was noted wistfully by one farmer. This amounted to the fact that, while farmers welcome the introduction of small machines, they were losing a measure of their independence. When he bought a buffalo, the farmer had no further need to communicate with or rely on the seller after purchase. The animal fed itself on straw and grass and rarely fell sick. By purchasing a tractor the farmer discovered he had entered into a continuing relationship with the dealer in that servicing, repairs and fuel were all needed. And at the end of its useful life he could not eat it.

SUMMARY AND RECOMMENDATIONS

One of the outstanding features of the IRRI small farm machinery extension program is that it reaches in a unique manner right to the people who need the benefit of research and development. In concept it is one of the few programs which attempts to forge the final link between research and the end user, a link without which so much research effort is lost.

We have good evidence that the type of service the IRRI program offers is welcomed both at a local industry level and at the farmer level. We believe also that the intensity of feedback from the end users to IRRI on farmer requirements will greatly improve the effectiveness of the overall program in future. This is not a one way relationship. It should be recorded however that IRRI machines have not yet found their way to the poorest farmers. It was noticeable that only fairly well off farmers were purchasing the machines, particularly the axial flow thresher.

The liaison between the IRRI staff and the Thai Ag. Eng. Dept. appears to be good. The presence of IRRI staff has ensured that tests are completed and reports made. The Ag. Eng. Dept. feels better informed about what other people are doing, and regular joint consultation takes place on design, testing and other matters.

A disappointing aspect of the program has been the slow recruitment of Thai staff which has restricted the scope and extent of its activities. A big problem will be how to ensure that the program will continue to operate under the direction of the Thai Agric. Engineering Division when direct involvement by IRRI has been phased out. We gained the impression that the program is only just getting under way and it will be important for it to gain sufficient momentum with a major involvement of Thai personnel before the contract finally expires. For this reason recruitment of Thai staff who could help carry the project forward later is most important.

This view is endorsed by the Ag. Eng. Dept. staff themselves who feel it will be difficult for them to offer entrepreneurial help when IRRI have gone. This gap may well be filled by the Regional Network for Agricultural Machinery (see interview with Mr. Majid Khan) later, but it will take time to develop this service, a service which has not yet actually started.

The IRRI program was started in Thailand at a time when local manufacturing and mechanization of the rice crop was already under way. Thus the climate was right for entrepreneurs to take an interest in IRRI designed machines. This has been a critical interest and only well adapted designs have been taken so far, notably the power tiller and the axial flow thresher, both of which have been modified to meet local needs. Manufacturers welcome the IRRI initiative in that by accepting and manufacturing designs which have already been tested they can save a lot of design and development time. Also they prefer an association with IRRI rather than Japanese companies on account of there being much less restriction and control. On the question of Japanese companies one manufacturer said Thai manufacturers were afraid of setting up small engine factories because they would soon be forced out of business by Japanese competition which they regarded as being unfair, and damaging to local interests. The IRRI approach was a welcome contrast which aimed at direct help.

Of the two machines manufactured in Thailand only the power tiller has so far reached the small farmer. This has sold quite well against Japanese and locally designed competition on account of its good design (except its appearance) and price. There is evidence that a small four wheel tractor might be even better. The axial flow thresher appears to have started a trend but so far only the more wealthy farmers are buying them (average income last year of 10 owners was U.S. $8600). There is an obvious need for a much cheaper machine.

One limitation of the project is that it is concerned only with IRRI designed machines. Yet there are many other locally designed machines which could greatly benefit from being independently tested and design advice given. Not much effort along these line is made by the Agricultural Engineering Division but is an effort which the IRRI project could well support.

In order to introduce new machines to farmers it is important to hold promotional demonstrations and participate in fairs. In this respect the Georgia Institute of Technology staff have been useful. Indeed the greater part of their activity appears to have been in promotion of IRRI designs.

All this leads us to a rather fundamental consideration, namely the question of the social and economic impact of mechanization and its effect on labour absorption. We believe that this is such an important matter that the IRRI project should proceed hand in hand with socio-economic impact studies in the rural areas. In this IRRI could enlist the assistance of other Institutes within Thailand.

Specifically we Recommend:

1. That the project should continue and the second phase be implemented.
2. That greater effort should be made to ensure recruitment of all necessary staff and equipment as provided for in the contract.
3. Steps should be taken in the second phase of the project to ensure continuity of the work after the IRRI project has been completed.

It is recommended that the opportunity be taken of working closely with the Regional Network for Agricultural Machinery, who may be expected to assume some responsibility for extension work in the rural areas.

4. That socio-economic impact studies of mechanization be initiated, if necessary with the assistance of local Institutes and Universities. These studies should monitor changing patterns of farming, of mechanization and of labour absorption in the areas where IRRI machines are being introduced.

5. That testing of machines and advice on design and manufacture should not be restricted to IRRI designed machines.

6. That consideration be given to offering a short training course for Thai entrepreneurs and their engineers in Thailand, in the Thai language.

7. That a small farm machinery Workshop be conducted at IRRI headquarters.

APPENDICES

A.1. MANUFACTURER SURVEY

[illegible] producing IRRI machines (supplied by Stewart Barton) indicated that, in effect, only two IRRI machines are being produced and sold in any quantity to farmers, namely the power tiller and the axial flow thresher.

