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Social Application of Science and Technology in Rural Development

สถาบันวิจัยสังคม จุฬาลงกรณ์มหาวิทยาลัย

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บทบรรณาธิการ

บทความที่นำเสนอในวารสารฉบับนี้ คือ บทความที่เกี่ยวข้องกับวิทยาศาสตร์และเทคโนโลยีจากแง่มุมของเศรษฐกิจสังคม ในการวิจัยและพัฒนาทางด้านวิทยาศาสตร์และเทคโนโลยีนั้น ขั้นตอนที่ขาดไม่ได้ คือ ขั้นตอนของการนำเทคโนโลยีไปประยุกต์ใช้ บทความในวารสารฉบับนี้ทั้ง ๕ เรื่องให้ความสำคัญในการประยุกต์ใช้เทคโนโลยีในการพัฒนาชนบท การพัฒนาทางเทคโนโลยีอาจได้รับความสำเร็จ แต่ถ้าเทคโนโลยีนั้นไม่ได้ถูกนำไปใช้งานที่ศึกษาค้นคว้ามา สิ้นเปลืองทั้งงบประมาณการวิจัยตลอดจนแรงงานและเวลาของนักวิจัยด้วย ก็จะไม่ได้ประโยชน์สมดังเจตนารมณ์ของนักวิจัย

รายงานของ Jacques Amyot เสนอว่าเครื่องอบข้าวแห้งที่นักวิจัยจาก AIT เสนอเป็นแม่แบบนั้นไม่ได้รับการยอมรับ เพราะขั้นตอนการอบแห้งทำได้ทีละน้อย ปริมาณของการอบแห้งแต่ละครั้งไม่สอดคล้องกับความต้องการของชาวนา ซึ่งอบข้าวเพื่อขายแต่ไม่อบข้าวเพื่อบริโภค ถ้ามีการปรับปรุงวิธีการอบแห้งให้สอดคล้องกับแบบแผนการปฏิบัติของชาวนาแล้ว การยอมรับคงจะเป็นไปได้ง่ายขึ้น อีกประการหนึ่ง ความตองการใช้เครื่องอบแห้งของชาวนาเพื่ออบข้าวเพื่อบริโภคนั้นไม่มี ถ้าชาวนามีความจำเป็นที่จะใช้เครื่องอบแห้งจริง ๆ ชาวนาจะยอมปรับวิธีการปฏิบัติให้สอดคล้องกับเครื่องอบแห้งได้ ปัจจัยสำคัญจึงมีอยู่สองประการ คือ ความสัมพันธ์ของสิ่งประดิษฐ์ใหม่กับวิถีชีวิตเดิม และความจำเป็นที่จะใช้สิ่งประดิษฐ์ใหม่

ในรายงานเกี่ยวกับเรื่องการนำพลังงานทดแทนไปใช้ในหมู่บ้าน ของอมรา พงศาพิชญ์ และกอบกุล ภู่ธราภรณ์ ก็มีลักษณะคล้ายคลึงกับรายงานของ Jacques Amyot อมรารายงานเรื่องการพยายามนำพลังงานทดแทนไปใช้ในหมู่บ้าน และกอบกุลเน้นเฉพาะเรื่องป่าฟืนชุมชน แต่เนื่องจากการนำพลังงานทดแทนไปใช้ในการพัฒนาชุมชน เป็นการนำเรื่องที่ชาวชนบทไม่เคยให้ความสนใจมาก่อนมาเสนอ และเนื่องจากโครงการวิจัยที่นำเสนอโดยผู้เขียนทั้งสองท่านนี้เน้นในกระบวนการของการพัฒนาโดยประชาชนมีส่วนร่วม ปรัชญาการพัฒนาชนบทเป็นเรื่องที่นักพัฒนาพอจะเข้าใจได้ แต่นักวิทยาศาสตร์และเทคโนโลยีไม่ได้ให้ความสำคัญกับปรัชญาการพัฒนามาก่อน นักวิทยาศาสตร์และเทคโนโลยีเคยสนใจแต่เฉพาะเรื่องเทคนิค ฉะนั้นการนำเทคโนโลยีเกี่ยวกับพลังงานไปประยุกต์ใช้ในการพัฒนาชนบท จึงมีปัญหาในสองระดับ คือ ระดับนักวิจัยผู้มีความรู้ทางเทคนิค และระดับชาวบ้านซึ่งสนใจเฉพาะส่วนที่สอดคล้องกับวิถีชีวิตเดิม รายงานทั้งสองฉบับนี้ชี้ให้เห็นถึงความจำเป็นที่นักวิจัยทางวิทยาศาสตร์และเทคโนโลยีจะต้องปรับความคิด และเรียนรู้ปรัชญาการพัฒนาชนบท ในขณะเดียวกัน ชาวชนบทก็จะต้องเรียนรู้ถึงความจำเป็น จะต้องพัฒนาพลังงานทดแทนมาใช้ เพราะเราไม่อาจพึ่งพาพลังงานน้ำมันตลอดไปได้

ส่วนงานวิจัยสองเรื่องสุดท้ายในฉบับนี้ทุ่งกุลาร้องไห้กับการทำนองเดียวกันกับรายงานสามเรื่องแรก โดยที่นักวิชาการทางด้านน้ำใต้ดินและปฐพีวิทยา ได้ศึกษาหาวิธีการนำน้ำใต้ดินมาใช้ และวิธีการแก้ปัญหาดินเค็ม แต่นักวิชาการผู้มีความรู้ทางด้านเทคนิคนี้ไม่แน่ใจว่าชาวบ้านจะยินดีปรับวิถีชีวิตและยอมรับเทคนิคใหม่ที่คิดค้นขึ้นมาได้ อาภา ศิริวงศ์ ณ อยุธยา ศึกษาเปรียบเทียบว่า ทำไมชาวนาในอำเภอราษีไศล จึงตกลงใจที่จะดูดน้ำบาดาลใต้ดินมาปลูกหอมแดงขายเป็นรายได้เสริมจากการปลูกข้าว แต่ชาวนาในอำเภอชุมพลบุรีไม่ทำ คำตอบก็คือชาวนาในอำเภอชุมพลบุรีไม่แน่ใจในตลาดของผลผลิตทางเกษตร และถ้าเขาสามารถหารายได้จากการรับจ้าง ไม่ว่าจะเป็นการรับจ้างในไร่นา หรืองานรับจ้างในโรงงานอุตสาหกรรม เขาก็จะเลือกทำงานรับจ้าง เพราะรายได้แน่นอนกว่า ในการแก้ปัญหาเรื่องดินเค็มก็เช่นเดียวกัน การยอมรับเทคนิควิธีการแก้ปัญหาทางกายภาพหรือไม่ ไม่ได้อยู่ที่ความขยันหรือความขี้เกียจของชาวนา แต่ขึ้นอยู่กับปัจจัยรอบด้านอีกหลาย ๆ เรื่อง การพัฒนาทางด้านเทคนิคแต่เพียงอย่างเดียวจึงไม่ทำให้

งานวิจัยและพัฒนาสำเร็จอย่างสมบูรณ์ได้ นภัส ศิริสัมพันธ์ชี้ให้เห็นว่า ชาวนาได้เรียนรู้เกี่ยวกับสภาพดินและปรับตัวเองเพื่อใช้ประโยชน์จากดินตามวิถีชีวิตแบบเดิม เมื่อมีผู้รู้แนะนำการแก้ปัญหาดินเค็มด้วยวิธีใหม่ ชาวนาจะต้องปรับระบบความรู้เกี่ยวกับนิเวศวิทยาที่มีอยู่เดิม มารับระบบความรู้ใหม่ และนอกจากนี้ยังต้องเปลี่ยนวิถีชีวิตใหม่ด้วย วิธีการทำนาแบบมีคันดินและไม่มีคันดินหมายถึงการเปลี่ยนระบบการหมุนเวียนของน้ำ การดำนาและการเก็บเกี่ยว ซึ่งทั้งหมดนี้มีความหมายรวมถึงการเปลี่ยนทั้งระบบความคิดเกี่ยวกับธรรมชาติรอบตัวด้วย

การจะทำให้เกิดการเปลี่ยนแปลงได้จะต้องมีการพิสูจน์ที่ชัดเจนว่าระบบใหม่ดีกว่า เหมาะสมกับสภาพชีวิตปัจจุบันมากกว่า เมื่อพิสูจน์แล้วก็ต้องให้เวลาในการปรับตัวอีกระยะหนึ่ง ฉะนั้นงานวิจัยและพัฒนาทางด้านเทคโนโลยีนี้เป็นงานที่เสียเวลามาก เมื่อศึกษาทางด้านเทคโนโลยีจนพิสูจน์แล้ว ต้องพิสูจน์กับ "ผู้ใช้" ให้ได้ แล้วจึงต้องเปลี่ยนระบบความรู้เกี่ยวกับธรรมชาติรอบตัวและวิถีชีวิตของ "ผู้ใช้" คือจะต้องเปลี่ยนทั้งการรับรู้ (perception) และระบบความรู้ (cognition) ทั้งระบบ ระบบความรู้ในที่นี้หมายถึงความรู้ในสภาพแวดล้อมและวิถีชีวิตโลกทัศน์ตลอดจนความคาดหวังในชีวิต

ถ้าผู้ที่จะใช้เทคโนโลยีใหม่เป็นผู้ที่มองว่า สภาพหมู่บ้านของตัวดีอยู่พอสมควร และตนสามารถใช้ชีวิตในสภาพแวดล้อมปัจจุบันได้อย่างสอดคล้องกันดีอยู่แล้ว เมื่อมีสิ่งใหม่มาให้ลองใช้ก็จะพิจารณาดูความเหมาะสมตามระบบความรู้ที่มีอยู่ แล้วจึงเลือกที่จะทดลองหรือไม่ทดลองสิ่งใหม่ แต่ถ้าผู้ที่จะใช้เทคโนโลยีใหม่คือผู้ที่ยากจนอยู่ในสภาพแวดล้อมที่ขาดแคลน ทุรกันดาร มีความจำเป็นที่จะต้องหารายได้มาเลี้ยงปากเลี้ยงท้องเพื่อความอยู่รอดของตนเองและครอบครัว โลกทัศน์และความคาดหวังในชีวิตอยู่ในลักษณะที่มองโลกแคบ จำเป็นจะต้องมุ่งมองหาหนทางที่จะประกันว่าจะมีอาหารกินแต่เพียงอย่างเดียว การจะทดลองเทคโนโลยีใหม่ด้วยความคาดหวังว่าจะทำให้ผลผลิตดีขึ้นนั้นเป็นเรื่องที่เสี่ยงการรับรู้ของใหม่อาจจะเกิดขึ้นเมื่อมีการแนะนำของใหม่ แต่ถ้าระบบความรู้ยังไม่ได้เปลี่ยน การปรับตัวและการผนวกสิ่งใหม่ให้สอดคล้องกับวิถีชีวิตและสภาพแวดล้อมก็จะยังไม่เกิดขึ้น

การวิจัยและการพัฒนาเทคโนโลยีเพื่อการพัฒนาชนบทจึงหมายถึงการวิจัยและพัฒนาทางด้าน 1) เทคโนโลยี 2) ปรัชญาการพัฒนาชนบท 3) วิถีชีวิตของมนุษย์ในส่วนที่เกี่ยวกับธรรมชาติและสภาพแวดล้อม 4) ระบบความคิดของผู้ที่จะนำเทคโนโลยีไปใช้ 5) การประยุกต์ปัจจัยต่าง ๆ ข้างต้นให้เหมาะสมและสอดคล้องกันจนเกิดการประสานระหว่างสภาพเดิมและสภาพใหม่

CONTENTS

Social and Economic Aspects of Dryer Use for Paddy And Other Agricultural Produce in Thailand

Jacques Amyot

Introduction[1]

The first part of this report discusses the potential applications of dryers in the context of current agricultural production in Thailand. Although the use of the dryer has applications for other crops and agricultural produce, the report concentrates on its application for the processing of paddy because of availability of data.

