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THAI CROPPING SYSTEMS RESEARCH PROGRAMS

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1. Present status

As known, the Thai rice-based cropping systems programs have been conducted since 1976. Some progress has been made and much more remains to be achieved. The research in rainfed farmers' fields with farmers as partners runs into some satisfactions, and set-backs.

It takes time for research outcomes to be materialized in terms of widespread adoption by the farmers. Take Ubon site us an example; four years have passed and we are still struggling to know how to get the farmers to adopt the cropping patterns that we have tested efficiently and effectively. The extension element has been pulled together with the research team, but more has to be done, personal dedication, sacrifices and total participation have to be attained, and transcended. At this stage, plans have been laid out for the transfer of technology and responsibility. The time has come for the farmers to use the knowledge.

It is interesting to know about the Ubon farmers' reaction to questions and personal contacts given out by a team of sociologists of Kasetsart University in 1979. Conclusions of that survey report are presented in Appendix 1.

In the meantime, at Pimai site rainfall is still playing a major role in determining the outcome of the research results. Rainfall distribution and amount have been very variable from year to year during the last four or five years. This has put research data out of pace. The research must go on for another year or two for confirmation of useful recommendations for the farmers in the area.

Kampangphet is another research site that started in 1979; this is a place where farmers are poor, soils are low in fertility and hard for transplanting rice. Research attempts are aimed at stabilizing the yield of rainfed rice and to introduce additional upland crops

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before rice. Results of the last two years point out that inclusion of upland crop before rice in the area is difficult due to problems relating to establishment of the stand resulting from untimely rains and poor drainage. However, research is being conducted to explore possible ways of growing two rice crops or to establish early maturity upland crops before rice followed by increasing rice production of the second crop.

At Prae, a newly opened site in the Northern Thailand, the first year data is encouraging. We can successfully grow peanut, mungbean and sweet corn before rice under rainfed conditions receiving a good yield. The cooperation of the farmers is excellent in the tested area. Farmers by tradition share their labour at working in the fields. They are really anxious to work with the research team to the point that some farmers by their own initiative are ahead of us in planting mungbean before the main rice crop in 1981. The results of the 1980-81 crop year at Prae are presented in Table 5. The first two crops are rainfed, the third crop is supplemented by irrigation. The first crop started on May 7, 1980.

Rainfall data together with the cropping patterns of Ubon, Pimai, Kampangphet and Prae are presented in Figures 1-4. Agronomic yields of the crops grown are presented in Tables 1-5.

2. Attempts in 1981

2.1 Ubon site: These recommendations for 1981 are only for rice fields on the mid and lower slopes of gently rolling terrain. The fields must be located so they can be drained. The recommendations are not suited to "bottom land" which floods easily nor upper paddies which do not regularly grow a good rice crop.

Peanut-Rice

This sequence has been found to be the most stable cropping pattern tried and the one most accepted by farmers. Its main limitations are: (a) early planting is essential, and (b) good seeds are hard to get. The recommended practices are:

Land preparation must start in April and the first week of May is the last planting date that will allow the following crop of rice, to be planted on time if the recommended cultivar Tinan 9 is grown. If rains come later another crop should be considered.

A good seedbed, requiring at least two plowings and narrowings, is needed. Furrows should be made every 3 meters to carry off excess water. The furrows can be made by plowing one way then returning in the same furrow throwing soil the other way. Then harrow, pulling the soil toward the center of the bed. A basal application of 206 kg/ha of 15-15-15 should be worked in with the last plowing. This fertilizer rate is still under investigation. The Tinan 9 seed should be planted 2 seeds per hill in hills 20 by 30 cms. The seed rate should be increased to 3 seeds per hill if the germination is between 70 and 85 percent.

If very dry conditions occur following planting Azodrin should be sprayed 10 days after emergence. If there are many weeds starting to grow weeding should be done at 20 DAE. At 40 to 45 days, hill up to improve pegging. The soil should not be disturbed during or after pegging. Peanuts have the ability to produce a good crop even with many leaves missing so do not spray any additional insecticide unless a very serious infestation occurs.

The peanuts should be harvested as soon as the paper like skin on the seeds starts to turn brown, usually 110 to 115 days after germination.

Yard Long Bean - Rice

This cropping pattern requires a higher level of management. Since the product is a perishable vegetable care should be taken not to plant an area that will cause a surplus in the local market. Since YLB requires stakes to grow on, sufficient stakes should be acquired prior to planting.

Land preparation and fertilization is the same as for peanut. However, the last planting date is May 25 but earlier planting is preferred as more pickings can be obtained. The local YLB type should be planted 3 to 4 seeds/hill in hills 50 to 100 cm. Three days after emergence spray Dimethoate for bean fly. Two or three sprayings with Azodrin may be needed depending upon aphid population later in plant growth. Ten to fifteen DAE put up the stakes. An early weeding 10-15 DAE may be needed if there are many weeds.

