Semiannual Progress Report No. 1
July 31, 1976
Research Project A-1801

COOPERATION WITH THE INTERNATIONAL RICE RESEARCH INSTITUTE IN THE INTRODUCTION OF IRRI-DESIGNED AGRICULTURAL EQUIPMENT IN THAILAND

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Project Title:	Introduction of IRRI-Designed Agricultural Equipment in Thailand and Pakistan (On-Site)
Contract With:	The International Rice Research Institute (IRRI)
Project Initiated:	February 1, 1976
Reporting Period:	February 1, 1976 through July 31, 1976
Prepared By:	Dr. Kenneth S. Stephens, Economic Development Laboratory (EDL), Engineering Experiment Station (EES), Georgia Institute of Technology (Thailand Portion of Project)

Introduction

This report has been prepared in sufficient detail to serve as an information source and guideline for IRRI, Georgia Tech, and other interested personnel in reviewing project start-up activities to date, establishing contacts and points of reference for future activities, and interacting on subjects covered for more complete effectiveness.

Preliminary to the project initiation date, preparation for the on-site project activities were carried out at EES. Besides the collection and review of materials and travel documents, this included exhibition and promotion of the AID-IRRI display of several pieces of equipment and explanatory panels in the main lobby of the Baker building on the Georgia Tech campus over the period from December 1975 through January 1976. Colored slides of closeups of the twelve panels and various pieces of equipment were prepared for promotional and informational presentations. This slide set, complemented by in-country slides of equipment in manufacture and use, was subsequently used for presentations to the Bangkok South Rotary Club on April 9, 1976, the Bangkok Central Rotary Club on April 15, 1976, and to the staff of the Agricultural Engineering Division of the Thai Department of Agriculture on May 21, 1976. A set of slides has been left with the IRRI industrial

extension engineer in Thailand for future presentations to promote the program and inform interested and influential groups.

Project Activities

A summarized outline of the project activity schedule, listing significant items in particular, is given in Appendix A. The period from February 1, 1976 through May 25, 1976 is divided into two subperiods of activities: one in the Philippines principally with IRRI from February 2 through March 4 and the other in Thailand from March 4 through May 25. The first subperiod was devoted to briefing at IRRI on the industrial extension program, the Thailand file, and IRRI's efforts in the Philippines. This included participation in the IRRI engineering training course. The latter part of this period included the arrival and intial briefing of Mr. Stewart Barton, IRRI's industrial extension engineer for Thailand. The second subperiod represents the start-up of the Thailand industrial extension program.

Principal activities during the Thailand portion of the project were as follows: (1) collection of information and establishment of contacts to identify the markets and market potentials for IRRI designs (or modifications thereof); (2) identification and establishment of liaison with pertinent in-country (and regional) organizations, government departments, associations, companies, etc., that will have interface with the Thai-IRRI project; (3) assistance in the design and planning of marketing activities, including the initiation of equipment demonstrations, establishment of an account, identification of related tasks, and procurement of an indigenous consulting group (Agribusiness Management Group, Kasetsart University) to carry out related activities between the on-site activities by Georgia Tech personnel; (4) business management assistance to several manufacturers also included in tasks referenced in (3) and the location and initial contact with manufacturers

not already engaged in producing IRRI-designed machines; and (5) general assistance to IRRI's Thailand industrial extension engineer, Stewart Barton, in becoming acquainted with Bangkok and Thailand during the start-up of the project.

Individual write-ups on most of the activities and visits outlined in Appendix A are given in Appendix B. These should be consulted for related details; some will be highlighted in the main body of this report. Many visits encompassed aspects of two or more of the five activities listed above. During the course of the project it became somewhat apparent that emphasis should be placed on reaching as many people and organizations as possible with the IRRI small-scale, locally made, farm machinery story--promoting the introduction of the IRRI design into manufacture and use and identifying design changes needed to make the existing machines more compatible with Thailand's conditions and varieties. Attempts to predict demand were seen to have little basis or even usefulness at this stage in the development of the project--except as might be made via various macro relationships such as units per hectare of cultivated paddy or horsepower per hectare, replacement of buffalo, etc.

Need and Urgency for Project

The situation in Thailand, in relation to the introduction of the IRRI-designed machinery, is not significantly different from that outlined by Davis, Parets and Duff in their report, reference 16 in Appendix C. The government, which was reorganized during the period covered by this report, appears to be headed along a path of strengthening the credit system for the Thai farmer as reflected in the following quotation in the business news section of the Bangkok Post of May 25, 1976: "All commercial banks will this

year have to release to the Government seven percent of their current total deposits to make an aggregate of about o000 million baht to finance farmers ..." This decision comes on the heels of news indicating that the Bank for Agriculture and Agricultural Cooperatives (BAAC) was almost at the brink of collapse. Further emphasis appears to be on the promotion and support of farmers' cooperatives and a revitalized land reform program. Directions being taken by the new government appear to support an earlier announced program under the Fourth Economic and Social Development Plan (see reference 33 in Appendix C). This plan identifies as development problems: administration and allocation of natural resources including land and water, diversification of agriculture, and productivity and pricing in the agricultural sector, among others. All of these activities are seen to support the spread of IRRI-type farm machinery.

Just after conclusion of the Thailand in-country portion of the Georgia Tech assistance (May 25, 1976), a significant supplement to the Bangkok World on "Rice" came out on May 31, 1976 (listed as reference 32 in Appendix C). The supplement contains an article by the author of this report on the Thai-IRRI project. The written dialogue in this issue emphasizes (1) a fairer reward for the farmers, (2) land reform, (3) financial aid to farmers, (4) water supply and control, (5) farm storage facilities, and (6) mechanization.

All of the activities mentioned above are seen to support the spread of IRRI-type farm machinery. Local conditions will favor specific machines--some with modification--as discussed subsequently.

The urgency of the problem in Thailand as well as in all of Asia is emphasized by reports of the 1976 annual meeting of ESCAP (Economic and Social

Commission for Asia and the Pacific) in Bangkok. It was reported that the International Food Policy Research Institute (IFPRI) of Washington, D.C. projected cereal deficits of between 37 to 46 million tons in Asia by 1985, nearly triple the deficits suffered in 1974-75. The annual ESCAP report, which focuses on rural Asia, shows that South Koreans get 2 1/2 times the yield per acre of rice field as do Burma and Thailand. It was reported that the use of fertilizer, as well as high-yielding variety seeds, irrigation facilities, and mechanization, is becoming more and more crucial since available arable land (in Asia) is shrinking almost visibly daily.

Farm Machinery Situation in Thailand

Somewhat underemphasized in the Davis, Parets and Duff report previously referenced and/or undergoing significant increases since their study visit is the widespread supply and acceptance of the Thai-designed two-wheel, single-axle power tiller known as the "Iron Buffalo." Unfortunately, it is still true that statistics on this type of development are unavailable. This area is even excluded at present from the massive project, involving some six or seven U.S. advisors, between the Ministry of Agriculture, Iowa State University and USAID/Thailand on "An Analysis of Thailand's Agricultural Sector." Only recently has the Agricultural Economics Department of MOAC attempted a survey on farm machinery, and results are not available at present (see individual write-up of May 22, 1976 visit in Appendix B). In reference 13, Appendix C, there is mention of some "100 companies and workshops turning out farm machinery and implements in Thailand." A later reference, chronologically, number 12 in Appendix C, states, "It is estimated that there are 26,000 tillers and mini-tractors in use**, each of which can plough up to three to four rai per day, compared to an average of one rai per day when the same land is tackled by a water buffalo." The double asterisk indicates use of

references by Chakkaphak such as numbers 8, 11, 28, and 29, Appendix C. (There are 6.25 rai to a hectare.) Another significant movement in Thailand is the use of four-wheel tractors of the imported type (65-85 hp range) and of the locally made type (12-45 hp range), especially the former for custom ploughing service. This subject is dealt with in references 12, 31a, 31b, 31c, and 35, Appendix C, particularly, and in the write-up of the March 8, 1976 visit to Anglo-Thai Motors (Ford tractor dealer).

Predictions of farm machinery populations and demands in Thailand vary considerably, even among papers prepared for the same meeting, as for example references 31a, 31b, and 31c in Appendix C. Tables of imported tractors must be viewed carefully with respect to the declines beginning in 1969. Some authors fail to point out that local assembly began to increase during these years and SKD and CKD units are not included in the figures. It is apparent that definitions of "tractor" vary considerably.

The following table (I) of imported "tractors" is contained in reference 31a and agrees with the write-up of the April 23 visit to DAE. The referenced source is the Customs Department.

Table I. Import of Tractors in Thailand

Year	Number of Tractors	Year	Number of Tractors
1963	2247	1968	5104
1964	3864	1969	3631
1965	5200	1970	2305
1966	4577	1971	2662
1967	5698	1972	1809

The latter figures are in sharp contrast to the estimated sales of over 3000 tractors (3500-3800 annually over years 1974 and 1975) as reported in the

visit of March 8 (Appendix B) to the Ford dealership. This same reference reports a population of "above 35,000 units" (1973). It is not clear if this refers to four-wheel tractors only. Reference 31b, of approximately the same date as 31a, reports "about 22,000 four-wheeled tractors in Thailand" and "about 9,000 two-wheeled tractors in use in the country." This reference contains a breakdown of the imported tractors of 1970 and 1971, with totals of 2,305 and 2,662, respectively, agreeing with the above table. Of these quantities, 683 and 1,367, respectively, are classified as "farm tractors." This reference quotes the FAO Provisional Indicative World Plan (1970) as estimating the demand for tractors of all types to be 2,900 units in 1972, 2,700 in 1975, and 4,500 in 1980. These figures appear to be grossly underestimated.

Reference 31c summarizes results from three reports, listed as references 58, 59, 60 in Appendix C. A 1969 view, as reported, saw the following figures of demand and production capacity for four-wheeled tractors and power tillers:

	Year	Demand	Production Capacity
Four-wheel tractors	1970	4500	4500
	1975	8000	6000
Power tillers	1970	1500	500
	1975	3500	5000

The power tiller figures, in particular, appear to have been underestimated.

Reference 35 (of Appendix C--circa 1973) contains some statistics for Asia, including Thailand, on (1) general pattern of agriculture, (2) general pattern of socioeconomic conditions, (3) riding tractors: quantity, demand and manufacturing schedules, (4) same as (3) for power tillers, diesel and gasoline engines, threshers, dryers and hullers, etc. The following figures from this report pertain to Thailand:

	Riding Tractors	Power Tillers	Threshers	Dryers
Population (units)	30,000	4000	N/A	Few tens
Density (units/1000 ha)	2.4	0.33	-	-
Annual Demand (units)	4000	1200-1700	Hand Opt. NIL Pwr. Opt. 100	NIL
Projected Annual Demand (units) 1975	8000	4000	N/A	N/A
1980	--	6000-8000		
Manufacturing Capacity: Manufacturers (no.)	3 (50-60 hp) 2 (10-12 hp)	2	NIL	NIL
% of Local Content	assembly (50-60 hp) 40 (10-12 hp)	30-40	-	-
Annual Production 1971 (units)	1100 (50-60 hp) 300 (10-12 hp)	800	NIL	-
Capacity 1971 (units)	3000 (50-60 hp) 300 (10-12 hp)	1000	NIL	NIL

The Thailand summary, pages 177-196 of this reference, should be consulted for futher details, recommendations and conclusions, many of which are considered still relevant.

Some of the above forecasts, especially with respect to power tillers, are in sharp contrast to the information in reference 51 (of Appendix C). Discussion of this reference is also given in the write-up of the March 15 and March 17 visits to the Industrial Service Institute, Chiengmai. In particular, estimated current production and sales of power tillers in the ten provinces surveyed is reported at approximately 5000 per month during a peak season of four months (or at least 20,000 per year in just ten northern provinces!).

It is obvious that more detailed study, assisted by a local Thailand infrastructure, will be necessary to obtain some accuracy of statistics on existing populations, growth and forecasts of farm machinery in Thailand. What is seen is that demand will be established and grow under the proper promotion for correct and adequate designs of farm machinery to ease the cost and timing of production, especially in land preparation, planting and harvesting for rice and other crops under a program of diversified agriculture and intensified land utilization.

In view of the indigenously designed power tiller, its acceptance by the Thai farmer, and growth in the number of workshops producing these units, emphasis on the IRRI power tiller is considerably less than in other countries. However, design characteristics of the IRRI-type power tiller make it particularly suited for low-cost production and use in small fields. It should receive additional promotion.

Mechanical rice threshers (other than use of tractors for treadmill type threshing) are almost nonexistent. Labor displacement, farming practices such as desire for long straw, and peculiarities of Thai rice varieties such as a strong awn to grain bond present problems that must be dealt with before widespread promotion, manufacture and use of mechanical rice threshers can be envisioned. However, in spite of these problems, mechanical threshers of the manual and engine-powered types are needed immediately in moderate quantities. They require introduction via extensive demonstrations, training and promotion of manufacture and use. Increases in multiple cropping through extended irrigation and new rain-fed technology will greatly increase the need for IRRI-type threshers.

Batch dryers occupy approximately the same position as threshers, though not so limited by immediate problems. They need introduction and promotion as well.

Designs to support various stages of production of diversified crops are also needed. References to specific needs are contained in the detailed write-ups of Appendix B.

The list of companies in Thailand producing IRRI and other types of farm machinery continues to grow. Several lists are available (some only in the Thai language) at the Thai-IRRI project office. The detailed write-ups of Appendix B make reference to at least 22 companies. Additional effort is needed to consolidate, expand and document these lists.

Though it may be overlooked easily, and nothing may come of it, the reference to the development of a series of farm machinery centers in the write-up of the April 29, 1976 visit to the Association of Thai Industries deserves some emphasis here. Properly promoted, perhaps further fostered through outside assistance, this interest on the part of ATI could become an important element in the proper development of farm mechanization in Thailand. This should be an item of follow-up and the subject of possible consideration for additional assistance.

The demonstrations of the rice thresher (with further interest in the batch dryer), as detailed in the write-up of the Padunwit Industrial Company rice mill of May 8, 1976, also needs emphasis. While it is highly recommended that similar demonstrations be developed in the principal geographical regions of the country, the availability of this site and the interest shown by its owner should be utilized to the fullest while additional sites are pursued. The proposal for a farm mechanization research station deserves

Table II. An Estimate of Principal Agricultural Crops of Thailand, 1971-1975

(in thousands of metric tons)

Crops	1971-72	% Change from Last Season	1972-73	% Change from Last Season	1973-74	% Change from Last Season	1974-75	% Change from Last Season	1975-76	% Change from Last Season
Paddy	13,744	+ 1.28	12,413	- 9.68	14,898	+ 20.02	13,386	- 10.15	15,092[1/]	+ 12.74
Maize	2,300	+ 18.63	1,315	- 42.83	2,343	+ 78.17	2,550	+ 8.83	3,023	+ 18.55
Sugarcane	5,926	- 10.02	9,513	+ 60.53	13,339	+ 40.22	14,592	+ 9.39	17,000	+ 16.50
Cassava	3,114	- 9.24	4,952	+ 59.02	6,301	+ 27.24	6,240	- 0.97	6,358	+ 1.89
Soybean	54.3	+ 7.74	72.0	+ 32.68	152.3	+ 111.53	110.4	- 27.51	126	+ 14.13
Kenaf	419.1	+ 10.03	427.9	+ 2.10	468.9	+ 9.58	384.1	- 18.08	250	- 34.92
Rubber	361.3	+ 10.13	336.9	+ 6.51	367.7	+ 9.14	382.1	+ 3.92	396	+ 3.64
Mung Bean	140	- 5.72	191	+ 36.43	192	+ 0.52	304	+ 58.33	326	+ 7.24

[1/] Including second rice crop

Source: Ministry of Agriculture and Co-operatives, Government of Thailand
ESCAP/FAO Agriculture Division, New U.N. Building, Sala Santitham, Bangkok, 1976.

Table III. Rice (Paddy): Comparative Study on Planted Area, Production between 1974-75 and 1975-76 Main Seasons, by Regions

Region	Season	Planted Area (rai)[1/]			Production (metric tons)		
		Total	Nonglutinous	Glutinous	Total	Nonglutinous	Glutinous
Northern	1975	11,648,500	8,344,075	3,304,425	4,125,163	2,535,071	1,590,092
	1974	10,181,000	6,854,474	3,326,526	3,780,000	2,327,019	1,452,981
	increased	1,467,500	1,489,601	--	345,163	208.052	137,111
	decreased	--	--	22,101	--	--	--
North-eastern	1975	24,990,550	7,510,456	17,480,097	5,321,329	1,698,551	3,622,776
	1974	20,635,000	5,000,224	15,634,776	3,772,992	892,359	2,880,633
	increased	4,355,553	2,510,232	1,845,321	1,548,337	806,192	742,145
	decreased	--	--	--	--	--	--
Central Plain	1975	13,155,740	13,133,816	21,924	3,663,642	3,666,638	7,004
	1974	13,238,000	13,068,151	169,849	4,029,000	3,987,848	41,152
	increased	--	65,665	--	--	--	--
	decreased	82,260	--	147,925	355,358	331,210	34,148
Southern	1975	3,449,117	3,437,232	11,885	981,599	977,130	4,469
	1974	3,767,000	3,767,000	--	865,000	865,000	--
	increased	--	--	11,885	116,599	112,130	4,469
	decreased	317,883	329,768	--	--	--	--
Whole Kingdom	1975	53,243,910	32,425,579	20,818,331	14,091,733	8,867,390	5,224,343
	1974	47,821,000	28,689,849	19,131,151	12,446,992	8,072,226	4,374,766
	increased	5,422,910	3,735,730	1,687,180	1,644,741	795,164	894,577
	decreased	--	--	--	--	--	--

Source: Ministry of Agriculture and Co-operatives, Government of Thailand
ESCAP/FAO Agriculture Division, 1976

Note: Main season only, excluding production of rice (paddy) from dry season, which totalled about 1.0 million tons in 1975.

[1/] 6.25 rai = 1 hectare

some attention and consideration and is seen as an important adjunct to the Thai-IRRI project.

Finally, the availability of the Agribusiness Management Group of Kasetsart University, as detailed in the May 24, 1976 write-up, deserves emphasis. This indigenous group may play a significant role in promoting the project and obtaining important facts for policy direction of the project. Activities beyond the subcontract period are envisioned and desirability of additional funding beyond the Georgia Tech subcontract should be studied.

General Information

Some of the latest statistics on the pattern of agriculture and rice in particular were obtained during the April 19, 1976 visit to FAO/ESCAP. These are presented in Tables II and III.

