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STUDY ON RICE YIELDS AND FARMER'S CULTIVATION
TECHNOLOGIES IN LAM NAM OCN IRRIGATED AREA
SAKON NAKHON

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BY

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FOREWORD

The Louis Berger International, Inc. advisory team at Lam Nam Oon produces various kinds of informational and analytical data. These comprise Reports, Technical Notes, Project Notes, and advisory memoranda.

We collaborate very closely with Royal Thai Government personnel working at Lam Nam Oon. Some are producing observations and studies which deserve wider distribution than only among the technical staff assigned at Lam Nam Oon.

One Royal Thai Government employee at Lam Nam Oon is the author of this Project Note. He is Khun Natavudh Bhasayavan who is assigned to the project by the Department of Agriculture, Ministry of Agriculture and Co-operatives. The contents of his Project Note is drawn from the details of a carefully organised and conducted Department of Agriculture Rice Yields Study - done at Lam Nam Oon during the Wet Season 1981.

The study and the contents of the Project Note have been written in the Thai language. We think the contents are of sufficient interest that it should be reproduced and circulated widely also in the English language.

A similar Project Note (Number 3) was written by Khun Sansonthi Boonyothayan, another Royal Thai Government employee at Lam Nam Oon in August, 1981. It is a companion piece to this Report since it deals with Dry Season production at Lam Nam Oon during the time period: 1980-81. The subject was "Study and Individual Case Report on Production of Peanuts (Groundnut) Dry Season of 1980-81". A Third Project Note on the same subject will be produced in August, 1983 reporting on the results of a similar study done in the wet season of 1982.

The Center for Rural Development, which is a Division of the Louis Berger Group of companies, issues Project Notes of this kind from time to time.

Currently, in 1982, the Center supports nine major rural development projects world-wide. These are funded by the World Bank, the U.S. Agency for International Development, the Asia Development Bank, some individual governments, and a number of other international agencies in Asia, Africa, the Middle East, and Latin America.

As a part of its services to clients and the professional community of those engaged in rural development, the Center releases technical and project information on various aspects of individual projects.

For those interested in Project Note Number 6, additional copies may be obtained from the Center for Rural Development, c/o Louis Berger International, Inc. 100 Halsted Street, East Orange, New Jersey, 07019, U.S.A.

I. Introduction:

The Lam Nam Oon area is located in Changwat Sakon Nakhon, Northeastern Thailand. The area is the site of a 185,000 Rai (32,000 Hectare) irrigation project now under development as an integrated irrigated Land Consolidation and cost recovery project by the Royal Thai Government.

As should be noted, the project area includes portions of three Amphurs (Districts). These are Phang Khone, Phannanikom, and Muang. Contained within those areas are thirteen sub-districts (Tambols).

The Royal Irrigation Department is a leading Agency in this Project. It is being assisted in this development by three Ministries and eleven Department or agencies located among those Ministries.

The Department of Agriculture (DOA) of the Ministry of Agriculture and Cooperatives has been working at the Lam Nam Oon Integrated Rural Development Project since B.E. 2522 (1979).

It is field testing earlier research findings appropriate to irrigated agriculture among the soil, water supply, and farmer state-of-technical-knowledge conditions at Lam Nam Oon (LNO). The work is done in both the Dry and Wet Seasons.

This particular study concerns DOA investigations of Wet Season Rice Yields at LNO in the year of 1981, (May-November 1981). In contrast to a similar subject study done in the Wet Season of 1980 by DOA this one was structured so that it investigated social, soil, rice variety, and farm practice factors. The methodology is described, elsewhere, below.

The 1980 Wet Season Rice Yields test results are reported in the April, 1981 Monthly Report of the Louis Berger International, Inc. advisory team. That report comprised an analysis of the 1980 results by Mr. William Bell of the Berger Advisory team. In the context of the 1981 study reported here there is one observation by Mr. Bell about the results of the 1980 study which is of interest:

"....The local varieties have yields (kg./rai) of 174 to 425 depending on irrigation regime, while the HYV's are higher but very near the same yields throughout. What this seems to imply is the need to use HYV's to achieve higher yield and not worry too much about the irrigation.... Thus it may be that greater emphasis on improved varieties, cultural practices, etc. for the wet season crop will have as great an impact on yields as supplementary irrigation...."

Since Lam Nam Oon is the only irrigation area in Northeastern Thailand that is to be entirely the subject of the 1974 Land Consolidation Act, with an accompanying cost recovery program, there is urgent need to increase yields, cropping periodicity, and farmer income. Hence, the Department of Agriculture, among the other participating agencies is constantly engaged at Lam Nam Oon in promoting such development and in observing production trends as well as farmer behavior.

II. Objective:

This particular study, as well as those held previously and several to be done by the Department of Agriculture during 1982, 1983, and 1984 are all aimed at two Objectives:

1. To sharply and clearly identify Rice Yields at Lam Nam Oon with reference to areas where Land Consolidation and the accompanying installation of on-farm water delivery systems has been completed. Such work is to be in the nature of establishing annual Bench Marks for comparative purposes.

In this connection, areas are also studied where Land Consolidation and accompanying on-farm water delivery systems are not developed or applied.

A number of variables are to be examined, in each case.

2. To identify rice cultivation technologies adopted by farmers within the project area and to examine constraints to expanded production - with a view to determining what kinds of applied research and special training might assist in breaking or reducing those constraints.