Green Corn-Rice

Green corn has proven to be a high risk crop. Marketing is a big risk as the green corn market in a local district can easily be over supplied which quickly drives prices very low. In addition corn has been found to be more susceptible to flood or drought damage than the other crops. Those farmers who have grown a good crop out of the usual season have made very high returns. Theft can also be a problem with this crop.

Seed bed preparation and basal fertilizer is the same as peanut. The last date of planting is May 25 but any corn planted this late must be in a field with very good drainage. A local glutinous type is planted 2 seeds per hill at 25 x 75 cms. The crop is top dressed with Ammonium Sulphate 20 to 25 DAE and immediately hilled up. No major insect problems have been encountered.

Mungbean-Rice

To date acceptable yield levels of mungbean have not been obtained and the crop has consistantly shown a loss. These findings are similar to research results in other parts of N.E. Thailand. The cause of the uneven growth is still unknown. It is therefore suggested that only small observation plots be planted.

Land preparation and basal fertilizer are the same for peanut. The last planting date can be June 1. Mungbean should be row planted in rows 30 to 50 cms apart depending on soil texture. The lighter the soil the further apart. Plant 8 to 10 seeds per meter in the row. Three days after emergence spray Dimethoate for bean fly. Up to 3 sprayings with Azodrin may be needed depending on aphids. Weed at 20 DAE.

2.2 Pimai Site:

Recommendations for cropping systems at Pimai.

Cropping systems used at both districts have been designed into 4 patterns:

1. Peanut (Tainan 9) - Rice (KDML 105)
2. Glutinous corn - Rice (KDML 105)
3. Glutinous corn/mungbean - Rice (KDML 105)
4. Glutinous corn/peanut - Rice

Experiments

Selection of farmers interested in cropping systems research and development was performed in the Pimai and Nonsong districts comprising nine farmers from each village. Experiments on cropping systems research, on the planned cropping patterns will be carried out in 24 plots, totalling an area of 21.38 rai or 3.42 hectaresof land. The cropping season will be started by growing upland crops at the beginning of rains followed by the main rice crop.

Peanut

Experiments are divided into two categories:

1. Fertilizer experiment on peanut by using the 16-20-0 and 15-15-15 formula comparing to no fertilizer treatment. The rates of fertilizer are 125, 187 and 250 kg of the formula per hectare.

2. Hand weeding VS herbicide application experiment. The herbicide used is Alachlor.

Glutinous Corn

Fertilizer of 15-15-15 formula at the rate of 312.5 kg/ha will be used together with the application of Alachlor to control the weed.

Glutinous Corn/Mungbean

Planting methods will be divided into 2 patterns:

a) alternating a paired row of corn with two rows of mungbean.

b) two rows of corn alternating with 4 rows of mungbean.

Glutinous Corn/Peanut

Row treatments will be the same with the glutinous corn/mungbean pattern. Usual ways of plot management will be carried out by using the fertilizer rate of 312.5 kg/ha of the 15-15-15 formula together with the application of Alachlor.

Rice

Rice growing will be done by using spacing of 25 x 25 cm or follow the farmer practices namely broadcasting or transplanting or by using the station's method of 25 x 25 cm row spacing. It will be dictated by the condition at planting time and farmers' preference.

2.3 Kampangphet Site

Two rice crops will be tried in the farmers' fields, suitable combinations will be tested. The first set of experiments will involve varieties in the following manners:

RD7 - an early promising line

RD7 - RD15

RD7 - Ratoon

The second set will include variety trial of RD1, RD7, RD9, RD11, RD15 and a promising line.

2.4. Prae Site

From 1980 field test, the performance of 100-day rice promising line which planted as the first crop showed poor performance in upland condition. In contrary, white sesame from observation plots locked very good, giving appreciable yield (500 kg/ha). In crop year 1981-82, white sesame, therefore, will replace the 100-days rice promising line and the pattern will be white sesame-rice-soybean. Hopefully, the patterns that are conducted at Prae site are:

a) white sesame - rice - soybean

b) mungbean - rice - soybean

c) supersweet corn (DMR) - rice - peanut

Nitrogen application is tested for white sesame, the treatments are 0-0-0 and 31.25-0-0 kg/ha of N-P_2O_5 and K_2O respectively applied as basal. Also, fertilizer 0-0-0, 18.75-56.25-37.5 kg/ha of N, P_2O_5 and K_2O respectively applied as basal will be compared to Rhizobium inoculation for mungbean crop. The treatments for super sweet corn (DMR) are the same as crop year 1980-81 which are 37.5-37.5-37.5 and 37.5-56.2-37.5 kg/ha of N, P_2O_5 and K_2O respectively.

Unfortunately water shortage was a big problem for the third crop in crop year 1980-81. So, it is doubtful if the third crops for 1981-82 will produce reasonable yields.