A further summary of statistics from combined information from the Agricultural Engineering Division and reference 35 is presented in Table IV with conversions to internationally used hectare units (compared with use of rai units in Table III, 6.25 rai equal one hectare). Obviously, the figures are approximate and vary among the different sources, due to timeliness and other factors.

Table IV. General Pattern of Agriculture and Socioeconomic Conditions

Total country area	60,400,000 hectares
Total arable area	14,200,000 hectares
Total cultivated area	12,170,000 hectares
Total irrigated area (also see write-up of May 21, 1976 visit to NESDB)	1,920,000 hectares or approx. 15.8%
Total paddy area (figure given is for approximately same time as others, probably 1973; note Table III figures of 7,650,000 for 1974 and 8,519,000 for 1975 with conversion to hectares)	6,850,000 hectares or approx. 48% of arable area

Table IV. (continued)

Average paddy yield production (1.63 in 1974 and 1.65 in 1975 from Table III)	1.5 to 2.0 tons/hectare
Total population	37,800,000
Active population in agriculture (%)	70-76%
Number of farms	3,400,000
Average size of farms	3.6 hectares
Average size of paddy farms	3.5 hectares
Farms more than 4 hectares, % by number	28%
% by area	60%

References

Appendix C contains a somewhat selected list of references related to the project. Arrangement is in no particular order, due to the diversity of the collection. Other bibliographies of related references which can be reviewed for additional information are (1) Bibliography, Agricultural Engineering Department, IRRI; (2) Department of Agricultural Economics, Kasetsart University, List of Staff Papers, List of Research Reports, List of Technical Reports, and List of Reprints; (3) Research Publications and Thesis Projects, Asian Institute of Technology.

Second-Year Project Recommendations

In the first year after start-up of the project, it is expected that IRRI's industrial extension engineer, with continued in-country residence, will be heavily occupied in (1) completion of office, workshop, and staffing arrangements; (2) evaluation and initial implementation of design changes necessitated by local conditions and new design activity; (3) conduct of further technical assistance activities with initial and additional manufacturers; (4) some continued liaison with organizational contacts established during the initial start-up, including the indigenous consultants; and (5)

language study and related matters. The situation at the start of the second year should be one of expanded manufacture (with associated sales) in terms of production volume, a larger number of manufacturers, and diversification of products produced, including the thresher and dryer, particularly, in addition to the initial activity in power tiller manufacture. There will be additional demand; additional manufacturers to work with; indigenous consultants with some experience on the project; additional awareness of the project by government officials, organizations, related bilateral and multilateral projects; etc.

Accordingly, the project recommendations for the second year are as follows:

1. Continue business management assistance to firms engaged in manufacture of IRRI-type machines, including production methods, quality control, financial evaluation and control, promotion and marketing servicing to facilitate expansion of production capacities and marketing activities.
2. Expand liaison with government departments, organizations, agencies, bilateral and multilateral projects, and institutions throughout the country to inform and promote the availability and use of IRRI-type machinery. Concurrently, survey demand for other types of machinery for feedback to feasibility evaluation and design activity.
3. Survey existing system of farm machinery dealerships and farmer cooperatives to develop liaison between manufacturers and dealers or cooperatives to promote the distribution and sales of machinery units.

4. Survey financial institutions in conjunction with dealers, manufacturers, cooperatives and farmers to establish credit requirements for each, the margin structure and provisions for meeting the credit requirements, adjusting margins, etc.
5. Develop a network of farm machinery exhibitions for demonstration, promotion, education, design improvement feedback, and possible sale of IRRI-type farm machinery for greater national coverage.
6. Assist in identification of need for and location of manufacturer for specific IRRI-type farm machines, with emphasis on rural areas of the country.
7. Assist in defining and developing the necessary contacts at policy-level government and institutional positions for enacting measures for greater utilization of IRRI machinery developments in meeting the country's goals for food production, industrial development, and labor utilization.

APPENDICES

APPENDIX A

SUMMARY OUTLINE OF PROJECT ACTIVITY SCHEDULE LISTING SIGNIFICANT ITEMS

Feb. 2-6	Initial briefing at IRRI, Los Banos. Review and copying of IRRI files on Thailand.
Feb. 9-20	IRRI Engineering Training Course including visits to manufacturers on Feb. 18.
Feb. 23-24	Central Bank of the Philippines, Department of Rural Banks; Asian Development Bank; Development Bank of the Philippines; National Grains Authority; UNDP/UNIDO; Board of Investment; Land Bank of the Philippines; Department of Industry.
Feb. 25	C & B Crafts, Cruz-na-Daan, San Rafael, Bulacan.
Mar. 1	Rural Bank of Los Banos.
Mar. 2	Rice farmer, Gaudencio Almario, San Antonio, Pila, Laguna.
Mar. 4	Travel from Manila to Bangkok.
Mar. 5	Thai Department of Agriculture and Agricultural Engineering Division; Rockefeller Foundation; Kasetsart University, Agricultural Economics Dept., Agribusiness Management Program.
Mar. 6	Winner Machinery Co. and Chai Dee Karnchang Co., Chachoengsao; Kaset Thai Co., Chonburi.
Mar. 8	Anglo-Thai Motors (Ford tractor dealer).
Mar. 10	Department of Industrial Promotion, Ministry of Industry; Department of Agriculture and Agricultural Engineering Division.
Mar. 12	Praset Karnchang Co. and Lert Chai Co., Praputabart, Saraburi; Ouppagon Co., Pitsenuloke.
Mar. 13	Seimlung Shop, Pitsanuloke (farm machinery dealer); Anusarn Co., Chieng Mai.
Mar. 15	Industrial Service Institute (ISI) Department of Industrial Promotion, Ministry of Industry; Northern Region Agricultural Development Centre (NADC), UNDP/FAO/UNIDO project with Ministry of Agriculture; Crop Replacement and Community Development, UNFDAC; Anusarn Co.; Ford Foundation Multiple Cropping Project, Faculty of Agriculture, Chieng Mai University; all in Chieng Mai.

Mar. 16	Maesa Integrated Watershed and Forest Land Use Project, UNDP/FAO; Maejo Field Crops Agricultural Experiment Station, Dept. of Agriculture; Chieng Mai Watchara Partnership Ltd. (farm machinery dealer); Chiengmai Food Complex, Thai-Israeli joint venture; all in Chieng Mai Province.
Mar. 17	Anantapun Shop (farm machinery dealer), ISI, Asia Karnchang Co., Chieng Mai Provincial Agricultural Extension Office, all in Chieng Mai; Thai-Australia Land Development Project, Hang Chat, Lampang.
Mar. 18	Lim Chin Seng, Kietpanit Co., Nakorn Sawan Tractor Co., Tatsanayum Co., Pratom Yon (farm machinery dealer), Nakornsawan Yontarakarn Co., all of Nakorn Sawan; Fushiose Seng (farm machinery dealer), Chaithong Motor Co., of Chainat; Seng Lee Karnkaset Co., Wonchai Tractor Co., of Singhburi Province.
Mar. 22	Siam City Cement Company, Asian Institute of Technology (AIT), Division of Community and Regional Development, Agricultural Systems Engineering; UNDP and UNIDO.
Mar. 23	International Engineering Co., Caterpillar Division.
Mar. 25	AIT; Klong Luong Rice Experiment Station and Farm Machinery Training Centre, Division of Agricultural Engineering, Dept. of Agriculture.
Mar. 26	UNDP, UNIDO, ESCAP Regional Centre for Agricultural Machinery Project (RCAM).
Mar. 30	Staff Meeting--Agricultural Engineering Division, Department of Agriculture, Ministry of Agriculture and Cooperatives (MOAC).
Apr. 7	J. Charoenchai Co., Ayudhoya.
Apr. 9	Presentation on the "Thai-IRRI Industrial Extension Project on Small-Scale Farm Machinery" to the Bangkok South Rotary Club; International Bank for Reconstruction and Development (IBRD).
Apr. 11	Initial visit to Padunwit Industrial Co. rice mill in Chachoengsao Province.
Apr. 12	ESCAP, RCAM; UNDP/FAO Regional Office for Asia and the Far East.
Apr. 14	Thonburi Rotary Club; FAO/ESCAP.
Apr. 15	Presentation on the "Thai-IRRI Industrial Extension Project on Small-Scale Farm Machinery" to the Bangkok (Central) Rotary Club.
Apr. 16	Initial meeting with Marketing Organization for Farmers (MOF), Ministry of Agriculture and Padunwit Industrial Co.

Apr. 19	Kasetsart University, Agribusiness Management Group; FAO/ESCAP.
Apr. 20	Allied Newspapers Ltd., Bangkok World.
Apr. 21	Commercial Credit Corporation (Thailand) Ltd.; Kaset Thai Ltd. Partnership, Phanat Nikom, Cholburi Province.
Apr. 23	Agricultural Economics Division, MOAC.
Apr. 28	Marketing Organization for Farmers, MOAC.
Apr. 29	Association of Thai Industries; Dr. Francis Bell of IBRD.
Apr. 30	Agribusiness Management Group, Kasetsart University.
May 3	United Motor Works (Siam) Ltd. (Briggs & Stratton engine dealer).
May 4	Agribusiness Management Group, Kasetsart University.
May 6	Padunwit Industrial Co. rice mill, Chachoengsao Province.
May 7	Thailand Management Association.
May 8	Initial rice thresher demonstration, Padunwit Industrial Co. rice mill, Chachoengasao Province.
May 11	Department of Land Development, MOAC.
May 14	Asian Institute of Technology.
May 20	Thailand Management Association seminar.
May 21	Agriculture Branch Economic Project Division, Office of the National Economic and Social Development Board; Presentation on Thai-IRRI-AID Project to Agricultural Engineering Division, MOAC.
May 22	Padunwit Industrial Co. rice mill, Chachoengasao Province (third thresher demonstration).
May 24	Division of Agricultural Economics, MOAC; Kasetsart University, Agribusiness Management Group; Statistics Section, Rice Department, MOAC.
May 25	Travel from Bangkok to Manila (Quezon City).
May 26	Meeting with John McMennamy, Agricultural Engineering Dept., IRRI, while attending the Georgia Tech/AID Conference on Adaptive Technology and Small Industry Development, UP-ISSI.

APPENDIX B

INDIVIDUAL WRITE-UPS FOR DETAILS ON SPECIFIC VISITS

Monday, February 23, 1976 visits by Ken Stephens to:

Central Bank of the Philippines (CB)

Discussions were with Mr. Mariano E. Gimenez, an assistant director with CB, and centered primarily on the CB-IBRD Rural Credit Project. Obtained from the visit were (1) 1974 Annual Report, (2) copy of loan agreement (third project-loan number 1010 PH) between IBRD & CB, (3) Rules and Regulations No. 3, (4) policies and guidelines in the implementation of the third CB-IBRD rural credit project, (5) supplemental implementing guidelines and (6) a copy of Letter of Instructions No. 372 (by President Marcos dealing with methods of collecting on the loans and penalties thereof). Additional papers on this topic are as follows: (1) two papers from the seminar on economics of rice production in the Philippines, IRRI, December 11-13, 1969, "The AGLF Credit Program" by Dominador A. Clemente, Jr. and "The CB-IBRD Credit Program" by Eugenio P. Labrido, (2) "Farm Mechanization in the Philippines and the IBRD Loan Program" by Ida Estioko, seminar on farm mechanization in Southeast Asia, Penang and Alor Star, Malaysia, November 27-December 2, 1972, (3) "Comments and Recommendations" by Glen Browne and John Brake, ad hoc committee on agricultural credit, Department of Agriculture and Natural Resources, USAID/Philippines, August 1972, (4) "Evaluation of the CB-IBRD Agricultural Credit Program in the Philippines" by Fred King, Operations Evaluation Department, World Bank, November 11, 1974, and (5) 1975 annual report, Agricultural Machinery Distributors Association of the Philippines (contains a summary of the first three CB-IBRD programs).

Collectively, these references give a great deal of information on the program and will serve as guidelines for comparative study and possible influence on similar programs in Thailand.

Asian Development Bank (ADB)

This visit was added to my schedule through discussion with Mr. Gimenez of CB with respect to credit systems in Thailand. He set up an appointment with Dr. Sam C. Hsieh, director, Projects Department I. Dr. Hsieh emphasized unsuccessful attempts over the past 5-6 years to establish ADB-assisted financial credit programs in Thailand. He stressed the lack of financial viability of farmers--especially those producing only one crop per year with no fertilizer, no herbicides or insecticides, getting from 1 to 1.5 tons per hectare yield. (Three and four tons per hectare per crop are common under IRRI programs--with double or multiple cropping in a year possible.)

In later discussions with Min Fajardo and Leon Chico of UP-ISSI concerning ADB activities in the Philippines and in Asia, they opined that ADB had extremely conservative policies which limited their activities seriously. So we have an interesting comparison of the fairly liberal policies of the Philippine banks (with and without IBRD cooperation) possibly with some serious collection problems vs. the conservative policies of ADB with limited implementation, at least for grass roots activities.

Dr. Hsieh suggested that I have discussions with Dr. Thalerng, deputy undersecretary of agriculture in Thailand. He is a relatively new appointee and may give more cooperation than his predecessor with whom ADB has been dealing.

The following items were obtained from the visit to ADB for further study and reference: (1) annual report for 1974, (2) basic information brochure on ADB, (3) January 1976 ADB quarterly review, and (4) paper on feasibility of using windmills in rural areas.

Development Bank of the Philippines (DBP)

Discussions were held with Mr. Verden Dangilan of the Agricultural Projects Division and served to emphasize the many-faceted financial credit programs in the Philippines via institutions of the government, especially. Items obtained from the visit are (1) annual report 1974/75 and (2) 44-page brochure on DBP's agricultural financing plans. DBP processes some 150 feasibility studies per month, with approximately 2% rejected by the banks.

National Grains Authority (NGA)

Added this visit to my schedule upon hearing from some of the manufacturers visited that they were producing IRRI-type threshers and dryers on direct order from NGA. Was able to obtain an appointment with the administrator, Jesus (Jess) Tanchanco, having met him last year during the US-NBS survey of Philippine standards. NGA is promoting the use of threshers and dryers, in particular, for post-harvest processing of palay to reduce losses and improve the quality of rice grain. They have budgeted procurement and rental or even loan of the machinery as a mechanism for introducing this type of processing to farmers. In recent bidding, IMAG was successful in winning the bid to produce threshers for NGA.

Mr. Tanchanco agreed to ask Mr. Frank Tua of their other office to mail information on NGA's program to me at IRRI. Learned that they are members of the board of the National Food and Agricultural Council (NFAC), which was set up to administer and promote the "Masagana 99" program (a rice production program to increase rice yields in the Philippines--"masagana" meaning "plentiful" and the "99" indicating 99 cavans per hectare) and the "Masaganang Maisan" program (a similar program for corn production). Also learned about the establishment last year of the Farm System Development Corporation, a

joint project of the Philippine government and AID. Understand that this is tied in with NEA in connection with the use of rural electricity. The primary emphasis is on irrigation, to be followed by mechanization promotion and support. A Mr. Leatham of AID is heading up this project, with offices located in the Villaflor building, corner of Banaue and Atok streets in Quezon City. A Teddy Ray is also associated with the program, but his role was not clear.

Tuesday, February 24, 1976 visits by Ken Stephens to:

UNDP/UNIDO

In Herman DeNie's absence (he is UNIDO field representative for this region and was visiting the Fiji Islands), I met with T. L. De Jonghe D'Ardoye, DeNie's assistant. Discussed UNIDO programs in the Philippines, strongly centered in Metals Industry Research and Development Corporation (MIRDC) under NSDB. Tried to get a copy of the three-volume set of papers on the "expert group meeting on the design and manufacture of wetland (rice) mechanization, harvesting and threshing machinery in developing countries of Asia and the far east region" jointly sponsored by IRRI and UNIDO and held at IRRI on March 12-17, 1973. No copy was available, but one was to be mailed to me at IRRI if located. This was not received, and additional follow-up is needed to obtain a copy for the Georgia Tech International Data Center and the IRRI office in Thailand.

Board of Investment (BOI)

Met with Agapito L. Kalingking, Jr., chief analyst with the Metal and Mining Industries Department. Discussed the incentives and promotional privileges afforded manufacturers under the Investment Priority Plan (IPP). Obtained a copy of BOI's folder on "Invest in the Philippines," containing several brochures on their program, including one describing the "Medium and Small Scale Industries Coordinated Action Program" (MASICAP) and "Investment Opportunities in the Philippines." Also obtained working forms used with industries to evaluate proposed projects.

At present four-wheel tractors are considered as an overcrowded industry and designated so by BOI. Though not designated as such officially, it was BOI's opinion that power tillers had already reached the threshold of being declared as overcrowded. Projects of agricultural machinery still receiving promotional privileges include: palay threshers, disc plows, harrows and rototillers, grain dryers and grain storage silos.

Land Bank of the Philippines (LBP)

Met with Mr. Pablito M. Villegas, farmer's assistance office. LBP is the financial arm of the agrarian reform program and as such, finances the

purchase of land by farmers from the larger landholders. They also provide full banking services, including loans for agricultural machinery. It was LBP that was designated to set up a special emergency program for financing the purchase of power tillers during the hoof and mouth disease epidemic among the carabaos last year.

Under this program LBP purchased 2763 power tillers from AMDA (representing the manufacturers) and financed their purchase by farmers in infected regions. More detailed information on this program was obtained for study and possible use in Thailand.

Department of Industry (DOI)

In follow-up of a visit to IRRI on February 19 by a group from the Department of Industry, headed by Joe Pernia representing their program of Medium and Small Scale Industry Coordinated Action Program (MASICAP), an appointment was set up with Thelma Dua who visited Georgia Tech last year. She briefly described her letter to Ross Hammond and indicated a great interest in receiving a reply on possible programs of small industry assistance with Georgia Tech. She indicated direct communication with Vicente Paterno, secretary of DOI and jointly chairman of BOI. If at all possible, programs with DOI, coordinated through UP-ISSI, could prove very successful since DOI has a great deal of influence (via Paterno) with President Marcos and the Philippine government. Thelma and Joe Pernia agreed to collect a number of examples of feasibility studies compiled under MASICAP. We returned to DOI on Wednesday afternoon, February 25, from the visit to C & B Crafts in Bulacan to pick up materials prepared by DOI. These include the following: (1) a project feasibility study on farm implements, Dao, Acuna Village Subdivision, Pagadian City, which covers power tillers of the IRRI type design, (2) the feasibility of establishing a pharmaceutical laboratory in Teresa, Rizal, (3) project feasibility study on Cramton Garments, Inc., and (4) data sheets and case studies used in national training programs by MASICAP. Some of this material will be useful on the current project and all of it should be useful in EDL's project evaluation and analysis seminar.