The use of specific dryers is discussed in the second part of the report. The main emphasis is on two dryers developed under International Development Research Centre (IDRC) funding : the Asian Institute of Technology (AIT) Solar Dryer and the Dept. of Agriculture (DOA), Agricultural Engineering Division, Flat Bed Dryer. For purposes of comparison, a third dryer developed by a farmer in Chachoengsao Province is also introduced in the discussion. This discussion focusses first on the technical evaluation of the dryer from the point of view of the farmer-users : the extent to which they have been able to use the dryers effectively and achieve the performance of the dryers meeting the specifications of the developers. Secondly, the discussion examines the issue of farmer acceptance of the dryers and the contraints relating to acceptance or non-acceptance of the dryers in their present form. The third part of the report draws conclusions from the findings and makes recommendations for follow-up R. and D. activity.

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[1] The article that follows is an abridged version of the original report dated May, 1983 and published by CUSRI.

Part 1

The potential applications of dryers in Thailand

1.1 Rice

Although many technological innovations have been accepted by Thai farmers in recent decades, a survey of farmers in all Regions of Thailand conducted by the Department of Agriculture did not encounter a single instance of the use of other than traditional means to dry agricultural produce such as paddy, maize, bananas, mangoes, fish, etc. (Dept. of Agriculture, 1976) i.e. laying it out on mats, terraces, roofs or road sides to dry in the sun. Given the widespread practice of drying in the agricultural and household context of Thailand, it seems that there should be much scope for the application of a more effective drying system, such as the use of a scientifically designed drying apparatus of the types under study.

In the case of rice cultivation, the use of a specific dryer to process the main crop is less readily evident, at least to farmers, except perhaps in the Southern Region where rates of rainfall are considerably higher than in the rest of the country. Traditionally, this crop is planted at the beginning of the rainy season and harvested after the rains have stopped. Harvesting takes place in clear sunny weather. The grain stalks are cut, usually by hand using a sickle or ani-ani knife, and laid out to dry in the field for a few days. According to data of a 1983 study of a large sample of farmers in all Regions of Thailand conducted by the Chulalongkorn University Social Research Institute (CUSRI), the average moisture content (MC) of the grain of this main crop at time of harvest is about 20%. The field drying reduces the MC to about 16%. After this field drying, the grain stalks are tied into sheaves and transported to the threshing place where it is threshed using animals or a tractor, and winnowed. The use of mechanical threshers is becoming more and more widespread however. No more drying takes place after threshing. As few farmers have paddy storing facilities or because of the need for immediate cash, most of the harvest is usually sold or disposed of immediately, a small part being retained for home consumption or for use as seed for the next planting season.

On the basis of their studies and experiments, both the AIT and Dept. of Agriculture dryer project workers make the point that there are benefits to processing even main crop paddy in a dryer. If the field drying is by-passed, there is less loss due to birds, rats and insects. The processed paddy is cleaner. Milling head yield of dryer processed paddy is higher : consistently more than 50%. According

to figures of the Department of Agriculture Rice Research Institute supplied by AIT, the head yield of dry season traditional dried paddy is closer to 40%. Although there is no significant difference in the germination quality of paddy dried by either method, by the fact that the paddy dried in the dryer can be brought down to a lower MC, its storage quality is enhanced and it can be kept longer without spoiling for use as seed.

The case for the use of dryers is much stronger for the processing of the harvest of a *second crop* from a farmer's perspective as this crop is usually harvested during the wet season. Weather conditions permitting, harvest practices followed are the same as for the main crop but the likelihood of adverse climatic conditions greatly increases the risk of crop losses at this time. Heavy rains causing flooding at the time of grain maturity makes it difficult or impossible to harvest. Some farmers attempt to salvage at least a part of their crop by cutting it under water but it must then be dried as soon as possible as paddy harvested under these conditions spoils every rapidly. One may note in passing that unseasonal rains can cause the same problem even for a main crop harvested say in December.

In practice, farmers harvest second crops of paddy, weather conditions permitting, as soon as they are ripe. If good weather appears to hold, the rice stalks are laid out to dry in the field in the usual way, but if rain menaces, the field drying is by-passed and the paddy is threshed immediately. Farmers who attempt to field dry their crop can push their luck too far. Rain comes and drenches the cut rice. As it cannot be threshed in this condition there is little they can do but hope for the rain to stop and for the sun to come out and dry the drenched crop. Even if this happens, the delay results in much spoilage.

Given these weather hazards during the rainy season, the farmers are naturally anxious to harvest and thresh their second paddy crop in the shortest possible time. Even independently of this motivation, compressing all of the steps of the harvest in a short interval rather than staggering them is a long established practice of Thai farmers. Traditionally they favor working in groups of several cooperating households who are usually related by kinship. All members of a cooperating group work together both for planting and for harvesting going successively from farm to farm until the work has been completed on all the farms of group members. This traditional pattern of cooperation has become eroded over the years with cooperative volunteer labour being replaced by hired labour, but this has generated a new kind of imperative to complete the harvest process with little delay. There is a shortage of agricultural labour for hire and much competition for its services. When a farmer has been successful in recruiting the needed number of workers, he is anxious to get his harvest in as soon as possible while the workers are still available. The work cannot be phased as workers are only paid for work accomplished. If they are left idle they move on to another farm where work is available.

As a result of this practice, farmers at the end of the harvest period are left with huge piles of threshed paddy on the ground. This is a critical period as it spoils rapidly because of ground humidity and from its own internal humidity if it was not properly dried. Weather conditions permitting, farmers attempt to dry it in any way they can by spreading it out on mats, on the edge of roads, fanning it by hand, etc. The worst that can happen at this time is for rain to come and soak the paddy. In this case there is a mad scramble to move this paddy to a sheltered place under and in houses, in animal shelters if they have any, or in any place available. Although farmers do not lack awareness of the relationship of MC to milling head yield, their main concern at this time is not to improve the milling quality of the paddy but to keep it from spoiling altogether because of wetting. If it cannot be dried at this stage, the only way the crop can be saved is to move it as soon as possible to a purchasing rice mill where it is usually parboiled before it is milled. The price received for wet paddy is much lower than for dry paddy but at least the crop is not a complete loss for the farmer. Very little is known of the extent of second crop post-harvest loss of rice due to wetness, but it is surely very high.

Potentially at least, the use of dryers in relation to the second rice harvest offers considerable promise for solving the problem both of wet paddy and of milling quality of the paddy. This could be achieved if the farmer by-passed the field drying, threshed the paddy directly after harvest, preferably using a mechanical thresher, processed the threshed paddy in a dryer bringing it down to the optimum MC, and delivering it without delay to the market outlet or rice mill.

1.2 Other agricultural produce.

We now pass on to other agricultural produce for which there are potential dryer applications. As mentioned earlier, the practice of drying many categories of food by simple exposure to the sun is very common in Thailand. The purpose is to keep the food from spoiling, Thai culinary requirements, or both. It is probably appropriate here to distinguish between the drying of food for household consumption and the drying of food to be sold commercially. The former is not a problem for the average household as quantities are small and the method is unlikely to be seen as needing to be improved upon, especially if an additional cost is involved. The latter is more likely to be seen as significant if the use of a dryer reduces the risk of spoilage of large quantities of produce which are depended upon as a source of income.

In the category of cash crops, the main candidates for consideration for dryer applications appear to be maize, ground nuts, mung beans and castor beans. Other candidates, are coffee beans, sesame seeds, coconuts, vegetables such as

shallots, garlic, chillies and mushrooms, fruits such as longan, lychee and so on, especially if there is a market demand for large quantities of such dried commodities, which is a prime consideration for the economic viability of dryer use. The most promising Regions to concentrate on are the North and the South. Such enterprise is not without problems as the following situation investigated by the writer illustrates. There was a strong export market for dried shallots in 1981–1982. Farmers in Rasi Salai District, a generally depressed area of the Northeast, began growing shallots in quantity at the beginning of the dry season using ground water for irrigation. Traders were paying 20 baht a kilo for their produce which was a greater source of income for farmers than all other agricultural activity – a windfall. By early 1983, the overseas market for shallots had vanished and farmers were receiving only 2 baht a kilo for their shallots. Overseas markets for agricultural produce are notoriously fickle but a possible explantion suggested by the local Agricultural Officer is that because the shallots were not properly dried, they had rotted by the time they were received by the importers, hence, orders were not renewed.

In conversation with farmers on dryer applications, the suggestion of fish recurs constantly. Fish abounds in Thailand, not only in coastal waters but in inland waterways, and also in vast quantities in flood waters covering paddyfields at the end of the rainy season. Farmers derive considerable income from trapping them in dug pits at that time and selling them on the market or to traders. Some of this fish is dried in the sun to preserve it for future consumption but the method is inefficient and unsanitary. In the Northeast of Thailand, farmers, especially in more isolated regions, such as Roi Et Province, preserve their surplus fish by marinating it in salt and transforming it into "plara" or fish paste, a standard staple of Northeastern diets. If the fish were dried it would be a more universally marketable commodity and source of income. For all of these reasons, therefore, fish and other water creatures such as prawn would merit consideration for dryer applications.

Part II

Discussion of specific dryers

2.1 Introduction

The main purpose of the discussion is an evaluation of two dryers developed under IDRC funding, the first, a solar dryer developed by the Asian Institute of Technology (AIT), and the second, a mechanical flat bed dryer developed by the Agricultural Engineering Division Department of Agriculture (DOA), Ministry of

Agriculture and Cooperatives. For purposes of comparison, a third dryer developed privately by a farmer in Chachoengsao Province, Mr. Chan Huatsawat (Chan), will also be included in the discussion.