Appendix I. Summary report of farmers' interviews by sociologists from Kasetsart University in relation to the cropping systems program in the villages at Ubon site.

Attitudes of farmers before planting

Farmers were asked why they decided to join in the research. Two main reasons were given. First, because of the previous research in the village the farmers had seen that they could obtain good yields. The second main reason was that the project would supply the fertilizers and chemicals needed during the growth of the crop and the farmers would have to repay only if they got good yields, thus the risk of growing the crop was greatly reduced. The farmers generally agreed that they made their mind up on whether to join in the research or not by themselves and were not influenced by the opinions of other farmers or leaders in the village. The farmers were also asked if they thought they could adopt the patterns suggested after the project finished. Most believed that they could for three reasons. Firstly, they had seen the crops grown before and thought they would be able to grow them on their own. Secondly, there appeared to be a market available for all of the crops grown, and a particularly good market and price for peanuts. They also felt that if the market was not adequate they would be able to consume the products that they grew within the village.

Survey results after growing first crop

Just before the farmers expected to harvest the crops another survey was taken to ascertain the attitudes and obtain an idea of the knowledge of the farmers about the cropping patterns that they were growing. A handout was given to each farmer explaining in detail how to grow the crops in the cropping pattern he had picked. One-third of the farmers did not read the handout. There was also a demonstration put on in one farmer's field to show how to grow the crops. Very few farmers went to the demonstration. However, a majority of the farmers went and discussed how to grow the crop with the man who had the demonstration in his field. Also, most of the farmers went to talk to the village assistant whenever they had a problem. It was found that the farmers went to the village assistants to discuss the cropping pattern an average of 2.5 times during the growing of the first crop in the pattern.

The farmers were also asked specific questions on the management of the crop they had selected. It was found that only one-third of the farmers knew the name of the cultivar they were growing. Only one-half knew the spacing suggested in the handout and demonstrated in the field. Also one-half knew the fertilizer formula that was being used

on the crop but two-thirds knew how much fertilizer to apply. In comparing the actual practice conducted by the farmers with the recommended practice it was found that two-thirds of the farmers ploughed as recommended while the rest were seven or more days late in land preparation. Twenty percent of the farmers planted immediately after ploughing as recommended while forty percent planted within four days and forty percent of the farmers planted four or more days later. One-half of the farmers used the correct spacing and correct fertilizer rates.

The farmers were then asked about the attitudes to the new technology. Two-thirds of the farmers felt that the new method of planting was more difficult than they were used to. Forty percent felt it took more labor and twenty percent thought it took more capital, indicating that the farmers did not realize the cost of the fertilizer and insecticides being used in the experiments. The farmers felt that the actual spacing they used was no great problem, but half the farmers did not know the correct spacing. Again they felt that the fertilizer application and use was no great problem. However, in weeding the farmers had considerable problems. Seventy percent of the farmers felt it was harder to weed the way suggested and on time. Timely weeding was a major problem. However, sixty of the farmers thought that timely weeding would likely give more yield and eighty percent thought that it would probably be more profitable.

Relationships

In analysing the relationships between the practices conducted by the farmers, the actual knowledge of the practices suggested and the attitudes to the practices suggested, some interesting relationships were found. The first relationship which would have a major influence on further research is the difference found between the village assistants. One village assistant made it a point to get the farmers involved in the fields at the correct time to insure that the recommendations were carried out. The second village assistant showed far less interest in the actual conduct of the experiments. As a result there was a considerable difference between the two sets of farmers in time of operation, based on which village assistant worked with them.

The second major difference related to the age of the farmers. The older farmers planned to join the project next year and the major reason for doing so was to get the materials and supplies to conduct the experiments from the project. The younger farmers joined the project to improve their production. Since most of the crops failed due to an untimely flood the younger farmers were discouraged and very few of them planned to join next year. It was also found that it was the younger farmers who stated that they knew how to grow the crops, but in actual practices it was found

that they did not follow the recommended practices as well as the older farmers. It appears that the older farmers are more aware of the risks and realize the importance of getting the cash inputs risk free while the younger farmers were interested in higher incomes quickly. Many of the younger farmers stated that rather than join the project in another year they would go off and try and find work in the city or find some form of employment that would give them cash. Thus the younger farmers have more alternative opportunities to go out and make money than the older farmers.

It was also found that there was a major change during the growth of the crops in the attitude about the crops, based on the expected area to be planted next year. The two crops that the farmers wanted to grow in another year were maize and peanut while rice and yard long bean were no longer wanted, particularly rice which no farmer wanted to grow in another year. It was also found that those farmers who wanted to grow a crop next year reduced the area that they wanted to plant considerably. This reduction is shown in the following figures, which show the area planned for next year stated in April followed by the area planned to be planted next year stated in July; corn 7.5-2.5 rai, yard long bean 2.5-0.5 rai, peanut 9-8.75 rai and rice 4.75-0 rai.