Wednesday, February 25, 1976 visit by Phil Hess; S. H. Mahmud, an agricultural engineering IRRI fellow from Pakistan; Nas Manalilis, an IRRI engineer, and Ken Stephens to:

C & B Crafts, Cruz-na-Daan, San Rafael, Bulacan
Host: Mr. Bonifario R. Isidro, proprietor

The following narrative-type write-up was prepared on this visit to reflect the development and progress of this company and its entrepreneur-owner:

"If my thresher sells like my pump has, I will become a millionaire, and that is my hope," says Bonifacio R. Isidro, owner and manager of C & B Crafts and a director of both the Filipino Inventors Society and the Philippine Inventions Marketing Corporation. Mr. Isidro, a former accountant, has used his love of machinery and his inventor's mind to expand his one-man pump making business into a rice thresher, cultivator, rice dryer, and pump business that now employs 22 people, is providing the owner a good profit, and has bright prospects for the future.

"I worked as an accountant for seven years, but even during that time I was hanging around machinery shops," Mr. Isidro recalls. "I guess I am just inclined towards machinery." This inclination, plus the introduction of electricity in Mr. Isidro's home town of San Rafael, helped start him into a new business. "I had gotten tired of pumping my own water, so I designed a cylinder-type pump that could use a ½ horsepower motor but could also be operated by hand in case the electricity was interrupted."

In 1964, Mr. Isidro built his first pump mainly of wood and installed it in his home. Mr. Isidro recalls, "My brother-in-law saw my pump, admired it, and had me make two pumps for him. He gave one to a relative, and soon by word-of-mouth people heard of my pumps. I soon had many orders."

Mr. Isidro later designed and built an all metal pump, but he did not limit himself to one product. When a large farmer who had bought three of Mr. Isidro's pumps complained that his thresher would not work during the rainy season, Mr. Isidro started to work on a thresher design. In 1967, Mr. Isidro completed his design for a hold-on type thresher, which he named the C & B Thresher. While the capacity was low for most purposes, Mr. Isidro was able to sell over 50 of the C & B Threshers over a number of years. Of these, he was able to sell 30 to the government. Mr. Isidro says that the best use of the C & B Thresher is for seed rice and that it is still the cheapest thresher on the market.

The C & B Thresher also won second prize for Mr. Isidro in the 1970 Philippine Inventors Week. This was not Mr. Isidro's only invention. He has received eight patents and has continued winning awards during the Inventors Week. In 1973, Mr. Isidro won two third prizes, one in the mechanical group for a cylinder pump and one in the agricultural group for an animal-drawn cultivator.

In trying to sell his C & B Thresher, Mr. Isidro found that the farmers wanted a throw-in type thresher, not a hold-on type. In 1973, he heard that a thresher designed by the International Rice Research Institute (IRRI) was being demonstrated locally. He went to see the axial flow throw-in thresher being operated and liked what he saw. He requested the free thresher plans from IRRI and built his first machine. An IRRI representative borrowed Mr. Isidro's machine, used it, returned it, and then ordered two of them.

Mr. Isidro's first sales to people other than the International Rice Research Institute occurred when some gentlemen came in to Mr. Isidro's shop to look at his C & B Thresher. When they saw the IRRI-designed thresher, they asked for a demonstration. After the gentlemen left, Mr. Isidro had an order for two of the IRRI-designed threshers.

While the IRRI thresher design was considered excellent by many manufacturers and users, Mr. Isidro could not help from changing the design to make, in his own mind, a better machine. He added an extra grain cleaner to produce cleaner rice. He added booms so that the machine could be pulled by a carabao (water buffalo). He added a generator so that the machine could be lighted for night work. He added pneumatic tires, leaf springs, and shock absorbers. He strengthened the machine in many places. He also added some refinements for better threshing under varying crop conditions that he wishes to remain secret. "If you want to know, you will just have to buy one of my machines," Mr. Isidro says with a laugh. Mr. Isidro's philosophy on improving a machine is, "If you can't add something that makes it better, don't make it; you won't make a cent."

Mr. Isidro also has a special interest in the durability of his machines; he owns seven of them himself. He started his own custom threshing business in 1975, using, of course, his own machines. "Why should I sell my threshers, when I can make more money by keeping them and doing custom threshing?" asks Mr. Isidro.

Mr. Isidro has not decided to stop selling his threshers, though, because he has 20 threshers in process at his shop. Since he has sold a total of 37 threshers since he started making the IRRI design, these in-process threshers indicate a large increase in production. Mr. Isidro has also decided to stop tinkering with the thresher and has decided on a design. "When I first started working on the IRRI-designed thresher, I thought it would take me three years to perfect it, but it has only taken me two," boasts Mr. Isidro.

Of the thirty IRRI-designed threshers he has sold, Mr. Isidro has found that he sold all of them to contract threshers like himself and not to farmers. Farmers would not be able to afford the P15,800 selling price, but custom threshers find that they can make money with the machine.

"I treat my customers well, because I know a satisfied customer will talk to his friends and will demonstrate my product for me," says Mr. Isidro. "I have recalled and improved, at my expense, many of the threshers I have sold. I want my customers happy."

Sales promotion for Mr. Isidro's threshers does not seem to be a problem. He says, "I will start building a number of threshers without one order, and before I am finished with them, people will have come in and bought them. I don't use any dealers for they would only reduce my profit. I did advertise in the newspaper once. It cost me P675 and I sold four machines. That is better than paying a dealer a large percentage of the selling price. I plan to advertise in the newspaper again."

Production techniques in Mr. Isidro's shop are very labor intensive and most of the shop equipment is self-made. Mr. Isidro has had very little luck with the major equipment he has bought. "I bought a box bender; it was no good so I sent it back. I bought a sheet metal cutter and I had to send it back. I purchased a lathe, but I'm not completely satisfied with it." He does own some hand drills and welding equipment, but if he needs special equipment, he usually makes it himself. Mr. Isidro does subcontract some of his work, but only to one farmer. "I don't want everyone to know about my improvements before I finish the machine," says Mr. Isidro.

Mr. Isidro keeps his labor costs low by hiring only unskilled labor and says, "I would rather train them myself, in my way." Mr. Isidro's family is also involved in the business. His son is now a supervisor in the shop and his wife cooks for the employees. These responsibilities have certainly grown, for the number of employees has increased from five to twenty-two in the time since Mr. Isidro first started producing the IRRI-designed thresher.

Mr. Isidro doesn't seem to use much of his accounting background now as he says he doesn't have (or perhaps he doesn't want to admit to) a formal accounting system to determine production costs. He says he does have an idea of what his production costs are, but that his accounting background helped him in a much different way. "When I was an accountant, I worked with many Chinese businessmen. From them I learned how to bargain effectively for the things I must buy for my business. This has helped me a great deal in keeping my costs as low as possible."

The financing of Mr. Isidro's business has taken the same course that many small businesses experience. When the business was small, no one wanted to loan money to Mr. Isidro. Now that he is larger and growing, many people want to provide loans, but Mr. Isidro has decided that he will expand with only his own resources. This has slowed Mr. Isidro's expansion plans, but he is proud to say, "I started my pump business with less than P1000 and started building those pumps under a tree. I put most of the money I earned back into the business, and now I have a good size shop which employs many people. And I owe no one."

He has been successful enough that another manufacturer of IRRI-type threshers has offered to build a large plant and have Mr. Isidro manage it. However, Mr. Isidro turned down the offer because "They would not let me put the name of my company on the machines. It would be their company, not mine. I want to have my own company."

Mr. Isidro also has plans for the future. He has designed a less complicated version of the IRRI-designed thresher so that he can compete with other manufacturers of threshers. He has also started producing and selling rice drying equipment.

Even with these other products, Mr. Isidro says, "I want to be known throughout the Philippines for my threshers, and I plan to concentrate on them." He also has confidence in his ability to meet the problems of the

future, "Come back in three years. If things work out the way I plan, perhaps I will have a new, big, beautiful house." While he may not reach his goal of becoming a millionaire, Mr. Isidro appears well on his way to becoming a successful and prosperous businessman. In the process, Mr. Isidro is providing employment to many people and is making a product useful to an increasingly important sector of the Philippine economy.

Monday, March 1, 1976 visit by Phil Hess and Ken Stephens to:

Rural Bank of Los Banos
Host: Mr. Caranto

There are some 778 rural banks--mostly privately owned family corporations. The Rural Bank of Los Banos is a stock bank with no stockholder owning more than 11%. It participates in the CB-IBRD program, but the unavailability of a supervising agriculturist is a serious bottleneck.

They have financed a total of 42 power tillers at an average cost of P9,000, using their own funds (not through the CB-IBRD program). Most were of the Honda or Hakoret imported type. Two loans under CB-IBRD were made for a four-wheel tractor and truck. Some seven loans were made for deep well irrigation pumps from their own funds.

Loans are based on the concept of "supervised credit" involving no collateral for what is called a class "A" farmer, based on a three-year agricultural record. A minimum of 2.5 hectares of irrigated land is required. Loans are for three years normally, payable on every harvest (every six months) at 12% per annum on the unpaid balance. They require that a technician (SEARCA or other government official) prepare a feasibility study. Technicians of good performance receive an allowance and often become agents for farm inputs. (Their salary is often as low as P360 per month from their home organization.) The bank requires that the farmer gets no less than 15% discount from the dealer or manufacturer. This is often used to purchase machine implements, i.e., plows, harrows, etc.

If the farmer is a beneficiary of land reform, he is charged P150 or 2%, whichever is larger. If farmer is not a beneficiary, the charge is 3% directly. Production loans have a ceiling of P1,600/ha. under Masagana 99%. The seventh phase of the Masagana 99 (six-month season) requires P30-50 per hectare for rodent control and P90 per hectare for certified seed. Seed price is P90/cavan. There is a Seed Growers Association of Los Banos and the Bureau of Plant Industry (BPI) has seed control inspectors.

The bank has some 12,000 depositors with assets of P17 million. Normal savings pay interest of 7.5% per annum; 730-day certificates pay interest of 12.5% per annum. A presidential decree requires that 25% of loanable funds be used for agricultural loans. A procedure by the Central Bank permits Central Bank Certificates of Indebtedness (CBCI's) as investments by commercial banks. Proceeds are used by rural banks for discounting purposes; commercial banks get 14% return.

Banks have regular monthly meetings involving provincial program officers (PPO).

Harvesting and threshing operator normally gets 1/6 th of threshed palay.

The Rural Bank of Los Banos is willing to finance dryers in addition to power tillers, threshers, irrigation equipment and production loans.

Several forms were obtained that are used for processing loans. A visit to a model farmer, Mr. Gaudencia Almario, was arranged.

Tuesday, March 2, 1976 visit by Phil Hess and Ken Stephens, accompanied by Mr. Caranto of the Rural Bank of Los Banos, to home and field of rice farmer:

Mr. Gaudencio Q. Almario, San Antonio, Pila and Victoria, Laguna

Mr. Almario leases 5.6 hectares of land in Victoria, Laguna and is more of a farm manager than just a farmer. He hires labor for all farm operations, including land preparation, weeding, harvesting and threshing. He appears to be a very progressive farmer, as he knows all the new technology and uses it. He also has some close contacts at UPLB.

Mr. Almario has been getting some very impressive yields and received the "citation for best farmer" on November 16, 1974 at the 25th anniversary celebration of the municipality of Victoria. He has attended the hand tractor operation and maintenance course conducted by SEARCA on January 26, 1974. He also participated in the farm safety symposium on August 29, 1974.

Each production season the bank extends a loan of approximately P10,000 to Mr. Almario, who has an excellent record of repayment. He bought a 12 hp Kubota irrigation pump in 1972 and attributes his large increases in yields to the irrigation provided by the pump. He also bought a Landmaster power tiller from England seven years ago and is very happy with it. He has had to have the engine overhauled and the chain and most of the bearing replaced. He claims the power tiller is cheaper for land preparation than hiring carabao teams (carabao and driver).

The following information on farming practices was obtained: Land preparation--a thorough plowing by hand tractor; Seedbed preparation--dapog about 1.5 meters wide by 3 to 4 cm high is prepared about seven days after field is plowed; Sowing--ten cavans seed is used for the 5.6 ha. and is sowed after soaking for 24 hours and incubated for an additional 48 hours; Transplanting--12-day-old seedlings are planted 23 x 23 cm at 4-5 seedlings per hill and 1-2 cm deep; Fertilizer--three applications are made, 4-6 days and 20 days after transplanting and just before formation of the panicle at a rate of 5 bags per hectare (50 kg bags of urea fertilizer @ P90 per bag in 1976 for P2700 cost for 30 bags); Insect control--use of recommended insecticide sprayed once a week (25 kg bags of Furadon @ P75 per bag in 1976

for P750 cost for 10 bags); Weed control--use of herbicide (one application), continuous flooding, rotary weeding (twice), and hand weeding as needed; Irrigation--continuous submergence.

He has rejected the idea of buying a rice thresher at the present time because "the people that do his harvesting and threshing are very poor and he wouldn't want to put them out of work." The following is a tabulation of his yield and cost data for the last five years.

RECORDS OF GAUDENCIO ALMARIO, SAN ANTONIO, PILA, LAGUNA, PHILIPPINES
Location of Farm: Victoria, Laguna
Area of Farm: 5.6 Hectares (leased)

	SEASON[1]	1971	1972	1973	1974	1975
Type of Irrigation		Gravity	Own Pump	Own Pump	Own Pump	Own Pump
Variety	Wet	IR-8	C4-636	IR-1561	IR-1561	IR-26
	Dry	IR-8	C4-636	C4-137	IR-26	IR-1514 IR-26
Yield (cavans)	Wet	410	408	672	677	730
	Dry	430	446	771	711	804
Yield Less LR, H & T (Cav.)[2]	Wet	231	230	441	445	487
	Dry	247	260	520	472	547
Aug. Yield (cav./ha.)	Wet	73	73	120	121	130
	Dry	76	79	137	126	143
Selling Price (P/cav.)	Wet	33	33	50	45	50
	Dry	25	25	35	48	49
Production Value (P x 1000)	Wet	13.43	13.46	33.60	30.47	36.50
	Dry	10.75	11.15	26.99	34.13	39.40
Production Expenses (P x 1000)[3]	Wet	3.50	3.54	4.48	6.00	7.00
	Dry	2.90	3.00	3.24	6.70	6.10
Land Rent @ 97 cav. per Season (P)	Wet	3201	3201	4850	4365	4850
	Dry	2425	2425	3395	4656	4753
Harvesting & Threshing Expense--20% of Harvest	Wet (cav)	82	81	134	135	146
	Wet (P)	2706	2673	6700	6075	7300
	Dry (cav)	86	89	154	142	160
	Dry (P)	2150	2215	5390	6816	7840
Total Expenses	Wet	9407	9414	16,030	16,440	19,150
	Dry	7475	7640	12,029	18,172	18,695
Net Income[4]	Wet	4023	4050	17,570	14,025	17,350
	Dry	3775	3510	14,956	15,956	20,701

1/ Wet Season: Planting--December & January; Harvesting--March & April
Dry Season: Planting--May & June; Harvesting--September & October
2/ LR--Land Rent; H & T--Harvesting and Threshing
3/ Does not include expenses for hauling and gasoline for pump
4/ Home consumption of rice is between 40 and 50 cavans per season

Friday, March 5, 1976 visit by Stewart Barton, John McMennamy and Ken Stephens:

Upon arrival in Bangkok, we visited the Agricultural Engineering Division of the Department of Agriculture and met with Samnao Rugtrakul, chief; Chak Chakkaphak, senior agricultural officer; and Suwit Bunyawanichkul, agricultural engineer. A further meeting was arranged with Dr. Prakob Karnjanasoon, director-general of the Department of Agriculture, attended by Samnao, Chakkaphak, Dr. Ben Jackson (IRRI representative in Thailand, plant breeder and director of the Thai-IRRI deep water rice project), Barton, McMennamy and myself. Discussions brought out (1) use of Kasetsart radio for possible promotion and advertising of the IRRI-type farm machinery, (2) suggestion to visit the Agricultural Economic Division of the Ministry-Office of the Undersecretary, the Rice Division (Dr. Damkarn) on the cropping system program and the Technical Division (Mr. Kluen) on cost of production, and (3) suggestion to visit the group handling the government-supported price on rice.

Met with Dr. Delane Welsch, agricultural economist with the Rockefeller Foundation and visiting professor at Kasetsart and Thammasart Universities. Introduced to members of the Department of Agricultural Economics, Agrobusiness Management Program, Kasetsart University (790113 X 353), viz., Mrs. Sriaroon Resanond, Montri Jeerakiet, Mrs. Preyanuch, Somkid and Vinich. The possibility was pursued that a member or members of this group may be able to assist with the marketing, liaison and business management program at the IRRI industrial extension work--possibly under contract with the Georgia Tech portion of the project for continuity of this work beyond the initial assignment.

Met and held project-related discussions with Dr. William R. Young, director of the Rockefeller Foundation in Thailand, and Steve Katz, administrative assistant.

Saturday, March 6, 1976 visits by Stewart Barton, Suwit Bunyawanichkul, John McMennamy and Ken Stephens to:

Manufacturers in the Chachoengsao and Chonburi Area

Toured the Winner Machinery Company in Chachoengsao, where small two-cycle engines are made, ranging in horsepower from 7 to 25. Most applications are for klong (canal) boats, but the experience and machine tools represent a potential source of indigenous engines for small farm machinery. Discussions were with Mr. Praprut Sornsuvana, plant manager. Looked briefly at the Chai Dee Karnchang Company in Chachoengsao, manufacturing the Thai-designed power tiller. Proceeded to Chonburi where we visited the Kaset Thai Company Ltd., 27 Intra-Asa Road, Panasnikom District, Chonburi, meeting with Mr. Charray Borriboon, owner and manager. Mr. Charray has had much previous contact with IRRI and has made and sold five axial flow threshers with the rotary screen at a price of ฿17,000 ($840) without engine. He is now working on the modified IRRI design with the oscillating screen for

which some suggestions for improvements were discussed. He expects to be able to sell this for around ฿15,000 ($740) without engine. He makes direct sales to farmers and holds some farmer demonstrations but generally lacks a marketing program. An agricultural cooperative has made offer for dealership (Mr. Boonsom), but this has not been pursued. Further work is needed to promote and encourage this company.

