

# **Appropriate Technology in Development of Rice Farming in Thailand**

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## **ABSTRACT**

This paper presents the evolution and development of rice farming system in Thailand. Brief history of rice farming and its development since prehistoric time to the present time (1993) were traced and discussed. Uses of farm tools and farm machine in Thailand are also briefly discussed.

## **1. INTRODUCTION**

For Thailand and South East Asian countries as well as many other countries of Asia, rice is one of the most important staple food of their populations. It is used to believe that rice were first found in India then taken up by countries of SE Asia. Many others also believe that rice may come from Vietnam then spreaded to the other area of Asia. Since no one actually can really pin down the origin of rice so at the present time it is now concluded that rice may have been found growing wild in many areas of East and South Asia. With the evolution of farming system and the development of hand tools, farm tools and farm machine husked rice (paddy) are now cultivated, harvested and processed to produce rice with no husk ready for cooking and becoming the most important staple food for people in Asia as well as others who live in other continents. Thailand is one of the most important rice producing country in the world with production of paddy about 16 million tons per year and the export of white rice up to 4.5 million tons per year. It is therefore most important to study the evolution of rice farming system and the use of farm tools in Thailand.

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## 2. OBJECTIVES AND SCOPE OF THE STUDY

### 2.1 Objectives

The objectives of this study are :

- (1) To study the technology of rice farming system in Thailand with an emphasis on appropriate rice production technology.
- (2) To make a brief study of traditional farm tools and farm machines used in rice production in Thailand.

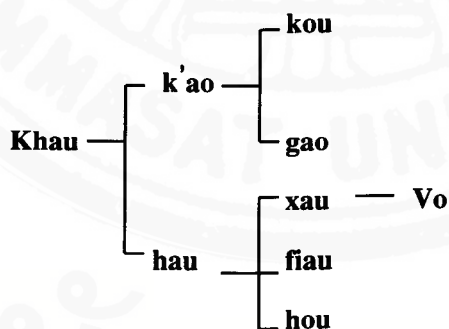
### 2.2 Scope of the study

Although the study of the evolution of the farming system and development are made mainly from observations and study in Thailand, some surveys and observations in other S. E Asian countries will also be included for the sake of comparison.

## 3. RICE FARMING SYSTEM IN THE PAST

### 3.1 Name

In many South East Asian countries the local word for rice has its name changed according to the following chart



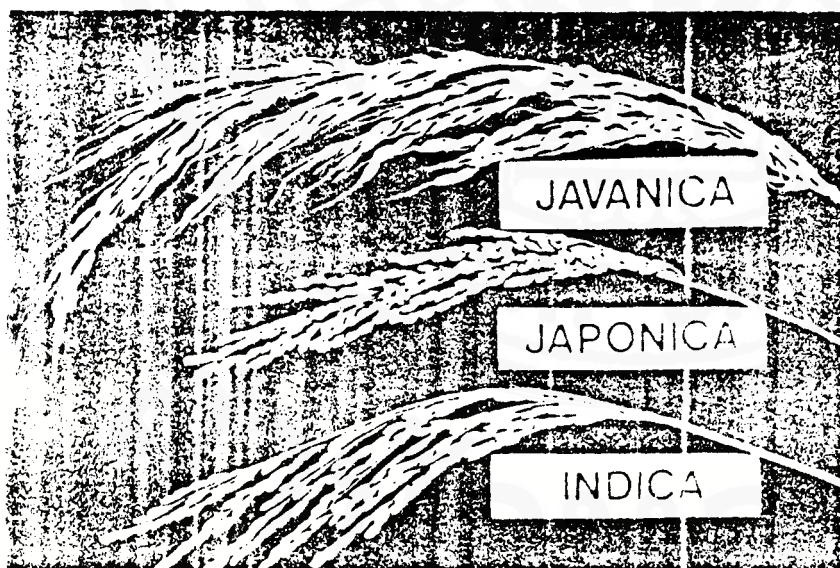
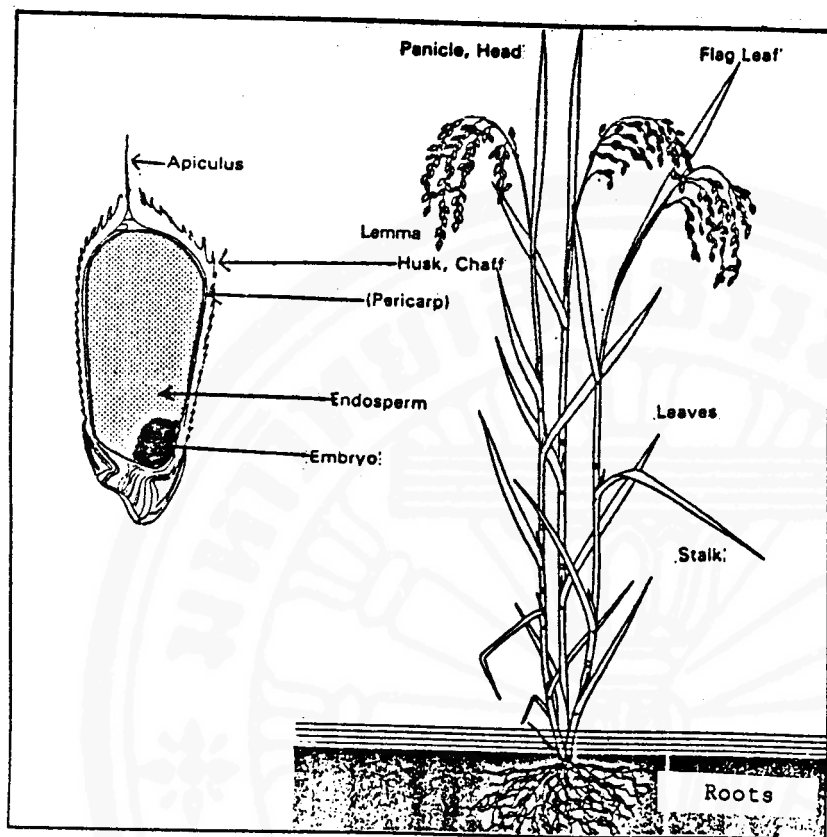