III. Methodology:

This particular study was divided into two parts: yield sampling and survey of rice production technologies used by farmer's in the area. The same farmer's selected, on a random basis, for yield samples were also interviewed utilizing a prepared questionnaire (pre-tested) aimed at eliciting information about agricultural practices and technologies that had been adopted.

1. Variables

Two factors were considered to be critical variables for study namely: the Soil Series where the farmers were located and the rice varieties used.

The entire project area has three principal Soil Series. These cover about 85.6% of the cultivated area. They are the Roi-Et (43.8%), Korat (25.7%) and the Chiang-mai and Pimai combined (16.4%).

Two main types of rice were classified for Yields tests on each of the three Soil Series. These were "Recommended" and "Local" varieties of rice. The "Recommended" varieties of rice were RD 6, KDM 105, and RD 7. These, varieties of rice have been introduced into the Lam Nam Oon area by the Sakon Nakhon Rice Experiment Station for several years. RD 6, is a glutinous rice variety which the same Experimental Station is now promoting in the area as a replacement to Niew Sanpatong.

Six main varieties of "Local" rice were tested for yields on the three different Soils Series. These included: Hawm Nang Nuan, Mae Harng, Khi Tom Khao, Khi Tom Lai, Khi Tom Yai, and Niew Sanpatong. The latter was included as a "Local" variety because it is being replaced by the Rice Experiment Station with RD-6. All "Local" varieties tested were of the glutinous rice type.

Both the Soil Series and the rice varieties were also classified in another dimension by distribution of tests with reference to Amphurs (Districts), Tambol (sub-districts) and Muban (Village).

The resultant distribution of selected farmer's Households is shown in Table i.

2. Yield Sampling:

2.1 The Samples were randomised by "stratified sampling" in order to select farmer's holdings by Muban, Tambol, and Amphur with reference to the three Soil Series - by use of the detailed ECI-prepared Soil Suitability maps for the Lam Nam Oon area.

2.2 Once a holding was selected, crop-cutting for Yield Tests was done as follows:

2.2.1 Random samples of an area of 2 X 4 square meters was taken from each variety planted by use of a random table. The number of samples taken was proportional to the area of each variety planted as follows:

<u>Area of Rai</u>	<u>Number of Samples</u>
less than 2	2
2 - 5	4
6 - 10	6
11 - 15	8

2.2.2 Crop cutting of each sample area was then done with the resultant production threshed, winnowed, and weighed at site. Moisture testing of each sample was done by use of a portable moisture tester on the same day.

2.2.3 The Yield per Rai was then calculated at a standard moisture content (14%) by formula:

$$W = \frac{100 - m}{100 - 14} \times w$$

where W = Weight of sample at 14% moisture

m = moisture content at weighing

w = sample weight

3. Survey of technology use:

At those selected holdings where crop-cuttings were made the farmers concerned were interviewed by questionnaire. The questionnaire, which had been pre-tested, was designed to obtain information about farming practices and applied technologies in the area during the 1981 Wet Season. The questionnaires were then analysed, tabulated, and percentages on responses calculated.

IV. Principal Findings:

1. Size and Ownership:

Virtually all Lam Nam Oon farmers own and operate their farms.

Ownership is at the third step in the four-tier Thai system of land ownership. That is, each LNO farmer holds a Naw Saw 3 type of ownership. At this step, the boundary lines of each farm have been jointly recognised by surrounding farmers and a rough sketch outline of the boundaries has been filed with the authorities.

Government has issued a paper recognizing the owner as the possessor of the land described.

Under Thai law, Naw Saw 3's cannot be used as collateral when borrowing money from the banking system. They are useful in helping to guide decision-making about subdividing land among family members or in defining the boundaries and rights when transferring land by sales.

At Lam Nam Oon, the entire irrigated area will ultimately be placed under the Land Consolidation Act. That Act, adopted in 1974, if applied by Royal Decree to an area, results in a listing of all holders, a survey of their holdings, and a statement of the exact amounts and locations of their holdings. Each farmer affected receives a title deed to his holdings. This is the highest and most negotiable legal instrument applicable to Thai lands.

Presently, the necessary surveying preparatory to issuance of such title deeds has been completed at Lam Nam Oon. This is a part, also, of the process of readying various areas of Lam Nam Oon for installation of on-farm water delivery systems.

The Department of Agriculture 1981 Wet Season study shows that 95% of the farmer's own their land (Naw Saw 3). The average size of holdings was found to be 22.2 rai or about 3 hectare.

2. Types of Rice Planted and Origin of Seed Stocks;

2.1 Photo-sensitive or Non-Photo-sensitive:

Traditionally, farmers in the Lam Nam Oon area plant photo-sensitive glutinous rice varieties which are local in origin and use. They have very tall growth characteristics, adapted to deeper water than normal.

- The DOA study of 1981 learned that this is still the practice. Approximately 95% of the farmer's sampled had planted their fields with photo-sensitive glutinous rice varieties. (Table 1)
- There appears to be one significant change. This concerns farmer adoption of government-recommended varieties of glutinous rice. Almost 60% of the farmer's sampled by DOA now grow government-recommended varieties. These include higher-yielding irradiated varieties such as RD 6, Kho Dawk Mili 105, etc.
- Among those sampled, it appears that adoption rates vary from one Amphur (District) to another. Phannanikom has a 66% adoption rate in the use of government-recommended varieties of glutinous rice. Amphur Phang Khon has the lowest, at 46%. (Table 1).