There was some difference in the farmers' interest between the different crops grown. Forty-four percent of the farmers knew the cultivar name for maize, 100 for rice, 0 for yard long bean and peanut. For the plant spacing 16 percent of the farmers knew the recommended spacing for yard long bean, 37 percent for rice, 55 percent for maize and 62 percent for peanut. For the fertilizer rate 25 percent knew the recommended rate for peanut, 33 percent for maize, 50 percent for rice and 66 percent for yard long bean.

Post Harvest Survey

After harvest the farmers were asked about their attitudes to the new technology, that is, growing a crop before rice. Generally the farmers felt that growing the crops in rainfed conditions was good. It allowed them to plant a large area where previously they had been planting a very small area to vegetables and carrying water. They also felt that the wider spacing made weeding easier. It should be noted that this was in conflict with the attitude while the crop was growing in that it took more weeding than they were used to. They felt that the maize and peanut gave no particular problem. Yard long bean took considerable effort in putting up the stakes to keep the beans off the ground. A high wind could blow the stakes down, and in one case a woman decided it was not worth the effort to put the stakes back up with the yard long beans growing on them and just gave up on the crop. They liked the idea of dibbling rice and some felt that they might try it in the future on the main rice crop as it reduces the labor requirement considerably.

However, they felt that dibbling rice resulted in more weeds. Growing two crops of rice was very hard and had very little future for them, particularly since it delayed the planting of the second crop which could then be lost to floods, as the second crop of rice was not tall enough when the floods came. The farmers felt that certain areas in the village were not suitable for two crops particularly those low areas which flooded. They felt that peanut-rice pattern had the most potential but would be more suitable if a slightly shorter growing period-peanut cultivar could be supplied.

Generally the farmers approved of the payback system where if they got a crop they had to repay in kind for the cost of the fertilizer, chemicals and use of the sprayer. However, they felt that the farmers should have a free choice to grow any crop they wanted and not limited to only 10 farmers per crop. This was particularly mentioned by those farmers who grew rice and yard long bean.

Recommendations

I. More emphasis is needed on the following:

A. Clearly define why the work is being done in the village for the staff and the village assistant. (More time should be spent in ensuring that all of the staff involved are clear on the objectives of working in the village and in the approach and methodology to be used while there).

B. How to contact, inform, discuss, plan, conduct and evaluate the research with the farmers. (It is important that the research staff integrate the farmer into the research and get his opinion and understanding of what it is the farmer wants and get feed back from him on how he evaluates the research. At the present time the farmer has limited interaction with the researchers on most of the research conducted on his fields.)

C. Supervision, particularly in relation to what the village assistant should be doing, when he should be doing it and how he should do it. (The village assistant in many cases did not have a clear understanding of his role or in some cases, the technical aspects of their work which meant that the interaction between the village assistant and the farmer was not productive; thus research suffered.)

D. Getting the biological scientist to interact with the farmer. (The biological scientist should spend more time talking with the farmers. Often they look at the plants and do not spend

time with the farmers thus missing the farmers' comments and evaluation. Thus the farmer is not really a partner in the research.)

E. More thought should be given to the characteristics of the participating farmers. (A decision must be made on what are the most important social characteristics of the farmers. Deal only with the active farmers who are likely to be interested in the work or should we include some who have less interest and thus give the cropping pattern a more severe test.)

F. More emphasis should be given to interdisciplinary work in the planning phases. (If there was more interaction and involvement in initial phase of the research amongst the disciplines much of the overlap and gaps in the research could be corrected).

Table 1. Yield of the first and second crops of rice based cropping systems at Ubon site during 1977-1979.

Pattern			Yield (kg/ha)	
First Crop		Second Crop	First Crop	Second Crop
(1) Yard long bean	-	Rice	4031	1769
(2) Glutinous corn	-	Rice	25938[1/]	2581
(3) Peanut	-	Rice	1050[2/]	2175
(4) Mungbean	-	Rice	269	1988
(5) Rice (non-sensitive variety)	-	Rice (sensitive variety)	1838	2638
(6) Rice (non-sensitive variety)	-	Ratoon	1044	681

[1/] Marketable ears

[2/] Dried pods weight

Fertilizer rate of 206 (15-15-15) kg/ha for all crops.

Fertilizer rate of 88 (21-0-0) kg/ha topdress rice and glutionous corn

Table 2. Yield of the first and second crops of rice-based cropping systems at Pimai site in 1980.

Pattern			Yield (kg/ha)	
	First Crop	Second Crop	First Crop	Second Crop
(1)	Glutinous corn	- Rice	26013[1/]	1413
(2)	Glutinous corn/ mungbean	- Rice	28750[1/]/244	1906
(3)	Peanut	- Rice	2450	1913
(4)	Sesame	- Rice	388	1731

[1/] Marketable ears

Table 3. The yields (kg/ha) of RD7 and RD9 as grown by transplanting and direct seeding methods at Kampangphet, 1980 wet season.