Fig 1 Rice grown in Asia

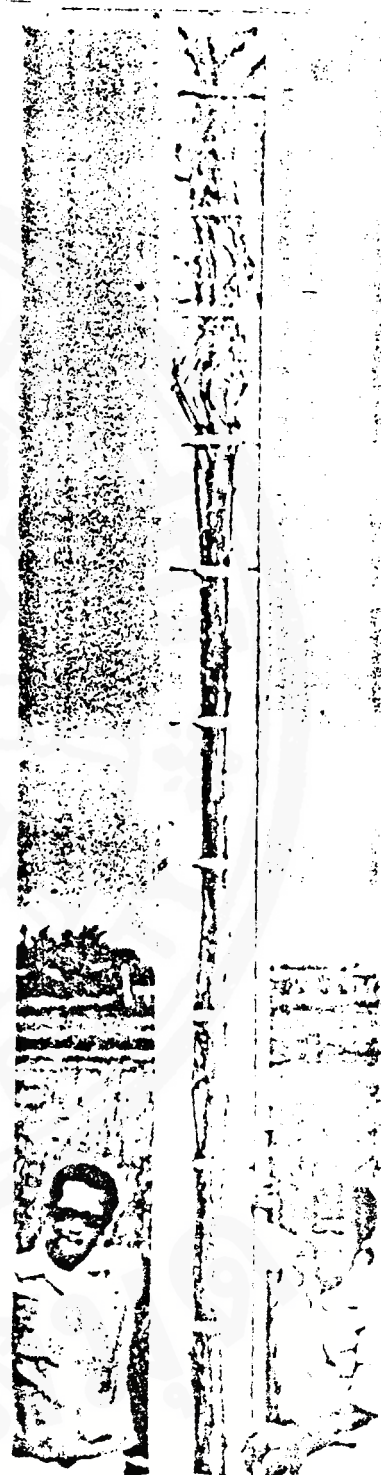
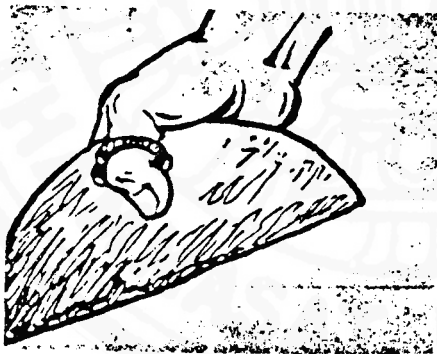