2.2 Origin of Seeds:

Traditionally, farmers' in the Northeast select their rice seeds for use in the coming year - from the best plants producing in the current year. This seed stock is both stored and exchanged with other farmers. Among those sampled, this still continues to be the practice at Lam Nam Oon. However, it also appears that government-recommended varieties are adopted and the availability of new varieties is expanded through seed multiplication programs. Farmer practices about repetitively using the same old rice seed stock are changing.

Presently, of those sampled, about 4% of the farmer's assert that they are acquiring new rice seed stock from the Department of Agriculture Rice Experiment Station. (Table 5) The survey did not investigate what other sources the farmers' in the area might be relying upon for new seed stocks (i.e. Department of Agriculture Extension, commercial dealers, etc.)

3. Soils of Lam Nam Oon and Rice Yields:

3.1 Types and Extent of Soils at Lam Nam Oon

A reconnaissance soil survey was conducted throughout the project area in 1962. A very detailed soil suitability, and Soil Series report was completed in 1973, (Land Classification Report, Volumes 1 and 2, Engineering Consultants, Inc.).

These studies indicate that the predominant Soil Series on the project is the Roi-Et series (an Ultisol), low humic gley, occupying 43.8% of the area. The second largest is the Korat series (an Ultisol), grey podsollic, occupying 25.7% of the area. The third largest is a combination of Chiangmai and Phimai series (Entisol), (veryisol) of an alluvial or hydromorphic alluvial nature, occupying 16.4% of the area.

The low pH values in these soils are indicative of acid. Their low Cation Exchange Capacity (CEC) values and the small amount of clay, seldom exceeding 15% in the principal soil series (Roi-Et and Korat) are indicative of soils of low fertility combined with low organic matter content, usually below 1.0%. In general, these soils are highly leached. They are derived from coarse sedimentary material and there is very little base activity in them.

Do these kinds of soils perform differently, in terms of effects upon Yields, when cultivating various varieties of Wet Season rice?

3.2 Yields on Different Lam Nam Oon soils:

Answers to the above question were sought in the survey that is the subject of this report.

The range of samples taken was somewhat skewed towards the Roi-Et series. That is, 57% of the samples were on that series of soil when - in actual fact - the total area occupied by that series is 43.8%. Furthermore, the samples in the Chiangmai/Phimai series were not distinguished as between those areas which are subject to considerable flooding and those that are not. This is a local phenomenon at Lam Nam Oon with reference to these particular soils and certainly should affect the location of sampling. Thus, it seems evident that this series was under-sampled in the survey.

- Nonetheless, the results show some highly significant differences in varietal performance (Yields) as between local varieties located on Roi-Et and Korat soils and government-recommended varieties located on those same soils. (See Tables 2,3,4) The Chiangmai/Phimai soils also show an improved production effect upon the yields.
- It seems probable, from these tests, that the soils do have a highly significant effect upon rice yields. However, further testing is required before sufficient conclusive evidence is assembled to transform this probability into a documented fact.

3.3 Yield on land-level soils:

One of the factors disputed at Lam Nam Oon concerns the long-term effects upon production caused by the removal of topsoil from the land levelled, block irrigation, areas of Lam Nam Oon. These now comprise 5,084 rai at Lam Nam Oon and may ultimately be expanded to 8,514 rai or about 4% of the entire 185,000 irrigated area.

The survey did not distinguish, in its sampling, between the yields achieved in such areas and those which have not been land levelled. Hence, with reference to Wet Season rice production - there are as yet, no organised observations on the differences in field that may result from removal of topsoil during the land levelling process.

4. Yields with Reference to Water Supply:

There are at Lam Nam Oon four different kinds of water supply conditions during the Wet Season. When Land Consolidation is completed by 1985 there will be only three kinds of water supply and distribution. One of these is supply and distribution by rainfall. It applies to all conditions and in the usual rainfall patterns at Lam Nam Oon can range annually between 1,400 mm. and 1,900 mm. In detail, the conditions are as follows:

4.1 Fields outside the project area - rainfed only. Table 1 shows that 21% of the samples were taken outside the irrigated area. However, the yields tables do not show whether any conclusions could have been drawn between the results of those samples and those taken under irrigated conditions.

4.2 Traditional ditch/dyke Wet Season systems linked to irrigation lateral canals.

As the Lam Nam Oon cement-lined lateral canals have been constructed a number of them have been linked to the earthen water conveyance ditches dug by farmers to channel rainfall flows toward and through the fields. According to Table 1, about 27% of the samples taken were in fields that could be served by the laterals and through the traditional ditch/dykes. Again, however, the yields tables do not show whether this added capacity to benefit from regular supplies of irrigated water affected rice yields in traditional ditch/dyke fields served by the irrigation system.

4.3 Ditch/Dykes installed, serving each farm, and linked to the irrigation lateral canals.

Approximately 1,700 kms. of these kinds of ditch/dykes will be installed at Lam Nam Oon during the next five years. They will serve about 175,000 rai. During the period when the 1981 Wet Season rice yield survey was done only 1,500 rai were served by newly installed systems of this kind.