Monday, March 8, 1976 visit by Stewart Barton, Chak Chakkaphak, and Ken Stephens to:

Anglo-Thai Motors Ltd. (Dealership for Ford Tractors Equipment)
Thai Motors Industries Ltd.
P. O. Box 33, Bangkok, Thailand
Tel: 791284-5, 790340
Host: Mr. Chamnong Sukontraswadi, Director of Tractor Operation

An initial suggestion to make this visit was by Bert Uichanco of the Ford dealership in Manila and president of the Agricultural Machinery Distributors Association (AMDA) in the Philippines. Mr. Uichanco thought that a similar association had been formed in Thailand with Mr. Chamnong as president. This is not the case, however. Some informal discussions are held between distributors (and some manufacturers), but due to the competitive situation, there is very little sharing of information.

A twelve-year summary of Ford tractor sales of the 5000 model (77 hp) was received. This shows a total of 10,765 tractors of this model sold between 1964 and 1975. Applications are for sugarcane, tapioca, corn, beans, rice, etc. Sales are seasonal with light sales over May to September and heavy sales over January to March. This model tractor sells for ฿265,000 ($13,120) new and some ฿200,000 reconditioned. A credit program is used to help promote sales, involving a ฿120,000 down payment with monthly payments on terms of 12, 16, 18, 24, or 30 months at approximately a 12.5% annual interest rate. A season payment program is also used with higher payments during harvesting months. (One program of ฿265,000 for 12 months with down payment of ฿120,000 and total payments of ฿288,000 was seen.) Action on payment failure is taken after three months to either refinance or repossess the tractor.

Fifty percent of sales are directly to farmers. Some 64 dealers and service centers are used. Some training of 10-14 days is provided for dealer's mechanics. Dealers' commissions are normally around 10%, with an approximate 50-50 share of profit between the dealers and the importer (Anglo-Thai). An approximate mark up of 18% on CIF price is used.

Three forms of imports are made: (1) built up units, 10% of supply with an import tax of 5.5% CIF price, (2) semi-knock down, 20% of supply with import tax of 5.5% and (3) complete knock down, 70% of supply with import tax of 3.3% of value of components. Semi-knock down and complete knock down units are assembled in the Ford factory using local tires (40% Goodyear, 60% Firestone, 7.5 x 16 and 15 x 30) and local batteries. Implements are locally made.

Another company (joint venture) imports secondhand tractors, mostly of 1965-69 models, for reconditioning and sale. An estimated 800-1000 units per year are sold.

An estimated 3500-3800 tractors of the 60-80 hp range are sold in Thailand annually. Ford is first in sales, with Massey-Ferguson second.

Some dealers of Japanese machinery are: Minsen Machinery--Kubota; Leouis T. Leonovens--Hinomoto; and Saha June--Yonmar.

Wednesday, March 10, 1976 visit by Stewart Barton, Chak Chakkaphak and Ken Stephens to:

Department of Industrial Promotion (DIP)
Ministry of Industry
Rama VI Road, Bangkok
Hosts: Dr. Prapart Chakkaphak, Deputy Director-General, DIP
Maru Leopairote, Chief Planning Division (Tel. 826164)

DOI's main emphasis is on small industry. Medium to large-scale industry promotion is by the Board of Investment (BOI) under the Office of Prime Minister. Besides the Planning Division and the Office of the Secretary, DOI has six major branches: (1) Industrial Service Institute (ISI-Bangkok and Chieng Mai), (2) Cottage Industries Division, (3) Thai Handicraft Promotion Division, (4) Textile Division, (5) Thailand Management Development and Productivity Centre (TMDPC), and (6) Small Industries Finance Office (SIFO).

Of major interest to the IRRI project are ISI and SIFO. ISI is currently under UN assistance with a UNIDO project, particularly centered in the Chieng Mai branch. Various industrial services are offered for promotion and assistance to small-scale industry. A brochure is available with copy in IRRI project file. A visit to ISI-Chieng Mai was confirmed during the meeting.

SIFO consists of four divisions: (1) administration, (2) screening and consulting, (3) loan processing, and (4) follow-up and evaluation. It was established in 1964 "to give long and medium-term loans of less than ฿500,000 to small-scale industries in the private sector at low rate of interest, aiming at the development of small industries by modernization of machinery, production equipment and factory buildings as well as rationalization of technology in order to increase productivity and profitability." (Loan ceiling raised to one million baht in 1972.) Loans are at 9% per annum with a three-year grace period followed by a 10-year payment period. It works through a government-owned commercial bank (Krung Thai) with 25% of funds from DIP and 75% from the bank. DIP conducts the feasibility studies and the bank handles collateral requirements.

A copy of the "Annual Report for Fiscal Year 1974" was obtained and will be kept in the IRRI project files for future reference. Several copies of a brochure on SIFO in Thai were obtained for possible reference to small-scale manufacturers under consultation.

Friday, March 12, 1976 visit by Stewart Barton, Suwit Bunyawanichkul and Ken Stephens to:

Prasert Karnchang Company
372 Saiku Road, Praputabart, Sarabuir
Yen Kerdchana, Owner-Manager

This company makes 3-disc plows and 7-disc harrows and rotovators for attachment to large tractors. They make three types of threshers, for sorghum @ ฿10,000, for soybeans @ ฿15,000 and for corn at ฿10,000 (prices without engine). Mr. Yen has designed the soybean thresher from one seen at Agricultural Engineering Division. It has a capacity of 1,000 kg/hr. These threshers use the PTO of a 35 hp tractor or can be operated with a 15 hp diesel engine. They are making and selling approximately 150 units per year of each of the sorghum and corn threshers and approximately 50-60 per year of the soybean thresher. There is an increasing trend in orders.

Sales are to north and northeast regions, where more land is being used for these crops. He sells to dealers and tractor agents (Nuffield, BMC, now Leyland). He visits dealers and gives a 10% commission, advertises in local yellow pages, and exhibited originally in fairs and provincial shows some 4-5 years ago with demonstrations. He feels he is well known by farmers and dealers and no longer uses the fairs and demonstrations. He builds units for stock to contemplate orders. Some farmers buy directly from him on a cash basis after they have finished harvesting a given crop.

Mr. Yen has borrowed from commercial banks at 12% per annum for factory machinery and working capital. He expects to make a hand-operated winnower for rice cleaning and will send the first prototype for testing to Agricultural Engineering Division.

Disc blades are imported from South Africa and McKay-Australia. Uses NTN bearings made in Thailand (NTN Toyo Bearing Company). Belts are made in Thailand. The shop consists of four machine lathes, two drill presses, grinder, electric saw, and arc welder.

We left pack of IRRI farm machinery folders and some interest was expressed in these units. Received a brochure (in small newspaper style) on his products in Thai with pictures of the various units.

Friday, March 12, 1976 visit by Stewart Barton, Suwit Bunyawanichkul and Ken Stephens to:

Lert Chai
244/1 Saiku Road, Praputabart, Saraburi
Mr. Lert Chai, Owner-Manager

An original design of the corn sheller and sorghum thresher won prize from General Sarit some 16 years ago for Lert Chai. Is now making approximately

100 corn shellers per year, and about 5-6 sorghum threshers per year. Corn sheller with tractor attachment sells for ฿12,000 and has a 9.6 tons/hr. capacity. A unit with engine attachment sells for ฿7,000 without engine and has a capacity of 4 tons/hr. He also makes the 3, 4, and 7-disc plows for large tractors at prices of ฿13,000, 15,000 and 11,000, respectively. He makes trailers to farmers' orders and does truck repair work in off season. Farmers buy directly from shop--no dealers are used.

Mr. Lert Chai was not available, but a pack of IRRI farm machinery folders was left for him.

Friday, March 12, 1976 visit by Stewart Barton, Suwit Bunyawanichkul and Ken Stephens to:

Ouppagon Company, Ltd.

4-4/1 Chaophraya Road, Pitsanuloke
Mr. Arune Pukprapi, Owner-Manager. Spoke with Narong Pukprapi, son of owner.

This company has made more than four axial flow threshers of the IRRI design--two were in yard in various states of disrepair. Another of Mr. Arune's sons is running for senator--threshers used to offer free threshing for farmers during campaigning. They feel that if perfected, it will sell and the farmers will consider it necessary for the higher output over that of using a tractor to run over the paddy for threshing. Ouppagon will consider making more units after the April 4 elections.

They have about 27 employees on an 8:00 a.m. to 5:30 p.m. day. There is a problem of turnover of employees.

Besides some manufacture (as the thresher), they repair heavy tractors. Equipment consists of AMC boring machine, precision grinding lathes. four machine lathes, shaper, three drill presses, and welding machines.

Saturday, March 13, 1976 visit by Stewart Barton, Suwit Bunyawanichkul and Ken Stephens to:

Seimlun Shop (Farm Machinery Dealer), Pitsanuloke

Interest was centered on two power tillers and one four wheel tractor displayed for sale. The following two companies were represented:

1. Chakkolpaisarn Company
   55/6 Soi Chusung, Bangkare, Tel: 672069

   a. Power tiller of Iron Buffalo type without steering clutches at a price of ฿4,000 without engine. A 5 hp Yanmar diesel engine was displayed with the power tiller.

b. A four-wheel tractor @ ฿18,000 without engine.

2. Numsengkarnchang Company
Bangkuntein. Tel: 681205
Power tiller with steering clutches @ ฿7,500 without engine but with plow recommended for use with a 6 hp diesel engine.

Saturday, March 13, 1976 and Monday, March 15, 1976 visits by Stewart Barton, Suwit Bunyawanishkul, Pairoje Phongsupasanit and Ken Stephens to:

Anusarn Company, Ltd.
94-120 Charoen Road
Chieng Mai Tel: 236137, 235688
Hosts: Mr. Santi Boonyakunakasaem
Mr. Ruang Nimmanshaeminda, Owner-Managing Director

We paid an earlier visit to this company on Saturday, March 13, 1976 upon arrival in Chieng Mai from Pitsanuloke. At that time we spoke briefly with Mr. Santi and visited Mr. Ruang at his garden home, where he was using the spiral plow to loosen silt at his river front in an effort to wash it downstream. This served as a demonstration and test of his spiral plow, which Mr. Ruang thinks will be very useful in the central plain area for paddy field preparation. He would like to promote the spiral plow but is interested in first devising a low-cost, efficient method of producing it in the large quantities (initially several hundred) that he feels will be necessary upon adequate demonstration to the farmers. Mr. Barton will look into the matter of volume production of the spiral plow for advising Mr. Ruang.

The subject of farmers' preference for long straw to be used for off-season (rice) vegetable and tobacco crops was brought up in connection with the IRRI thresher, since the thresher will cut the straw during threshing. Harvesting and threshing of rice also appears to be an important occupation which many workers depend upon for a livelihood, making displacement of labor a serious consideration in promoting the thresher. Its use may be limited initially to those areas where double cropping places a time constraint on completing the job and where work peaks actually result in a shortage of available labor. Subsequently, at the moment, Anusarn Company is not too interested in manufacturing the thresher.

Additional details on the company were obtained during the Monday visit. Anusarn has done auto and water pump repair work and has been a dealer for water pumps and other farm equipment, such as the AMF power tiller, Kubota pumps, Honda power tiller (now discontinued), herbicide sprayer and Carrier air conditioners. They started making the IRRI-type power tiller in February 1975 with assistance (including drawings) from Niyom on the subcontract as well as from Pairoje of ISI. They have produced about 70 units and had sold 64 to date, mostly in the Chieng Mai area and directly to farmers. They printed brochures in December 1975 and displayed

and demonstrated the power tiller at the Chieng Mai winter fair held at the sports stadium in December 1975. They are now producing about six to seven units per month and have a maximum capacity of about 12 units per month with overtime work.

A wide range of implements have been developed for the power tiller and sell separately. These include the following:

Set of cage wheels--(dry soil, semi-dry soil and paddy)	---฿ 800 ea.
Set of rubber tires	--- 1000
Moldboard plow	--- 1500
Rotovator (blades made from auto leaf springs)	--- 1200
Comb harrow (with adjustable angle)	--- 500
Ridger, hiller (furrower)	--- 800
Spiral plow (to be developed further)	--

Colored slide photographs of many of these implements with attachment to the power tiller have been taken and are available.

Modifications in the power tiller from the basic IRRI design include: (1) engine mount from sliding frame which also got clogged up with mud, (2) changed to two V-belts in matched sets and (3) bearing housing to cast iron.

Sprockets are bought from Bangkok manufacturers and the small one from Japan. Bearings are SNR from France, single-row. deep-groove ball bearings. AFNOR and ISO/CT4 and 6.5, via International Sales Management, SNR, 1, rue des Usinis, B.P. n° 17-74010 Annecy, France.

Copies of the brochures (in Thai) were obtained and will be kept in the IRRI project files for reference. The following specifications were noted:

Length	2.25 m
Width	1.0 m
Height	1.0 m
Weight	100 kg (including engine)
	125 kg (including plow)

Double V-belt system--2 speeds
Gasoline consumption--1 litre/hour

Monday, March 15 and Wednesday, March 17, 1976 visits by Stewart Bartor, Suwit Bunyawanichkul and Ken Stephens to:

Industrial Service Institute
Thung Hotel Road
Box 82, Chieng Mai Tel: 235494
Hosts: Ulf F. Bjernseth, Project Manager (March 17)
W. Feinberg, Industrial Design Adviser (March 15)
Pairoje Phengsupasanit, Design Engineer

This is a UNIDO project with the Ministry of Industry, Department of Industrial Promotion (see report of March 10, 1976 visit to DIP) and has continued for many years with major facility development in the Chieng Mai location. An organization chart for the project was obtained and will be retained in the project file for reference. A phasing out of UN assistance is under way and will be reduced drastically by year's end.

ISI has a direct interest and relationship to the Thai-IRRI industrial extension project with complementary activities. Mr. Pairoje attended the last session of the agricultural engineering training course at IRRI, Los Banos. Promoting the improvement of agricultural tools and implements in the Northern Region, representing the industrial side, is an activity built into the project document. In this respect, then, as ISI remains viable, the IRRI industrial extension project can coordinate its activities in the Northern Region with ISI and obtain their assistance on information, workshop operations, and implementation.

The first meeting was devoted principally to the organization of a schedule of visits in the Chieng Mai area to places believed to have interests and activities related to the IRRI project. ISI personnel further assisted in setting up appointments and accompanied our team on most visits. The second meeting explored the activities of ISI. A well-equiped metalworking shop has been developed and is seriously underutilized. Additionally, woodworking, ceramic and foundry facilities are available.

Directly related to the IRRI project was an "Agricultural Implements and Hand Tools Industry Survey." This survey was completed over January 5-14, 1976 by Wilburt Feinberg, Pairoje Phongsupasanit, and Vim Reenggrent, Extension and Training Section, ISI (on January 12). It covers ten northern provinces and generally supports the necessity for farm equipment of the IRRI type. A copy will be retained in the project files for reference and information.

Mr. Pairoje has been in contact with the Asia Karnchang Company, with Mr. Prasert as manager. They are interested in producing the batch dryer and Pairoje will follow up on this item.

Noted the following report at ISI, listed here for reference. A copy was not available but might be obtained from FAO for project information.

"The Employment of Draught Animals in Agriculture," Centre d'Etudes et d'Experimentation du Machinisme Agricole Tropical by FAO of the UN, Rome 1972, compliments of Gina Caramici, Supervisor, Administrative Unit, Distribution and Sales Section, FAO, Via delle Terme di Caracalla, 00100, Rome, Italy.

Monday, March 15, 1976 visit by Stewart Barton, Suwit Bunyawanichkul, Pairoje Phongsupasanit, and Ken Stephens to:

Northern Region Agricultural Development Centre (NADC)
P. O. Box 1101
Chieng Mai
Hosts: Lynn J. Hewitt, Farm Management Specialist, UNDP/FAO
Adrian G. Rijk, Agricultural Engineer , UNDP/FAO
C. J. Van der Meer, Agricultural Economist, UNDP/FAO

Obtained copies of the following items of background on NADC which will be kept in the IRRI-Thailand project file:

1. Function and Status of the Northern Region Agricultural Development Centre (NADC).

2. UNDP Project Document, Establishment and Operation of a Northern Region Agricultural Development Centre, Chieng Mai, Thailand, THA/72/023/B/01/12.

3. Memo of 28 October 1975 from G. Veldman, project manager to all experts and senior counterparts, concerning assigned responsibility for working papers.

Briefly, NADC has been established for the purpose of "catalyzing the integrated agricultural development of the region" by promoting coordinated action by the various Departments involved. Three other regional centers are to be set up: one in Chainat for the Central Region, one in Khon Kaen for the Northeast Region, one in the Hat Yai/Songkhla area for the Southern Region. The centres are under the Office of the Under-Secretary of the Ministry of Agriculture and Cooperatives. NADC is being developed with assistance of a UNDP/FAO project for which there are currently some 16 advisers and a four-year project budget of US$ 1 million.

As to the IRRI-Thailand project, NADC expressed an immediate interest in a rice dryer for use in September-October. Arrangements were made to provide one from the two units available at the Agricultural Engineering Division, Bangkhen. They were aware of the desire of northern farmers to retain long straw for use in covering tobacco and other vegetable crops--making limited use of the axial flow thresher. Either this practice must be replaced or mechanized threshing compatible with this practice must be developed and promoted such as the hold-on type.

Mention was made of the NESDB meeting on regional planning beginning on Monday, March 29. Also discussed was an Israeli team UNDP/FAO study of the Northern Region.

IRRI leaflets on farm machinery were left with NADC and the availability of services from ISI were emphasized.

Monday, March 15, 1976 visit by Stewart Barton, Suwit Bunyawanichkul, Pairoje Phongsupasanit, and Ken Stephens to:

Crop Replacement and Community Development Project
46 Huai Kaew Road
Super Highway Corner
P. O. Box 156
Chieng Mai Tel: 221536
Host: Richard S. Mann, Project Manager

Project concerned with replacing growth of opium poppy with other crops and simultaneously improving the living conditions of the farmers. It is a United Nations project under the UN Fund for Drug Abuse Control (UNFDAC). Copy of the progress report, September 1972 to June 1973, was obtained and will be retained in the Industrial Extension Project files. It gives a summary of the project and activities to date of writing. The program is administered by the UN Division of Narcotic Drugs, Geneva, with W. Micsuta, director. It is further complemented by the USOM activities under W. Williams.

As to interests in farm machinery, animal-drawn equipment has highest priority at the moment. There is also interest in a castor bean huller and information on equipment for coffee processing.