Variety	Transplanting	Direct seeding	Average
RD7	3.932	4.266	4.099
RD9	4.826	3.589	4.207
Average	4.379	3.927	4.153

Table 4. The yield (kg/ha) of RD7 and local variety with fertilizer and without fertilizer. Kampangphet, 1980 wet season.

Variety	No fertilizer	Fertilizer	Average
RD7	3.015	3.932	3.474
Local	2.435	3.452	2.943
Average	2.725	3.692	3.208

Table 5. Yields (kg/ha) of the first and second crops of rice-based cropping systems at Phrae site in CY 1980-81.

Patterns	Yields (Kg/ha)					
	First Crop		Second Crop		Third Crop	
	Village 1	Village 2	Village 1	Village 2	Village 1	Village 2
1. Super sweet-rice-peanut corn (DMR) (Glutinous)	42,225[1/] 45,969	48,194 45,000	3421	4041	data not available yet	
2. Mungbean-Rice-Soybean (Glutinous)	1000/913[2/] 881/869	563/531 725/513	3533	3837	831	662
3. Mungbean-Rice-Supper sweet (Glutinous) Corn (DMR)	867/1102[3/] 781/885	769/813 631/588	3841	3694	no yield of corn due to insufficient water at ear-forming stage	
4. Rice (100-days)-Rice (Glutinous)	can not harvest	-	3623	-		

1/ Marketable ears; fertilizer 37.5-37.3-37.5 and 37.5-56.2-37.5 kg/ha of N, P_2O_5 and K_2O for the first and second rows, respectively.

2/ The upper pair with drilling planting method, with fertilizer rate 18.75-56.2-37.5 kg/ha of N, P_2O_5 and K_2O respectively. The lower pair with dibbling planting method, same fertilizer rate.