As yet, it appears, no yield tests have been done at Lam Nam Oon showing what happens to rice of varying varieties located on different soils under such systems.

4.4 Land Levelled, block irrigation systems linked to lateral irrigation canals.

Mention has already been made above, in 3.2, about this system. As indicated there, there are no separated or distinct samples in the Tables showing the results of Wet Season rice production in those areas.

5. Yields with Reference to Varieties Used

The tests, in general, show that the "Recommended" varieties have highly significant increases in yields over "local" varieties in the case of the area of Amphoe Muang in the project area (see Table 5); but the evidence concerning such differences, if any, in the areas of the other two Amphoes is less conclusive.

It appears that additional testing will be required in order to develop more conclusive evidence on this subject. One important variable (not observed in this study) and admittedly difficult to observe is the quality/viability of the rice seed stock used by the farmers in the Lam Nam Oon area. It is conceivable that this variable may have a greater effect upon rice yields than any other single factor.

6. Farm practices:

These can be defined in different ways. In the case of this survey the effort was aimed at looking at farmer practices without distinction as between rainfed cultivation only and irrigated cultivation only. However, in future, if such surveys are to have increased relevance as indicators about what is happening in irrigated areas - the samples drawn as well as the content of the practices will have to be sharply focused on such different areas. The following practices were noted among those sampled:

6.1 Traction power:

All but two farmers of those sampled used water buffaloes as their sources of traction power during land preparation, cultivation, etc. This result conforms with earlier observations done in the area - which note continued reliance upon water buffaloes as the principal means of traction power.

6.2 Labor:

Most of the rice cultivation operations surveyed in the samples were done by families. Transplanting required some hired labor among 2% of the samples and harvesting/threshing demanded much more, 22% (Table 5). With the exception of one farmer sampled all employed hired labor from villages only. The one reported using "outside labor" but the Tables do not explain the meaning of that term.

6.3 Salinity:

This was reported as a "severe" problem (Table 1) by 8% of those sampled and a "light or localised" problem by 44%. Thus, it can be said that slightly over 50% of those sampled were experiencing some degree of difficulty with saline conditions. Nothing was asked in the survey concerning the effects of the salinity condition on rice production nor about what practices (adoption of salt-tolerant varieties, improved drainage, etc.) that individual farmers might be using to deal with the problem.

6.4 Fertiliser Usages:

Of those sampled, 62% claim that they use fertiliser. However, nothing is reported in the survey about amounts used per rai so that a meaningful data set is absent.

The samples do suggest that manuring is the most widely used fertilising practice, 52.4% (Table 5) followed by use of chemical fertilisers, 41.0%. Composting was reported as used by only four farmers or 6.6% of the sample.

Most of the fertiliser usage, of any kind, appears to be concentrated into the period when seedlings are under development, prior to transplanting. (Table 5)

6.5 Weed control, diseases, and insects:

Almost 75% of those sampled report that diseases or insects cause problems for them in rice cultivation. (Table 5). Of these, 21% regard the problems as serious while 52% report that they have a "few problems" either with diseases, insects or both.

Only a few, 3%, report that they do anything serious about applying control measures.

By contrast, a much larger percentage (17.3%) report that they doing something serious about another problem: that of weed control (Table 5). In that case, more than 80% of those sampled regard weed infestation as a serious or moderate problem. Of that number many more regard weed infestation as serious, 43.9%, than those expressing a similar perspective on diseases and insects (21.4%).

6.6 Production and Consumption:

The results drawn from the survey on these two subjects are not clearly definable. (Table 5, section 9.1) This is caused, probably by lack of precise definition in the survey about what is wanted. For example, production is broken down into "sufficient" and "insufficient". What do those terms mean? Do they mean only sufficient to provide the farmer with enough food to feed his family annually, etc?

Similarly, the figures on consumption with reference to amounts stored, sold, etc. are confusing so that no useful conclusions can be drawn from this data.

V. Conclusions:

Evidence gathered in the 1981 Wet Season Rice Yield Survey tends to confirm what was discovered in the 1980 Wet Season Rice Yield Survey - namely that improved varieties are being adopted and they do produce more yields.

In the opinion of this writer it is now time to focus the survey work more intensively upon cultural practices and learning the age and derivation of the improved seed varieties used, their locations on what soils under what drainage conditions, and their locations with reference to rainfed, traditional ditch/dyke, new ditch/dyke, and land level, block, irrigation systems. More time and attention should be spent upon obtaining essential answers to the following questions:

- What recommended varieties are being adopted by the farmer's?
- What yields do they get off new varieties where seed stocks are 1 year old, 2 years old, etc.?
- Where do they get their new variety seed stocks?

- Does location of recommended varieties of varying age of seed stock, on the three main soils series show any notable variances in Yields?
- With reference to the above set of variables, does location of the recommended varieties on varying ages of seed stock on the three main soil series and on the four different kinds of water supply conditions at Lam Nam Oon - make any difference in Yields?
- What crop production problems (in Rice) are most persistent at the farm level at Lam Nam Oon, what special training do the farmer's need to solve these problems, what additional inputs of credit, fertilizer's, weedicides/pesticides are needed and in what volumes?

Table 1,2,3,4,5,6,7,8,8,9.

Table 1

Showing number of households under different areas and Soil Series taken for yield sampling and technology survey.