The specifications and performance of the AIT and DOA dryers are provided in the technical reports of these organizations. Those of the Chan dryer were described by its developer and by Mr. Sa'athip, a DOA engineer familiar with it. For convenience of reference, the characteristics of all three dryers are summarized here :

(1) AIT Dryer

Type : solar dryer
Capacity : 1 ton of paddy
Drying time : 1 to 2 days; more if heavy continuous rain
Components : a solar collector area, a paddy box and a chimney
Dimensions : 7 × 6 meters
Building materials : bamboo, plastic sheeting
Cost : about Baht 2,500 (US$ 109), not including labour; less if cost of bamboo not included.
Operating expenses : nil

(2) DOA Dryer

Type : mechanical flat bed dryer
Capacity : 2 tons of paddy
Drying time : 3-6 hours
Components : paddy box, thermometer, screen, canvas air duct, 8 HP engine (farmer multi purpose Kubota Type engine), rice husk or oil furnace, air duct, cyclo-fan.
Building materials :
paddy box : plywood
furnace : bricks and cement or asbestos
Dimensions : 2.44 × 2.44 meters.
Cost exclusive of engine which most farmers already have (1981 prices)
- Rice husk furnace model - Baht 10,400 (US$ 452)
- Oil furnace model - Baht 9,700 (US$ 422)
- With both types of furnace - Baht 12,460 (US$ 540)

Breakdown
- Paddy bin Baht 4,500
- Cyclo fan 3,200
- Rice husk furnace 2,700
- Oil furnace 2,000

Operating expenses : variable depending on type of engine (gasoline or diesel) and type of furnace (rice husk or oil burning) used.
Minimum : Baht 10.35 (US$ 0.45) /hour
Maximum : Baht 41.4 (US$ 1.80) /hour

(3) Chan Dryer

Type : mechanical flat bed dryer
Capacity : 12 tons of paddy
Drying time : 6 – ? hours
Components : paddy box, thermometer, hot air duct running through the paddy, farmer multi-purpose engine, oil furnace, cyclo-fan.
Building materials :
paddy box : plastic sheeting lined wire cage
Dimensions : 2 × 18 meters
Cost including engine : Baht 45,000 (US$ 1,950)
Operating expenses Baht 6 (US$ 0.04) hour/ton

2.2 AIT solar dryer

Of these three dryers, a full evaluation is possible only for the AIT design as it is the only one to have been adequately field tested from the point of its appropriateness and acceptance from a user perspective involving a convincing sample of farmers.

Overview of farmers' experience with and reaction to the AIT solar dryer

The dryer design is not beyond the capacity of the farmers to build themselves. Although all village sited dryers were built by the Project team, the farmers were associated with this work and could clearly build it on their own if provided with the Do It Yourself Handbook. The farmers are also capable of operating the dryer on their own. That all did not in fact operate the dryer according to specification is not due to a lack of understanding of the basic technology but to other factors.

All users recognize the advantages of using the dryer. Those most frequently mentioned are the possibility of drying paddy even when it rains (slowly but better than letting it rot in the field), protection from rats, birds, insects, etc.; a cleaner product; better price received for dry paddy; improved storing quality mainly in relation to the storing of seed grain for the next crop. Many are critical of some aspects of the basic dryer design from a user point of view. This view deals mainly with the loading and unloading of the paddy bin, however, such problems can be easily corrected.

The users' basic difficulties with the solar dryer can be summarized under the following headings:

(1) The construction materials are not durable.

The bamboo is rotten after a couple of seasons and the plastic sheeting has to be replaced every few months either because it gets torn by dogs or children,

or simply disintegrates because of exposure to the sun. Because of this, besides the original investment, the farmer has to keep on paying maintenance costs if the dryer is to remain functional. It would be better, they suggest, to develop a dryer using more durable materials. This would increase the cost but it would be recovered over time.

(2) The one ton capacity of the dryer is too small.

This is the most common complaint. Given current harvesting practices described earlier, there is no way this dryer can cope with the volume of paddy harvested unless the harvest is staggered and this the farmers are unwilling or unable to do. In practice, the farmer users combined both traditional drying and dryer processing in different proportions. These proportions were most apparent in the dryer process involving the more serious wetted paddy. In practice also, they were more concerned with saving their crop from rotting due to wetness than with improving the quality of the paddy from a milling point of view so that dryer processing time was abreviated. This is apparent from farmers statements to the effect that they could dry their paddy in the dryer in four hours. Suggestions for dryer improvements to solve this problem in their view is to increase its capacity by up to five times and/or to add an auxiliary source of heat for rainy days.

An additional argument against the small capacity of the dryer is that paddy traders and millers are not interested in purchasing paddy in small lots. While waiting for successive batches of dryer paddy to accumulate into a suitable bulk, the farmer runs the risk of it being wetted again in the rainy season if he does not have sufficient storage facilities.

(3) Farmers do not receive a better price for dryer processed paddy.

This of course is a key issue which is examined in more detail below. The user farmers were all asked the difference in price received between dry paddy and wet paddy for the second crop of 1981 and 1982. On average, they received about 500 baht a ton more for dry paddy. They were further asked if there was a difference in price received between dry paddy processed in the dryer and dry paddy processed in the traditional way. All answered no, the price received was the same in both cases. It follows then that the farmers get no bonus by using the dryer to produce a better quality paddy having a higher head rice yield in the milling.

(4) The dryer is in use only a few weeks a year.

The implication is that it is a poor investment. This is a somewhat spurious objection. Firstly, not all, but some users made use of the dryer all year round with apparently good results to dry other agricultural produce besides paddy such as maize, chillies, fish, etc. Secondly, as there are many such applications, it would

be possible for all users to engage in such practices if they wanted to. Most farmers of this sample use mechanical threshers which are much more expensive than the solar dryer. There is no complaint that they also are used only a few weeks a year, presumably because compared to the dryer, the benefits are seen to be great enough to warrant this investment.

AIT Solar Dryer Acceptance by Farmers.

The results of the field testing are quite clear in this respect: the demonstrations have, with few exceptions, elicited no strong interest among the users and among their fellow villagers. One of the dryers was not used at all on the pretext that it was poorly located. (Could it not have been moved easily enough?) Another dryer was not used for paddy at all but for drying bananas (granted that this is not without interest). In the two demonstration villages visited by the writer, the dryers were in state of disrepair and not in functional condition. Most tellingly in the writers view, there are only two instances, both in Sing Buri Province, of other farmers being sufficiently impressed by the demonstration to undertake to build their own dryer in all nine demonstration villages. On the one hand, the benefits provided by the dryer were not perceived by the farmers to be substantial enough to motivate them to adopt it. On the other, traditional practices are deeply rooted hence not easily changed. These provide limited means of coping with the hazards of uncertain weather during the second crop harvests but the farmers are used to this and the level of risk is seen as acceptable.

2.3 The Chan Dryer

It is useful at this point to report on another dryer development experience that has bearing on the evaluation of both the AIT dryer and of the DOA dryer. Apart from the circumstances of its development the particular interest of the Chan dryer is that it does not require any change in farmers' harvesting schedules and it was conceived in the context of an overall post rice harvest strategy. The developer of this dryer is

Mr. Chan Huatsawat
No. 14, Plaengyao Village 7
Plaengyao King District
Chachoengsao Province.

Mr. Chan is a very remarkable individual. Presently in his early 40's, he is a farmer with only four years of formal education. He is deeply committed to farmer organizations and is a member of the Provincial Committee of the farmer associations sponsored by the Dept. of Agricultural Extension. He is mechanically inclined and earns his living partly by repairing agricultural equipment of all kinds. He also produces and sells motorized vehicles using the all-purpose Kubota engine which have become so popular in rural Thailand.

Chan has designed and built dryers of different sizes powered by a Kubota engine and using liquid gas or oil as a source of heat. His 12 ton dryer (see supra for specifications) is the latest of the series. In his view, any dryer with a capacity smaller than that is inadequate. He admits that the price (Baht 45,000) is steep for individual farmers but the set-up he has in mind is ownership by a group of farmers each investing a share of the cost of what would be a communal facility. Also, given the size of the dryer (2 meters by 18 meters), it would require a shop-like installation and could not be set up in the open. He is already demonstrating his dryer to his group of farmers by drying some of their paddy free of charge and getting them to compare the prices they are getting for this paddy with what they get for field dried paddy. He is receiving financial support for demonstration expenses through the District Office which is complemented by doing some drying for hire. Chan finds that the farmers need a lot of convincing before they are won over. Several groups of farmers in the Province are said to be interested and to have requested funds from the Government Rural Employment Generation Program for this project.

Chan has demonstrated that the quality of even main crop paddy can be improved importantly by the use of his dryer. Although moisture is not as much of a problem for this crop as for a second crop, inevitably there are bad spots in a farmer's fields where water persists even at this harvest time causing paddy to rot, discolour, etc. This gets mixed up with the good quality paddy and spoils the whole lot by contamination causing it to smell, lose its good taste and so on, and reducing its market value. Chan noted in this context that moisture content is not the only determinant of price paid for paddy by traders. Certain strains are preferred by consumers, e.g. Hom Mali rice, and these are not usually the so-called improved varieties. These preferred varieties can sometimes be sold at a higher price.

Besides his rice dryer, Chan has also designed and built a village rice mill. Both the dryer and rice mill were submitted to an appropriate technology competition sponsored by Chulalongkorn University. His rice mill won third prize but his dryer lost out to the DOA dryer for second prize. Chan's village rice mill can process 10 tons of paddy in 24 hours and costs about 60,000 baht. He is not satisfied with this and is currently working on increasing its capacity. His objective in developing the rice mill is to transform the role of the farmers from sellers of paddy to sellers of milled rice which will give them a much better bargaining position. Market prices for rice that are milled and graded are fixed and can no longer be determined more or less arbitrarily by traders as in the case of paddy.

Mr. Chan's vision of farmer appropriate post rice harvest technology includes the development of a mechanical harvester to complete the system. In his view, the most effective way of handling the harvesting process, especially for a second crop, to eliminate loss from shattering, wetness and other causes is to harvest the crop

when it is precisely ripe using his mechanical harvester. By-passing the traditional field drying, the paddy is then directly processed in mechanical threshers, an efficient model of which is already commonly used by farmers in this Region. The threshed paddy is then dried immediately to the optimum moisture content in his mechanical dryer which has the capacity to handle it. The final step then is to mill this paddy in his rice mill where it is graded, bagged and ready to sell on the market.

Besides his lack of formal training, a remarkable aspect of the accomplishments of this grass-root genius is the fact that he is not supported financially by any organization in his ventures but uses his own money, selling hogs and so on as needed to purchase equipment and materials. As he noted wryly, this can become on expensive proposition as some equipment purchased, e.g. heaters for his dryer, does not always work and has to be rejected. He does seek advice however. For example, engineers of the Agricultural Engineering Division of the Department of Agriculture helped him in the design of the heaters for his dryer. He is also assisted by a friend in the Faculty of Engineering at Chulalongkorn University. An important source of ideas and encouragement is his neighbor, Mr. Thawanchai Naksaphan, also a farmer, one of the few who chose to go back to farming after earning a bachelor's degree in agriculture at Kasetsart University.

Given the experience and backgound of Mr. Chan, one is fascinated but not surprised to hear this "illiterate" farmer discuss the fine points of post harvest technology with great precision and using the scientific terminology always stressing the need for, in his own words, appropriate technology.

2.4 The DOA Flat Bed Dryer

The DOA dryer can be used to process a variety of agricultural produce. According to the literature, reviewed by the writer, the Agricultural Engineering Division, has tested it for use with at least paddy, maize, chillies, longan and coffee beans. With the exception of its use to dry longan for which technical problems remain to be worked out, the results of these tests are positive.

In order to get some reaction from the field on the DOA dryer, the writer adopted the strategy of describing its features to farmers and Agricultural Extension Officers associated with the AIT solar dryer project in Suphan Buri and Sing Buri Provinces, to Mr. Chan and Agricultural Extension Officers, in Chachoengsao Province. Reactions were sought on four dryer options :

(1) The original AIT solar dryer.
(2) A solar dryer of the same capacity and performance made of permanent materials and costing 10,000 baht.
(3) The DOA dryer.
(4) The Chan dryer.

In *Suphan Buri*, AIT solar dryer user Sanan Wiangkham rejected the Chan dryer as being too big for his needs. Although he found merit in option (2), his unequivocal preference once it was described was for the DOA dryer. The reasons for his choice are as follows :

- The capacity and performance are just right.
- It is not dependent on the weather and can be used 24 hours a day if necessary.
- It is durable.
- It is compact and requires less space than the solar dryer.
- As most farmers already have engines, the investment would not be more than for option (2), and would be more attractive.