3/ Same as 2/

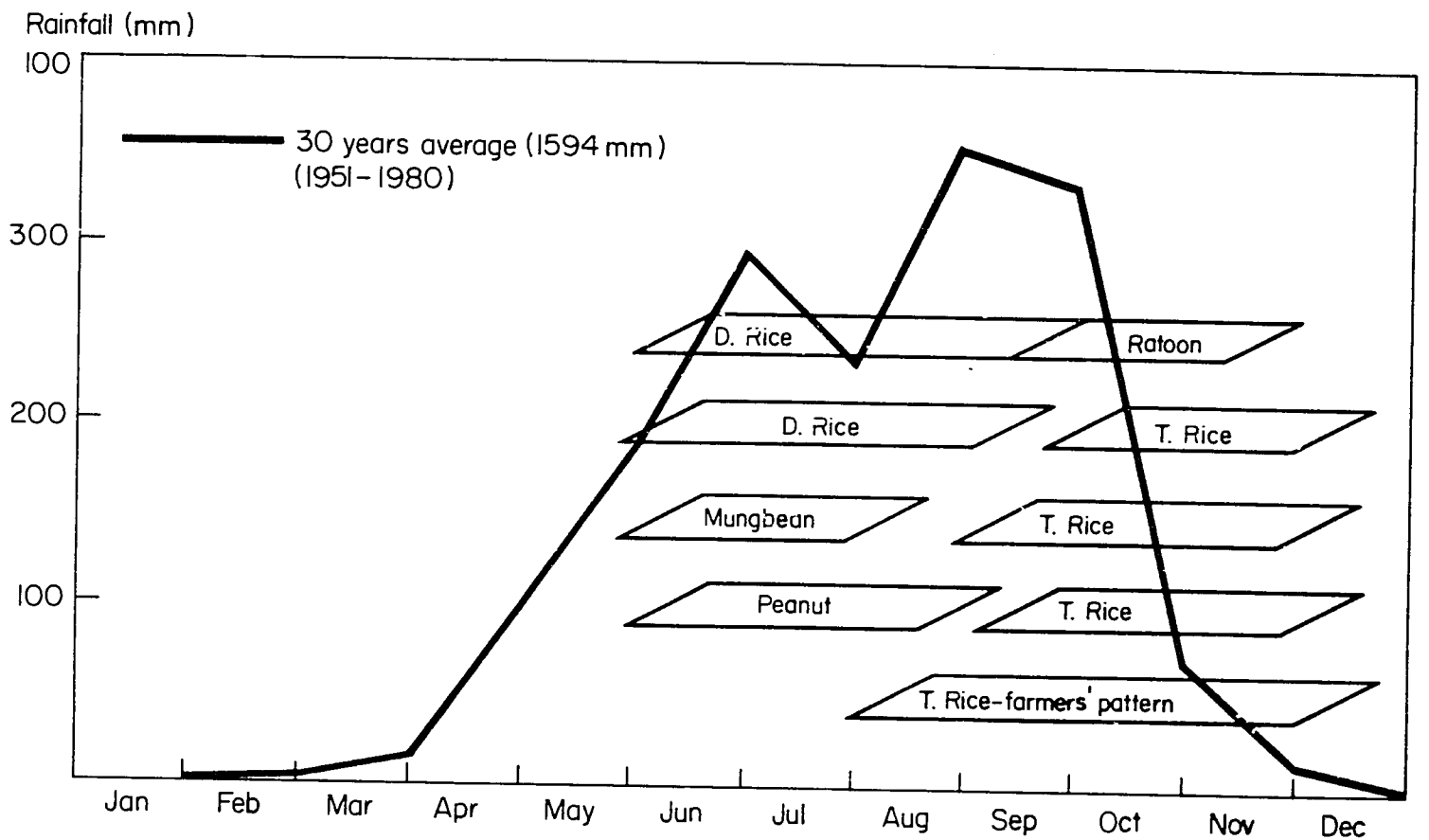

Fig. 1. Rainfed cropping pattern trials in farmers' fields at Ubon site.

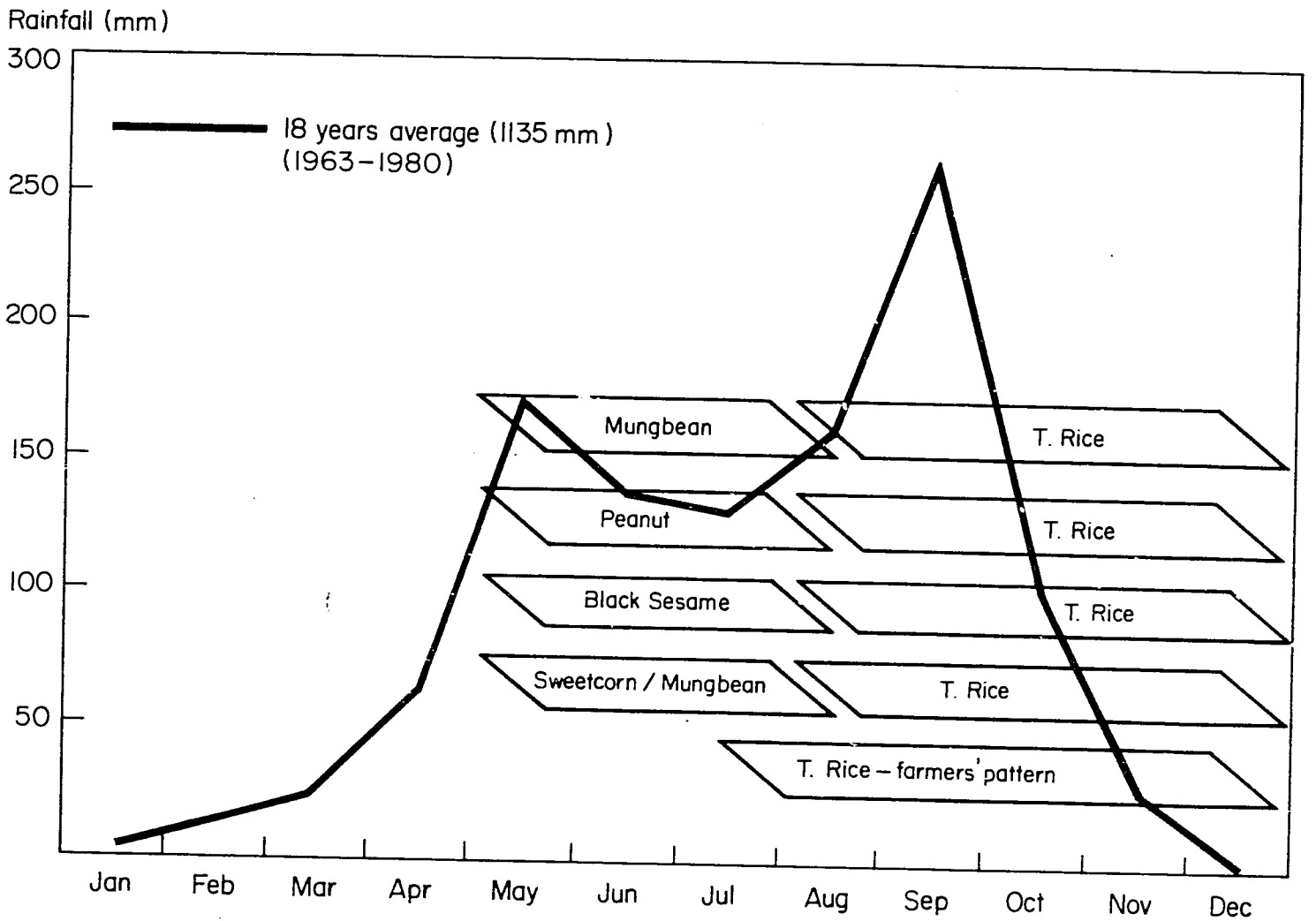

Fig. 2. Cropping patterns and monthly rainfall (mm) at Pimai site.