Monday, March 15, 1976 visit by Stewart Barton, Suwit Bunyawanichkul, Pairoje Phongsupasanit, and Ken Stephens to:

The Ford Foundation
Multiple Cropping Project
Faculty of Agriculture
Chieng Mai University
Chieng Mai Tel: 221275
Host: Dr. Murray D. Dawson, Project Consultant (Soil Scientist)
Earl D. Kellogg, Project Consultant (Agricultural Economist)

Visit arranged to acquaint principals of the project with the Thai-IRRI Industrial Extension Project and to learn something of the farm systems in the area and possible needs for mechanization. Obtained copy of the following report which will be kept in the IRRI industrial extension files for further study and reference:

"Agro-Economic Characteristics of the Chieng Mai Valley 1972-73," Agricultural Economics Report No. 5, Faculty of Agriculture, Chieng Mai University, by Benchavan Tongsiri, Pichit Lerffamrab and Alan Thoday, January, 1975.

It represents a baseline survey of the valley covering such items as household, farm and crop characteristics, and will provide valuable data for the IRRI farm machinery project.

The Multiple Cropping Project is an inter-departmental project of the Faculty of Agriculture, Chieng Mai University. It has been supported by the Ford Foundation since its initiation in 1969 through the provision of project specialists, scholarships, and equipment. It is based on ecological and economical soundness. Program involves experimental plots on farmers' fields with technical assistance provided. Three treatment levels include: I--farmers do anything (traditional), II--farmers do the work under assistance program, and III--university students do the work for the prescribed program. An extension program includes training of agricultural extension workers. Some support is available for agricultural economics research.

Some cropping systems include rice, soybeans, tobacco, peanuts and tomatoes; Chinese cabbage, tomatoes and rice; and rice, tomatoes and rice. Canal irrigation facilities are used. Ajun (professor) Amnat, Agronomist for the Faculty of Agriculture, is involved in water management work and small farm machinery and should be visited on future trips to Chieng Mai.

Learned about a Thai-New Zealand Rural Development Center for training and a New Zealand Seed and Grain Storage Project for the Northeast. Met the following principals involved on the latter project by overlapping visits: Bing Crosbie and Grahame Harrington of the New Zealand Ministry of Agriculture, Grahame Keen, MFA Advisor from New Zealand, and Russ Eceleston, consultant (marketing organization--Soi Polo, Polo Club). This project is to involve five storage silos at separate sites, each with capacity of 1,000 tonnes, to be maintained by two Thai persons of engineering and crop quality background. Expect that these indigenous staff will receive training abroad for six months--with IRRI, Los Banos is a likely location. This project is in cooperation with the Marketing Organization for Farmers (MOF) and represents a budget of two million baht investment from each of the Thai and New Zealand components. Sites will be on farmers cooperative or government land. Thai principals are Dr. Thalerng, Deputy Undersecretary for Agriculture, and Mr. Pantam of MOF. Also learned during visit of a Thailand-Seed Development Loan by AID-USOM (AID-DLC/P2115).

Tuesday, March 16, 1976 visits by Stewart Barton, Suwit Bunyawanichkul, Pairoje Phongsupasanit, and Ken Stephens to:

Maesa Integrated Water Shed and Forest Land Use Project

Host: T. Eren, UNDP/FAO Project Manager Tel: 234195

Maesa is a small tributary of the Ping River. The project involves a cooperation between UNDP/FAO and the Royal Forestry Department and is concerned with forest management. A team of seven UN advisers with a project budget exceeding US$ 1 million is involved. The project objective is to stem the tide of forest destruction (estimated at 300,000 rai annually) via shifting slash and burn cultivation and to replace these practices with planned use of forest resources. Equipment needs at the farmer level have not as yet been determined. A copy of the project summary with background, integration strategy, coordination of activities and work program was obtained and will be maintained in the files for reference use.

Maejo Agricultural Experiment Station, Department of Agricul'ure

Hosts: Dr. Amnuay, Director of Station, and Mrs. Umnuoyporn Ekasingh, Agricultural Engineer on assignment from Bangkok

The Station concentrates on field crops, with soybean representing the principal emphasis. Other crops are mung bean, peanut, and other vegetables. Of approximately 100 hectares in the Station, about 40 hectares are devoted to soybean. A single-row Japanese-made harvesting unit for soybeans is being used experimentally at the Station. It is seen to be too complicated, with numerous adjustments and features. A more simple design is needed for farmer use on small fields of from one to one and a half hectares as well as larger farms. Planting is in a 50 x 20 cm matrix at the Experiment Station.

A large area is devoted to soybean cultivation at Swonskalonk in Sakutkai province. They feel that land preparation should have first priority for development. For other tasks farmers prefer to use family manual labor.

Small-scale soybean threshers were in use at the Station as well as a Japanese-built dryer of about 1 ton capacity that reduces the moisture from 15% to 9% in about five hours, using an electric motor for the fan and diesel fuel for the burner.

The average monthly rainfall at the Station from 1952 to 1967 was observed as follows:

J	F	M	A	M	J	J	A	S	O	N	D	
10	5	20	40	135	135	170	240	258	120	35	20	mm

Chiengmai Watchara Part, Ltd. (farm machinery dealer)

24-30, 44-46 Charyapoom Road, Chieng Mai, Tel: 235160

Host: Lertsak Watcharapecha, Director-Manager

Watchara has been in business for about three years and now sells all over the north in about five provinces. Farmers come to the shop for purchases and they do field demonstrations, but a large number of sales resulted from the display in the winter festival in Chieng Mai. Sales pick up in April for land preparation. They are the only dealer in Chieng Mai for several equipment items, keep approximately 35 power tillers in stock and sold approximately 300 units last year, with about 50% on a cash basis. They have sold about 1,000 units altogether. They do not use salesmen; they keep a record of every sale and conduct a service route every week during the working season.

They maintain a machine shop for repairs and preventive maintenance, give a guarantee of two years on units, and provide a three-month training program for their mechanics. Mechanics accompany shipment to farmer after sale and conduct a demonstration on use and maintenance of the units. Engines are picked up for complete overhaul and/or minor servicing during the off season as needed.

Power tillers from Ling Lon, J'Charoen Chai and Adythoya are stocked and sell for ฿8800 excluding engine but with plow and harrow. A Honda 6-8 hp or Mitsubishi 7 hp engine is recommended. Common sales are on a 35-40% down payment with six months terms at 12.5% or 12 months at 25% through the Siam Financing Branch. Imported tillers of the Yonmar type at ฿29500 and Mitsubishi at ฿3700 are also stocked.

Four-wheel tractors of the Shibura type of 18-20 hp at ฿80,000 and the Yanmar type of 24 hp at ฿82,000 are stocked. A rotovator for these tractors is available at ฿22,000. The same type financing is available but may be for 24 months.

Chieng Mai Food Complex

P. O. Box 102, Chieng Mai
(Crown Frost Ltd.) Lampoon Factory
Host: Mr. Obed Lev, Director

This is a new modern food processing factory with three major units for canning, quick freezing or dehydrating food products. It represents an investment of some US $15 million. Equipment is principally from the US. Thai-Crown Property is the major Thai shareholder. Operations are by the United Development International of Tel Aviv, Israel.

The plant has an output capacity of over 5-6000 tons, a processing area of approximately 5000 sq. meters, witha cold storage capacity of about 2500 sq. meters. An approximate farm area of 10,000 rai is also included in the operation to supply an estimated 40% of input. The remaining input is to come from small farmers from off-season (rice) vegetable crops on 15-20 rai and smaller holdings. Irrigation by deep well was being developed for the company farm during the visit. Instruction and contract sessions were being held with thousands of farmers in an effort to procure raw materials, which represents a significant start-up problem.

Company is promoting three crops per year, rice from April to October (or December), 80-day broccoli or similar vegetable from October to January (or February), 60-day green stringless beans, corn or similar item from January (February) to March. They are interested in maximum mechanization, especially in soil preparation and irrigation, and feel that individual farmers will benefit by the continual demand for crops throughout the year. Their contracts with farmers for supply will specify that all monies paid will go through a bank, which will facilitate payback on loans that the farmers may make for mechanization or working capital.

In the area of new equipment there is an immediate need for a machine to separate soybean pods from the plant in a semi-ripe state for direct freezing and packaging for the Japanese market. They expect that a few thousand tons could be shipped to Japan annually.

Wilburt Feinberg, UN industrial design expert assigned to ISI, accompanied us on this visit.

Wednesday, March 17, 1976 visits by Stewart Barton, Suwit Bunyawanichkul, Pairoje Phongsupasanit, and Ken Stephens to:

Anantopun (Farm Machinery Dealer)

Tel: 236676 (Card in Thai obtained with address and particulars)

A brief visit to this farm machinery dealer was prompted by display of a power tiller by the Nakorn Luang Machinery Company, 1938 Cherlin Charocrakrung Road, Bangkok (Tel. 39476 and 30258). The dealer stocked Shibura diesel engines with prices of ฿8600 for the 8 hp and ฿14000 for the 10 hp units. Approximate sales were 30 units each last year. They also sell plows and harrows, with about 50-60 sold last year.

They are the dealer for the MT four-wheel 77 hp tractor from Russia selling for ฿170,000, with four units sold last year.

Chieng Mai Provincial Agricultural Extension Office

Host: Kangsdarn Tephasdin, Extension Agent, Chiengmai Province

With respect to irrigation there are four major government projects and some 1187 individual projects covering an area of 878,463 rai or approximately 66% of agricultural land area.

Farmers' holdings are around 5 to 6 rai. Farmers request training for small machinery, and several programs are planned. A program is being organized for late April or May. There is a need for a low-cost soybean thresher. Boonward Brewery (Singha beer) is doing some experimental work on barley in the area. Custom charges are ฿120-140 per rai for land preparation with heavy tractor. Water buffaloes cost around ฿3000 and farmers are applying for loans to purchase buffalo and machinery. A Farmers Association (cooperative) can get money at 9% through the BAAC for loan to farmers at 12%.

Farming practices in the area are: First crop of glutinous rice (variety RD2) mostly for home consumption with planting in June and harvesting in November. A photosensitive "Sunpatong" variety is also used. Second crop of RD1 or RD2 (also RD7, 8, & 9) is planted in January or February with harvesting in April. Yields of 450 to 500 kg per rai are common.

Some summary statistics on the area served by the extension office are as follows:

Total Land Area	14,370,625 rai
Agriculture Land	1,316,974
Rice	706,010
Crops (Corn, Soybean, Tobacco, Peanut)	333,234

Fruit (Mango, etc.)	14
Vegetables	13
Forest	13,03
Ponds, Reservoirs	601
Other	22,620

Thai-Australia Land Development Project

Lampoon

Hosts: Clive Massey, Project Director, John Schiller, Agronomist, and John Lawn, Mechanic with Snowny Mtn. Corporation

Project is with the Department of Land Development of the Ministry of Agriculture and Cooperatives. Emphasis is on land with slopes equal to or less than 5% to 6% of sandy loam soil. Some 26 to 28 thousand rai of land have been cleared with contour drainage ditches. Some 3460 households are now in the project. Nature of project requires reallocation of holdings for planned and coordinated approach. An extension project is also carried out in Changrat Nan. Seven Northern provinces, all with emphasis on rainfed agriculture, are ultimately concerned. Principal crops are upland rice, peanuts, mung beans soybeans and vegetables. Project emphasizes fertility of soil studies, erosion control, contouring, seed variety introduction, fertilization, etc.

Animal-drawn equipment work over the past three years may be outdated already. Custom plowing is being introduced at ฿75 per rai for one plowing. Herbicides are a current priority to give better weed control than manual labor. There is a problem with even application of herbicides and fertilizers.

A batch dryer was requested and arranged for the Nan location to help pull rice three-fourths through the wet season. Planting rice in April or May instead of June with earlier harvesting is being encouraged in an attempt to get two crops.

Besides the batch dryer, there is some interest in the rice thresher. A big expansion of power tillers in the Nan area is expected since there are practically none now. Steering clutches will be important for upland use. Has seen big expansion of tractors of two- and four-wheel type from Bangkok-North over the past several years, especially. A big problem is sufficient extension workers for introducing new machinery.

Thursday, March 18, 1976 visits by Stewart Barton, Suwit Bunyawanichkul and Ken Stephens to:

Lim Chin Seng (CS Trademark)

78-80 Swanwidhi, Nakorn Sawan, Tel: 62357

Company is making a full range of auto accessory and medical furniture products in addition to the power tiller. Has produced the PT for the last two years. They sell between 200 and 300 per year and have dealers in Champang

Phet, Tak and Chainat. Price is ฿4000 with slotted moldboard plow, harrow and "ekuck" (puddler) but without engine. Units weigh approximately 120 kg without engine. A 10 hp diesel engine is recommended.

About 10 employees are used. Shop equipment includes large (12 ft) sheet metal guillotine, a smaller (5 ft) one, sheet metal roller (10 ft), three 3-ton presses, three lighter weight presses, shaper, homemade rod bender for cage wheel rims, sheet metal break (10 ft), fly press, two lathes, one large drill press and one small one, channel former from sheet metal, arc and spot welders.

Many handles (50 plus) for power tillers were in stock, as well as many cage wheels. Making their own sprockets (from mild steel). Using Daido Kogyo Company roller chain received in 10 ft length of RK80, bearing JIS mark B180 -2726.

Interest was expressed in the axial flow thresher and IRRI brochures were left.

Kiet Parit Company

86-80 Swanwidhi Road, Nakorn Sawon, Tel: 212478
Host: Mr. Warakiet Warapamul

Started power tiller production this year and has sold about 200 units. Price is ฿4500 with moldboard plow, harrow and "ekuck" (puddler). Weight is 150 kg without engine. A 10 hp Briggs-Stratton or similar engine is recommended. Has dealers in Chang Panp Phet, Chainat, Utthar Thani and Nakon Sawan.

Has 20 employees. Equipment includes abrasive disc cutoff saw (Bellinger), homemade cage wheel rim bending machine, heavy-duty three-roll sheet former (4 ft.), six arc welders (Japanese made), one large and one small drill press, fly press, two lathes, shaper and press break. Using welding fixtures for fabrication. Roller chain is RK80 from Takasago Chain Company with JIS mark.

Expects to expand and move to new location for better planning of work with 50-60 employees. Expected production level of power tillers is 300 per month in about three months. Will do miscellaneous metal work, construction equipment, oxygen tanks, pumps, steel suction pipes, engine spare parts, four-wheel tractor, power tiller, winnower, corn and sorghum thresher.

Nakorn Sawan Tractor Company (NT trademark)

1302 Praholyathin Road, Nakorn Sawan Tuk, Tel: 213747
Host: Samat Truankaipol, Designer

Factory in operation for about three months, transferred from former shop. Had produced about 150 power tillers and 20 trailers in a one-year period at former shop. At present shop have produced about 20 four-wheel tractors, 50 to 60 power tillers and some 60 trailers (1.8 ton capacity). Expected production is 120 power tillers per month, 20 four-wheel tractors per month, and 30 trailers per month. These figures may have some seasonality in them, however.

Has Ratyaw and Nakorn Sawan dealers. Trailers are at ฿3400 to dealers, ฿3800 direct sales. Power tillers are at ฿4500 to dealers (including plow and harrow) and ฿4800 on direct sale (excluding engine). A 10 hp gasoline or 6-8 hp diesel is recommended. Four-wheel tractors are at ฿1900 to dealers (including two-disc plow, harrow, six-lug wheel but without engine), ฿21,000 on direct sale. A 12 hp diesel of the Kubota or Mitsubishi is recommended.

There are at present 30 employees. The factory is well equipped, especially with modern arc welders. No power tiller production was in progress at time of visit. They are interested in the axial flow thresher and feel it is badly needed in Thailand.

Tatsanayuh, 270/1 Sawanwidhi Road, Nakorn Sawan

Small shop making seven-disc harrow and four-disc plow.

Pratom Yon (Farm Machinery Dealer)
405-7 Kosri Road, Nakorn Sawan

Had in stock a four-wheel tractor manufactured by Poonwidhi Company of Sukhunwit Road, Soi 101, Bangkok. With two disc plow, harrow and moldboard plow but without engine, this unit sells for ฿16,000. Diesel engines of Mitsubishi made from 12-14 hp sell for ฿13,500 to ฿17,500.

Power tillers made by Talatong Manufacturing Company of Panatnikom, Cholburi Province were in stock. One unit with steering clutch sold for ฿7300 with moldboard plow and harrow but without engine. A Yanmar ES80C was displayed with it. Another unit without steering clutch sold for ฿4000 including moldboard plow and harrow but without engine. A Yanmar ES70C was displayed with this power tiller. An 8 hp diesel engine sells for about ฿10,400.

Other power tillers by Chakkolpaison, Bangkok, and Lim Chin Seng, Nakorn Sawan were displayed at ฿3500 with moldboard plow and harrow but without engine.

Nakornsawan Yontarakarn

Steel fabrication shop making disc plow and harrows.

Fushiose Seng (Farm Machinery Dealer)
188/1 Soi Paseesong, Chainat

A four-wheel tractor by Ayudthaya Tractor Company of 63/4 Near Predeethumrong Bridge (Tel. 251194 and 251616) was displayed. An imported four-wheel tractor by Shibaura (TL 2100, IHI) was displayed. Two types of power tillers were displayed (made in Thailand). A Yanmar YZ8NPT, 6-7 hp diesel engine was in stock. Price information was not available.

Chaithong Motor Company (Dealer and Manufacturer)
119 Buncrobwidhi Road, Amphur Huncha, Chainat
(Showroom and Dealer Location)
60/15-16 Wuongtho Road, Amphur Muang, Chainat
(Factory Location)

Power tiller by Chackolparison displayed for ฿4200 without engine but with moldboard plow and harrow. Power tiller by Mitro Chaeroen, Bangkuntien, Bangkok at ฿5500 with implements but without engine also displayed. Yanmar diesel engines displayed, 6-7 hp at ฿9500 and 7-8 hp at ฿10,500. Dealership started some two years ago and 50-60 power tillers have been sold.

They manufacture a four-wheel tractor at factory location and are interested in other machines.

Seng Lee Karnkaset Company
Sukaphiban Road, Amphur Intraburi, Senghburi Province

A home-type shop making a four-wheel tractor of some used parts. Unit uses a Yanmar ES130C engine, 10-13 hp (at 2200 and 2400 rpm respectively). It sells for ฿42,000 with engine and two-disc plow, harrow and ekuck (puddler); ฿35,000 with engine and no implements, and ฿16,000 without engine or implements Has sold about 300 units in the past five years directly to farmers.

Shop equipment includes small shaper, drill press, lathe, two arc welders, electric saw, and portable welder.

Is also dealer for power tiller from Lengarunloha, Thongburi, Bangkok selling for ฿5500 with moldboard plow and harrow but without engine. Uses Yanmar ES70C (6-7 hp at 2200-2400 rpm, respectively). Has sold about 40 units per year.