Fig 2 Longest rice stalk  
found in Bangladesh



**Fig. 3 a Area known to have wildrice grown**



**Stone knife**



**Bone Sickle**

**Fig. 3 b Earier rice harvesting tools**

### 3.2 Early rice farming

Rice were known to be cultivated in Thailand as far back as about 7000 years ago but evidence of rice cultivation could easily be seen from bricks with remains of rice husk indentified as "*Oryza japonica*" (see fig. 1) Remains of part of wild rice, recently identified as "*Oryza rufipogon*" were found in many parts of SE Asia. Wherever wild rice were found cultivation of rice was also possible. (see fig.3). As many flood plains of countries in SE Asia usually have high floodwater during August-November many rice grown in these area may have stalk 3 m or more long (see fig. 2). The usual type of rice grown in Asia is *Oryza sativa* which presently develops into 3 main types, *Oryza indica*, *Oryza javanica* and *Oryza japonica* (see also fig. 1)

## 4. RICE FARMING TECHNOLOGY

### 4.1 General

Technology can be defined as scientific knowledge that can be applied to give benefit to man. It has 4 major components

- (a) Software : the conceptual part of technology such as farming system etc.
- (b) Hardware : the tool and machine necessary for the successful carrying out the system,
- (c) Peopleware : the technology user's understanding and capability to carry out the system and
- (d) Management ware : the ability of technology user to manage the system.

### 4.2 Levels of Technology Difficulty

Level of difficulty of technology concerning the Software and Hardware part of the Technology can be subdivided in to at least 4 levels as follows :

- (a) Low Technology : simple technology that can be transfered by demonstration e.g how to dig ditches and construct small earthen dyke. Technology user's educational background should be at least primary school.
- (b) Intermediate Technology : Simple technology using simple machine. Transfer of technology is usually done by teaching and practicing. Educational background of users should at least be at secondary school. Examples of this type of technology are how to



operate simple farm machines such as small power tiller, rice planting machine, simple threshing machine etc.

(c) High Technology : complex technology using complex or sophisticate machines. Transfer of Technology is done by teaching, extensive training and practicing. Educational background of user should be at vocational institution or university education in technical field. Example of High Technology is seed preparation by highly complex production system etc.

(d) Advanced and Future Technology : very complex technology often using advance theory and recent research results. Transfer of this types of technology usually requires highest education background ie Master or Ph.D with experiences in researches. Examples are seed selection, propagation of seed by tissue culture technique, computer controlled operation of farm machine and other equipment etc.

#### **4.3 User's capability to operate technology**

The user's copability usually addresses to the users' s capability to carry out and to manage the system. The level of capability can be classified into 4 catagories as follows

(1) Benefit but not involve in the operation e.g farmers hired tractor operator to till their lands.

(2) Operate only e.g farmer operates his own tractor to till his land. He should have at least primary school education.

(3) Select, operate and maintain e.g farmer selects a suitable farm machine to suit the terrain and type of soil of his farmland, operate it on hisown and if the machine breaks down, he knows how to take care of it on his own or know where to obtain assistances. He should at least has a secondary school background.

(4) Able to adapt/modify existing technology or even create a new technology. He should have higher education background : vocational institution or University background.

Majority of farmers in Thailand as well as in other SE Asian countries has primary education only hence they are able to operate upto intermediate technology only.

#### **4.4 Appropriate Technology**

The appropriateness of the applied technology is addressed to user's capability. It should not be too difficult for user to understand or manage. It should use more local inputs than from outside. Local inputs includes labor, fund and resources, materials and local made machinery. Local supports such as experts, training team and memory system should be found near by.