In spite of the additional expense for operation, Sanan would select the oil burning version. Burning rice husk is too messy. He feels confident that the construction of this dryer is not beyond the capacity of village craftsmen : carpenters, etc. This would be facilitated by the fact that a fnnctioning DOA dryer is available for viewing at the nearby Suphan Buri Rice Station. Agricultural Extension Officer, Phairot Jindaphon, an AIT Workshop participant who accompanied the writer on this visit, was clearly fascinated by the DOA dryer and made it his first choice also.

In *Sing Buri*, the owner of the AIT solar dryer was absent at the time of the writer's visit and although the farmers interviewed were knowledgeable about the solar dryer they had not used it themselves. It is also relevant to note that although there was interest in the dryer in this village, it had not been used as successfully as in the Suphan Buri village. Although less exhuberant than Sanan, these villagers also showed a clear preference for the DOA dryer over the other options with the provision that they would like to try it first before committing themselves. Particular interest was shown here for other applications besides drying paddy. As there is much fish in this area, the possibility of using the dryer to launch a dried fish industry was entertained. Farmers here prefer the rice husk burning version to the oil burning version. Here again they feel that they could build the dryer on their own with proper instructions. Both the Deputy District Agricultural Officer and the Sub-District Agricultural Officer (a Workshop participant) showed strong preference for the DOA dryer option.

In *Chachoengsao*, the writer's discussion of dryers was with the creator of the Chan dryer as reported above, and with officers of the Provincial Agricultural Office. Here there was no support given to the original solar dryer for the same reasons given at the Workshop. Chan understandably defended his dryer against the others. He maintains that his dryer is more cost effective than the DOA dryer

and finds the cost quoted for it by the DOA outrageous to his, given the performance of both dryers. The Extension Officers were clearly not very knowledgeable about dryer use in general, but tended to prefer the DOA dryer.

2.5 Paddy pricing practices in Thailand

One of the main selling points made by all dryer developers is that by processing their paddy in a dryer, its milling quality in terms of head yield is substantially improved and consequently commands a higher price on the market. In fact, however, these theoretical benefits are not received by dryer users which is the main explanation for their lack of enthusiasm for the dryer to process paddy and the related low level of acceptance of the innovation. This issue merits closer examination.

It has always been fashionable in political and activist circles to accuse middlemen -- paddy traders and rice millers, Chinese, of course, according to the stereotype -- of taking advantage of the farmers and cheating them in any way they can. The following brief description of paddy trading practices attempts to set the record straight.

We start with the understanding that rice trading is a business transaction and not social welfare and that, on principle, all involved seek to maximize their profits. Rice traders buying paddy from the farmers all follow the same practices be they village traders, outside brokers, or representatives of rice millers. They start from a basic price for all paddy. In principle, the value of 10 kgs. of paddy is deducted from the value of a ton of paddy to compensate for excess weight due to assumed moisture content. No instrumentation is used to measure this however, neither by traders at farm gate, nor by rice millers at the mill. Evaluation is based on visual examination and other various folk practices. Some cheating by traders sometimes takes place using a larger than standard measure (*Tang*) if the purchase is made by volume, or by using an inaccurate balance if the purchase is made by weight. The method used for checking for broken grains is to spread some paddy on a board and rolling it with an iron bar. By rolling it too energetically -- a ploy used by some unscrupulous traders -- more grains get broken than existed beforehand. Bargaining for the price starts from here, the trader trying to find reasons why more deduction should be made from the total weight : the paddy contains impurities, is discoloured, etc. If the paddy is wet from rain, a deduction of 200–300 baht is made from the value of a ton. The farmers argues on the basis of the good points of his paddy : the tastiness of the particular strain, etc. Both sides are willing partners; both are knowledgeable and aware of what the other is up to. It is normally not easy for either side to take much advantage of the other, unless of course a farmer is so badly in need of cash that he is willing to accept any price for his paddy.

There is much evidence to show that the charge that rice traders and millers exploit the farmers has little foundation in fact, at least at the local level. The writer has investigated rice marketing in Ayutthaya, Suphan Buri, and Chachoengsao Provinces and feels secure in stating that at least in the Central Region it is a reasonably efficient self-regulating system. For one thing, competition is high. If a farmer is not satisfied with prices or pricing practices of one trader, there are many others he can turn to. In these circumstances, no trader wanting to stay in business can engage in blatantly outrageous cheating. Secondly, traders and rice millers are local people well-known to the local population. Trading relations are also based on relationships of trust. No outside trader can deal in a local community without being introduced by a local broker who vouches for him (and receives a commission for his services). Local rice millers also provide important services to farmer clients. Few farmers have paddy storing facilities. Those not wishing to sell their crop at harvest time when the price is lowest make deals with the millers to take delivery of their paddy on consignment for sale later in the season when the price goes up. Farmers have an advantage over traders when the market demand for rice is high and the price is also high. Traders are then competing to buy available stocks and are willing to pay a good price for the paddy. The opposite is true when market demand and prices are low. Traders are then reluctant to deal in rice because of low profit margins. The self-regulating mechanism of the market system is less operative in areas of lower rice production such as the Northeastern Region. As there is less paddy available for sale, there are also fewer rice traders, hence, less competition. Poor communication is also a contributing factor. In such circumstances farmers have no choice but to deal with the trader who comes to their village, no matter how questionable his practices are.

Farmers, especially in the Central Region, are quite sophisticated in rice matters and do not lack awareness of the relationship between MC and head yield. Traders and rice millers also understand this and although they do not use scientific instrumentation, they have enough experience to evaluate quite accurately the quality of paddy submitted to them for purchase. Why then are farmers not receiving top prices for top quality paddy, at least at the government minimum guaranteed price? To get an answer to this question, the writer consulted Mr. Suthep Wasantiwong, Manager of the Huo Dong Cooperative cum rice mill in Phichit Province who has a rice business of his own and has more practical information and wisdom on rice matters than most.

According to Khun Suthep, the guaranteed price program of the government is unsuccessful because mechanisms needed to implement it are not in place. The government Marketing Organization for Farmers which should be doing this has neither the funds nor the storage facilities to handle paddy purchases in the volume

needed. Secondly, given the rice pricing policy of the government to keep the price of rice sold within the country low, there is no way millers and traders can pay the guaranteed price and still make a profit. The export price of rice is higher than the domestic price. The average export price of 5% broken rice (FOB Bangkok) from 1979 to 1983 was US$430/ton. In fact, there was considerable variation from year to year and, within any given year, from month to month. Thus, the average price was $482.81 in 1981 and $292.73 in 1982. In 1981, the same rice was valued at $535.00 in June and $383.00 in December. The share of this export value of rice that is available to up-country traders is controlled in a number of ways : the rice premium, a special tax imposed by the government on export grade rice; an export tax which is a standard ad valorem tax; a government imposed rice export quota which controls the amount of rice that can be exported at any given time; and finally, price controls for domestically sold rice determined by the Ministry of Commerce for different grades of rice on a scale that provides little incentive to produce higher grade rice. At the level of up-country traders and millers, they deduct their profit from the best price they can get from their own market outlets and the burden is then passed on to the farmers. This is not inconsistent with good relations between traders and farmers. The traders play a necessary role and are not generally exploitative at the local level as was mentioned, but they also have to survive and are subject to the same pricing contraints as the farmers.

Part III

Conclusions and Recommendations

3.1 Conclusions

Although the AIT Solar Rice Dryer Project has achieved its objectives in technological terms, the low level of acceptance of this technology as tested in the field pilot program does not seem to justify further efforts to promote it in its present form. Despite these disappointing results, the project has proved to be extremely useful in identitying issues and problems in dryer technology of which there was previously little awareness. Experience thus gained could be valuable to all involved in R. and D. on dryer technology.

In the writer's view, one of the main lessons learned from the AIT project is that the development of a technically successful dryer and its introduction to a farming population is not sufficient by itself to provide the farmers with the theoretical benefits calculated by the developers on the basis of its technical performance

alone. In the case of its application to paddy, for example, drying is but one operation in a whole crop process going from ground preparation and planting to harvesting, post-harvesting practices, and eventual marketing. The success of a dryer depends on the smooth integration with conditions and operations that precede as well as follow the drying of paddy. Thus, with the benefit of hind-sight, one can identify the conditions under which the AIT solar dryer can be used effectively, as follows :

(a) The farmer has the technical ability to stagger his rice harvest to conform to the capacity and drying rate of the dryer through crop management, either by staggering planting or by using a mix of seed strains with different maturing periods. Relatedly, he has access to irrigation water as needed for this cropping pattern.

(b) The farmer has the manpower to maintain this harvesting pattern. The work force could be smaller but must be available over this longer period.

(c) There is an effective rice marketing system in place that is responsive price-wise to the quality of paddy for sale, i.e. offering substantially higher prices for dryer processed paddy.

d) The farmer has full control over the disposition of his crop and is therefore motivated to improve it in any way he can to get the best price. This condition is not met in the case of share-cropping or of so-called green rice contracts i.e. pre-harvest agreement with a creditor to deliver the full harvest at a low set price against a cash advance.

(e) The farmer maximizes the utilization of his dryer by using it all year round to dry other agricultural produce as well.

In the writer's view, the inability of the farmer solar dryer users to cope with the first three of these conditions is the basic reason for its lack of acceptance, not the commonly voiced dissatisfaction about the flimsiness of its structure.

The advantage of the Chan dryer over the AIT dryer is that it is perfectly compatible with traditional crop management practices and requires no adaptation or change on the part of farmers. As it is basically a communal dryer it follows a different concept requiring institutional cooperative arrangements among users that are not needed for the AIT dryer. The concept is interesting but its viability and acceptance not sufficiently demonstrated. Its applications for other agricultural produce are not clear. For obvious reasons, none of the farmers consulted expressed interest in investing in such a dryer for individual farm use.

The design of the DOA dryer proved most popular among farmers consulted, but this is inconclusive because the dryer was never really field tested and the number of farmers consulted too small. Independent of its durable structure, its capacity and performance were seen as giving it a definite edge over the solar

dryer mainly because it could be operated with minimal adjustments to traditional crop management practices. The level of initial investment and of operation costs was seen as acceptable by relatively more affluent Central Plain rice farmers. It would probably be too high for poorer farmers there and in less affluent Regions such as the Northeast. Another valued feature was its compactness and versatility.

From a farmer's perspective, the most important reason for resisting the adoption of dryer technology for paddy is the inadequacy of economic incentive due to rice pricing policies in Thailand. Benefits for improving the quality of the paddy by the use of the dryer are seen as providing too little reward for the effort involved. This situation can be improved with the use of an integrated post-harvest technology system following the Chan model. It would be considerably enhanced if used in conjunction with an effective rice marketing support organization as demonstrated by Suthep and the Huo Dong Cooperative in Phichit Province. Such benefits are not likely to become available to many farmers in Thailand for a long time however.

Given this situation, R. and D. on dryer technology for paddy in a short term perspective needs to take into consideration the fact that its main interest for farmers is its contribution to alleviating the problem of wet paddy, not to improving its milling quality. In a longer perspective, the improvement of post rice harvest technology is a valid scientific pursuit which sooner or later will benefit the farming community.