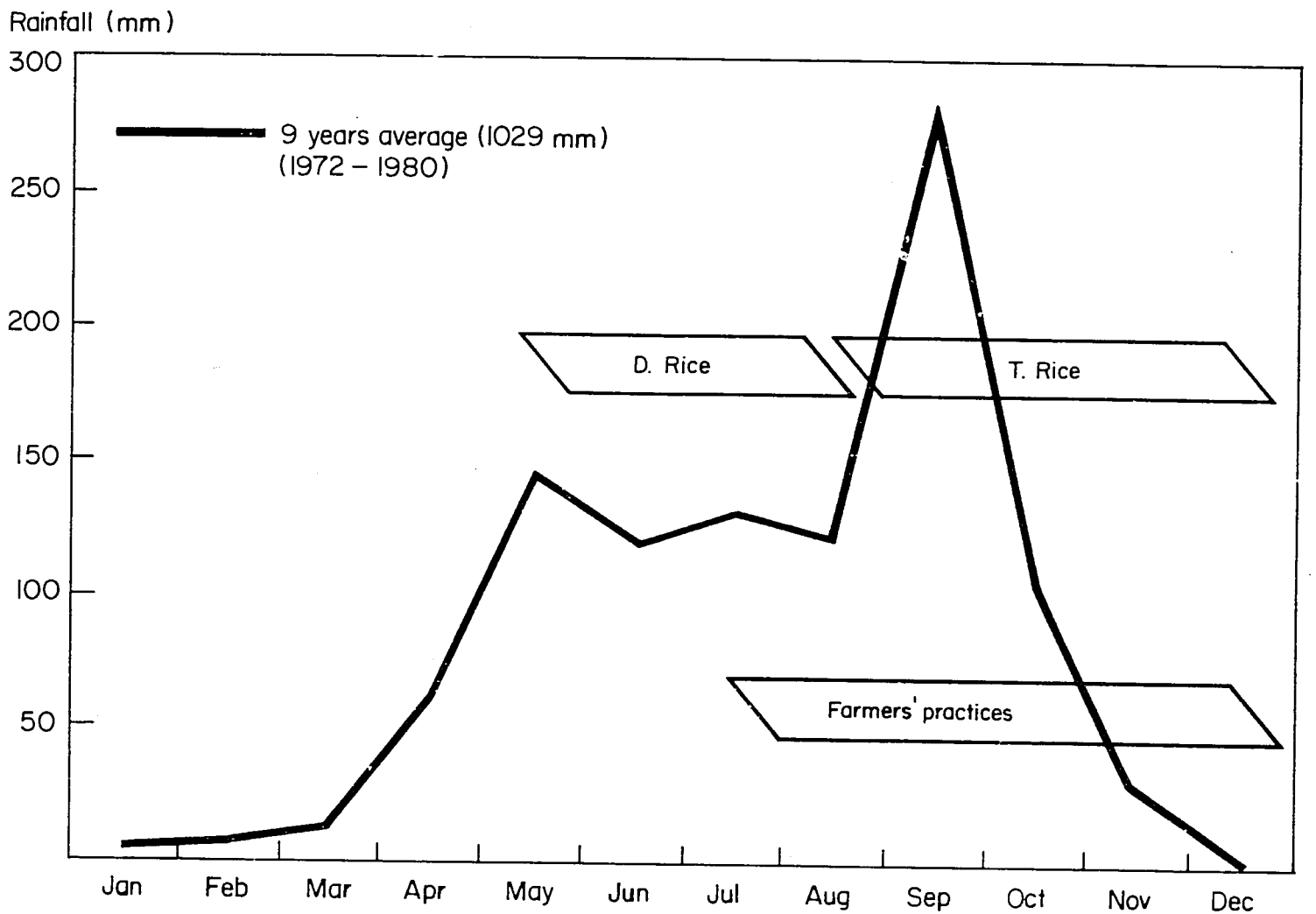

Fig. 3. Cropping patterns and monthly rainfall (mm) at Kampangpet site.