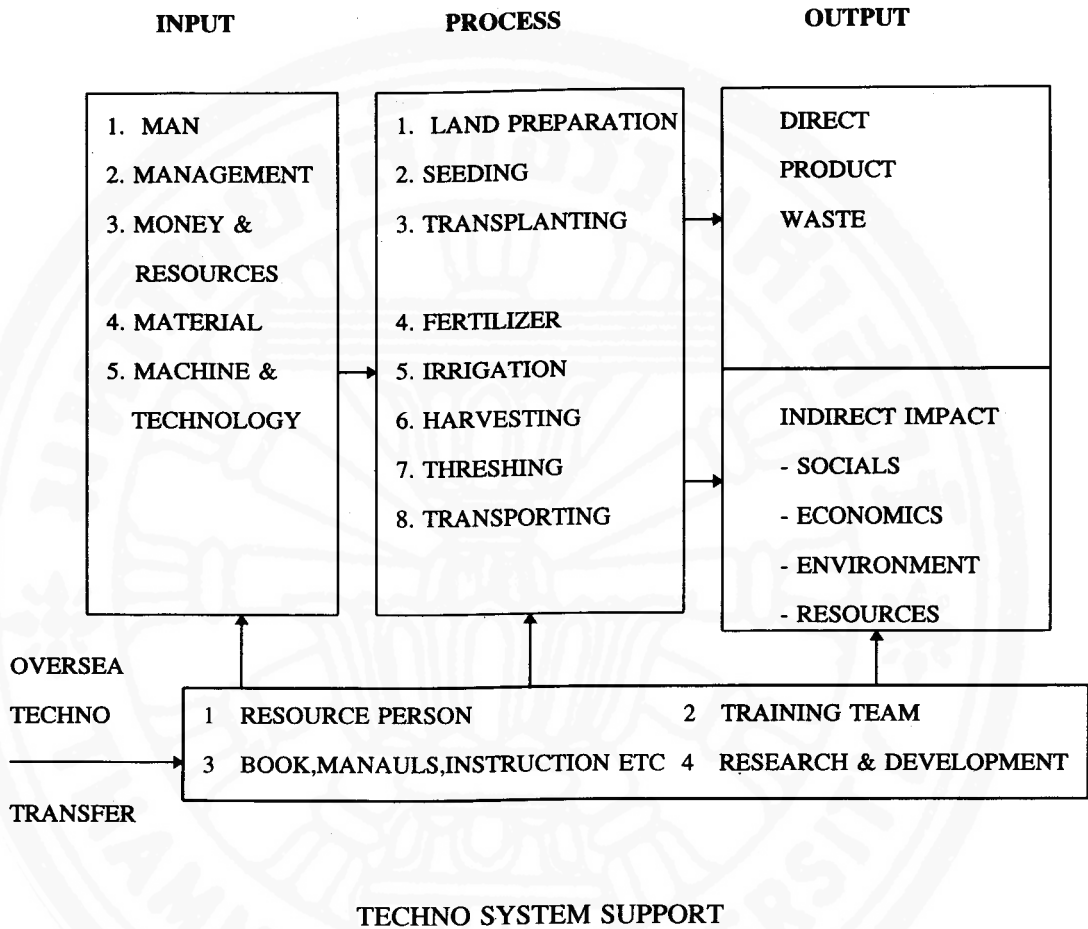
#### **4.5 Rice Farming System in Thailand**

Farming system has 4 component : inputs, processes, out put and supports. For rice farming system (see the fig. 4) shows in details the inputs (Manpower, Management, Money/Resources, Machinery and Materials), the processes from land preparation to the transportation of paddy out of the planting area, the outputs both direct and indirect impact on social, economic, environment and resources, the supports of the system, the expert in various fields of production process, training team, memory

### **5. RICE PRODUCTION PROCESSES**

#### **5.1 Past Production Processes**

Rice production processes, up to 1950, in Thailand were very much the same status as in other SE Asian countries shown in Table 1

**TECHNOSYSTEM****FIG.4 RICE FARMING SYSTEM**



**Table 1 Past Rice Production Process (post 1950)**

Process	Thailand	Kampucha	Myanmar*	Lao
<b>1. Land</b>				
Primary Tillage	Wooden Ox or Buffalo drawn plough	same	same	same
Secondary Tillage	Wooden Ox or Buffalo drawn rake/harrow	same	same	same
<b>2. Plantin</b>				
Seedbed and transplanting	Manually with contract labour	same	same	same
broadcasting	Manually	same	same	same
<b>3. Watering and Control</b>				
Seed bed	Well/Canal	canal	well/canal	Well/canal
Lifting water for higher elevation	Wind driven wooden paddle pump or Village dam/canal	N.A	N.A	N.A
<b>4. Weeds and insect control</b>	none	none	none	none
<b>5. Fertilizer</b>	Natural	same	same	same
<b>6. Harvesting</b>	Manually	same	same	same
<b>7. Treshing</b>	Manually/Animal	same	same	same
<b>8. Transporting</b>	Bullock cart/Slide cart	same	same	same

\* Presonal communication with Professor Kin Aung Kyi, Rangsit University

## 5.2 Present Day Rice Farming System

### (a) Rice Farming Process in 1993

Individual ownership of farm with the normal farm size of about 4 ha is practiced in Thailand. In wel irrigated area of Central Thailand, farm machines are used in all most al production processes while elsewhere farm equipments and farming methods are traditional. With increasing industrialization it is expected that many young generation work forces in the farming sector will move to work in the industrial sector leaving the older generation farm worker to work in the farm. The farming processes are as summarized in Table 2. Observation of present day rice production processes is also shown in Table 2.