There is little that can be concluded from this study on the use of the dryers for other agricultural produce other than the fact that there appears to be genuine interest in it on the part of the farmers. Before anything can be concluded on the appropriateness of the technology for this application, more information is needed not only on the technology itself but also on the social and economic aspects of its utilization. Factors that need to be considered wethe following :

- The kinds of agricultural products for which there are dryer applications for domestic and commercial purposes.
- The distribution and scale of their actual and potential production in Thailand.
- Value-added in real terms, i.e. taking into consideration actual market prices available to farmers, accruing from the drying process.
- The relative efficiency of traditional drying practices in comparison with the performance of a scientific dryer.
- The scale of production needed to make the use of a dryer cost-effective.
- Current farmer practices and preferences in agricultural pursuit favoring or conflicting with dryer-based enterprises.

3.2 Recommendation

The following suggestions are offered by way of recommendation for future dryer technology development.

(1) AIT solar dryer. Given the constraints described in the report, further efforts to promote this design among farmers do not appear to be justified for the time being. The interest of AIT in developing solar dryer applications for maize appears to be more promising given the volume of maize produced in Thailand, the need for drying it, and the difficulties of drying unthreshed corn in a mechanical dryer due to heat loss. Another possibility emerging from this study is the appropriateness of developing a smaller "home appliance" type of solar dryer to dry produce for household consumption.

(2) DOA dryer. As this dryer shows considerable promise it would be extremely useful to conduct monitored field trials by farmers as was done for the solar dryer in order to understand its practical potential and problems. This should be done in association with the line officers of the Dept. of Agricultural Extension. This cooperation with the Dept. of Agriculture should be sought at the Director-general level of both Departments. The field officers involved should be trained by the DOA in the theoretical and practical aspects of building and operating the dryer. Funds will need to be made available to the Dept. of Agricultural Extension as a budget is currently not available for such trials. It would also be useful to involve academic institutions to conduct further studies on the social and economic aspects of the dryer applications and to monitor the field trials. These could include appropriate provincial universities in Chiang Mai, Khon Kaen and Songkhla. Institutes for Skill Development having agricultural engineering sections in Lampang (North), Khon Kaen and Songkhla could provide useful support to train farmers to build and repair the dryer. The question of whether or not the farmers would be willing or able to build the dryer needs more investigation. An alternative would be to sound out operators of small scale agricultural implement factories to determine their interest in dryer production. There are many such small factories in Ayutthaya Province for example, manufacturing mechanical tillers. Should the dryer become popular, a spin-off would be a contribution to the development of small scale industry in up-country locations, a Fifth Plan priority. The most obvious source of credit to farmers for the purchase of the dryers is the government Bank for Agriculture and Agricultural Cooperatives, (BAAC).

References cited.

1. AIT Interim report on IDRC-AIT Solar Rice Drying Project. Bangkok, December 1982.

2. Center for Agricultural Statistics. Agricultural Statistics of Thailand, crop year 1980/81. Agricultural statistics No. 150. Bangkok, Office of Agricultural Economics, Ministry of Agriculture and C-operatives, 1981.

3. Department of Agriculture. Research report on post-harvest practices for certain crops throughout the country. Bangkok, Agricultural Engineering Division, 1976 (In Thai).

4. Vasana Singhakowinta. Research report on the rate of losses and wastage in agricultural production : rice in Central Region of Thailand. Bangkok, Kasetsart University, 1976.

"Self-Reliance" and "Participation" in Rural Energy Development

Amara Pongsapich

1. Introduction

Research and development activities have been becoming more popular during the 1970's and 1980's. Research projects are increasingly seen as a continous process going from invention to experimentation, testing, implementation, and finally to adoption. However, in development concepts where the ideas of self-reliance and participation are introduced, interaction between researchers and villagers is the most crucial relationship leading toward successful projects. Joint efforts between researchers and users are emphasized instead of a dichotomy of change agents and adopters. The idea of technology transfer or diffusion of technology, with the implication of technology flow from a more advanced to a less developed society or from the top down, is being abandoned. Participatory action research has now become a more attractive and popular development concept.

In this context the development of nonconventional sources of energy supply should be considered as an import-substitution policy. It should also be examined in terms of minimizing deforestation problems. From both points of view, research and development in renewable nonconventional energy is an activity of vital importance to the country. For rural renewable energy development, a bottom-up approach seems appropriate because renewable energy development means resource development at the local level. And since different energy sources are available in different ecological zones, local people know best about the natural resources available in each zone. Outside researchers cannot claim such an expertise regarding local conditions. Mutual cooperation is certainly necessary.

This paper describes activities of a survey component of the Non-conventional Energy Project supported by USAID. The survey component is designed as a part of a larger research and development project. The concepts of paticipation and self-reliance are used in the survey and form the development philosophy to be promoted. Before describing the project, it is therefore appropriate to review some of the development concepts proposed and used by many development agencies.

2. Background on Development Concepts

2.1 The western development model

For many decades, development theories have used western countries as a model for the developing countries. To reach development, therefore, one has to find means and ways to get oneself to that stage. Rostow's theory[1] of stages of development is a good example of a theory following this concept. The "underdeveloped" must therefore, change themselves in ways of living, their socio-cultural beliefs, political organization, etc. in order to become "developed." Technology transfer or technology diffusion are among the concepts used, especially in early development studies.[2] It was later discovered in practice that technology cannot be merely brought into a community to make that community developed. It takes more than diffusion of technology or innovation for development to take place.

2.2 Economic indicators as a measure of development

Following neo-classical economic theories emphasizing demand, supply, profit-making, and the like, a development model is one in which communities are evaluated as developed or not developed according to certain economic criteria such as per capita income. After this development model was criticized heavily, the Gini coefficient was then introduced as a second indicator to measure income dispersion or distribution. However, many critics are still not satisfied because social conditions were not considered at all.

In the case of Thailand, Oey Astra Meesook*'s World Bank report concluded that though economic indicators have enabled analysts to make certain conclusions, definitive conclusions cannot be made because either the macro-data are not accurate enough and/or qualitative data are not included in the analysis.

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disparities in household incomes and in the proportion of the poor population in the total. Moreover, to the extent that the reduction in disparities originates from direct improvements in the agricultural sector, then we have not witnessed any trade-off between agricutlure and nonagriculture, as well as across regions. One would. however, have to know what has happended to the distribution of income within the agricultural and non-agricultural sectors themselves before drawing final conclusions on this issue. As far as the role of the government is concerned, however, the resources available to it have not been used in such a way as to contribute to a reduction in the disparities in the living standards across major population groups.

2.3 Social indicators as a measure of development

The criticism of economic indicators as a means to measure development led to the identification of social indicators. However, as yet, no one has come up with an agreed-upon set of social indicators. Many have reached the conclusion that it is not possible to identify a set of social indicators, where as others are still working on the problem. Significantly, the social indicators identified (or in the process of being identified) are items which are quantifiable, such as the ratio of teachers to students, the literacy rate, the infant mortality rate, etc. Even if these sets of variables are established as social indicators, critics will still not be satisfied because nonquantifiable items are excluded.

2.4 Development model for non-western countries and renewable nonconventional energy

Many international agencies are now promoting development concepts that are more relevant to the *quality* or characteristics of the development process than to the *measurement* of development itself. This approach stems from the rejection of western development models which are appropriate for western societies but not necessarily appropriate for non-western societies. Third world countries have a different process of development. They will not be able to reach the take off stage of development identified by Rostow, and they should not try. Ways of living are different due to different ecological and geographical conditions. The "dependency" model argues that since third world countries try to follow development models designed by the West for the West, they *end up* being dependent on western economic system and become worse off economically and socially than they were before.

Two important concepts which are being promoted and followed as appropriate development strategies for third world countries are the concepts of self-reliance and

popular participation.* We use these concepts in our projects to develop questionnaires for baseline surveys which will be followed by introduction of technology. The concepts are elaborated in the following paragraphs.

(1) Self-reliance. In renewable non-conventional energy projects, the supply and demand of energy in a community are two of the most important factors to be identified. The identification of available sources of energy supply will indicate the energy technology most appropriate for implementation. Identifying Energy demand will help to determine the magnitude or the amount of energy needed to make the community self-reliant. In other words, self-reliance in energy supply must be the goal of implementing any particular energy technology in a community. Using renewable energy supplies will make the community more self-reliant and not as dependent on imported fuel.

(2) Participation. The process of making energy available for the community use should be participatory. Villagers should be involved in the identification of energy demand and supply as well as in bringing about an alternative energy supply introduced through the implementation of energy technology. Once an appropriate energy technology is identified, villagers should be able to contribute their labor and/or income in making the energy technology available. Energy technology should not be handed out, merely leaving it up to the community members to accept or reject the technology. Villagers should be involved and participate in bringing the energy technology into the community. Their participation will indicate their needs and their willingness to take care of the technology in the future. Villagers' participation will also create a sense of belonging in the project and in the community.

3. The Concepts of Self-reliance and Participation in the Surveys

The concepts of self-reliance and participation are built into the survey design at all stages in the following manner.

3.1 Preliminary preparation

Secondary data sources were studied to help identify regions where certain sources of energy supply are located. For example, the South is known for the availability of wind required for the windmill water-lifting component, while the Northeast has biomass material available such as agricultural waste and animal

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* see Norman T. Uphoff, John M. Cohen, and Arthur A. Goldsmith. *Feasibility and Application of Rural Development Participation: A State of the Art Paper.* Rural Development Committee, Center for International Studies, Cornell University. January, 1979, and also Bernard van Heck, *Participation of the Poor in Rural Organizations.* FAO Rural Organizations Action Programme (ROAP), 1979.

waste. The North has sources of water for minihydro, and wood for charcoal making. And, the Central region represents a fruit growing ecological zone with other lowland cultivation. The identification of the survey area based on ecological zoning and locally-available resources is done in order to make the selected communities self-reliant in energy supply.

3.2 Baseline survey--survey stage

In the baseline survey, in addition to collecting information on energy supply and demand (which will lead to implementation of energy technology that utilises local energy supply sources), information on socio-cultural conditions, existing factionalism and/or group participation activities was also collected. The baseline questionnaires and researcher's observation and field notes were designed to enable the survey team to identify villages for the implementation of appropriate energy technology leading toward energy self-reliance through the participation of villagers. In selecting a site for the implementation of energy technology, the potential for group participation in the energy activities is one of the most important criteria.

3.3 Transitions survey--implementation stage

The concept of popular participation becomes very clear in the transition survey. In order to implement energy technology in a village, a social science researcher will make preliminary contacts, getting villagers together in a meeting to introduce the technology, and ask for their agreement and cooperation on the technology to be imiplemented. This step is very necessary if the transition survey is to be carried out properly according to the concept proposed, by the papers. It is at this stage that direct interaction between technical people, social science researchers, and villagers becomes crucial. When cooperation is possible, villagers will contribute toward the implementation of the technology. They will feel that the technology is community property to be looked after for the well being of the community. The technique of participation and involvement brings villagers into the project at the earliest stage, to prepare them to take over the project when technical the people leave.