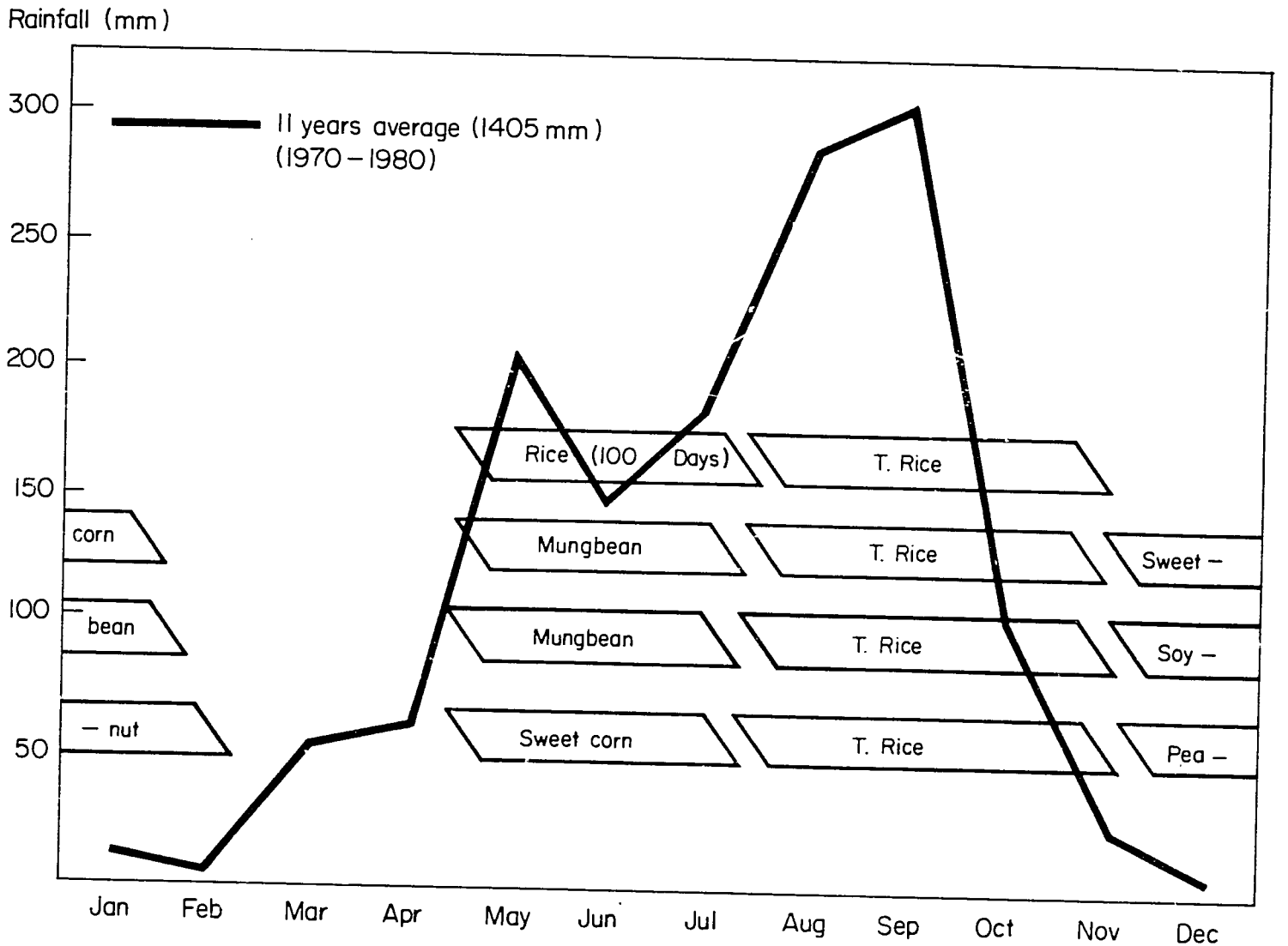

Fig. 4. Cropping patterns and monthly rainfall (mm) at Phrae site.

COLLABORATIVE RESEARCH IN AGRICULTURAL ECONOMICS

Collaborative work in the economics area was mainly concerned with methodology development, related to site level research.

National programs have problems of limited manpower and computational facilities, and need a methodology which matches research objectives with research resources. In the past few years agricultural economics work at sites have moved in the direction of using less data and manpower intensive techniques. The meeting of the economics group in May, 1979 in Nepal was very useful as it allowed these issues to be brought out and discussed. Substantial changes in the economics methodology in the network has taken place over the last two-three years.

In 1980, collaborative activities were aimed at meeting requirements for better trained economics staff in national programs.

Many national programs now have incountry training programs (e.g. Indonesia, Bangladesh, Sri Lanka). The economics group met after the Cropping Systems Symposium in March, 1980 at IRRI and planned a handbook on basic tools needed for site level economics research. A further meeting in November, 1980 at IRRI produced a draft of this. This is now being tested in training programs and will be revised and published in the near future.

Greater attention is now paid within the Network to the pilot production program stage of cropping systems research. Economists have an important contribution to make at this stage. In the study tour of Nepal and Sri Lanka in Feb., 1981, a useful exchange of views took place. We hope to follow this up with more collaboration in the methodology for studying economic dimensions of pre-production evaluation of technologies. This will involve research into community, institutional (and market) level factors influencing technology adoption.

Another area in which collaboration may be fruitful is in developing data processing capacity through use of micro-computers and programmable calculators. Significant progress in this area is being made in Indonesia and this experience may be of use to other national programs.

Given the diversity in conditions prevailing in different national programs, no single recipe will meet all requirements in any discipline. However, the development of closer collaboration in economics area has shown benefits which should encourage greater collaborative work in other disciplines.

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