<u>Soil series</u>	<u>Amphur</u>	<u>Tambol</u>	<u>Mu Ban</u>	<u>Households</u>
Roi et (43.8%)	Phang Khone	1	1	16
	Phanna Nikom	3	5	15
	Muang	2	3	25
	Sub-total	6	9	56
Korat (25.7%)	Phang Khone	2	3	8
	Phanna Nikom	3	5	13
	Muang	2	4	6
	Sub-total	7	12	27
Pimai & Chiangmai	Phang Khone	2	4	4
	Phanna Nikom	3	6	11
	Muang	2	2	-
	Sub-total	<u>7</u>	<u>12</u>	<u>15</u>
	Total	<u>17</u>	<u>33</u>	<u>98</u>

Table 2
 Showing General Farming Status, Number
 and Percent of Farmers in the Lam Nam Oon
 Irrigation Project area, Studies and Survey
 for Evaluation of Yield, and Rice Production
 Inputs Utilized by the Farmers during the
 1980-1981 Wet Season.

Farming Status	Amphoe Phang Khone No. of Farmers		Amphoe Panna Nikhom No. of Farmers		Amphoe Muang No. of Farmers		Total No. of Farmers	
	No.	%	No.	%	No.	%	No.	%
<u>1. Holdings</u>								
- Owned	28	100	38	97.6	29	93.6	95	96.9
- Rented	-	-	1	2.6	2	6.4	3	3.00
<u>2. Holder</u>								
- range (Rai)	3-71	-	2-56	-	6-55	-	2-71	-
- average (Rai)	19.9	-	19.6	-	28.0	-	22.2	-
<u>3. Rice Varieties</u>								
- early	-	-	1	2.6	6	19.3	7	7.2
- medium	28	100	38	97.4	25	80.7	91	92.8
- late	-	-	-	-	-	-	-	-
- photosensitive	28	100	36	92.3	29	93.5	93	94.9
- non-photo-sensitive	-	-	3	7.7	2	6.5	5	5.1
- local	15	53.6	13	33.3	12	38.7	40	40.8
- recommended	13	46.4	26	66.7	19	61.3	58	59.2

Table 2 (continued)

Showing General Farming Status, Number and Percent of Farmers in the Lam Nam Oon Irrigation Project area, Studies and Survey for Evaluation of Yield, and Rice Production Inputs Utilized by the Farmers during the 1980-1981 Wet Season.

Farming Status	Amphoe Phang Khone No. of Farmers		Amphoe Panna Nikhom No. of Farmers		Amphoe Muang No. of Farmers		Total No. of Farmers	
	No.	%	No.	%	No.	%	No.	%
<u>4. Topographical Characteristics</u>								
- outside irrigated area	8	28.6	1	2.6	12	38.7	21	21.4
- inside irrigated area	20	71.4	38	97.4	19	61.3	77	78.6
● in L Consolidated area	2	10	-	-	6	31.6	8	10.4
● out L Consolidated area	18	90	38	100	13	63.4	69	89.6
●● Ditch/Dyke	8	44.4	10	26.3	1	7.7	19	27.5
●● without Ditch/Dyke	10	55.6	28	73.7	12	92.3	50	72.5
<u>5. Irrigation Water Supply</u>								
- incomplete	7	25	17	43.6	18	58.1	42	42.8
- moderate	3	10.7	6	15.4	7	22.6	16	16.3
- complete	15	53.6	14	35.9	5	16.1	34	34.7
- adequate rainfall	3	10.7	2	5.1	1	3.2	6	6.1
<u>6. Soils</u>								
Soil Series:								
- Roi-Et	16	57.1	15	38.5	25	80.6	56	57.1
- Korat	8	28.6	13	33.3	6	19.4	27	27.5
- Chiangmai Phimai	4	14.3	11	28.2	-	-	15	15.4

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Table 2 (continued)

Showing General Farming Status, Number and Percent of Farmers in the Lam Nam Oon Irrigation Project area, Studies and Survey for Evaluation of Yield, and Rice Production Inputs Utilized by the Farmers during the 1980-1981 Wet Season.

Farming Status	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	NO. of Farmers		NO. of Farmers		NO. of Farmers		NO. of Farmers	
	No.	%	No.	%	No.	%	No.	%
<u>Salinity Problems</u>								
- none	14	50	25	64.1	8	25.8	47	47.9
- light (localised)	12	42.9	14	35.9	17	54.8	43	43.9
- severe	2	7.1	-	-	6	19.4	8	8.2

<u>Remarks:</u>	No. of farmers	A. Phang Khone	28
		A. Panna Nikhom	39
		A. Muang	<u>31</u>
		Totalling	<u>98</u>

Table No. 3

Showing average Recommended and Local Rice Productions from the Soil Series of the Amphoe in the LNO Irrigation Project area coverage, Studies and Survey Evaluation of Yield, and Rice Production Inputs utilized by the Farmers during the 1980-1981 Wet Season

Soil Series	Amphoe	Recommended		Local		Recommended local	
		No. of Plots	Kg/rai	No. of Plots	KG/rai	d. f.	KG/rai
Roi Et	Muang	19	575	9	434	26	141*
	Panna Nikhom	10	364	9	361	17	3 ^{ns}
	Phang Khone	1	216	8	292	-	-76
	Average	30	492	26	365	54	127**
Korat	Muang	4	541	1	394	-	147
	Panna Nikhom	9	458	4	411	11	47 ^{ns}
	Phang Khone	3	328	3	347	-	-19
	Average	16	454	8	385	22	69 ^{ns}
Phimai/ Chiangmai	Muang	-	-	-	-	-	-
	Panna Nikhom	4	496	-	-	-	-
	Phang Khone	3	469	1	333	-	136
	Average	7	484	1	333	-	151
Total Average		53	480	35	369	52,34	111**

NOTE: Recommended Rice composed of: RD 6, Kho Dawk Mali 105, RD 7; Local Rice composed of: Glu. Sanpatong, Hawn Nong Nuan, Mae Karng, Khitom Khao, Khitom and Khitom Yai.