**(b) Natural Approach**

Some farmers in NE Thailand now prefer to employ rice production system that use neither agricultural machine nor farming technology inputs ie industrially prepared fertilizers and/or weedicide/insecticide. Agricultural machines especially power tiller would till the land deeper than the normal animal drawn plough which will compact the soil more and upset natural habitat of small animals which usually make home in the top layer of the surface soil thus increase soil porosity. For fertilizers they prefer compose and other natural fertilizers and for weedicide and insecticide they also prefer natural weedicide/insecticide. They believe that this natural way will not upset the environment too much. All rice stalks after threshing will be put back to cover up the soil surface to keep soil moisture in the soil as long as possible. Bean and pea are planted in the rice field if soil moisture is thought to be enough for them to grow. After threshing all bean stalks are also left in the ground to serve as natural fertilizer. The technologies used are as shown in Table 3. The average income is much less than those practises as shown in 5a but the practice is sustainable and help to keep the cost down.

**(C) Mixed crop farming system combining with animal raising**

Some other farmers in the N and NE Thailand prefer to subdivide their land and carry out rice farming, vegetable farming, fruit orchard and animal raising. They do not have much time left for other social activities but the income seem to be sufficient for them to live

**Table 2 Rice Production Processes**

Process	Thailand			S. Vietnam Celta area
	Rainfed Area	Irrigated Area	Large Corporation	
1. Land	Animal drawn plough (1)	Power tiller (2)	Large tractor (3)	Large tractor (3)
2. Seeds	Local (1) or Government prepared seed (3)	Government prepared seed (3)	Government Prepare seed (3) or tissue culture (4)	Government prepare seed (3)
3. Planting	Manual transplanting (1) or Broadcasting (2)	Broad casting (2)	Broad casting (2) or machine Planting (3)	Broad casting (2)
4. Watering	Rain (1) or irrigation ditch (3)	Irrigation ditches + pumpin by local made pump (2-3)	Pumping by imported pump through computerized control sprinkler (3-4)	Irrigation (2-3) (no pumping)
5. Weedicide/ pesticide	Natural (1) or Manually operated sprayer (2)	Industrially prepared (3) power sprayer (3)	Industrially prepared (3) computer control spraying machin (4)	Industrially prepared (3) sprayer (2)
6. Fertilizer	Compose (2) or Industrially prepared (3)	Industrially prepared (3)	Industrially prepare (3)	Industrially prepared (3)
7. Harvesting	Manual (1) or small harvesting machine	Manual (1) or Combined harvester- tresher machine (3)	Combined harvester tresher (3)	Manual (1)
8. Treshing	Manual (1) or small theshing machine (2)	Manual (1) and/or Treshing machine (2)	Combined harvester tresher machine (3)	Manual (1) or small treshing machine (2)
9. Transportation	Human/animal (1) or adapted farm truck (2)	Farm truck (2)	Imported transported (3)	Boat (1)
Average level of technology difficulty	1.6	2.4	3.1	2.1

N.B 1 = Low Technology

3 = High Technology

2 = Intermediate Technology

4 = Advanced Technology

**Table 3 Other Approaches to Rice Production Processes**

Process	Thailand	
	Natural approach	Mixed operation
1. Land	Animal drawn plough (1)*	Power tiller (2)
2. Seeds	Local (1) or Government prepared seed (3)	Government prepared seed (3)
3. Planting	Manual transplanting (1)	Broad casting (2)
4. Watering	Rain (1) or irrigation ditch (3)	Irrigation ditches + pumping by local made pump (2-3)
5. Weedicide/pesticide	Natural (1) Manually operated sprayer (2)	Industrially prepared (3) power sprayer (3)
6. Fertilizer	Compose (2)	Industrially prepared (3)
7. Harvesting	Manual (1)	Manual (1) or Combined harvester-thresher machine (3)
8. Threshing	Manual (1) or small threshing machine (2)	Manual (1) and/or Threshing machine (2)
9. Transportation	Human/animal (1) or adapted farm truck (2)	Farm truck (2)
Average level of technology difficulty	1.5	2.4