The power tiller manufacturers are:

J. CHAROENCHAI LTD. PART., Ayudhya, (Mr. Preecha)

ANUSARN CO. LTD., Chieng Mai, (Mr. Rueng)

Some sixteen manufacturers were producing the axial flow thresher but only three of these had manufactured more than ten. These were:

KASERTTHAI LTD. PART., Chonburi, (Mr. Charroy)

PRAMOULKOLKIT LTD. PART., Bangkhen, Bangkok, (Mr. Anusorn)

PRADITYONT SHOP, Chachoengsao.

One other manufacturer who produces a modified IRRI axial flow thresher was interviewed:

J. CHAIDEE PANICH, Chachoengsao.

In addition one important dealer in IRRI power tillers was interviewed:

WACHARA, 24-30, 44-46 Chaipom Rd., Chieng Mai.

As regards the remaining IRRI machines, five manufacturers are listed as making the manual weeder but only three appear to have been sold altogether. Five manufacturers have made one or more IRRI diaphragm pumps but these are mainly for testing and demonstration purposes.

WACHARA, Chieng Mai.

No. Employees: 48.

This company is essentially a retail distributor and is the principal agent for J. Charoenchai of Ayudhya. J. Charoenchai extend credit to them

:o assist sales of their power tiller. Wachara says he relays comments from :armers back to J. Charoenchai who then modifies the design accordingly to fit 'equirements. At present the machine suffers by not have steering clutches to ake turning easier.

Sales were at a peak in 1975 when more than 200 were sold. In 1976 this ell to less than 50 but he expects to sell around 100 in 1977. He appears ɔ be losing business to Anusarn Company, the local manufacturer.

He was most concerned that a scheme should be started to help farmers ɔtain credit at low interest rates to purchase tractors on an instalment plan.

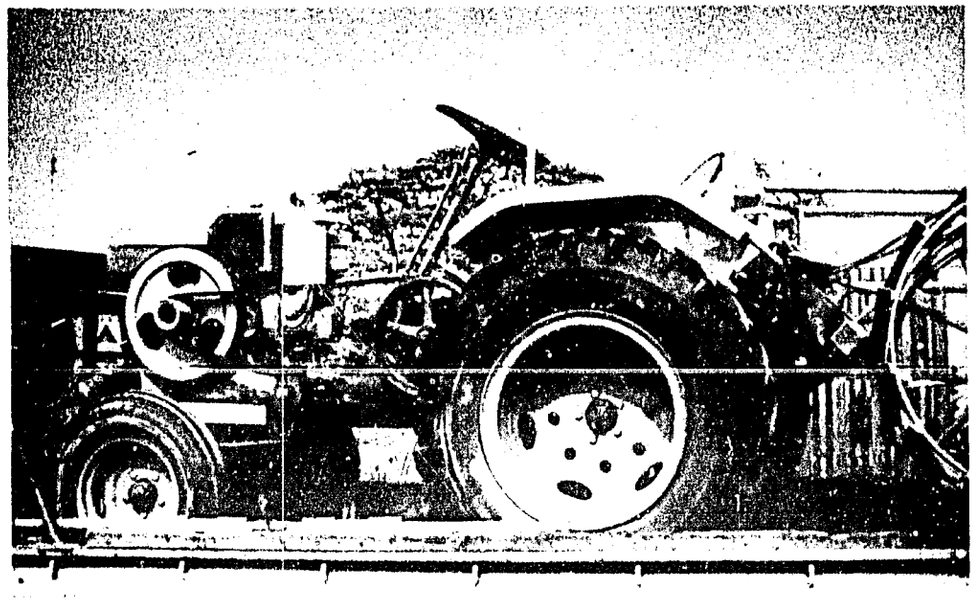
MR. CHARROY (Kasertthai Ltd. Part., Panus Nikom, Chonburi)

No. Employees: 12 permanent. Up to 25 casual during peak production.

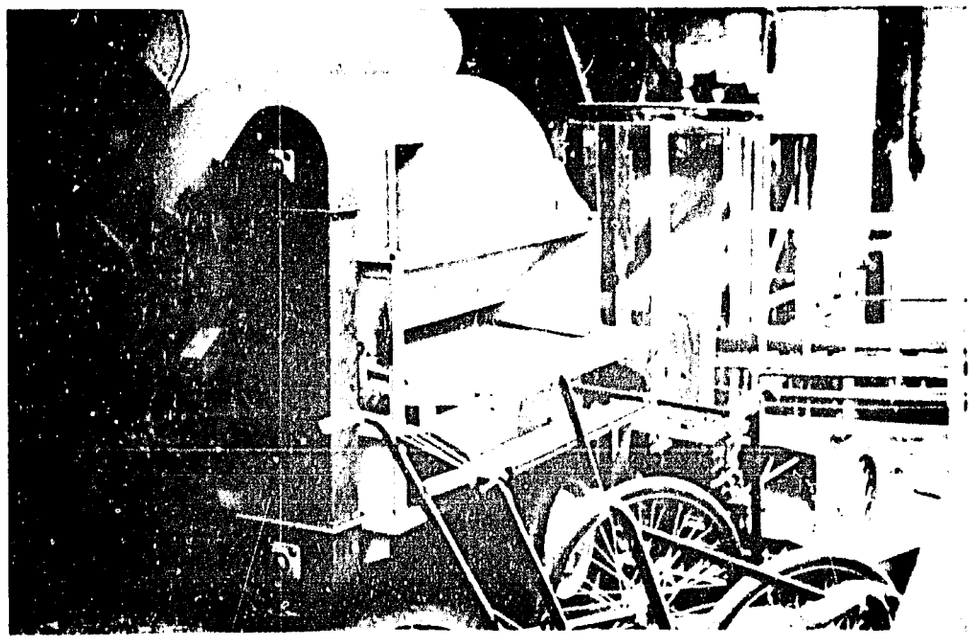
The principal manufacturerto date of the IRRI axial flow thresher has been Mr. Charroy who, since the end of 1973 has manufactured and sold some sixty machines (see photographs).