* Significant

** Highly Significant

ns Non-Significant

Table No. 4

Showing Comparison between 3 Rice Varieties Widely Grown by the Farmers (Khao Dawk Mali 105, RD 6, and Nio Sanpatong) in the LNO Irrigation Area Coverage, Studies/Survey on Yield Evaluation, and Rice Production Inputs Utilized during the 1980-1981 Wet Season

Variety	Khao Dawk Mali 105		RD.6		Niew Sanpatong		KDM 105 RD.6		RD.6 NSanpatong		KDM 105	
	No. of Plots	KG/Rai	No. of Plots	KG/Rai	No. of Plots	KG/Rai	d.f.	KG/Rai	d.f.	KG/Rai	d.f.	KG/Rai
Roi Et	6	640	22	460	23	367	26	180	43	95*	27	273
Korat	1	672	14	447	5	362	-	225	13,4	85**	-	310
Phimai/ Chiangmai	-	-	6	466	1	333	-	-	-	133	-	-
Average	4	645	42	456	29	365	47	189	69	91	24	280

* Significant

** Highly Significant

KDM 105 = Khao Dawk Mali 105 (non-glutinous)
NSanpatong = Niew Sanpatong (glutinous)

Table No. 5

Showing Average Recommended and Local Rice Production by Amphoe in the LNO Irrigation Project Area, Studies and Survey for Evaluation of Yield, and Utilization of Agricultural Inputs for Rice Production during 1980 - 1980 - 1981 Wet Season

Amphoe	Recommended		Local		Recommended Local	
	No. of Plots	KG/Rai	No. of Plots	KG/Rai	d.f.	KG/Rai
Muang	23	569	10	430	31	139**
Panna Nikhom	23	424	13	376	34	48 ^{ns}
Phang Khone	7	373	12	309	6,11	64 ^{ns}
Average	53	480	35	369	52,34	111

Remarks: Recommended varieties are: RD.6, KDM 105, RD. 7
 Local varieties are: Nio Sanpatong, Hawm Nang Nuan,
 Mae Harng, Khi Tom Khao,
 Khi Tom Lai, Khi Tom Yai.

** Highly significant

ns non-significant

Table No. 6

Showing Number and Percent of Farmers Utilizing
Agricultural Production Inputs in the LNO
Irrigation Project Area, Studies and Survey
for Evaluation of Yield, and Utilization of
Rice Production Inputs During 1980-1981 Wet Season

Inputs for Rice Production	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmer	
	No.	%	No.	%	No.	%	No.	%
<u>Seeds</u>								
- Stored	21	75	35	89.7	23	74.2	79	80.6
- Exchange	7	25	1	2.6	7	22.6	15	15.3
- Bought from Rice Exp. Sta.	-	-	3	7.7	4	3.2	4	4.1
<u>Land Preparation</u>								
- Family	28	100	37	94.9	31	100	96	97.9
● Buffalo	28	100	35	94.6	31	100	94	97.9
● Farm Tractor	-	-	2	5.4	-	-	2	2.1
- Hired	-	-	2	5.1	-	-	2	2.1
● Buffalo	-	-	2	100	-	-	2	100
● Farm Tractor	-	-	-	-	-	-	-	-
<u>Pulling Seedlings</u>								
- Family	26	92.9	35	89.8	26	83.9	27	88.8
- Family + Hired	2	7.1	2	5.1	5	16.1	9	9.2
- Hired	-	-	2	5.1	-	-	2	2.0
<u>Transplanting</u>								
- Family	26	92.9	28	71.8	26	83.9	80	81.6
- Family + Hires	2	7.1	9	23.1	5	16.1	16	16.3
- Hired	-	-	2	5.1	-	-	2	2.1
<u>Using Fertilizers</u>								
- Not using	18	64.3	15	38.5	4	12.9	37	37.7
- Using	10	35.7	24	61.5	27	87.1	61	62.3
● manure	4	36.4	9	37.5	19	70.4	32	52.4
● compost	1	10	2	8.3	1	4.7	4	6.6
● chemical	5	45.5	13	54.2	7	25.9	25	41.0

Table No. 6 (continued)

Showing Number and Percent of Farmers Utilizing
Agricultural Production Inputs in the LNO
Irrigation Project Area, Studies and Survey
for Evaluation of Yield, and Utilization of
Rice Production Inputs During 1980-1981 Wet Season