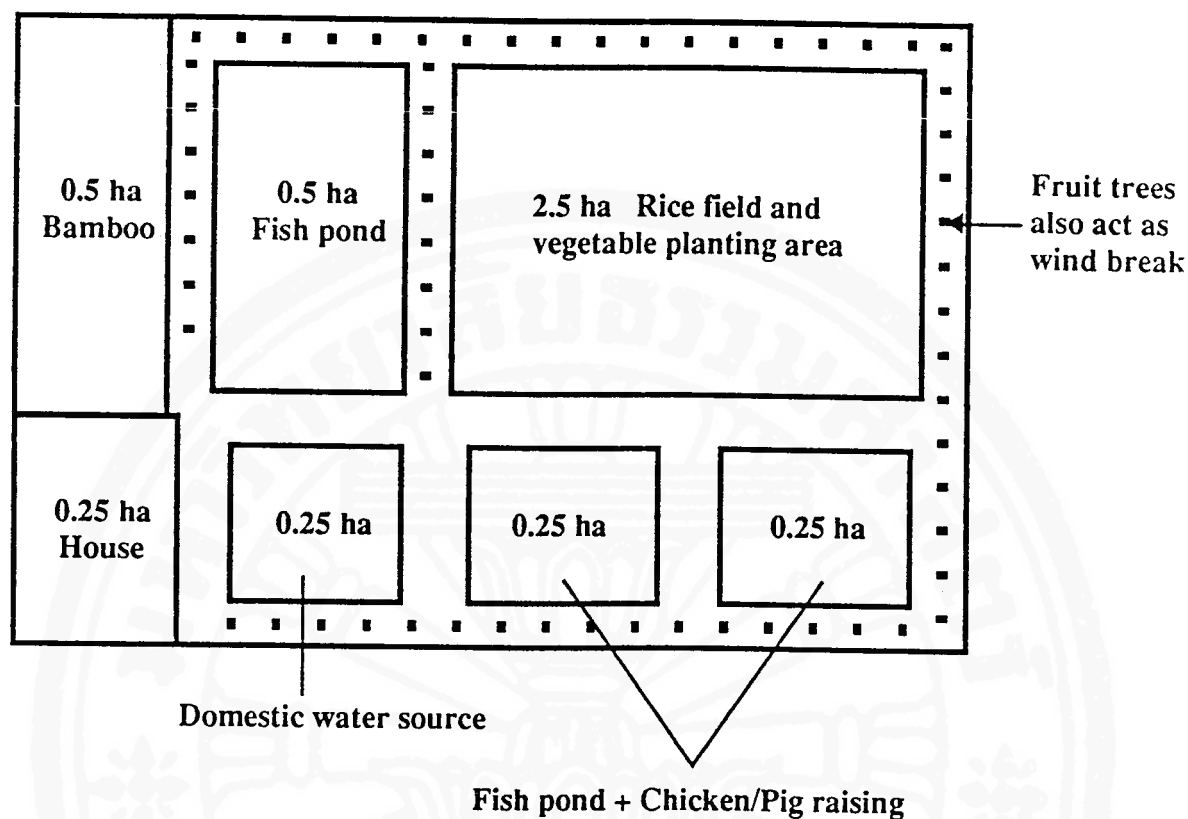
N.B 1 = Low Technology

2 = Intermediate Technology

3 = High Technology

4 = Advanced Technology

on. The production process of this mixed system is as shown in Table 3 and the layout of one farm is also shown in Fig 5



**Fig 5 Mixed System Kong Krai Las, Sukhothai, Thailand**

**Total gross cash income \$6,000 US/year/family**

## **6. Farm Tools and Farm Machine**

### **6.1 Earlier farm tools and farm equipment**

The earliest farm tools found in Thailand and in other countries are stone knives and bone sickle. Fig 3 show stone knife for cutting rice stalks and bone sickle for rice harvesting as found in china dated back to several thousand years ago. Wooden plough and rake were used several hundred years ago. In certain area of Thailand these wooden tools are still in use. Traditional oxen or buffaloes drawn cart were also used in Thailand as well as in other SE countries see fig A1-A9 in the Appendix.

### **6.2 Present day farm tools and farm machine**

After world war I some agricultural machines such as tractor appeared in Thailand but they were not widely used in the soft flood plain area where rice are grown. After World War II some smaller machine and farm equipments e.g two wheel power tiller, insecticide

sprayer threshing machine etc were introduced to Thai farmers who readily accepted them as labor saving devices and in the decade of 1990 transplanting machine, combined harvesting and threshing machine were introduced and accepted by farmers in the well irrigated land area i.e Central and Northern parts of the countries. Labor shortage due to movement of labor force to industrial sector helps spur demand for farm machines and other production technology inputs to relief the labor shortage effects in the farm section. Recently (1985-1994) many large agricultural production firms started to introduce advanced agricultural technique and machinery for use in their own farm and they are very successful.