3.4 Evaluation survey

The criterion for evaluating the success or failure in implementing any energy technology is not whether or not the technology "works", but rather, the evaluation should be based on how the technology works in the community setting. A biogas digestor may work technically but if villagers do not use it, the implementation of this particular energy technology must be considered a failure. When technology fails to serve the community, something must be wrong. The evaluation survey of any research and development project is designed to detect the weakness in imple-

mentation and make adjustments, accordingly. A successful project is one where users (villagers or another target group) adopt the technology and are able to operate and maintain the technology without outside assistance. Self-reliance in the operation of technology which leads toward self-reliance in village energy supply, are the two levels where the concept of self-reliance applies. Of course, self-reliance in the operation of energy technology is only possible through the participation of villagers in the activities required. This means that the villagers must be involved in the project at every stage of implementation to enable them to learn as much as possible about the technology so that they can operate the technology after the technicians leave the community.

In this project the rural energy survey is to serve as a baseline or pre-implementation survey and will be followed by transition and evaluation surveys. The sampling frame was designed to select villages for the baseline survey who have different natural resources requiring different energy technologies. The original plan was to serve technology component leaders in the project in site selection and implementation. But since the other component leaders either were not aware of the plan or did not need the service, the baseline survey (conducted at high cost) was not utilized by other component leaders.

Self-reliance and participation are the two concepts inherent in the survey component. The implementation of energy technology should be carried out to promote both concepts. In the baseline survey, questions regarding community group activities were asked in an attempt to predict the degree of participation and self-reliance the villagers have in carrying out development projects with little outside assistance. Self-reliance was also viewed in terms of self-reliance of the energy supply. If natural resources are available to supply a particular energy technology, the introduction of that technology will certainly help make that village more self-reliant in the energy supply.

4. The Concepts of Self-Reliance and Participation During Implemenation

It became clear to the survey team that any good research and development project needs to have a good site study prior to implementation. Ideally in this stage, energy need assessments must be carried out. The project should be implemented only if there is a need for the project. Identification of energy need in the village is tricky here. Most villagers would readily state that they would like to have their village electrified. But in a renewable energy project, implementation of energy technology means extra effort on the part of the villagers. A full understanding of their required participation in different energy technologies will help villagers appraise those energy technologies.

A good transition survey will make implementation of technology easier and more meaningful. In addition to a socio-economic study, conflicts and factions that are identified in the communities prior to implementation will be important information to forming strategies. This is because the villager's participation at all stages of implementation in this project are good indicators of successful research and development. Conflicts and opposing factions indicate that full participation cannot be expected.

4.1 The concept of self-reliance and participation in the woodlot component

When the selection of the first woodlot sites was made in 1981, the need for energy resources and availability of land, were the most crucial criteria. Sisaket was identified and 4 plots of land were selected. If the participation concept was to be used, once plots were identified, community members in the vicinity would have to participate in all activities related to the woodlot from the beginning. Community members must agree that the woodlot would become community property meaning that labour input in planting, weeding, and harvesting would be communal and that the output would also be shared. Community members should become woodlot committee members having their say in the management of the woodlot plots from the first planting until harvest time. But in this project, villagers were not involved in the woodlot project because seedlings were planted with paid labour. The foresters and their hired labour took care of the plots for the first few years. And later at the end of the USAID project, we were told that the woodlots would be given to the subdistrict councils under the supervision of the districts and the provinces. The transfer of the woodlots from the Department of Forestry of the Ministry of Agriculture and Agricultural Cooperative to the Ministry of Interior will be made officially. After that the subdistrict councils will take care of the woodlots and "participation" will then take place.

Most officers of the Department of Forestry were familiar with hiring local labourers to plant the trees. The provincial foresters had a staff whose main duty was tree planting. Therefore, they felt that there was no way to make the villagers plant the trees in the woodlot without pay. But the statement was made under the assumption that the villagers will not benefit from the project. If the whole picture of the community woodlot project was presented to the villagers, participation in the community woodlot project would not be a problem. However, since the foresters themselves did not want the villagers to benefit from the project, there is no reason why the villagers should contribute labour to the project.

It appears that in the woodlot component, the concept of participation and self-reliance in fuelwood supply were not fully understood by the foresters who implemented the project. The foresters assumed that woodlot planting was a

re-forestation project of the Department of Forestry which they should carry out in a manner similar to other such projects. Trees planted by the government belong to the government. Conservation is the main purpose and therefore, harvesting is not possible. It is understandable why the community woodlot concept is not readily acceptable by most foresters. It will take a few more years to change their traditional values.

4.2 The concepts of self-reliance and participation in the biogas and microhydro components

Since the community biogas and microhydro components require labour input during the construction phase, the participation of the villagers was necessary from the beginning. The component leaders and the technical team had neither labour nor cash in hand to construct the necessary infrastructure without labour contribution from the villagers. Therefore, the two components involving the concept of participation of community members in the energy self-reliance projects were tried. Villagers were called to meetings where the whole project was identified. Participation of villagers during the construction phase was admirable. Rotation systems for labour contribution were set up. Punishment systems for those who neglected their duties were introduced and monitored strictly to guarantee participation.

After the construction was completed and the systems became operational, monitoring and operating schedules were also set up and carried out. In the Mae Kampong microhydro project at Ban Huai Kaew, San Kamphaeng Distict, Chiengmai Province which has operated for several years, the maintenance crew has been very active. Subcommittees were set up to supervise the different subsections of the project The social scientist of the survey component did an excellent job in establishing a committee to enable the villagers to take care of the project in the future. It was at this point that participation and self-reliance were seen in operation. The Participation of villagers was observed in the construction and implementation/ operation phase with self-reliance of energy supply and self-reliance in operation also evident. The villagers now know how to operate the microhydro system for village electrification and know who to contact at the NEA in case of technical problems.

Though the biogas village electrification has been in operation in a manner similar to Mae Kampong microhydro system, it has not been operating for long. Since the completion of construction, a series of problems kept arising. All of the problems were technical which took many months to solve. Therefore, though the project started in 1981, neither of the two villages were electrified for more than 3 months continuously. In this component, The villagers' participation, when needed, was exceptionally good during construction. In the initial stage of the operation, participation was not required for a long period because the system broke down. Later on, the routine requirements of filling dung into the biogas digestor and operating the generator proved to be boring and time consuming.

In 1984, when the team visited Ban Khwao, Si Saket Province, where one of the biogas project is located, sufficient pressure registered on the digestor guage. But the dung filler appeared to be very dry and clean as if not used much. Furthermore, upon examining the operating record, the generator was found to be operated only 1 or 1 1/2 hours a day. It turned out the young men responsible for operating the generator turned it off when they wanted to leave the village to see their friends or to go to town. None of the villagers complained and were content with having electricity only during the evening meals. After dinner, there was no need for electricity and if anyone wanted lighting, they lit kerosene lamps. Life continued the way it had been previous to having electricity.

On a further visit one month later, the survey team found that electricity had not been used for the whole of May. The dung had not been filled and the generator had not been operated. May is the month when villagers start planting and many did not have time to carry on the duty regarding the biogas digestor. When one or two groups neglect to fulfil their responsibility, others follow suit and the biogas digestor is left idle. The survey team encouraged everyone in the village to continue the biogas operation and the villagers promised to do so. However, the household energy model of Meta Systems Inc., which registers choices of energy technology preferred by each household, indicates that the biogas digestor and gassifier are the two least popular technologies because of the daily labor input requirement. During the planting and harvest seasons, the villagers cannot afford to spend time on energy acquisition. In rural Thailand the villagers have been able to do without electricity and so, during busy months, they readily turn back to the old way of life, depending on kerosene lamps.

It is reported that in 1985 when the site was visited, the system was not in operation. One reason for the villager's non-dependence on electricity was that electricity had not been available continuously for long periods of time. Demands for electricity have not been created sufficiently enough to encourage the villagers to make daily efforts to generate electricity for the village.

4.3 The concept of participation and self-reliance in water-lifting projects

Since the implementation of technology in the water lifting component was done in conjunction with other projects, it is very difficult to judge whether participation and self-reliance were a consequence of this project or not. In regards to participation, one needs to distinguish between participation in the implementation of water lifting activities exclusively or participation in general. In the case of the windmill, implementation of the windmills were carried out by paid subcontracting firms. From the villagers' viewpoint, the windmills were given to them free of charge with no investment required of any kind. They owe the District Agriculture officers

gratitude for being able to request and acquire technology which will help improve the potential for a successful experimental plot. A successful project will benefit the villagers while also demonstrating to the high ranking officers the ability of their subordinates to carry out projects. Since most government officers are very cager to prove the success of development projects, the windmill water lifting project has served them well, especially since the project is located in a community where other development projects are located. Included in the development activities are the King's biogas and the wier projects which are being anxiously watched to make sure of their success.

Similarly in Sakon Nakhon, where many of the King's and the Queen's projects are located, the photovoltaic water lifing component is another indicator of the development of the village. The water pump has become an object of decoration whose actual function does not serve the felt need but instead has become a luxury. There is no objection to villagers having luxurious lives if the basic needs are met. However, only a detailed evaluation survey can accurately answer the question of whether or not the felt needs are met. One incident became apparent, however. Now that the villagers have become reliant on pipe water, they have started complaining whenever water from the tanks is not sufficient to supply everyone. While the villagers are not self-reliant for their energy needs, they have become dependent on a new technology which is not designed to serve the whole community.

In terms of participation, the photovoltaic cell at Ban Tha Yiem in Sakon Nakhon is very small and does not need participatory input from many individuals. And for maintenance, this project is under the management of the headman who takes care of everything efficiently. There is no complaint and the villagers are basically satisfied except for an occasional minor complaints.

Conclusion

The above experiences in the implementation of different energy technologies at the village level indicate quite weli the different ways which the concepts of "self-reliance" ane "participation" have been interpreted and followed through. In some instances, the involvement of the villagers appears to be, mostly, labour-oriented participation and not participation in decision-making process. The implementation of energy technology in a village was made by technical people and the villagers had no opportunity to contribute in the process. If the villagers had been asked to be involved in the need assessment and project appraisal stages, their participation in the project would have been possible from the beginning. As it is, the villagers' participation during the most critical stages of the project was ignored. The villagers merely contributed their labor for construction.

Villager participation during the operation and maintainance phases, in the case of the microhydro projects, was admirable. In other technology components, results are not yet evident. The ideas have to be dissiminated further. Different energy technologies perhaps require different models. Never the less, attempts should be made to foster the concepts of participation and self-reliance to the villagers, government officers, and volunteer agencies working in rural development. It is not too late to promote and encourage the villagers to rely on their own natural and human resources and not depend on external resources.

Another step the government can take after fostering participatory and self-reliance concepts among villagers and government officers working on energy related activities, is to introduce the idea of rural energy planning at the tambol council level. A community can identify the need for energy supply; members of the community with the assistance of an energy expert can then appraise and identify the energy technology most appropriate for the community. Funds for implementation can be requested through the tambol council budget and/or government agencies such as the Department of Forestry for village woodlots or the National Energy Administration for other energy technologies.

Village Woodlots

Kobkul Phutaraporn

1. Introduction

Fuelwood is the main source of energy for cooking and heating for people in the rural areas of developing countries. In the case of Thailand, according to a study by the FAO in 1971, 23.0 million cubic meters of firewood and 15.5 million cubic meters of charcoal were used for cooking in that year.[1] The use of fuelwood in such amounts would not be a problem if there existed accessible forests from which to cut it; however, at present Thailand has encountered a serious problem of deforestation. It is not certain if the supply of fuelwood in the native forests will be sufficient for public use.