Originally he manufactured exactly to the IRRI specification but later adapted it to Thai taste and introduced an oscillating sieve (note that farmers complained this frequently broke). He liked the IRRI design because of its small power requirement compared with the Japanese equivalent and liked its higher efficiency. He is conscious that his sales may drop this year because of competition from other local manufacturers who have copied his design. He was enthusiastic about a 10 day training program he underwent at IRRI, Los Banos in 1974, where he got to know more about the rice crop, saw other manufacturers and learned more about tools and equipment. He was pleased with the technical assistance offerred by IRRI but it would be better if marketing assistance could be given.

He believes IRRI should give serious thought to the design of a 4 wheel tractor for which there was a good market in the lowlands. He is contemplating trying to make the smaller IRRI portable thresher and is interested (in de-



Locally designed and manufactured four wheel tractor.
This tractor is produced at the rate of 80 per month and sells for $2125. (J. Charoenchai Ltd., Ayudhya)



Locally produced IRRI designed axial flow thresher.
About 60 of these machines have been sold in three years.
Price $850-900 without engine. (Kaserthai Ltd., Part. Chon-buri)

creasing order of importance) in a drier, the weeder, a two wheel tractor with steering clutches and a 4 wheel tractor. In summary he is an enthusiastic advocate of the IRRI program.

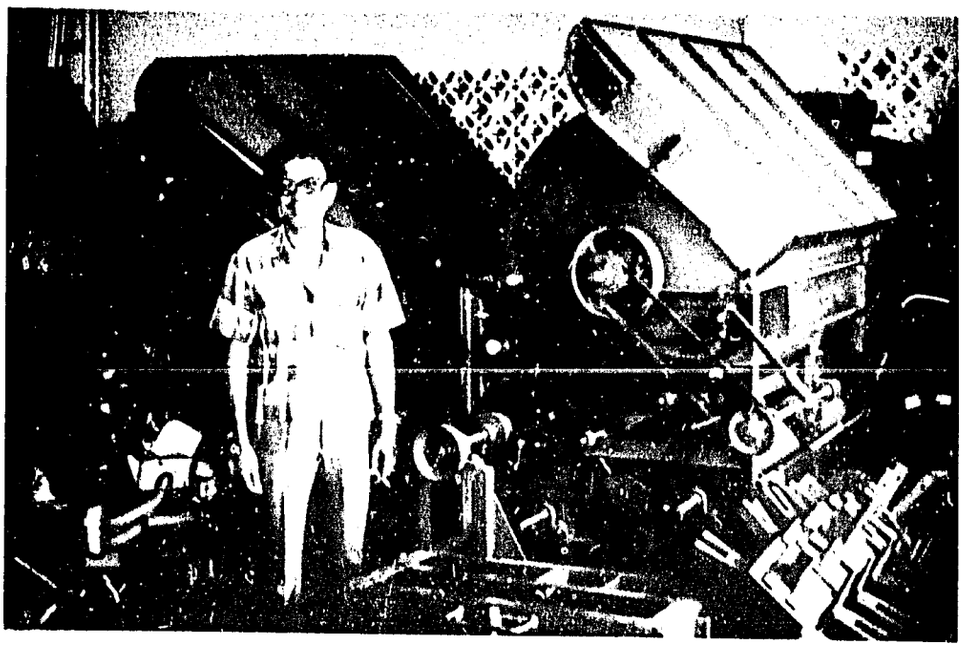
PRADITYONT SHOP, Chachoengsao.

No. Employees: 35.