## **7. CONCLUSION AND DISCUSSION**

### **7.1 Discussion and conclusions**

Rice were cultivated in Thailand many thousand years ago. The farming system and processes are very slowly changing from that employed simple tools and equipment to a system employing sophisticated tools, equipment and machinery. The capability of farmers has not been raised to the point that they can handle these sophisticated tools and machinery. Therefore the use of machinery will make Thai farmer depends more on outside assistances. They will not be able to practice sustainable rice production system nor able to select the appropriate technology that suit their own capability. The future trend in agricultural production is to keep agricultural production excess down to minimum. The production must be kept low but production processes must be most efficient and effective so that the production of rice will be sufficient for local consumption. Improvement on high yield seeds and application of weedicide/insecticide will improve the rice production in many rice imported countries. The export of rice and rice products from Thailand will face a tougher competition from neighbouring countries as well as a shrinking world market.

### **7.2 Recommendations**

#### **(a) Education**

It is recommended that the Thai government must try their best to lift the education structure in Thailand. At least 60% of her population must have at least secondary education or higher to prepare them to handle more sophisticated tools and machinery in the future.



**(b) Industrialization v.s Agriculture**

The Thai government must pay serious attention to the policy to guide the country towards becoming a Newly Agricultural Industrialized Country (NAIC). As the trend of the agricultural production is on the decrease, the policy may have to be changed to becoming NICS (Newly Industrialized Countries) instead.

**(c) Farm Machinery Production**

Local production of adaptive farm machinery should be encouraged to keep the cost of machinery inputs in farming system down as much as possible. Maintenance of locally produced farm tool can more easily be done than imported machine.

**(d) Agricultural Researches**

The research on high yield seed and agricultural technology inputs must be encouraged to keep the farm production increase to the point of national self-reliance.

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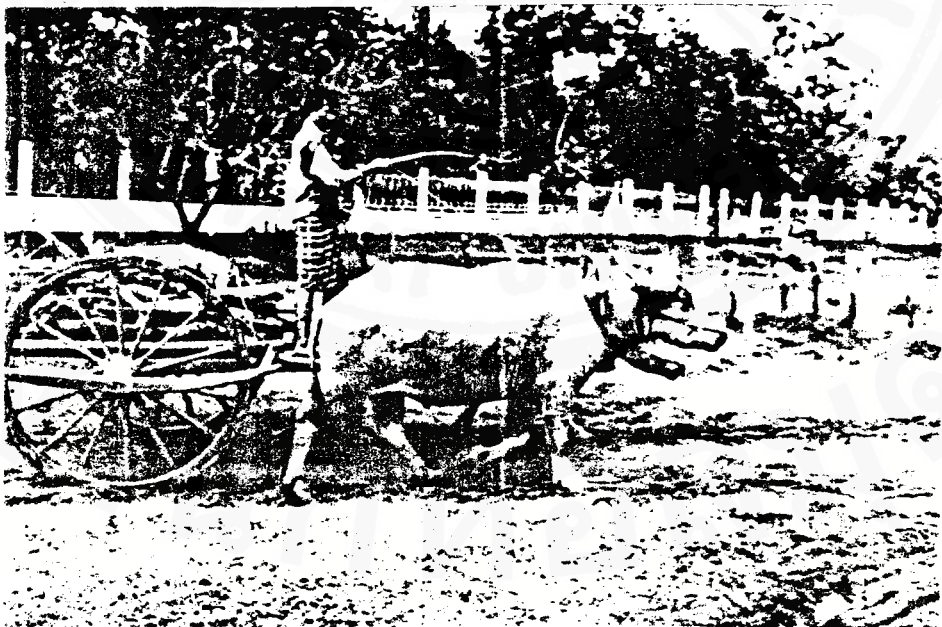
## APPENDIX

Table A1 Rice Production and Machinery used in Rice Farming in Thailand

Production Year	Total Rice Planting Area (M ha)	Rice Production (M tons)	Power Tiller	Imported Tractor	Loan for farm Equipment M\$US
1985	9.97	19.9	366,243	4,673	25
1986	10.15	20.3	402,082	2,734	30
1987	9.85	18.87	450,033	2,910	39
1988	9.36	18.04	515,075	4,205	60
1989	10.35	21.26	582,753	9,369	66