Inputs for Rice Production	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmer	
	No.	%	No.	%	No.	%	No.	%
5.1 Using Manure								
5.1.1 In Seedlings								
Plots:	4	100	5	55.6	19	100	28	87.5
● before seeding	3	95	5	100	19	100	27	96.4
● after seeding	1	25	-	-	-	-	1	3.6
Application								
● piling	-	-	-	-	-	-	-	-
● plow under after piling	-	-	5	55.6	3	15.8	8	28.6
● piling, level- ling down, plow under	4	100	-	-	16	84.2	20	71.4
5.1.2 In Transplanted Plots								
● pre-transplant- ation	-	-	4	44.4	6	31.6	10	31.3
● post-trans- plantation	-	-	4	100	6	100	10	100
-	-	-	-	-	-	-	-	-
5.2 Using Compost								
5.2.1 Seedlings								
Plots:	1	100	2	100	1	100	4	100
● pre-seeding	1	100	2	100	1	100	4	100
● post-seeding	-	-	-	-	-	-	-	-
Application:								
● piling	-	-	-	-	-	-	-	-
● plow under after piling	-	-	2	100	-	-	2	50
● piling level- ling down, plow under	1	100	-	-	1	100	2	50

Table No. 6 (continued)

Showing Number and Percent of Farmers Utilizing
Agricultural Production Inputs in the LNO
Irrigation Project Area, Studies and Survey
for Evaluation of Yield, and Utilization of
Rice Production Inputs During 1980-1981 Wet Season

Inputs for Rice Production	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmers	
	No.	%	No.	%	No.	%	No.	%
5.2.2 <u>Transplanting</u> <u>Plots</u>	-	-	2	100	-	-	2	50
● Pre-Transplanting	-	-	2	100	-	-	2	100
● Post-Transplanting	-	-	-	-	-	-	-	-
<u>Utilization of Chemical Fertilizers</u>								
3 <u>Seedlings Plots</u>	5	-	13	-	7	-	25	-
5.3.1 <u>Seedlings Plots</u>								
● Pre-seeding	-	-	8	61.5	-	-	8	32
● Post-seeding	5	100	5	38.5	7	100	17	68
5.3.2 <u>Transplanting</u> <u>Plots</u>								
● Pre-transplantation								
● Post-transplantation								
5.3.3 <u>Application</u>								
● Broadcasting								
● Broadcast and plow down								
5.3.4 <u>Rate (16-20-0</u> <u>Kg/Rai)</u>								
- between	2-25	-	3-12	-	3-15	-	2-25	-
- average								
<u>Weed Control</u>								
6.1 <u>Weed Problem</u>								
- none	8	28.6	8	20.5	1	3.2	17	17.3
- moderate	10	35.7	18	46.2	10	32.3	38	38.2
- serious	10	35.7	13	33.3	20	64.5	43	38.6
6.2 <u>Control</u>								
- no control	14	50	8	20.5	11	35.5	33	33.7
- moderate	11	39.3	26	66.7	11	35.5	48	49.0
- complete	3	10.7	5	12.8	9	29.0	17	17.3

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Table No. 6 (continued)

Showing Number and Percent of Farmers Utilizing
Agricultural Production Inputs in the LNO
Irrigation Project Area, Studies and Survey
for Evaluation of Yield, and Utilization of
Rice Production Inputs During 1980-1981 Wet Season

Inputs for Rice Production	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmer	
	No.	%	No.	%	No.	%	No.	%
6.3 Weed Control								
<u>Method</u>								
- Pulling	14	100	31	100	20	100	65	100
- Chemical	-	-	-	-	-	-	-	-
Diseases & Insects								
7.1 Problems								
- none	14	50.	9	23.1	2	6.5	25	25.5
- few	10	35.7	22	56.4	20	64.5	52	53.1
- plenty	4	14.3	8	20.5	9	29.5	21	21.4
7.2 Control Measures								
- none	26	92.9	22	56.4	17	54.8	65	66.3
- moderate	2	7.1	14	35.9	14	45.2	30	30.6
- serious	-	-	3	7.7	-	-	3	3.1
Harvesting & Threshing								
- family	24	85.7	29	74.4	23	74.2	76	77.6
- mutual-help labor	-	-	-	-	-	-	-	-
- hired	4	14.3	10	26.6	8	25.8	22	22.4
Hired Labor								
● Village labor	4	100	9	90	8	100	21	95.5
● Outside labor	-	-	1	10	-	-	1	4.5
Threshed by								
● hand	28	100	39	100	31	100	98	100
● buffalo	-	-	-	-	-	-	-	-
● mechanical thrashers and vehicles	-	-	-	-	-	-	-	-

Table No. 6 (continued)

Showing Number and Percent of Farmers Utilizing
Agricultural Production Inputs in the LNO
Irrigation Project Area, Studies and Survey
for Evaluation of Yield, and Utilization of
Rice Production Inputs During 1980-1981 Wet Season

Inputs for Rice Production	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmer	
	No.	%	No.	%	No.	%	No.	%
<u>Production Consump-</u>								
<u>tion and Selling</u>								
<u>9.1 Production</u>								
- sufficient	13	53.6	34	87.2	28	90.3	77	78.6
- insufficient	13	46.4	5	12.8	3	9.7	21	21.4
<u>9.2 Consumption</u>								
- Stored	28	100	39	100	31	100	98	100
- Sold	7	25	-	-	-	-	7	7.2
- Shared with Relations	-	-	13	33.3	5	16.1	18	18.4
<u>9.3 Selling</u>								
- locally	3	42.9	-	-	-	-	3	42.9
- rice mill	3	42.9	-	-	-	-	3	42.9
- MOF	1	14.2	-	-	-	-	1	14.2

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Table No. 7

Showing Problems and Obstacles Encountered by Farmers in the Increase of Yield in the LNO Irrigation Project area, Studies and Survey for Evaluation of Yield, and Rice Production Inputs Utilized during the 1980-1981 Wet Season.