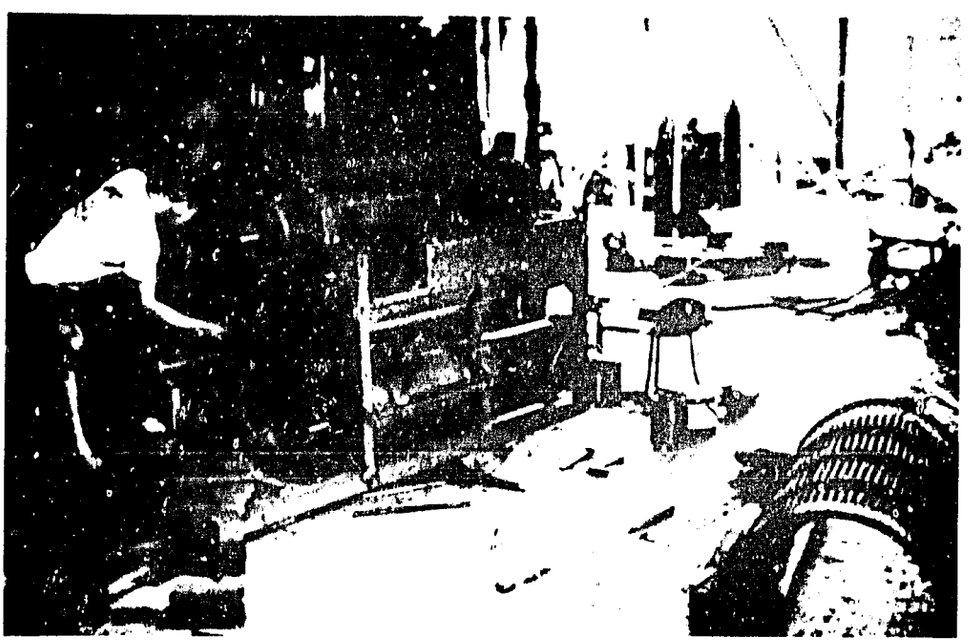
This small factory produces power tillers of their own design and has sold 10,000 units in 8 years. Sales are now levelling out at about 1000 per year, which nevertheless makes the shop the largest power tiller (non IRRI) manufacturer we visited. He supplies about 10 dealers.

The owner is a breezy independent man with an obvious flair for copying and adapting other peoples' designs. For example he originally borrowed a Catalog of the U.K. Landmaster tractor from a neighbour and copied the pictures. Essentially he did the same with the IRRI axial flow thresher and says that the only contact he has had with IRRI personnel, apart from an initial visit from them when they took photographs of his tractor, was to receive a Catalog from them, from which he was able to copy.

In the first season of production he has sold 18 axial flow threshers at a retail price of ฿ 15000 ($ 750). His own profit is ฿ 2000 per machine. He thinks it is too early to tell whether farmers will like the machine but the trend is for sales to increase. The machine has problems, and cannot yet produce a clean enough sample (the racilla sticks to the grain with some varieties). He has not been on the IRRI training program but thinks it would cost him too much. Nevertheless he would like to go. He was not enthusiastic about the IRRI weeder, which he said he tried, but discovered that the seed bed prepared by Thai farmers was not smooth enough for it to work properly. In the future he is interested in producing a harvesting machine and is thinking of copying a design from the Peoples Republic of China,



Local copy of IRRI designed axial flow thresher. Three of these machines have been sold at $600 each. (Chydee Panich, Chachoengsao)



Inside local workshop showing manufacture of axial flow thresher. (Chydee Panich, Chachoengsao)

J. CHYDEE PANICH, Chachoengsao.

No. Employees: 8 permanent, 8 apprentices

This factory has started producing a modified copy of the IRRI axial flow thresher. Starting this year they have manufactured seven and sold three at ฿ 12000 each. The owner says he has had one visit from IRRI personnel and later went to the Ag. Engineering Division of the Ministry of Agriculture to ask about the axial flow thresher. There he gained the impression that it was not yet successful. However he looked up some IRRI machines made by others and copied them with modifications.

He claims to have improved the quality of threshing by increasing the number of pegs on the drum and reducing the spacing between the bars on the concave.

This manufacturer produces power tillers of his own design and sold 100 last year at a price of ฿ 5000 ($250) without engine. He also sells 500 - 600 water pumps per year. He says he introduced the IRRI power tiller earlier but found it unsuitable and so discontinued manufacture and continued with his own design. His complaint centred mainly around the mouldboard plough which he claimed was of the wrong proportions. It did not turn over the local soil which was sticky and contained long weed roots.

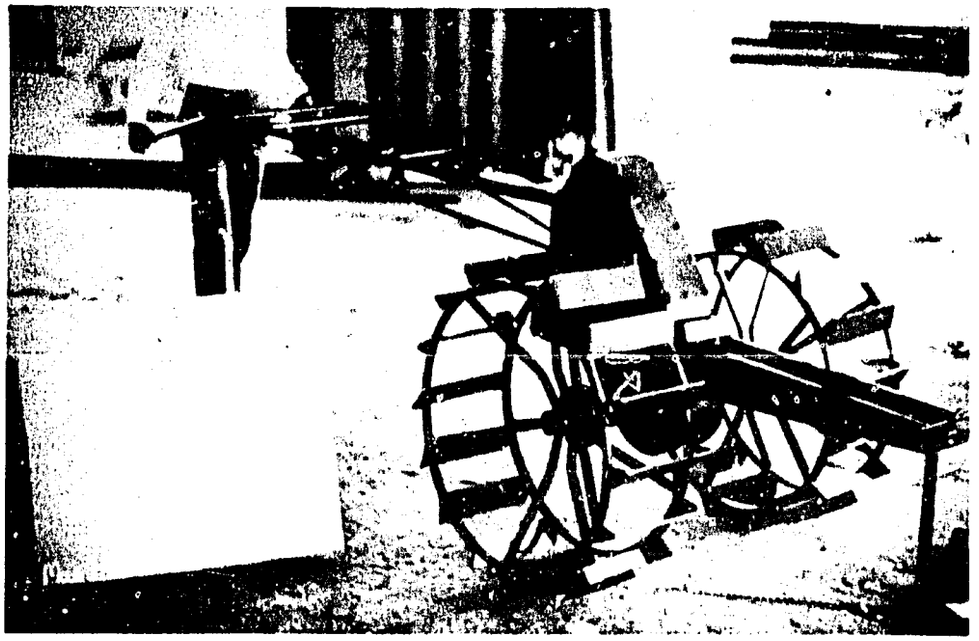
The factory sells direct to the farmer.