Due to this situation, it can be predicted that the greater the decrease in the natural forest area, the more intense the problem of fuelwood scarcity will become. The best method to solve this problem is to grow new trees for fuelwood. Since the problem of fuelwood shortage has been recognized by governments in nearly all developing countries, many experimental projects for its solution can be examined.

Thailand's village woodlot project is one of these. In the project, local residents are persuaded to grow their own fuelwood trees instead of depending only upon the natural forest as was formerly the case. The concept of community woodlots grown to provide fuelwood for people in rural communities in Thailand was implemented to meet the energy crisis with the help of the foreign organization-USAID. The project, under the National Energy Administration of Thailand, includes ten components established to manage the ten energy technologies advised for rural development.

This paper will attempt to show the different models used in the experimental village woodlot project in Thailand. It cannot be determined at this point which model is ideal or which will succeed, since this is only the beginnning of project implementation. However, the paper will present evidence concerning the pilot villages, and will attempt to analyze the success of the project under the following two assumptions: that the technology related to woodlot establishment is

[1] De Backer and Openshaw, *Present and Future Forest Policy Goals* : A Timber Trend Study 1970-2000 (No. TA 3156), F.A.O. 1971.

well known, and that trees best serve the community's fuel needs and are the cheapest source of energy. This project appears ideal for implementation on a large scale; if this does not happen however, the reasons must be examined.

2. The Project

The Village Woodlot Project is one of the ten components of the Renewable Non-Conventional Energy Project conducted by the National Energy Administration of Thailand, a five-year project extending from 1980 to 1984. The project's purpose is to plant fast-growing trees in selected public areas at a rate of approximately 128 *ha.* per year. The principal concepts of the Village Woodlot Project are as follows:

1. To allow reforestation which will provide firewood for people in selected villages;
2. The administration of the project should be the responsibility of each selected community;
3. The project area should fall within the public grounds of each community.

The Village Woodlot Project component is under the jurisdiction of the Royal Forestry Department of Thailand (Fig. 1). The first stage of project implementation is the selection of sample communities for experimental village woodlot cultivation according to the following criteria:

1. The village should have enough public land to operate the woodlot project without affecting other activities i.e. grazing of cattle, etc.;
2. There should be no forest near the village and the problem of firewood shortage should exist;
3. The priority in demand by villagers for the village woodlot project should be determined by examination of the baseline data.[1]

2.1 Tree Type.

The types of tree which should be planted are fast-growing varieties which can be grown in a rotation period of not less than five years. The type selected for the project sites considered here was *Eucalyptus camaldulynsis.*

2.2 Stages in Implementation.

In principle, the stages in the implementation of the Village Woodlot Project should be as follows:

1. Site selection;
2. Public relations with the people in the area;
3. Plantation;
4. Maintenance.

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[1] Economic and Social Preliminary Survye of Energy Shortage for fifty villages in four regions: survey by the researchers of Chiang Mai Social Research Institute, Chulalongkorn University Social Research Institute and Khonkaen University 1981.

Steps (1) and (2), site selection and public relations, will be the responsibility of the project officers while (3) and (4), plantation and maintenance, will be the responsibility of each community.

1. Site selection. The site selection stage has been divided into two phases due to the different management of operations in each.

Phase 1.

The initial year of the Village Woodlot Project was 1981 when three pilot villages were selected from the baseline data, all of which were located in the north-eastern region. The initial purpose of selection was primarily to compare the project success with the difference in demand priority among the villages. The three chosen sites were Ban Khwao, Ban Pong, and Ban Chang Khra Darn, all located in Pri Bung districts of Si Saket province.

According to the baseline data, the degree of demand in each village differed. Among the ten types of energy technology introduced to the community, including community biogas, windmills, etc., the village woodlot method was the first choice from respondents in Ban Khwao, while Ban Pong and Ban Chang Khra Darn selected it as their second and third choices.

Due to space limitations, however, the woodlot project was not feasible in Ban Khwao, since the public land in the village covered only 2.56 ha. What was accomplished in Ban Khwao was the planting of the recommended type of fast-growing tree, *Eucalyptus camaldulynsis*, in the small public area and on the temple grounds as demonstration plots, while seedlings were given to the villagers to plant in their own fields.

Although Ban Pong and Ban Chang Khra Darn did not rank the woodlot project as their first choice, both were nevertheless selected as pilot sites in the first year of woodlot project implementation due to the severe problem of fuelwood shortage in that area.

Under the project plan, the total land covered by all village woodlots would amount to 128 *ha.* annully for all selected villages. However, due to time limitations, the full 128 *ha.* could not be developed and only 31.5 *ha.* were used in pilot areas during the first project year (1981).

Phase 2.

The second phase of implementation was started in January 1982, when the component leader delegated the responsibility of site selection and project management to local foresters in the chosen provinces. During this phase, the criteria for woodlot village selection were: (1) The public ground must be large enough to grow sufficient fuelwood to meet community needs; and (2) these grounds should be adjacent to a public road for proper demonstration of the project.

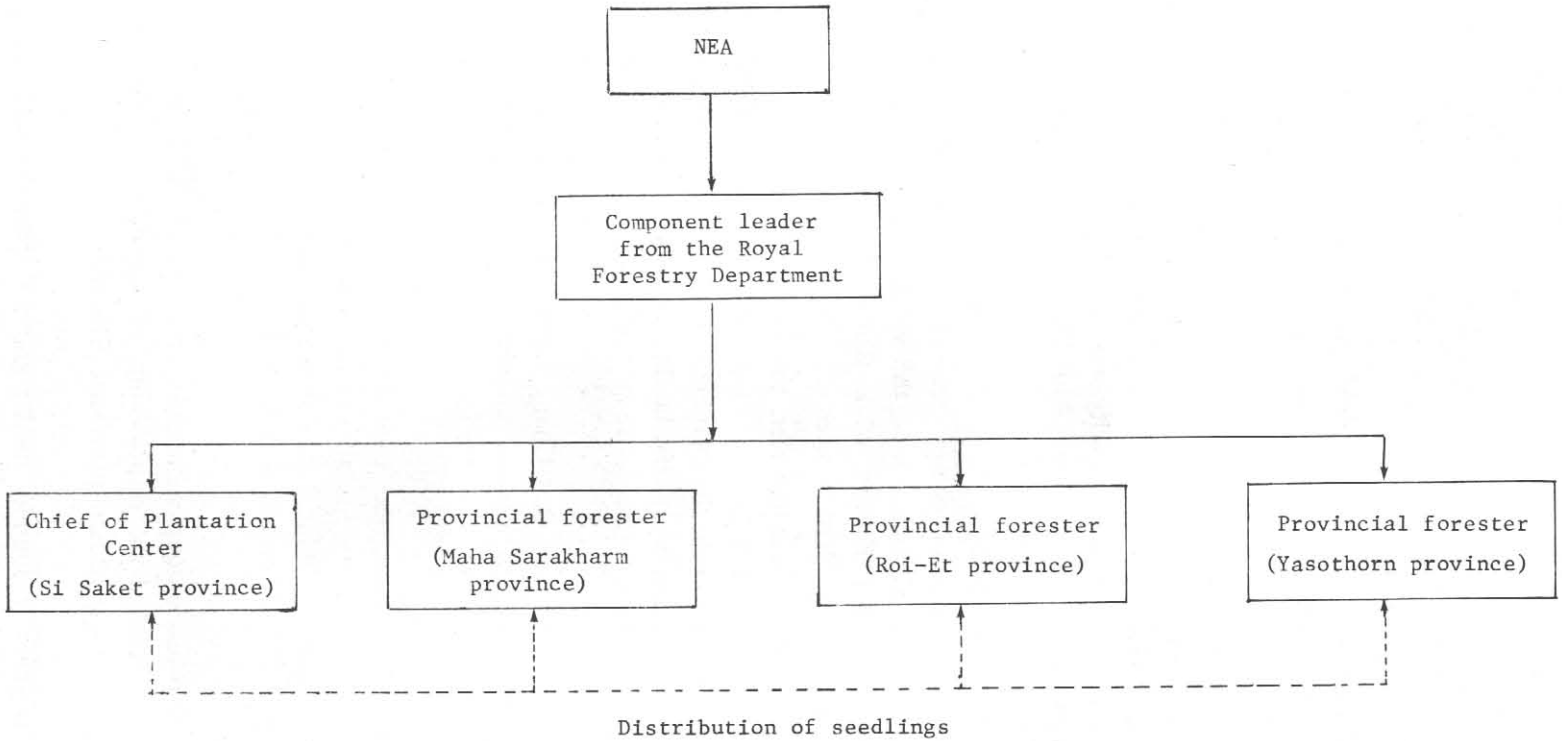


Figure 1 : Administration chart of Village Woodlot Project.

In the second project year, sites selected were in Maha Sarakharm, Roi-Et, and Yasothorn provinces. The total area planted in 1982 was 160 *ha*., More than the area specified in the plan, since Yasothorn province has exceptionlly large public areas available for woodlot planting. All of the selected public areas also served as the local grazing pasture.

2. Public relations, Following the main project concept that administration should be conducted by the people in each project area, public relations with local residents were established during implementation. For the project to succeed, it must be certain that these people understand their responsibilities and are ready to manage the project themselves under the supervision of project officials.

Public relations concerning the woodlot project was the job of the social scientists working with the villagers from the initial stages of implementation onward. They attempted to coordinate activities between villagers and officials to work together toward project goals. The most important task of the social scientists, however, was to help villagers form a project committee to administer the woodlot operation after the departure of the officials.

3. Plantation. The optimum planting times for woodlot trees are in August and September, since these are in the middle of the rainy season. Land for planting must be cleared and prepared before the rains begin. Work done in this period includes land clearing, staking, and planting. Due to the differences in management among the three chosen provinces each will be discussed individually below.

Si Saket province

Although three villages were chosen in Si Saket, one (Ban Khwao) had to be eliminated due to a shortage of public land, as mentioned. Ban Pong and Ban Chang Khra Darn remained the only sites in the province.

(i) Ban Pong. The village's public area measured 40.7 *ha*. and was used for grazing cattle. The project administrator established a plan to grow 8.8 *ha*. of *Eucalyptus* trees annually. The public land is located in front of the village, adjacent to the main road. All plans for the village were made by the project officers with no participation from the villagers. During planting, laborers from the Plantation Center and a small number of students were hired to work.

(ii) Ban Chang Khra Darn. The public land in this village is far from the settlement, about 2 kilometers in distance, and measures approximately 32 *ha*. It was planned to plant 6.8 *ha*. of woodlot trees per year.

During the first year of implementation, no one in the village, not even the headman, was aware of the project. He only knew that foresters came and planted trees in the area, but was not aware of the purpose of the project. As with Ban Pong, planting used labor from the Plantation Center, with no outside help.

Considering the results of the first-year implementation in Bon Pong, the trees were thought to have grown well since the officials had hired the village headman and his assistant, who lived on the public land, to take care of the trees. In Ban Chang Khra Darn, however, nearly all the planted trees died because no one took care of them and cattle were allowed to graze in the area.

Due to the problem of tree survival, especially in Ban Chang Khra Darn, the project chief had to change the management plan during the second year of implementation. The main cause of low tree survival was due to the lack of participation by villagers; no one took responsibility for the woodlot project. To solve this problem, the chief used the technique of agro-forestry, where villagers would be permitted to grow cash crops in the area between rows of trees on the condition that they helped maintain the trees. The results were good in that trees grew well, with a better survival rate in Ban Pong and Ban Chang Khra Darn.