Problems and Obstacles	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmers	
	View	%	View	%	View	%	View	%
Lack of Water	5	20	13	33.3	14	32.6	32	29.9
Diseases & Insect Pests	5	20	15	38.5	17	39.5	37	34.6
Flood	4	16	-	-	3	7.0	7	6.5
Saline Soil	3	12	1	2.5	4	9.3	8	7.5
Low Soil Fertility	3	12	4	10.3	5	11.6	12	11.2
Weeds	2	8	4	10.3	-	-	6	5.6
Rodents	1	4	-	-	-	-	1	0.9
Crabs	-	-	2	5.1	-	-	2	1.9
Lack of Capital	1	4	-	-	-	-	1	0.9
Lack of Knowledge	1	4	-	-	-	-	1	0.9
Total:	25	100	39	100	43	100	107	99.9

Remarks: Scoring is based on counting the views consecutively from the total numbers of farmers in each amphoe.

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Table No. 8

Showing Sources from which the Farmers Received their Agricultural Knowledge in the LNO Irrigation Project, Studies and Survey for Evaluation of Yield, and Rice Production Inputs Utilized During 1980-1981 Wet Season.

Sources of Knowledge Received	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmers	
	View	%	View	%	View	%	View	%
Royal Irrigation Department	40	44.4	28	44.4	28	27.5	96	37.7
DOA	2	2.2	-	-	6	5.9	8	3.1
DOAE	29	32.2	17	27	17	16.7	63	24.7
Department of Fisheries	4	4.4	-	-	4	3.9	8	3.1
CDD	14	15.6	18	28.6	15	14.7	47	18.4
Department Non-Formal Ed.	1	1.1	-	-	13	12.7	14	5.5
Radio	-	-	-	-	19	18.6	19	7.5
Private Sector	-	-	-	-	-	-	-	-
Total:	90	100	63	100	102	100	255	100

Remarks: Scoring is based on counting the views consecutively from the total numbers of farmers in each Amphoe.

Table No. 9

Showing Farmers' Views on Aids from the Project in the LNO Irrigation Project Area, Studies and Survey for Evaluation of Yield, and Rice Production Inputs Utilized During 1980-1981, Wet Season.

AIDS	Amphoe Phang Khone		Amphoe Panna Nikhom		Amphoe Muang		Total	
	No. of Farms		No. of Farmers		No. of Farmers		No. of Farmers	
	Views	%	Views	%	Views	%	Views	%
1. Good Seeds	2	4.4	1	2.9	-	-	3	2.3
2. Sufficient Water	10	22.2	15	42.8	20	31.7	45	34.1
3. Fertilizers	12	26.7	5	14.3	5	7.9	22	16.7
4. Herbicide	12	26.7	11	31.4	20	31.7	43	32.6
5. Reclamation of Saline Soils	1	2.2	-	-	4	6.4	5	3.8
6. Transmit Knowledge	-	-	3	8.6	1	1.6	4	3.0
7. Canals Dredging	-	-	-	-	1	1.6	1	0.7
8. Animal Diseases Control	-	-	-	-	1	1.6	1	0.7
9. Capital	8	17.8	-	-	-	-	8	6.1
Total:	45	100	35	100	52	100	132	100

Remarks: Scoring is based on counting the views consecutively from the total numbers of farmers in each Amphoe.

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AUTHOR

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- Member of the Research Committed of the Farming Systems Research Institute.
- Site Coordinator at Lam Nam Oon Integrated Rural Development Project in matters concerning:
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Khun Natavudh joined the Lam Nam Oon project as the site coordinator for the Department of Agriculture in late 1980. Prior to that and since 1967 his experience had been with:

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- Rice-Yield Constraints Project of the International Rice Agro-Economic Network, in Central Thailand, in cooperation with the International Rice Research Institute in the Philippines.
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Other specialised training includes studies at the Ruppin Institute of Agriculture, Israel on 'Fertilisers and Extension Methods' and 'integrated Farming' in Sri Lanka.

Among other papers published by the author in the Thai and English languages the following are a representative list:

- Asian Farm Level Rice Yield Constraints, 1979.
- Study on 'Integrated Tri-Commodity Farming Systems: an Intensive Agricultural Development for Thai Small Farmers'. Paper presented at Crop/Livestock/Forestry Seminar, Chiang-mai, FAO/UNDP, 1980.

- Research papers for Department of Agriculture on Lam Nam Oon Integrated Rural Development Project (Thai language) - 1981.
- Principles of Integrated Farming Systems (Thai language) 1982.
- Technology Constraints to Rice-based Cropping Systems in the Central Plain of Thailand, for Department of Agriculture and the Tropical Agricultural Research Centre (TARC), 1982.
- The Production of Groundnuts at the Lam Nam Oon Irrigation Project - Sakon Nakhon. A paper presented at the Groundnut Seminar, Nakhon Sawan, 1983.
- Cropping Systems Development in Lam Nam Oon Irrigation Project (Thai language). A paper presented at Udon Policy Conference, 1983.