J. CHAROENCHAI LTD., Ayudhya, (Mr. Preecha)

No. Employees: 135.

The principal product of this factory is a 4 wheel 14-15 HP rubber tyred tractor selling for ฿ 42,500 ($2125) at the rate of 80 per month. As far as we know this is the largest indigenous tractor manufacturer in Thailand.

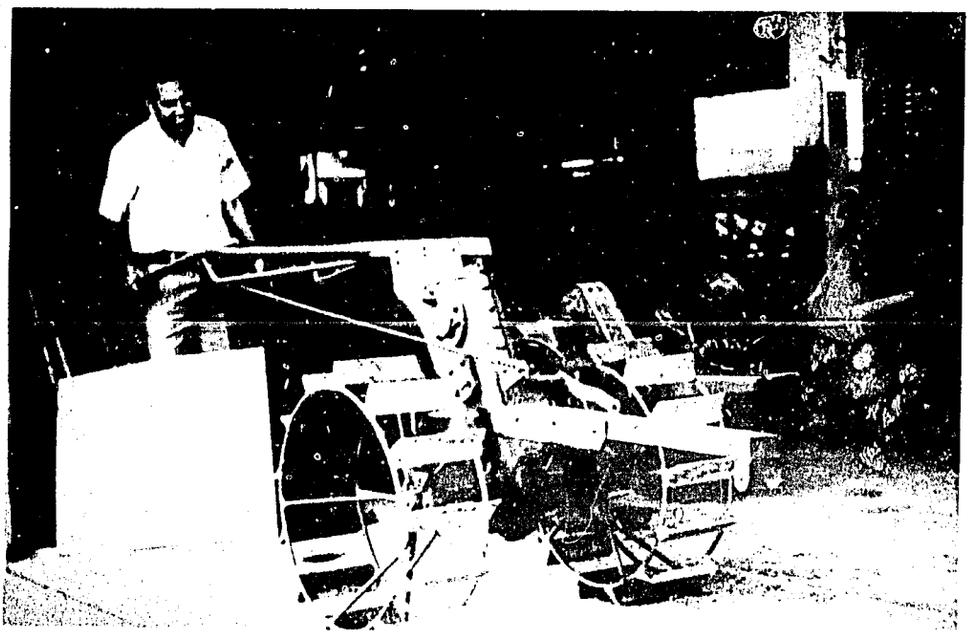
In 1974 they began to produce the IRRI power tiller and have sold some 500 altogether, including 300 in 1976. Most of the power tillers are not



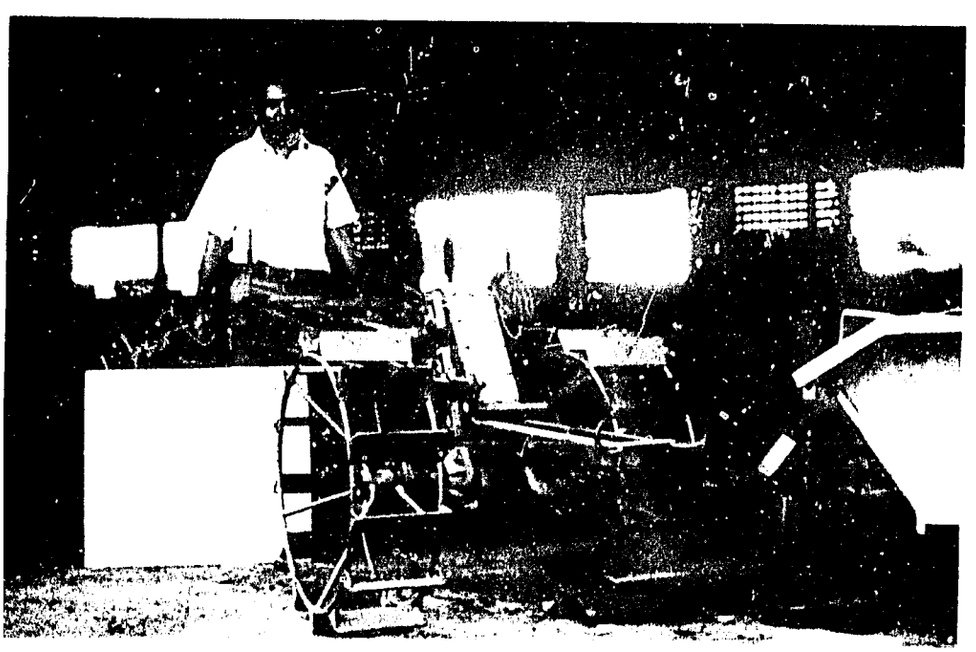
Locally designed and manufactured power tiller. Price $250 without engine. (J. Charoenchai Ltd., Ayudhya)

Locally manufactured power tiller plough.