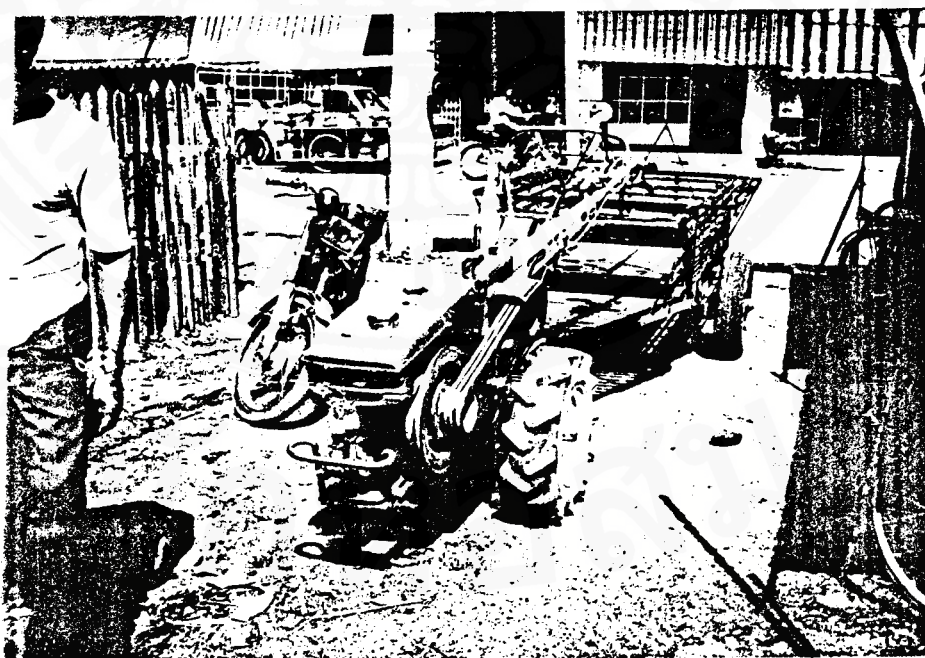
**Fig A1 Steel Plough 1950-1993**



**Fig A2 Buffaloes drawn cart 1300-1993**



**Fig A3 Rice husk remover 1800-1993**



**Fig A4 Power tiller can also be used as mean of transportation (1970-1993)**





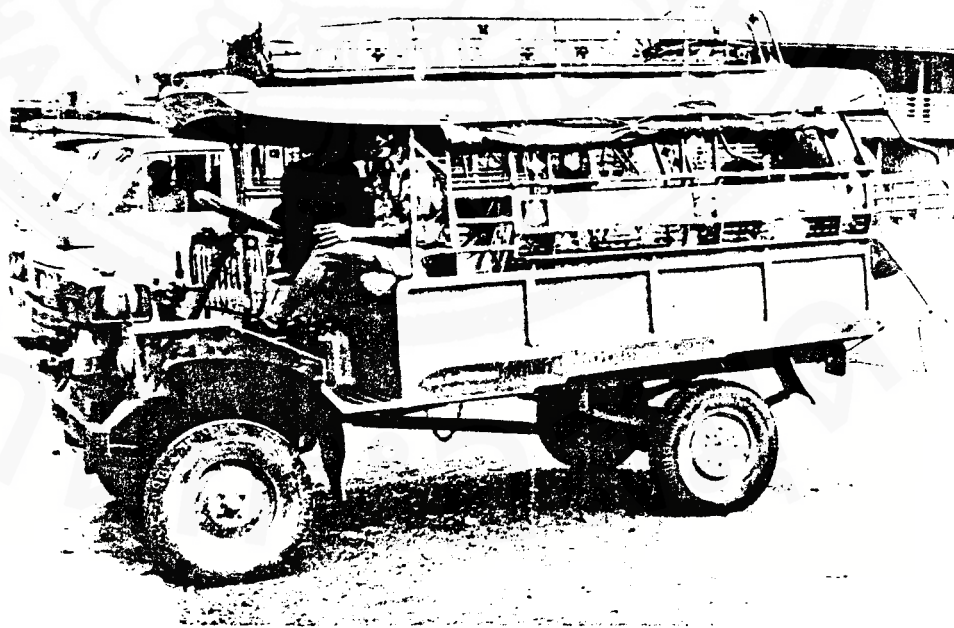
**Fig A5 Bicycle powered water pump**



**Fig A6 Transporting of harvested rice to threshing area (1980-1993)**



**Fig A7 Threshing of rice by threshing machine 1980-1993**



**Fig A8 All purpose agricultural truck (1980-1993)**





(1) Land Preparation  
in Sri Lanka



(2) Transplanting in  
Kampuchea



(3) Harvesting in  
Bhutan



(4) Rice husk/bran  
removing in Myanmar

**Fig A9 Some Rice Operation in Asia**