Wonchai Tractor Company
Sukaphiban Road, Amphur Inthaburi, Senghburi Province

Makes a four-wheel tractor with used parts (transmission, etc.) selling directly to farmers at ฿48,000 including engine (Yanmar ES155C, 12-15.5 hp at 2000 and 2200 rpm, respectively), two- or three-disc plow and harrow or ฿47,000 with a 13 hp engine. Equipment includes two lathes, drill press, electric saw, two arc welders, portable welder, hand-operated small metal guillotine.

Monday, March 22, 1976 visits by Stewart Barton and/or Ken Stephens to:

Siam City Cement Company
Bank of Ayuthaya Building, Ploenchit Road, Bangkok
Host: Mr. Suli Mahasandana, Director and General Manager

Mr. Suli is an active member of the Bangkok South Rotary Club and agreed to arrange for a presentation in the Thai-IRRI project with the program committee.

For future contacts on farm machinery development, the following were suggested: Keo Phanponit, Managing Director, Yarnopund Company Ltd., auto spare parts factory, with factory and head office at No. 42 Soi 81 Sukhumvit Road, Prakanong, Bangkok (Tel. 911859-919350) and sales office at No. 487 Luang Road, Plubplachai, Bangkok (Tel. 220477) (Mr. Keo is viewed as mechanically inclined and very innovative), and Propat Thaisetwatanakul, Winner Manufacturing Company, 164/1 Damrongrak Road, Bangkok (Tel. 813911 and 813543). Mr. Propat may be interested in four-cycle engine production and expansion of present two-cycle engine manufacture.

Asian Institute of Technology (AIT)

Hosts: Dr. Pakorn, Chairman, Division of Industrial Engineering and Management
Dr. Peter Cowell, Associate Professor of Agricultural Systems Engineering and Chairman, Division of Community and Regional Development
Dr. Gajendra Singh, Assistant Professor of Agricultural Systems Engineering

Meeting served to acquaint principal AIT staff with the Thai-IRRI project and enlist their support for the continuing program. Information on reference 31 of Appendix C was obtained--being one of the latest comprehensive meetings on the subject of agro-industrial development, with major emphasis on Thailand. With respect to areas of interest at AIT having interface with the Thai-IRRI project, (1) agricultural systems relates to Community and Regional Development, (2) soils relates to Geotechnical Engineering and (3) irrigation relates to Water Resource Engineering.

UNDP and UNIDO

Hosts: Tom Powers, Resident Representative, UNDP
Kurt Aselmann, Senior Industrial Adviser, UNIDO

Described Thai-IRRI project to inform UNDP and UNIDO of the planned program. Discussed program and project document for proposed UNDP/UNIDO/ESCAP Regional Centre for Agricultural Machinery, reference 54, Appendix C. Set up appointment to meet Dr. M. R. Khan on March 26 to discuss this project. Learned of UNIDO project in Laos on production of agricultural tools and obtained address of expert for correspondence. Learned about references 10, 56 and 57 in Appendix C.

Thursday, March 25, 1976 visits by Stewart Barton, Chak Chakkaphak and Ken Stephens to:

Klong Luang Rice Experiment Station and Farm Machinery Training Centre, Patumthani Province, Division of Agricultural Engineering, Department of Agriculture

Hosts: Paitoon Nagalugsana, Director, and Pramote Anugul

Visit was planned to check on IRRI batch dryer used on occasion in the training program. Discussions served to focus attention on training programs around Thailand and the necessity to place principal IRRI-type machinery in these training centres for exposure to trainees. Besides the one visited, the Department of Agriculture has a newer centre at Takfa, Nakorn Sawan Province. A Thai-Austrian school near Sattahijo, a Thai-German training school in Patumthani, the Department of Vocational Training of the Ministry of Education's training program and efforts at rice experiment stations at Chainat, Khon Khaen, Suphanburi, etc. were mentioned for follow-up.

Arrangements were made to construct a rice hull furnace for attachment to the IRRI batch dryer for shipment to the NADC or the Thai-Australian Land Development Project.

Friday, March 26, 1976 visit by Stewart Barton, Chak Chakkaphak, and Ken Stephens to:

ESCAP (UNDP and UNIDO) Regional Centre for Agricultural Machinery Project
Host: Dr. M. R. Khan, Project Manager

Referenced project document had just been completed for submission (copy obtained from Mr. Aselmann (reference 54, Appendix C) to UNDP-New York for approval. Proposed network would serve to establish communication and exchange of information on machinery development between the member institutions of participating countries. Information on IRRI machinery developments would have an additional channel to potential users. Institutions from the following eight countries are participating: India, Indonesia, Iran, Pakistan, Philippines, South Korea, Sri Lanka, and Thailand. Thailand's representative is counterpart to the Thai-IRRI project.

Tuesday, March 30, 1976 visit by Stewart Barton and Ken Stephens to:

Staff Meeting--Agricultural Engineering Division, Department of Agriculture, Ministry of Agriculture and Cooperatives
Hosts: Samnao Rugtrakul, Chief
Chak Chakkaphak, Senior Agricultural Officer

This division is host to the Thai-IRRI project. Meeting served to introduce Mr. Barton and Dr. Stephens to staff of the division with brief discussions of background. Various staff member also outlined their activities. The following is a brief description of the responsibilities of the division and a list of staff.

Agricultural Engineering Division is responsible for study, research, development and demonstration of machineries and tools for agriculture use and small industries making agricultural products. The main objective are: to promote suitable machines for the farmers, to train the young farmers in utilization of the farm machinery, and to assist the Experiment Station in

improving their lands for the research work throughout the year. It also provides services in machine repair and maintenance.

The sections are:

1. Administration
2. Machine Repair and Maintenance
3. Workshops and Servicing
4. Engineering Storage and Processing
5. Farm Machinery
6. Research and Testing
7. Agricultural Engineering Training

Agricultural Engineering Div., Department of Agriculture

Ministry of Agriculture and Cooperatives

Director: Mr. Samnao Rugtrakul

Research and Testing Section

Head:	Mr. Winij Ketupanya
Assistant:	Mr. Suthin Noparatana
Officer:	Mr. Chak Chakkaphak
	Mr. Surapong Panijcharoen
	Mr. Charu Chiarakul
	Mr. Chalermchai Suksri

Thai-IRRI Cooperative Project

Mr. Suwit Bunyawanichkul
Mr. Chalit Churnsombut

Storage and Processing Section

Head:	Mrs. Sriwai Singhagachain
Assistant:	Mr. Maitree Thongsawang
Officer:	Mr. Maitree Naeupanit
	Mr. Suravet
	Miss Vasana Putmuk

The IDRC Cooperative Project

Mr. Dawee Umsuriya
Mr. Pramote Kummuang
Mr. Ruangari Srihawong

Training Section

Head:	Mr. Paitoon Nagalugsana
Assistant:	Mr. Rapeepun Pasabutra
Officer:	Mr. Boonsom Suwanaruk

Wednesday, April 7, 1976 visit by Stewart Barton, Suwit Bunyawanichkul, Chak Chakkaphak, Phil Hess and Ken Stephens to:

J. Charoenchai Tel: 251152
55-57 U-thong Road
Ayudhaya
Host: Mr. Preecha Ngam Boonserb (also his father and younger brother)

This company has had numerous contacts with IRRI in the past and Mr. Preecha has visited IRRI at Los Banos. They have been in business only the last five years and currently have 80 employees. They now have 28 dealers in 25 provinces including Watchara in Chieng Mai (see write-up of March 16, 1976 visit) and Yont Siam in Pitsanuloke (not visited as yet).

They have been producing a modified version of the IRRI-type power tiller for 3-4 years with total sales of approximately 400-500. They sell through dealers and directly to farmers. Sales this year were around 200. Price is ฿4,500 on direct sale and ฿3,500 to dealers, without engine.

Power tiller is one speed with no steering clutches and weighs approximately 150 kg without engine. It uses a 5-7 hp gasoline or diesel engine.

Most sales are in the North, Northeast and South (Hat Yai area). Central plain area prefers the heavier Iron Buffalo type of power tiller. Factory provides service to customers in region. Dealers also have mechanics to provide service and the factory sends their mechanics to train dealers' mechanics. Had noted that power tillers of two years use required no repairs.

This company is also making two models of the four-wheel tractor, enjoying greater sales than the power tiller. The older design has two forward speeds and one reverse speed. It sells for ฿19,000 on direct sales and ฿15,000 to dealers, including double moldboard plow, comb harrow, cage wheels and rubber tire wheels. It uses a 10-14 hp diesel engine of the Yanmar, Mitsubishi, Kubota or Neda make. It weighs approximately 400 kg including engine. Sales have been 400 in 1973, 600 in 1974, and approximately 1,000 in 1975.

They have switched over to a disc type plow but have felt the necessity to develop a hydraulic lift system. This new design tractor has four speeds forward and one reverse and still uses a 10-14 hp diesel engine. It weighs approximately 500 kg with engine. It sells for ฿30,000 directly and ฿25,000 to dealers with three-disc plow, comb harrow, cage wheels and rubber tire wheels. Some nine units have been sold: three in Lopburi for upland applications and six in Singhburi and Suphan for paddy applications.

New units are demonstrated to dealers, who generally order one unit and estimate further orders from customer exposure. The five-speed unit has not as yet been demonstrated in the South. Sales are seriously affected by the price of rice. Mr. Preecha felt that the government program of guaranteed paddy price of ฿2,500, which was unsuccessfully implemented, had a serious effect on reducing machinery sales.

Technically, they have experienced some problem with the mobility of the three-speed and five-speed tractors in mud. Mr. Barton conferred with Mr. Preecha on the fast fall of the hydraulic system with a possible solution via a flow restrictor. Also discussed the hydraulic valve manufacture for reduced leakage via reaming, boring and lapping. One of the defective valves was brought back to the engineering division for measurement and study. A further problem involved the transmission jumping out of second gear during plowing. A used transmission of the Toyota "Dyna" two-ton truck type is used for the five-speed tractor. Solution may involve using a stronger spring on the gear selector in the gear box and/or better alignment when the gear box is linked to the pulley.

Friday, April 9, 1976 visit by Stewart Barton, Chak Chakkaphak, Phil Hess and Ken Stephens to:

International Bank for Reconstruction and Development (IBRD)
5th Floor, Udomvidhaya Building (Olympia Building)
956 Rama IV Road Tel: 866748-9, 868412
Hosts: Mr. Hendrik van der Heijden, Chief of Mission
Mr. Donald Martinusen, Deputy Chief of Mission

IBRD is currently studying credit requirements and needs of manufacturers and farmers and is definitely interested in some assistance in the establishment of farmer credit programs, given the proper administration and organization.

Programs of assistance include the Chao Phya phase I and II projects with the Royal Irrigation Department and the Dutch consulting firm of Ilaco, Bert Kramer, director; a project in the Northeast with Tahal (an Israeli firm); and the National Agricultural Extension Development Program with the Department of Agricultural Extension. A 95 million baht program in Pitsanuloke with Capt. Soonthorn, deputy-director general of the Irrigation Dept., is being developed.

The visit served to acquaint the IBRD directors with the IRRI-Thai project and provide some basic information for additional follow-up on related projects and potential credit programs. Leaflets on the machinery and project were distributed. Staff to be visited at a later date include: Amrik Singh Cheena, Senior Agriculturist, and Francis Bell, Programme Advisor.

IBRD is currently recruiting an agricultural economist. The idea was suggested to bring together such economists from the numerous organizations employing them throughout Thailand for common exchange of information and programmes. Noted later, in discussions with Dr. Delane Welsch, that this is done via the Agricultural Economic Society of Thailand--per proceedings of annual conference, 1975, with English language summary section.

Monday, April 12, 1976 visit by Stewart Bargon, Phil Hess and Ken Stephens to:

FAO (Regional Office for Asia and the Far East)
Maliwan Mansion
Phra Atit Road
Bangkok 2.
Hosts: Dr. D. L. Umali, Asst. Director-General and Regional Representative for Asia and the Far East
Dr. Bhakdi Lasanada, Regional Plant Production and Protection Officer, FAO
Mr. K. S. Park, Regional Water Development and Management Officer
Mr. Thet Zin, Regional Agricultural Services Officer and Secretary, Regional Common Farm Management
Mr. J. C. Mathur, Director, Asian Agrarian Reform and Rural Development

This meeting served primarily to acquaint the regional FAO staff with the IRRI-Thai project. Leaflets on the machinery and description and address of the project were distributed. The greatest interface appears to be with Thet Zin, who has responsibility for farm mechanization efforts. Cooperation and input of the IRRI project to the proposed ESCAP/FAO regional network of agricultural machinery was explained and discussed. Confirmation of the potential acceptance of the IRRI approach was voiced--with emphasis on local manufacture and adaptability to local farming needs.

FAO reports and agricultural statistics will be made available to the project. Staff to be visited at a later date include: C. Y. Lee, Regional Marketing, Credit and Cooperatives Officer; H. K. Oh, Regional Statistician and Technical Secretary on Agricultural Statistics. Meeting with FAO/ESCAP group set for Wednesday, April 14, 1976.

Mr. Mathur expressed direct interest in the IRRI machinery and program for Nepal, Bangladesh and the Philippines where specific work was under way. He will correspond initially with Mr. Barton and may be able to introduce manufacture of some units in government-type workshops.

There was some discussion of the importance of training the farmers. Inclusion of key IRRI-type machinery units in the training program of the Division of Agricultural Engineering (Paitoon Nagalugsana's program) was to be pursued.

Wednesday, April 14, 1976 visit by Stewart Barton, Chak Chakkaphak and Ken Stephens to:

FAO/ESCAP Agricultural Division
Hosts: Ray Billingsley, Deputy Director
Dr. Toyoo Tomita, Expert on Development of Agricultural Information Scheme

Meeting served to acquaint this division with the Thai-IRRI project and to obtain further information on the interface with the proposed Regional Network for Agricultural Machinery.

Monday, April 19, 1976 visit by Ken Stephens to:

FAO/ESCAP Agricultural Economics Division
Host: Dr. Boonchu

Principal discussion was centered around contacts with individuals and organizations relating to the Thai-IRRI project. The following were indicated: Dr. Virach Aromdi, Director of Long-Term Loans, BAAC; Dr. Lomnuk Sriplung, Director of Agricultural Economics, MOAC; Dr. Prokob, Director General of Department of Agriculture (met earlier); Dr. Yukti, Director General of Extension Department; MOAC; U Tun Thein, Industry Division, ESCAP; Dr. Lopin Thongpon, Dean, Department of Agricultural Economics and Business Administration, Kasetsart University.

Reference was made to Dr. Koboyoshi's reports pertaining to what size of farm should use what size of farm machinery. Reports were not immediately available. Copies of some of the latest statistics on Thai agriculture were obtained. These are referenced in the body of the report.

Tuesday, April 20, 1976 visit by Ken Stephens to:

Allied Newspapers, Ltd.
3rd Floor, U-Chuliang Foundation Building
968 Rama IV Road, Bangkok Tel: 233-8040
Hosts: John P. Loftus, Supplement Editor for Bangkok World
Norachai Prasertmanukitch, Advertisement Representative

Information on IRRI and the Thai-IRRI Industrial Extension Project was discussed in reference to the forthcoming publication of a Bangkok World supplement on "Rice," scheduled for May 26, 1976 (actual date of May 31, 1976; see reference 32, Appendix C). Several reports and brochures were left for their information. It was agreed to write a brief description of the Thai-IRRI project for possible inclusion (write-up was used).

Wednesday, April 21, 1976 visit by Ken Stephens to:

Commercial Credit Corporation (Thailand) Ltd.
392 Sukumvit (near soi 18)
G.P.O. Box 1731
Bangkok Tel: 391-7211, 391-7836
Host: Nicholas L. Hayes, Managing Director

CCC is an affiliate of the First National City Bank of New York. It provides credit for working capital to a network of 25 farm machinery (among other items) dealers throughout Thailand in the four major geographical areas of North, Northeast, Central and South. It has financing capability and collection capability.

Mr. Hayes agreed to conduct a survey of the dealers with respect to the IRRI type farm equipment. The survey would be designed to: (1) determine the customer interest in the IRRI units, (2) estimate anticipated sales, (3) give reading on financing requirements of customers (farmers and/or farmer groups).

To conduct the survey, the Thai-IRRI project would supply to CCC in sufficient quantities: (1) product information in Thai (IRRI product leaflets translated to Thai), and (2) possible sales price and operating expense information in Thai.

Bruce C. Tomsom, General Manager, IBM World Trade Corp; Burma, IBM Thailand Company, Ltd., IBM building, 1 Silem Road, Bangkok (Tel: 233-0111, 233-0121), was invited by Mr. Hayes to join our meeting. IBM has a corporate interest in making some contribution to help improve the world food problem. They will take part in programs designed to increase food production and distribution. IBM will donate a model 370 computer to IRRI in the near future as part of this program of corporate interest. Other worthwhile projects are being sought.

Wednesday, April 21, 1976 visit by Stewart Barton, Suwit Bunyawanichkul, Chak Chakkaphak, Paiteen Nagalugsana, Ken Stephens and Boonsom Suwanarug to:

Kaset Thai Ltd. Partnership
27 Panutnikom (Intra-Asa Road)
Chelburi (Province)
Host: Mr. Charrouy Booriboon

This visit followed one on March 6 accompanied by John McMennamy of IRRI, Philippines, to observe changes to the thre her suggested during the earlier visit. The thresher prepared for observation actually differed considerably from original design and did not incorporate earlier suggestions. The oscillating screen was completely eliminated, replaced with a large diameter (5-6") auger to produce rubbing action on the threshed rice. Pitch of the auger was about 12 inches linear movement per revolution. It was agreed that better rubbing action would be produced with a pitch of about 3 inches linear movement per revolution. Threshed rice was being collected at two different places with considerable losses elsewhere. It was agreed that this unit was not ready for use or commercial production.

Parts for four threshers had been prepared and were ready for assembly--using the conventional IRRI design with oscillating screen. An appointment with a farmer in the Chachoengsao area was set for Thursday, May 13, at his farm. We agreed to accompany the demo, meeting Mr. Charrouy at his residence and factory at 8:00 a.m. Chak placed considerable emphasis in discussions with Charrouy on preparing a thresher that would be reasonable for commercial production. Charrouy indicated that he could produce about 30-50 threshers per month. Prices for the rotary screen thresher were set at ฿17,000 (approx. US$850) and ฿15,000 (US$750) for the thresher with oscillating screen, without engine. A 7 hp engine was recommended.

Kaset Thai also produces a power tiller of the Iron Buffalo type. They have manufactured and sold about 500 over the last three years. Originally sold through many dealers @ ฿4500 (US$225), who sold to farmers at ฿5000 (US$250) without engine. Now selling directly to farmers @ ฿6300 (US$315) without engine. A 6-8 hp diesel engine costs around ฿12,000 (US$600). But production is to orders only.