(J. Charoenchai Ltd., Ayudhya)



Locally manufactured IRRI designed power tiller.
First improved model. (J. Charoenchai Ltd., Ayudhya)



Locally manufactured IRRI designed power tiller.
Second improved model. Note increased size of components.
Price $440 including 6-8 HP. petrol engine. Sold 300 in 1976.

sold in the immediate vicinity but in Chieng Mai (See Wachara), Singburi, Chainat and Saphanburi all further north. In spite of selling so many, the IRRI power tiller is regarded as a side line.

Mr. Preecha says that the IRRI machine is good technically and mechanically. Originally he manufactured exactly to the IRRI specification but found it necessary to increase the size of the major components. In this he obtained assistance from IRRI in Thailand.

his main criticism of the IRRI machine was its poor appearance. In fact he says that when he redesigned it to improve the appearance his sales went up. His pattern of sales has been as follows:

1974 20

1975 200

1976 300 +

1977-He will sell 300 or more depending on the competition. If any other 2 wheel manufacturer goes bankrupt his sales will increase.

Mr. Preecha points out that in the Northern provinces the farmers preference is moving towards a 4 wheel tractor. He is therefore very interested in the IRRI 4 wheel tractor which is at present at the design stage (cf. Mr. Rueng).

He attended the IRRI training course in the Philippines but since his English is poor the most valuable part to him were the slides he saw. He made the suggestion that an English speaking Thai person should attend the IRRI training course, and then give the same course in Thai in Thailand. He would like to have learned more about other non - IRRI machines.

PRAMOULKOLKIT, Bangkhaen

No. Employees: 20.

This factory produces milling and mixing units for animal feed and some cultivating equipment and tractor trailers. The only IRRI design manufactured

is the axial flow thresher of which about 15 have been sold mostly in Sukothai and Chieng Mai.

Originally he obtained IRRI blueprints and started manufacture in 1976. He sells them for approximately ฿ 15000 ($750). He was very enthusiastic about the IRRI program. He pointed out that by adapting IRRI designsthere is a tremendous saving in design and development work. Furthermore, in order to sell to the farmer demonstrations must be held. There was no Agricultural Engineering extension service in Thailand and IRRI were useful in this regard by organizing demonstrations.

ANUSARN CO. Chieng Mai, (Mr. Rueng).

No. Employees: 60.

This company make the IRRI power tiller with few modifications. Since 1975 he has sold close on 200 machines and continues to make them at the rate of 30 per month.

Formerly he used to sell the Honda power tiller. He discontinued because it was more expensive and complained that the Japanese company controlled him too much. He liked the easy going relationship with IRRI.

He felt farmers would like the IRRI machine to be heavier and more robust (note that J. Charoenchai already sells a heavier machine). He felt the IRRI service was particularly valuable in that it saved his company time at the drawing board and in development, time they did not have.

He commented that the Philippine Government and IRRI appear to have very good cooperation. This has not been developed yet in Thailand. There is very little agricultural engineering training in Thailand.

He felt that the Thai IRRI group should employ a local technical consultant to make it easier for manufacturers to use components locally available. With regard to 4 wheel tractors he felt they were better suited to larger farms further south than the Chieng Mai area.

A.2, FARMER SURVEY

Since the largest IRRI power tiller manufacturer (J. Chareonchai Ltd.,) was located in Ayudhya and the largest axial flow thresher manufacturer (Kasertthai Ltd.,) was located in Chachoengsao it was originally intended to concentrate the farmer survey in these areas. However it was soon discovered that most of the Ayudhya power tillers were sold in the Chieng Mai area, largely through aggressive selling by the Chieng Mai dealer Mr. Wachara.

Consequently a survey of 40 farmers was conducted concentrating in two areas - Chieng Mai (29 farmers) and Chachoengsao (11). These two groups of farmers were using IRRI designed power tillers and axial flow threshers respectively.

There were certain political constraints to be faced in conducting the farmer survey. At the present time Thailand is going through a period of extreme political uncertainty and individuals making random surveys in rural areas may soon run into difficulties with the police and security forces. We were fortunate in this respect that the major manufacturer in the Chieng Mai area, Mr. Ruang, was also the mayor of that city and rendered us the necessary co-operation. Likewise the principal axial flow thresher manufacturer in the Chachoengsao area (Mr. Charroy) was also the mayor of Panas Nikom and kindly facilitated our survey work.

POWER TILLER OWNERS

In all 29 farmers in the Chieng Mai region were surveyed. Of these 7 had a power tiller manufactured by Anusarn Co., of Chieng Mai and the remaining 22 had one manufactured by J. Charoenchai Ltd., Ayudhya.

Although the two tractors are essentially the IRRI design, only the Anusarn Co., machine is manufactured closely to the IRRI specification. The Charoenchai machine has been modified by generally increasing the size of components and making

it bigger and heavier (see photograph). Also the appearance was modified to make it look more attractive to farmers.

The average farm size of the power tiller owners was 13.56 rai (2.17 hectare), individual fields being somewhat scatterred. Of this 10.32 rai (1.65 hectares) was planted to first crop rice and on 9.92 rai (1.59 hectares) a second rice crop was grown. No farmer grew a third crop. The average income of the group last year was ฿ 15, 270 ($763.5) but this includes four farmers earning more than ฿ 30,000. The maximum claimed income was ฿ 70,000 on a 50 rai farm. 21 of the power tillers were manufactured by Charoenchai Ltd., (Ayudhya) and were all sold through the local dealer Wachara at a price ranging from ฿ 8700 to ฿ 9800 ($435 - $490) including a Japanese 6½ to 8½ HP gasoline engine. The remaining seven power tillers were purchased directly from the Chieng Mai manufacturer Anusarn Co., at ฿ 16000 to ฿ 21000 ($800 - $1050) including 6½ to 8½ HP Japanese gasoline engine. All those farmers buying from Anusarn Co., were equipped with a mouldboard plow, harrow, rotary tiller, trailer, cage wheels and lug wheels. Those buying from Wachara (J. Charoenchai) had only a mouldboard plow and harrow. The gasoline engine was preferred to the diesel on account of its being less vulnerable to damage if the tractor overturned in the

On average, according to farmers' estimates, each tractor was used 113 hrs. per season on their own farms. 62% of the farmers also did contract work for others averaging 171 hrs. per season. 40% of them spent an average of 42 hrs. working on neighbours' farms free of charge. The average estimated usage per season of all tractors amounted to 233 hrs.

Without exception all farmers agreed the power tiller speeded up work and enabled them to grow two rice crops per year. In this regard it should be noted that a buffalo operates continuously only at about $\frac{1}{3}$ HP. Farmers were equally emphatic that the power tiller reduced the cost of labour. Normally two people were required to operate the machine, usually the farmer himself and

a brother or child, occasionally a hired worker.

All farmers agreed the power tiller made their work easier. With regard to design all farmers except two (who had no opinion) felt that the tractor was well designed. However, in response to a question as to whether they would buy another one of the same make only half said that they would. Eight farmers said they would not buy another Charoenchai machine because it could not be used with a rotary tiller. Instead they would buy one which could, citing the Japanese Kubota or an Anusarn machine. The rotary tiller attachment made the tractor much more versatile in that it could be used for dry land cropping instead of being limited to rice cultivation.

With regard to the quality of work all with the exception of two (one did not know) agreed that the power tiller enabled them to do a better job of cultivation than before. Farmers did not on the whole experience difficulty in getting spare parts and said (17) that the repair service was readily available.

The most consistent complaints with the Charoenchai machine were that the cage wheels could not be changed for rubber tyred wheels and that it had no rotary tillage attachment. Also it was often remarked that the handle bar broke easily. As regards the Anusarn machine two farmers complained about the absence of steering clutches.

A big problem for the farmer are kamoys (thieves) who, with soft words in the night, can easily persuade a buffalo to quietly wander off with them. Tractors are no so easily persuaded and so offer a smaller security risk. Also deliberate poisoning of animals for political or for simple reasonsof neighbour antagonism is not uncommon. A fully grown buffalo costs around ฿ 4000 ($200) which represents a considerable investment for the Thai farmer.

AXIAL FLOW THRESHER OWNERS

The most striking feature about this survey (11 respondents) was the relative affluence of the farmers owning axial flow threshers. The mean farm size was 112 rai (17.9 hectare) and the average income per farmer per year was ฿ 172,000 ($8600). This excludes the farmer owning 200 rai who claimed to have had a gross income last year of ฿ 1,490,000 ($74,500); if this figure is true he is obviously not making his money out of farming. Most farmers appear to have another business but it was not possible to distinguish farming income from non-farming income. All the farmers grew two crops per year averaging 107.3 rai (17.2 hectare) for the first crop and 121.8 rai (19.5 hectare) for the second crop, which indicates that some are utilizing other farmers' land for the second crop. Most of these farmers had two power tillers and associated cultivating equipment and usually owned one or two water pumps. All the farmers interviewed bought their axial flow threshers from Kasertthai Ltd. (Mr. Charroy). Farmers owning machines manufactured by J. Chydee Panich and Pradityont Shop were not interviewed because although both claim to copy with modification Mr. Charroy's machine the direct connection with the original IRRI specification is more tenuous.

By contrast with the power tillers all but one of the axial flow threshers was powered by a Japanese diesel engine (6 to 8 H.P.). The diesel engine was chosen on account of its cheaper running cost. The price of the machine excluding engine was ฿ 17000 ($850). None of the farmers had been using them more than a year and several (3) had had only one season's use out of them.

On average the farmers estimate they used tha machine 100 hrs. per season on their own farms. Three of them (27% of the sample) used them on average 210 hrs. on neighbours' farm free of charge and six of them (55% of the sample) spent on average 143 hrs. on contract work. The estimated overall average machine use was 235 hrs. per season.