Mr. Charrouy indicated dissatisfaction and distrust in dealers. Initially he would give dealers two months credit. They are always pressing for three, four and even six months credit and trying to get units at lower prices. Also with respect to marketing the thresher, he is reluctant to use dealers. They may ask other shops to build the thresher at lower quality (internally) and at lower price and then ask him to reduce his price for sales. There is difficulty in collecting from dealers. They promise payment upon sale and then renege for credit as above. Also, the dealer may not promote his product adequately by demonstrations, etc. One solution to Mr. Charrouy's objections to dealers may be to use dealers participating in a network of credit through a common financing company. (See April 21, 1976 write-up on the Commercial Credit Corporation.)

Also participating in the visit was Jeerakiat Apibunyopas from the Agribusiness Management group at Kasetsart University, having just returned from special studies at the University of Philippines, Los Banos. His participation in the visit was prompted by a discussion held with the Agribusiness group on Monday, April 19, with Dr. Delane Welsch in attendance. The Thai-IRRI project was described in detail and the possible use of the group for continued studies on a consultancy basis was proposed for their consideration.

Friday, April 23, 1976 visit by Chak Chakkaphak and Ken Stephens to:

Division of Agricultural Economics, MOAC
Tel: 793536
Hosts: Supote Dechates and Jumrosh Intachaisri

A copy of reference 50 of Appendix C was obtained and discussed with respect to various economic indicators relating to agriculture in Thailand. Table I-6 pertains to farm equipments and farm machinery and is as follows:

Year	Number of Registered Tractors for Agricultural Use	Number of Imported Tractors	Number of Imported Water Pumps
1963	413	2247	19,741
1964	655	3864	26,931
1965	685	5200	39,099
1966	648	4577	60,923
1967	1130	5698	82,125
1968	1236	5104	151,343
1969	1024	3631	106,666
1970	1685	2305	136,686
1971	1672	2662	105,109
1972	1798	1809	90,092
1973	--	--	150,095

Other comprehensive tables on land holdings, prices, crops, imports, exports, etc. are being included.

Wednesday, April 28, 1976 visit by Stewart Barton and Ken Stephens, accompanied by Ittipon Padunchewit and Maitree Satitratanachewin of Padunwit Industrial Company, to:

Marketing Organization for Farmers
275/1 Samsen Road
Bangkunarom, Bangkok Tel: 2828551-3
Hosts: Choke Srisithikom, Director
Pantum Thisyamondol, Deputy Director
Achar Romyanan, Director of Administration
(List of additional staff attending presentation and initial discussion given at end of the write-up)

Delivered the attached letter of April 27, 1976 containing a proposal to set up a cooperative demonstration of the IRRI thresher. Made presentation of the project with circulation of a number of copies of the project address, brief description (in Thai and English) and leaflets on the IRRI agricultural equipment. Showed slides of the IRRI thresher from pictures taken at IRRI and C&B Crafts, Bulacan (Philippines). Discussed the IRRI philosophy of small-scale, low-cost, easily manufactured and maintained farm machinery (Barton).

Held further discussions with Mr. Choke & Pantum with Dr. Ittipen assisting. Agreed to set up first demonstration on May 8 at the Padunwit Industrial Co. rice mill. MOF agreed to provide the paddy, publicity, transportation assistance and staff observers. Mr. Choke agreed to attend. Expect to continue such demonstrations on subsequent Saturday afternoons, including the grain dryer and other equipment on occasion. Professor Pantum will serve as MOF coordinator for these programs. Mr. Sakchai, representative for MOF in the Chacoensao area, will assist in local arrangements.

Thai-IRRI project to provide the threshing machine, technical staff, display and literature (including thresher description in Thai), and incidentals such as canvas sheets, petrol and oil, tools and extra belts and portable PA system (bullhorn), if possible.

MOF indicated a serious interest in manufacturing the thresher and possibly the dryer and expressed an interest in our assistance in obtaining financial resources for undertaking such a venture (possibly through World Bank financing) as well as the regular technical assistance outlined in our project description, assuming financing and go-ahead approvals. Will consider this proposal together with the alternative of directing MOF to request bidding from several manufacturers to supply their needs for threshers and dryers. Discussion indicated rough estimates of 100-200 threshers annually to meet the needs of the MOF program--mostly to handle the off-season rice crop.

MOF will also assist in arranging presentation of a thresher and dryer to His Majesty the King for use in programs of rice farming. This is projected for about three months hence, sometime after July 11, 1976.

THE INTERNATIONAL RICE RESEARCH INSTITUTE
Cooperative Thailand - IRRI ~~Deep Water Rice Project~~
Industrial Extension Project

April 27, 1976

Mr. Choke Srisithikom
Director
Marketing Organization for Farmers
275/1 Samsen Road
Bangkunprom
Bangkok

Dear Mr. Srisithikom:

It was a pleasure to meet with Professor Pantum and Saengtawan of your organization on April 16, 1976 and to learn from them something about your operations and plans to help the rice farmers in the marketing of their products. We believe that you will be interested in a new project launched in March of this year between the Agricultural Engineering Division of the Thai Department of Agriculture and the International Rice Research Institute. A brief description of the project in Thai and English is attached. Also attached are leaflets with information on a number of the small scale agricultural machines developed at IRRI and available for manufacture and use in Thailand.

The overall objective of the Thai-IRRI project is to help Thai farmers increase the production of rice. Demonstrations of the performance of the machines will be an important activity to acquaint and interest farmers with their use. Then, coupled with the identification and assistance of local manufacturers to supply the demand, local industry will be stimulated.

It was also a pleasure to renew my acquaintance with Dr. Ittipon Padunchewit of Chulalongkorn University and the Padunwit Industrial Company and to learn that he had now established a rice mill in the Chacheongsao area and was cooperating with MOF in carrying out your objectives. On a previous United Nations assignment in Thailand I enjoyed some teaching at Chula and the hospitality and friendliness of Dr. Ittipon.

MAIL: G.P.O. BOX 2453, BANGKOK, THAILAND • CABLES: ROCKFOUND, BANGKOK

With the activities and objectives of your organization, the availability of a demonstration site at the Padunwit rice mill and the availability of some of the machines for demonstration, it is proposed that we collaborate on setting up a program of demonstrations for introduction of these machines. It is proposed initially that a demonstration of the axial flow thresher be organized during the first part of May to show the threshing of paddy on a small but effective scale for small farm groups. Further demonstrations of the thresher and the batch dryer would be planned over the next year.

In a cooperative effort it is proposed that the Thai-IRRI project provide the machine, support staff of engineers and technicians and descriptive literature. The Padunwit Industrial Co. will provide the demonstration site, display and milling of the threshed paddy with statistics on head loss and milling yield. It is requested that MOF provide the paddy, assist with the publicity among the farmers of the area and assist in providing transportation for farmers to reach the demonstration site. You may also want to send a technician or other staff member to observe this technology for introduction to other parts of the country.

Further details and discussions on this proposal can be made during our scheduled meeting on April 28, 1976.

Sincerely yours,

Kenneth S. Stephens

Kenneth S. Stephens
Research Consultant
Engineering Experiment Station
Georgia Institute of Technology

cc: Dr. Ittipon
Mr. Barton

KSS/wv

TRANSLATION

MARKETING ORGANIZATION FOR FARMERS
275/1 Samsen Rd., Bangkok 2
Tel. 2828550 -4 Cable "FARMAKET"

12 May 1976

No. GS 2100/ 1447

SUBJECT: Demonstration of IRRI Thresher

TO: Dr. Ittipon Padunchewit

REFERENCE: Dr. Kenneth S. Stephens' Letter Dated 27 April 1976

According to the cooperation of the president of Paduuwit Industrial Co. and the representatives of IRRI Philippine to provide the demonstration of the IRRI Thresher at PIC rice mill compound, MOF has sent the division chief of Production to observe this demonstration.

The division chief reported his opinion that the farmers has shown great interest to this thresher, it will prove to be very useful to the farmers as well as better their economy. In reference to Dr. Stephens letter, we wish to inform you that we are very much interested to his demonstration. Nevertheless, at present we must meet the urgent requirements of several Government projects, however, we have assigned the division chief to follow up the demonstration. Please be so kind as to inform Dr. Stephens of this letter and assume that we has answered his letter accordingly. Thanks.

Sincerely,

Chok Srisithikum
Director

Dircetor Office, Tel. 2828553.

Mr. Achar Romyanan, Director of Administration, expressed an interest in obtaining drawings for the bellows pump.

MOF staff attending the slide presentation and initial project description are:

Sawang Roongkhum
Malis Chansanjai
Vicharn Pramuanmitr
Saek Watanakul
Tiravit Kunasup
Apichara Leelasiri
Phipat Masnaruemitr
Saengtawan Sintuwanik
Pantum Thisyamondol
Anake Wongsom
Achar Romyanan

Thursday, April 29, 1976 visit by Stewart Barton and Ken Stephens to:

Association of Thai Industries
Suriyothai Building - 7th Floor
260 Phaholyothia Road
Bangkok 4 Tel: 279-7233
Host: Mr. Prachuab Udomsilpa, Director

Introduced the Thai-IRRI Industrial Extension Project and left copies of the project address, description (in Thai and English) and leaflets of the IRRI machinery. ATI publishes a monthly magazine and a number of circulars periodically during each month. Mr. Prachuab will arrange to publish a circular on the Thai-IRRI project or put an announcement in the monthly magazine.

ATI has been interested in developing a series of farm machinery centers throughout the country. These centers would serve as exhibitions of products (perhaps even dealerships) and provide maintenance and repair service. Mr. Prachuab indicated that there are 71 principal cities in the country where these centers would be located. This subject has been discussed by their members and board of directors. They may ask two of their members to assist in the effort, namely Asia Equipment Industry Company and Siam Motor Company.

ATI currently has aronnd 400 members from medium- to large-scale industries. A directory of members was obtained and will be retained in the project file for use and reference.

Monday, May 3, 1976 visit by Stewart Barton and Ken Stephens to:

United Motor Works (Siam) Ltd.

156 Surawongse Road
Bangkok Tel: 234-4930 to 4
(Briggs and Stratton Engine dealership)
Host: Mr. Goh Woh Kim, Assistant Managing Director
(Mr. Wong Weng Mee, Managing Director, on a visit to US)

Reviewed the Thai-IRRI project with Mr. Goh. Left copies of the project address and description (in Thai and English) and IRRI equipment leaflets. Discussed correspondence from J. H. Cook, B & S Sales Director for Asia, including recent communique from John McMennamy concerning B & S donation of some 10-15 engines to the Thai-IRRI project. Made arrangements for pickup of a 7 hp B & S engine, model 170431, to be used as backup (perhaps primary--in view of missing engine!) for the axial flow thresher at Agricultural Engineering Division (originally from B & C Crafts, Bulacan), which is to be used for the demonstration on May 8, 1976. Mr. Goh invoiced engine at no charge to be recovered by B & S donation.

Introduced to Banchob Chantrasmi, Sales Manager, General Products Division, and to Surin Keogun as additional contacts in the event Mr. Wong or Mr. Goh are not available. United Motor Works is not interested in retailing farm machinery (such as the IRRI type). In fact, they are trying to get away from it altogether. They have approximately 100 dealers of B & S engines throughout Thailand. Most of these dealers also handle farm machinery. A list of these dealers by name and address was mailed to us at the project address and is attached.

They would like to be informed of IRRI equipment demonstrations (they were informed and attended the one on May 8) and they expressed interest in the names and addresses of equipment manufacturers. (Have sent them our list.)

Received copy of fuel use chart for the different engine models. Noted that the 170431 (7 hp) engine at probable running condition of 3000 rpm at 3/4 load uses 0.47 US gallon per hour (1.78 liters per hour @ 3.7854 liters/gal.). At ฿3.42 per liter, this amounts to a probable operating cost of ฿6.90 per hour for gasoline. At ฿2.75 per peso, this is 2.21 pesos per hour compared to the figure of 1.50 pesos per hour in cost analysis table on the axial flow thresher prepared by IRRI (Duff) reflecting Philippine conditions. Lubrication oil is approximately ฿9 per liter and replacement is recommended after every 25 hours of operation. At 2.11 pints per liter and 2.75 pints capacity, normal operating cost for lubrication is ฿0.469 per hour. (This is 0.17 pesos per hour comparable to 0.11 used in referenced table of Philippine costs.)

A price list of engines in baht was obtained for reference purposes. The 7 hp 170431 model lists for ฿2600, while the 10 hp 243431 model lists for ฿5150, for example.

DEALERS LIST

PROVINCE	NAME OF CUSTOMER	ADDRESS
Nakornsawan	Chareonkij	357-359 Kosi Road, A. Muang

	Thaisomboon	385 Kosi Rd., A. Muang
	Virunhakij	444 Kosi Rd., A. Muang
	Boriphan Panich	67-69 Railway Station, A. Chumsaeng
	Nguan Hua Ha	361-363 Kosi Rd., A. Muang
Suphanburi	Sa-Nguan Panich	288-9 Khor, Phrapanvasa Rd., A. Muang
Lopburi	Pichai Karnchang	184-188 Surasongkram Rd., A. Muang
Singburi	Singthong	891/24-26 Borirak Rd., A. Muang
	Thaivanich	882/11 Borirak Rd., A. Muang
Uthai-Thani	Yong Hong Jua Machinery	387-9 Sri-Uthai Rd.
Kamphaengphet	Songchai Panich	1070/22-24 Chareonsuk Rd., A. Muang
Sukhothai	Sukhothai Watanayont	1/1-2 Rat-Uthit Rd.
	Tia Nguan Ki	146/3-4 Charodvithithong Rd., A. Muang
	Kunasin	107-8 Srisatchanalai Rd., A. Sawankalok
Phitsunulok	Seam Long	20-20/1 Chaophya Rd., A. Muang
	Yont Siam	8/1-2 Phyalithai Rd., A. Muang
	Nam Seng Lee	14-15 Phyalithai Rd., A. Muang
Phichit	Sombat Panich	291-293 Rimnan Rd., A. Taphanhin
	Yuen-yong Panich	283 Rimnan Rd., A. Taphanhin
Lampang	Lampang Chai Co., Ltd.	327 Chatchai Rd., A. Muang
Chiengmai	Mathana Panich	198/1 Chang Moi Rd.
	Sahayont Chiengmai	165 Chareonmuang, A. Muang
	Vachara Ltd., Part.	24-28 Chaiyapoom Rd., A. Muang
	Anusarn	90-120 Chreon Muang Rd.
Chiengrai	Chiengrai Tavi Yont	608 Phaholyothin Rd., A. Muang
Phrae	Kijthavorn	191-193 Yontrakijkosol Rd., A. Muang
Utaradit	Siriyont	13-5 Ratsanan Rd.
Petchabun	Siengthong Vitayu	294 Ronakij Rd., A. Lomsak
	NanaVasadu	292 Ronakij Rd., A. Lomsak
	S. Watana	59 Pitak Bumroong Rd., A. Lomkao

Cholburi	Phalphibul Machinery Patanayont	688/1-6 Sukhumvit Rd., A. Muang 844/16 kor 5-6 Sukhumvit
Rayong	Prasertsak	94 Talad Samyan, A. Klonge
Nakorn Ratchsima	Taifar Machinery Taifar Motor Thai Yen	2107/9-10 Prachak Rd. 2067/1-2 Chainarong Rd. 1827-8 Prachak Rd.
Chaiphum	Srisomwongse	383/42-43 Nivesrat Rd.
Khonkaen	Racha Miller Tor Patayakij Meefar Motor	125/17-18 Namuang Rd., A. Muang 171 Namuang Rd., A. Muang 320-322 Rajthurakit Rd., A. Banphai
Udorn	Tep Udorn Udorn Yontrakij	1-2 Hayak Circle, A. Muang 404-408 Po-sri, A. Muang
Nongkhai	Nguan Mong	903-4 Mechai Rd., A. Muang
Ubol	Ubol Miller	5/4-8 Uparach Rd., A. Muang
Roi-et	Uthen Kolakarn	34-36 Sunthornthep Rd., A. Muang
Buriram	Chib Hong Long Karnchang	23/3-4 Kumuang Rd., A. Muang
Chanthaburi	Yusenghuat	6-8 Benchamarachuthit Rd., A. Muang
Chachoengsao	Sahalimtia	268-272 Talad Padriew, A. Muang
Prachinburi	Tor Chareon	35-36 chor. Ratdamri Rd., A. Muang
Kanchanaburi	Lo Heng Mong	105 Tarua, A. Tamaka
Trang	Trang Loha Trang Engineering Yont Pisal	36-38 Rachadamnoen Rd., A. Muang 1/3-4 Rama VI Rd., A. Muang 101 Rachadamnoen Rd.
Songkhla	Sanguan Panich	22/1-3 Chana Rd., A. Muang
Satul	Satul Motor	48-50 Burivanich Rd., A. Muang
Ratchburi	T. Phatana Panich Taifar (Ratchburi)	103-9 Voradej Rd., A. Muang 82-5 Voradej Rd., A. Muang
Phetchaburi	Or-Sukhachit	49 Panichchareon Rd., A. Muang
Chumphon	Chumphon Chakphand	148/1-3 Saladange Rd.

Ranong	Nava Alai Panich	91/3 Sapanphla, A. Muang
	Aroon Sawasdi	210/5 Tamuang Rd., A. Muang
Surat-thani	Chareonphand	11 Cholkasem Rd., A. Muang
	Udomphand	49-53 Bandon Rd., A. Muang
Nakhon si thammarat	Chittiphand	780-781 Panichsamphand Rd., A. Pakpanang
	Sahayont	1835/5-6 Yommaraj, A. Muang
	Srinakorn	55/1-2 Talad A. Cha-aud
Phang-nga	Hongthong Panich	255-257 Sritakuapha Rd., A. Takuapha
Phuket	Hock Huat	73-77 Yaovarat Rd., A. Muang
Phatthalung	Dusit	142-146/1 Ramet Rd., A. Muang
	Thai Rung Ruang	108-110 Ramet Rd., A. Muang
	Thai Yont	113-115 Ramet Rd., A. Muang

Saturday, May 8, 1976 demonstration of rice thresher at:

Rice Mill
36 Moo 2 Klong Kwang, Plongarkard
Bangnampuro District
Chachoengsao Province Tel: 2337203-4, 2337206-8, ext. TM 552

Padunwit Industrial Co. Ltd. (Head Office)
589 Penprapa Building
6th Floor, Yaowaraj Rd.
Mahajak Road
Bankok Tel: 2222144
Host: Dr. Ittipan Padunchewit, President

This demonstration was set up by visits, discussions and arrangements with MOF (see write-up of April 28, 1976), Padunwit Industrial Company and Agricultural Engineering Division (AED). An initial visit to the rice mill on Sunday, April 11, generated the idea. Arrangements were made to use one of the threshers manufactured by Kaset Thai (visited on March 6, April 21, and May 6 with interim letters and cables). An additional thresher at AED, originally brought to Thailand from the Philippines and used for training and demonstration over the past two years, was reconditioned to serve as backup for the demonstration. This thresher was transported and set up at the rice mill on Thursday, May 6 by Suwit, Chalit and Stephens while Barton and Chakkaphak visited Kaset Thai and accompanied Charroay Booriboon to the Padunwit rice mill with one of Kaset Thai's threshers.