All farmers agreed that the machine speeded up work and reduced labour cost. On average 7 (6.8) people were required to operate the machine. All agreed that the machine was easy to operate and that it did a better job than the method they used before. (In Thailand the traditional method of threshing is by treading the crop with buffaloes or by riding over it with a small tractor on a specially prepared threshing floor. Hand winnowing is carried out separately).

Half the farmers (6) had trouble with breakdowns. Those having breakdowns suffered an average of five per season, the usual fault being that the oscillating tray broke. Most farmers (8) said that the machine was easily repaired and that the repair service was both reasonable (8) and readily available (8). Spare parts were readily obtained.

Although most farmers (9) felt that the machine was well designed there were a number of persistent complaints. In order of magnitude they were:

The oscillating tray breaks (6)

The machine needs an extra sieve to separate broken grains from the chaff. As matters are, winnowing is necessary afterwards (5).

Rice tends to be lost by being blown out with the straw (4).

Some varieties of rice are not cleanly threshed. The racilla remains attached to the grain (3).

The machine is cumbersome and difficult to move (3).

The machine is heavy to operate (3).

Other minor complaints were that the machine does not work properly with wet paddy (2), that dry paddy is not threshed properly (1) and that sometimes straw gets entangled with the peg drum.

When asked if they would buy another axial flow thresher from Mr. Charroy only two said that they would. Seven declared they would not the principal

reason being that they preferred to have the locally designed and locally modified machine which was cheaper. Pradityont Shop offer a machine for ฿ 15000 ($750) and Chydee Panich offer one at ฿ 12000 ($600).

A.3. AGENCY OPINIONS

Agricultural Engineering Division of the Ministry of Agriculture, Bangkhaen.

Director: Mr. Samnao

Assistant Directors: Mr. Paiboon, Mr. Winij

Head of Workshop and Services: Mr. Chak Chakkaphand

This is the Department with which the IRRI project liaises closely, and is located in the same building. The Director and his staff showed considerable enthusiasm for the IRRI project, which they thought was going well, better in fact them a current IDRC project on rice drying and storage. The latter involved money only, not people.

The Division is and has been engaged in design and testing in the past but it is clear that the presence of the IRRI project has given a much needed impetus to this activity. They see their task not as one of coming up with new invention but of adapting existing designs for Thai use. In this IRRI are of great help.

Also they are aware of the need to assist local entrepreneurs in their design and adaptation. If the IRRI project closes down they see little prospect of being able to continue this activity.

Recently the 3rd Social and Economic Development Plan was initiated. This called for double cropping and increased yields. Also government wishes to encourage small scale industry in rural areas. Formerly the excuse for growing only one crop of rice was 'thai may tan', which means that ploughing was carried out too late. Tractors have now eliminated this. The problems now is 'Kiaw may tan' which literally means "harvest not in time". Thus reaping and threshing machines are required to speed up harvests. Latterly the problem of 'haeng may tan' has arisen, which refers to the problem of drying second crop rice. All this pointed to the urgent need for appropriate machine design of the IRRI type.

A number of Thais associated with the Division had been to IRRI for training, which they found very useful. They feel they should try out repeating the IRRI course in Thailand in Thai.

With regard to training, testing, design and research, they said they would like to see in addition other Institute such as the Asian Institute of Technology (AIT) who had more people available, taking part in the cooperative program.

Regional Network for Agricultural Machinery (RNAM)

Director: Mr. Majid Khan

This organization was originally proposed by UNIDO in 1972 as a UNDP project. In its original concept it was to have been a Centre for the design of agricultural machinery which would assist entrepreneurs in Asia with design and manufacturing advice. In this form it was commented that the organization would mostly benefit the host country and would in any case be duplicating some of the work of the IRRI Agric. Eng. Dept.

Consequently the function of the organization has been reviewed and it is now set up as a Regional Network in which individual nationally sponsored Farm Machinery Development Centres will be supported. This will take the form of helping to coordinate such centres thoughout the region to avoid unnecessary duplication, and to enlist the aid of such organizations as IRRI, the International Crops Research Institute for the semi-arid tropics (ICRISAT, Hyderabad) and the Asian Institute of Technology (A.I.T., Bangkok), indesign and consultation, and to provide information feedback to them on regional needs, It can thus be seen that the RNAM will rely to a considerable extent on the presence of the IRRI program at Los Baños.

In the first two years the RNAM project will be concerned mainly with government contact and encouraging them to set up National Farm Mechanization Committees. Some involvement in design will take place during this period; managerial advice capability will come after two years or more.

The Director therefore is very much in favour of the IRRI project in Thailand which he sees as beneficial locally and complementary to the RNAM project. It is very desirable from his point of view that the IRRI project in Thailand should continue into the second phase. It would seem also that much of the present effort of IRRI in Thailand could be assummed by the RNAM when the IRRI project has been phased out.

United Nations Industrial Development Organization (UNIDO)

Mr. Aselmann:

Mr. Aselmann was in favour of the IRRI project in Thailand which he thought should be continued. He remarked that practical application of this nature was not often found. From his experience workshops in Thailand are primitive and they need help. The IRRI project approach was both good and sound and one which, in principle, he strongly supported.