Besides personnel from the Thai-IRRI project and Padunwit Industrial Co., a list of attendees is included at the end of this write-up. The farmer designated by (1) provided the paddy used for the demonstration. Aside from the demonstration of threshing was the disappointment of this farmer with his paddy, which contained a large number of empty grain hulls due to attacks of insects (many of which were visibly present on the paddy). Resulting yields of this crop were estimated at under 200 kg per rai (1.25 tons per hectare), less than half that desired. The need for insecticide application was apparent.

Threshing by both machines was demonstrated (the Phillippine machine with rotary screen and the Kaset Thai machine with horizontal oscillating screen). Moisture of the paddy was quite high, with measurements running between 20-22%. Apparent was the inability of the machines to totally separate the rice kernels from the panicles on a proportion of the paddy for this variety of Thai rice (a problem earlier identified by IRRI). The farmers were very quick to point this out. Running the threshed rice through the thresher a second time reduced this problem considerably. It is apparent that some sort of de-awning (rubbing action) will be needed on the Thai threshers to solve this problem. Kaset Thai is already experimenting with this (per Barton's visit on May 6), having adopted a large unit from a rice mill for attachment to the thresher. It uses a rotating shaft with leather straps attached and metal screen cylinder walls. A smaller unit of this type, incorporated in the feeding auger or other appropriate place, may work.

Another farmer attending the demonstration, designated by (2) on the following list, was invited by Mr. Charrouy based on a previously scheduled demonstration for May 13 at his farm location. After viewing the demonstration, he expects to see Mr. Charrouy on Sunday and arrange for a thresher to be brought to his farm for threshing the crop being harvested. Upon successful threshing, he will buy a thresher. He expects three other farmers (one his brother) to view this secondary demonstration with interest in buying. He has approximately 200 rai (32 hectares) with yields of 500-600 kg/rai (3.1-3.8 tons/hectare) and for the last two years has been harvesting two crops per year, using mostly the RD7 variety. The other farmers also have large fields of 180, 150 and over 100 rai, respectively. (Information feedback during the week following the demonstration indicates sale of one machine.)

Another attendee, designated by (3) on the list, presently makes the seven-disc plow and grader (scraper) blade for four-wheel tractors. He expects to make the three-disc plow shortly. He is a dealer for the Russian-made MG tractor and has been for the last 10 years. He sells about 100 tractors a year, currently at ฿190,000 (approximately US$9500) including seven-disc plow and grader blade.

Dr. Ittipon Padunchewit, president of Padunwit Industrial Company, expressed interest in providing IRRI with an experimental station for demonstration, testing, promotion, etc. at his rice mill area if IRRI were interested. He will direct a letter to the project for IRRI's consideration (copy with reply

attached). Dr. Ittipon's primary occupation is that of professor at Chulalongkorn University's Computer Science Department. Had association with Dr. Ittipon on my former UN assignment in Thailand during which I taught a graduate course on Systems Analysis in the Computer Science Department, June-October, 1973. His primary purpose in establishing the rice mill at Chachoengsao is a personal interest to assist in the further development of Thai farming and rice productivity. He has excellent rapport with the Thai government and was assisted by the government and bank in developing the rice mill. His concern is more that of a break-even operation and a contribution to the improvement of rice farming and processing than a totally commercial objecti . Of his 50 rai of land, 10 rai is used for the rice mill and 40 rai in rice farming. Under negotiation with MOF is a Thai government silo storage facility at the rice mill location to serve this large rice-producing area. These developments are seen to complement an IRRI experimental station.

(1) Mr. Lamai Chitrbut
Mr. Boontid Yacmpiam
Mr. Ming Srisai
Mr. Surin Kaewkun
Mr. Ong-arj Penpakkul
Mr. Chalin

(2) Mr. Umnuay Yantrsri

(3) Mr. Komin Nincharoenwan
Mr. Chae Payungwong
Mr. Sakchai, Chief, Machinery Division, MOF
Mr. Sirichai, Scientist, Machinery Division, MOF
Mr. Veerachai Huadsiri
Mr. Nesy Yantali
Mr. Prasert Yampiem, farmer at rice mill area who operated thresher.

Tuesday, May 11, 1976 visit by Chak Chakkaphak and Ken Stephens to:

Department of Land Development Tel: 2825897 and 2818301
Ministry of Agriculture and Cooperatives
Hosts: Dr. Buncherd Balankura, Director-General
Mr. Sitilarp Vasuvat, Chief, Land Policy and Planning Division
Mr. Semmataya Sukhyanga, Chief, Mechanical Engineering Division

Visit arranged through an earlier meeting with Dr. Francis Bell, Programme Adviser with IBRD, on Thursday, April 29. Met briefly with Dr. Buncherd, described the Thai-IRRI project, and left a set of machinery leaflets, project description and address. Met with Mr. Sitilarp, who described DLD's two major projects, the Thai-Australian Land Development Project in the north, with center at Lampang (see write-up of March 17, 1976), and the cooperative project with the Royal Irrigation Department in the Hua Hin area, referred to as the "King's Project."

This latter project involves an area of some 50,000 rai, of which approximately 25,000 rai are suitable for homesteads and farm land. The land is prepared, taking erosion control into consideration, and divided into family and village areas.

PADUNWIT INDUSTRIAL COMPANY

YOUR REF :
OUR REF :
DATE :
TO :

OFFICE : 6TH FLOOR
PENPRAPA BLDG.
589, MAHAJAK-YAWARAJ RD.,
BANGKOK - THAILAND.
TEL : 222144
CABLE : PIC BANGKOK

Mr. Stewart Barton, Industrial Extension Engineer
International Rice Research Institute
Cooperative Agricultural Machinery Project in Thailand
G.P.O. Box 2453
Bangkok.

May 11, 1976

Dear Mr. Barton:

First, we want to congratulate and thank the Thai-IRRI project for the successful demonstration of the IRRI designed axial flow rice thresher at the Padunwit Industrial Co. rice mill on Saturday, May 8, 1976. It was a privilege to participate in this exciting new development in practical farm mechanization in Thailand.

Based on the experience of this initial demonstration and our interest in succeeding demonstrations involving the thresher, dryer and other machinery, as discussed, we have an additional proposal to submit for IRRI's consideration. We have established the rice mill at Chachoengsao with a personal interest in contributing to the improvement of Thai rice farming and processing. Its location is in the midst of an important and significant rice growing area with close proximity to many farmers, farmer groups, local and regional government organizations, industrial enterprises and commercial organizations, such as machinery dealers. We are presently negotiating with the Marketing Organization for Farmers (MOF) of the Thai Ministry of Agriculture and Cooperative for the establishment of a major silo storage facility to serve the area farmers. A portion of our land area will be donated for this development.

In view of IRRI's objectives, the establishment of a Thai-IRRI experimental station at the rice mill location is proposed for your consideration. Such a station would help to carry the IRRI program to a rural area and assist in implementation by activities such as the following:

1. Demonstrations and training in the use of farm machinery for farmers, government officials, manufacturers, dealers and other recommended persons.

2. Marketing promotion for manufacturers being assisted by IRRI in the manufacture of IRRI type designs.

3. Field experimentation, test and evaluation of new prototypes, modified designs, for local conditions, etc.

4. Determination of farmer's needs, opinions, preferences, etc. in farm mechanization.

5. Extension of machine services, such as threshing and drying, to farmers through the experimental station, possibly on a reduced cost custom basis for early introduction of the machinery.

6. Coordination of credit to farmers through the experimental station for the purchase of machines via banks, foundations or other interested organizations.

7. Data collection and analysis of rice milling production yields under traditional and mechanized processing by varieties of paddy.

8. Cooperating with the government (through organizations such as NEF, agricultural extension, food storage bureau, farm cooperatives, land reform, etc.) on the rice reserves as part of world food productivity and storage.

While the Padumwit Industrial Co. rice mill is a commercial establishment, with interest in financially viable operations, we are motivated to cooperate with IRRI in this venture beyond purely commercial grounds as indicated above. We do recognize, however, the business advantages of additional contacts and publicity afforded by the proposed program and are frank to acknowledge this to IRRI.

We will be glad to discuss this proposal and any of its aspects with you and other IRRI representatives at your convenience. Upon interest, we will assist in the planning for the experimental station and stand ready to allocate land ajacent to the rice mill for this purpose. Please let me know if we can cooperate to the extent detailed above. In the meanwhile, we are pleased to continue cooperation via demonstrations such as that of May 8, 1976.

After you have reviewed this letter, we would appreciate hearing your comments.

Sincerely,

Ittipon Paduncheewit

Ittipon Paduncheewit
President.

cc: John A. Mercennary
Kenneth Stephens ✓

Dr. Stephens

XXXXXXXXXXXXXXXXX
Industrial Extension Project

Mr. Ittipon Paduncheewit
Paduwit Industrial Company
6th Floor, Penpraya Building
589 Mahajak-Yawaraj Road
BANGKOK.

May 19, 1976

Dear Mr. Ittipon:

I thank you for your letter of the 11 May, and the offer contained therein, to make available sufficient land at the rice mill, Chachoengsao for the establishment of a Thai-IRRI Experimental Station. To consider the matter completely, I shall have to consult with my superiors at IRRI. After this has been done, I will contact you again.

Yours faithfully,

P.S. Barton
Industrial Extension Engineer.

PSB/jc
cc: Mr. John A. McClenaney
✓ Dr. Ken Stephens
Dr. Ben R. Jackson

For the first village, an area of 25 rai was used for each family, 7 rai for homestead and 18 rai for farm land. For villages 2 thru 4, the distribution was changed to 4 rai for homestead and 21 rai for farming. Villages 5 thru 8 were further changed to 4 rai for homestead and 16 rai for farming--a reduction of 5 rai per family. It is estimated that the 20 rai area can yield ฿12,000 per year for the homestead family.

Early experience with a sugarcane crop indicated a net return of ฿1,350/rai against a total cost of development of approximately ฿1,200/rai. These areas involve rainfed agriculture. Deep wells have been drilled for villages 1 and 2. Each village is to have five ponds of approximately 20,000 cubic meter capacity. Agricultural cooperatives are organized across several villages for obtaining crop inputs. Each village consists of somewhat less than 100 families.

The need for farm mechanization as to specific nature is not yet apparent. Note than an IRRI batch dryer has already been provided to the Thai-Australia project. Upon discussion with Mr. Sommataya, he will contact the Thai-IRRI project when needs are better defined.

DLD also maintains some 17 land development centers for advice to farmers on soil management, erosion control, etc. Some 2,000 employees are in the Department. A booklet on the Land Development Department was obtained and will be maintained in the project file for reference.

Friday, May 21, 1976 visit by Stewart Barton and Ken Stephens to:

National Economic and Social Development Board (NESDB)
Agriculture Branch, Economic Project Division
Host: Mr. Pairoj Sarchand, Chief

Preparation of the Fourth Economic Plan is scheduled for completion by October 1976. An outline of its objectives and strategies was published in The Nation, shown as reference 33 in Appendix C. It calls for "diversification of agriculture" and "productivity and pricing in the agriculture sector" in matters pertaining to agriculture especially. Rural development is to be emphasized also.

The Agriculture Branch of NESDB is active on the Water Resources Development Committee, working directly with the Royal Irrigation Department. Some 400 irrigation projects are under way. It is estimated that by the end of 1976 there will be (1) 19.6 million rai of land supplied by main canals, (2) 15 million rai of "irrigated area," (3) 7 million rai of efficient water supply and (4) 2.5 million rai provided water in the dry season, including a drainage system, i.e., "totally irrigated." The above figures are not additive; each is a subset of the previous.

Large projects are the Chao Phya I and II and Pitsanuloke (Nan River) with IBRD assistance. The latter is scheduled for completion covering some 900,000 rai. Where there is a shortage of water, crops are being diversified to reduce the requirement for water.

NESDB knows of no data or organization predicting or studying farm mechanization in the country. They will be glad to participate and would be interested in the outcome of any such study.

Mr. Suchinda helped in arranging an appointment with Dr. Somnuk of the Division of Agricultural Economics for Monday, May 24.

Monday, May 24, 1976 visit by Ken Stephens to:

Division of Agricultural Economics
Office of the Under-Secretary of State, MDCA Tel: 2810685
Host: Dr. Somnuk Sriplung, Chief

A major project being undertaken by this division in addition to their regular activities on agricultural economics is as follows.

Thailand Agricultural Sector Analysis, a project of the Ministry of Agriculture of Thailand, has as its overall purpose the development and application of sector analysis models and methods for use in guiding agricultural development in Thailand at national, regional, and local levels. The program of research includes the construction and application of linear programming models which permit the comparison of the potential impact of alternative development policies and programs. In this way, the model is designed to provide assistance to administrators and planners both within the longer-term context of the Thailand five-year plan and on a shorter-term operations basis.

The major component of the research is the national linear programming model based upon 19 agro-economic zones. In addition, demand analysis models, transportation and marketing models, and regional development models are being constructed. The demand analysis work will provide fixed-point estimates of domestic and export demand, and estimates of price-consumption relationships for the commodities which appear in the interregional competition models. The transportation and marketing research consists of developing the transportation sector of the national model, designing and building transportation models for major commodities, and developing processing models. The regional models are being developed to provide greater detail on regional problems, resources and program needs within a national framework.

The Thailand agricultural sector analysis project is a cooperative effort between the Ministry of Agriculture, Iowa State University, and USAID/Thailand. Some seven advisers from Iowa State University are assisting the project, with Dr. Art Stoker, chief of party.

At present the above model does not include farm mechanization. A survey has been conducted to obtain information on farm mechanization, but the results are not yet available.

Obtained copies of references 48 and 49 of Appendix C. The update for the latter covering crop year 1973/74 was expected to be completed at the end of the month.

Monday, May 24, 1976 visit by Ken Stephens to:

Agribusiness Management Program
Faculty of Economics and Business Administration
Room 306, Pittayalongkorn Building
Kasetsart University Tel: 5790113, Ex. 353
5791544

Previous visits to this group were made on March 5, April 19 and 30, and May 4, 1976 to coordinate some continuity of activity for the Thai-IRRI project in marketing studies, liaison with important organizations and agencies, etc., and business management assistance to manufacturers. Earlier visits were in the company of Stewart Barton and/or Dr. Delane Welsch. This final meeting prior to departure from Thailand was devoted to outlining several tasks for initial consultancy efforts. These are described at the end of this write-up.

Members of the group, who may carry out proposed activities, are:

Dr. Chamnen Booma
Mr. Jeerakiat Apibunyopos
Mr. Montri Kongtrakultien
Miss Preeyanuch Sangpassorn
Mr. Somkit Tugsinavisuitti
Mrs. Sriaroon Resanond
Mr. Yinich Yeerongura

Tasks in addition to these outlined below which may also be considered are: (1) Study of the profitability per rai of rice cultivation needed and expected by the farmer, including cost of supporting a person in a rural village area. It was observed that rice farming had a cost-benefit ratio of about 2.09 in studies conducted in the Philippines. (2) Studies of credit systems in Thailand. Contacts with Mr. Cheusak Himotongkan, chief of agricultural credit, Bangkok Bank, are maintained by the group on other work and will be useful in this activity.

Tasks for Agribusiness Management Group

in consultancy with

Thai-IRRI Industrial Extension Project

and

Engineering Experiment Station
Georgia Institute of Technology

1. Reference is made to project write-up of April 21, 1976 visit to the Commercial Credit Corporation (Thailand) Ltd. Assist the Thai-IRRI project in preparing for the reference survey of dealer networks, coordinating the survey with CCC, evaluating and reporting results to Thai-IRRI.

   Cooperate with Thai-IRRI in the preparation of the IRRI product leaflets in the Thai language for several of the principal products, such as the power tiller, axial flow thresher, batch dryer, and others as directed by Mr. Barton. These will then be printed or otherwise produced in quantity by Thai-IRRI. Likewise participate in the preparation of price and operating expense information and associated reproduction in Thai language.

   Supply these materials to Mr. Hayes of CCC for conduct of the survey. As necessary assist CCC in the preparation of a survey form and/or questionnaire to obtain product preference and details of immediate usefulness to the Thai-IRRI project as outlined in referenced write-up.

   Collect and evaluate results of the survey and prepare report of results and of task activities for Thai-IRRI.

   Task budget expected ceiling: ฿ 10,000.

2. Survey information and prepare list of places, actual and/or usual dates; names, organizations and addresses of related contacts, etc. of national, regional, and local fairs and public exhibitions for display and promotion of locally made farm machinery of IRRI-type design.

   Task budget expected ceiling: ฿ 1,500.

3. Conditional on a confirmation of interest of the Kaset Thai Company and/or the Anusarn Company, assist these companies in cooperation with the Thai-IRRI project in a marketing plan for the IRRI-design products produced. This to include programs of direct contact with farmers and farmer groups, sales through dealers networks, credit requirements and means of meeting these requirements, etc.

Task budget expected ceiling (per company): ฿ 8,000.

4. Survey information sources and prepare a list of project names, related organizations, principals involved, addresses, etc. of agriculture-related projects in Thailand (particularly those having farm machinery requirements owing to double cropping, intensification, etc.) receiving outside assistance via multilateral or bilateral aid. Such projects are seen to have the structure, finances, and interest in introducing farm machinery of the IRRI type which can serve to further acquaint farmers and farmer groups with such machinery.

   Task budget expected ceiling: ฿ 1,500.

Additional tasks can be defined by Mr. Barton of the Thai-IRRI project, IRRI-Philippines, Georgia Tech, or the Agribusiness Group itself as association with the project and general knowledge of the Thai situation may dictate.

The relatively low travel budget can be stretched considerably by combining necessary travel with Thai-IRRI personnel on same or separate business to a given area, manufacturer, etc.

Mr. Barton will oversee tasks, advise on clarification, coordinate scheduling and reporting, and arrange payment for services rendered. Reports and receipts of payment should be sent to Georgia Tech.

APPENDIX C

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