However, although this situation appears to have better participation by the villagers, it is not real participation however: people growing cash crops in the project area did so without knowing the purpose of the project, even the village headman. They only knew that the government allowed them to plant there because the woodlot area was within their village boundary, and that it was their duty to take care of the trees for the government. They did not think the trees belonged to them. In their opinion, everything was up to the government.

A woodlot committee existed in each village, but it took responsibility only for supervising villagers who grew cash crops and agreed to care for the trees. Project administration was solely under the direction of the chief of the Plantation Center.

Maha Sarakharm province

In Maha Sarakharm, one village woodlot project was implemented over a public land area of approximately 64 *ha.* located about 3 kilometers from the village and adjacent to the main road. Twelve *ha.* of woodlot trees were planned for planting per year

Woodlot project management in Maha Sarakharm was under the jurisdiction of the provincial forestry official and the village woodlot committee. Initially the forestry official managed the project by himself without informing any of the villagers of its purpose, while only reporting to the subdistrict council to request permission to plant trees in the specified area. As a result, some mistakes were made in the selection of the project area within the public land and in the hiring of laborers during the plantation phase.

The problem concerning the selection of woodlot area was related to forest encroachment on the public land, where in fact another nearby village was using

the area thought to belong to the woodlot village. The forestry official, however, selected the encroached area for planting; this resulted in a conflict between the two villages over the rights to the public land.

The problem concerning the labor hiring for planting was related to the number of laborers hired from the woodlot village, which was small, which caused villagers to complain to the forestry official. In the end he was forced to hire most of the villagers for planting by reducing the daily wage.

Subsequently the villagers, on the advice of the social scientist working on the project, formed a woodlot committee to manage the project in conjunction with the forestry official. Problems such as the land conflict among villages were solved by using agro-forestry, as in Si Saket province, allowing the poorer residents of the two villages to grow cassava between the rows of planted trees.

In summary, the Maha Sarakharm province project's results were congruous to the main concept of the plan, since villagers participated in the project and the project committee became quite strong. Moreover, the forestry official was coordinated to work with the committee. It is thus hoped that this concept and its operation will spread to nearby villages in the future as well.

Roi-Et province

Two project plots were planted in Roi-Et province with each plot including three villages, as follows.

(i) Plot 1. Three villages were located within a one-kilometer radius around the total public area of 240 *ha.*, of which the woodlot project took 36 *ha.* It was intended to grow 12 *ha.* of trees in the first project year (1982) and 8 *ha.* thereafter for the next three years. The public land is presently used for grazing by the nearby villages; some 7,000 head of cattle were said to have used it before conducting the project.

(ii) Plot 2. Three villages located about 2 kilometers in distance from the public area shared this woodlot, which comprised 24 *ha.* of the 64 *ha.* of total public land.

The reason these two plots were chosen for woodlots included the following:

1. The plot sizes were large and used only for grazing, not agriculture;

2. A Pubic Voluntary Tree-Planting Project had been located near the woodlot project area;

3. A demonstration garden already existed near Plot 1, tended by the abbot of the village temple.

Reasons (2) and (3), the nearby location of a Voluntary Tree-Planting Project and the existence of a demonstration garden, were essential for the woodlot project. The provincial forester believed that villagers were accustomed to tree planting and thus should readily adopt the woodlot project.

Most villagers in the pilot woodlot villages, however, did not participate in the project. Furthermore, a serious conflict among villagers took place in Plot 1; however, the provincial forester paid no attention to the conflict, thinking it would not affect the outcome of the project. This attitude considered the villagers not relevant to project management and it was solely his responsibility to carry it out. This resulted in the absence of an active village woodlot committee, since project administration was handled by the forester alone.

During the planting process a small number of residents from the woodlot village were hired to work, including the head of the senior village committee, who was hired to care for the trees. Although, most villagers still were unaware of the project since there was no communication between the provincial forester and the residents. Despite the efforts of the social scientists to clarify the matter to villagers, the result was the same: no participation in the project except by those hired to plant trees. Even when told that the trees would belong to the village they had no idea how such a benefit could be utilized.

Yasothorn province

Implementation in Yasothron province was very different compared to others. Since the public land areas were very large but the soil quality poor, the governor provincial forester agreed to promote the woodlot project by selecting two villages in Kho Wang district' and allowing them to grow cashew nuts in the public area. This provided an incentive by also allowing them to lease out ownership of the trees. Each village would receive rights to 200 trees per household. This project was done in 1980 before the operation of the village wood project.

Although grazing land was used to implement the woodlot project, no problem of disturbance by cattle occurred since the villagers were required to maintain their own trees. From their experience in the volunteer reforestation project, it is expected that people in this area will readily accept the concept intrinsic to the woodlot project.

No hired labor was used in the Yasothorn project areas; people living near the public land who were interested in the project could participate by giving their names to the provincial forester, They were required to implement the planting of their own trees, with advice and supervision from the forester.

In using this alternative method of management, the Yasothorn Woodlot project covered a larger area than planned, but nevertheless, did not need extra budgeting due to the free lobor available for planting.

4. Maintenance. In theory, maintenance should be the responsibility of individual villagers or of the village woodlot committee. However, in practice, maintenance was relegated to official management except in the case of Yasothorn

province. In Si Saket and Roi-Et some villagers were hired to care for the trees, and in Maha Sarakharm province, upon agreement by the woodlot committee, some village volunteers were established as guardians of the project plantings.

3. Conclusion.

The Village Woodlot Project may be summarized according to the following points:

1. Hired labor was used in the project villages in Si Saket, Maha Sarakharm, and Roi-Et provinces. In Yasothorn, interested volunteers carried out all activities themselves from land preparation to planting under supervision of the provincial forester.

2. In theory, at the village level there should exist a woodlot committee to supervise and administer the project. In practice, the committee in Maha Sarakharm province was more active in project administration than those in other provinces, which were only nominal committees incapable of action.

3. In the Roi-Et, Si Saket, and Yasothorn province sites, project administration and supervision fell directly under the authority of the provincial foresters, and the villagers' participation was minimal. The participation level at the Maha Sarakharm site, especially by the wooklot committee, was much greater.

4. Forestry officials in Roi-Et and Maha Sarakharm worked closely with the subdistrict council with the idea that the council should take the responsibility for project administration after the Woodlot Project officials moved out of the area.

Project administration may be summarized through the following three categories:

1. Administration closely controlled by project officials, who are directly responsible for project implementation. The villagers are merely passive recipients and do not feel that they own or are involved with the project, as in the cases of Si Saket and Roi-Et.

2. Administration where the village woodlot committee is jointly responsible with the officials, who give advice as needed, as in the case of the Maha Sarakharm site. Although under authority of the officials, villagers may still participate in the project.

3. Administration where only interested villagers are included in the project. In order to attract more interested parties, incentives are given by leasing out ownership of woodlot trees. This resulted in a growth of more trees and a larger number survived, because the villagers tended to take better care of them than the wage-labor maintenance workers, as in the case of the Yasothron site. The project, however, was still controlled directly by the officials.

The decision of which type of administration would be most suitable is a difficult one since conditions vary from village to village; no overall rigid decision should be made. What can be done, however, is to try and improve a given administration type and make it more appropriate in specific cases. For example, while villagers in Roi-Et are becoming more interested in the project through the establishment of a village woodlot committee, there is still no definite administrative structure, unlike the Maha Sarakharm site.

3.1 Problems Specific to Each Administrative Type.

3.1.1 Fully official administration. Since the villagers are only the passive recipients of project action taken by officials, they are unaware of how to benefit from the fully-grown trees. The lack of the villagers' participation in administration, results in their inability to make administrative decisions later on: Without planning, which they are unable to do, implementation of the project will not be in accordance to its goals. Moreover, if there is any change in the official staff, villagers will feel even less involved. It can be predicted that this system will result in a new forest, rather than a planned woodlot for community consumption.

Futhermore, in this type of administration, village leaders or respected residents are the ones who will carry out official ecommendations; hence, this discourages others from participating and can only induce negative attitudes toward the woodlot project.

Some positive aspects of official administration do exist in that generally the trees grown are in good condition as a result of the officials' maintenance efforts. Moreover, the villagers dare not interfere with this since they feel that the trees belong to the government.

3.1.2 Joint administration with the woodlot committee. Problems related to this administrative type include the fact that here the decisionmaking power is monopolized by project officials, and mistakes may be made when officials cannot readily provide advice or supervision when needed.

3.1.3 Administration by interested villagers only. This may be used only in cases where there is sufficient public land to include villagers who have not yet joined the project in participation. However, this administrative type is unfair to villagers when there is a limited public area. Furthermore, if all village households participate, the average allocated planted area will be too small to be economically feasible.

However, if some control measures can be introduced into this system the joint administrative type may be improved, as it is compatible with the objective of involving villagers' participation for the benefit of the community.

3.2 Summary of Problems in the Village Woodlot Project.

Problems encountered in the project implementation may be summarized in the following points:

1. Lack of understanding about the project. The lack of a clear understanding of the objectives on the part the project administrators, as well as the villagers who must take over their responsibilities after these administrators leave the site, is the main obstacle to the woodlot project.

The reason for this is the lack of adequate information from project officials regarding project objectives, giving villagers and even occasionally the officials themselves the misconception that the government owns the forest, and that the woodlot may become a national reserved forest.

2. Problems in implementation. The involvement of the subdistrict council in project administration, rather than project officials, has produced more negative than positive effects. This results from the fact that (although not more than three villages are actually responsible for maintenance of the trees), the subdistrict council is composed of members of several villages in the same subdistrict which may not be involved in the woodlot project. This may be a basis for problems in the long run.

3. Problems in management. These arose in the three implementation phases, involving the follow situations :

(i) Pre-plantation period. Problems usually occurred over the selection of a suitable project area; encroachment in the public area selected for the project; and poor soil quality in the selected area.

(ii) Initial planting period. Main problems occurring during this phase were disturbance from grazing cattle in nearby areas, which wandered into the project area and damaged the seedlings.

(iii) Felling period. When the trees are sufficiently grown to be felled, problems in the distribution of benefit will occur. Distribution may be done in one of the following three ways:

- Equal distribution among households;
- Benefit used only for the general public good;
- Wood output may be sold to provide money for the general village fund.

These distribution types, however, must be agreed upon by the relevant administrators involved in one of the three types of woodlot administration mentioned previously.

4. Problems of internal conflict in the community. These are important and a major obstacle to community development. The ideal concept in community development is to urge people toward self-help using local resources in their own

community, with technical advice and supervision by officials. In short, the ideal form of development evolve arise within the community itself. Thus, if there is divisiveness in the community, development will be harmed. For instance, in the case of the Roi-Et woodlot site, if the officials leave, the project may fall apart due to factionalism among the villagers.

5. Problems in participation. Project success does not depend purely on the initial stage of project development when officials are still involved, but depends also upon the participation by villagers. In the village woodlot project, participation was quite low, mainly in the form of hired village workers, meaning only a small number were involved at all.

From the participation viewpoint, Yasothorn province had an advantage over other sites in that it involved a greater number of participants, however, this was due to the extra benefit they stood to gain. Non-participation was often due to a lack of identification with the project; villagers did not feel they owned the woodlots. In Si saket and Maha Sarakharm this problem was solved by granting villagers permission to grow crops between the rows of planted trees. This agro-forestry technique succeeded in solving some aspects of the participation problem, but not enough to make villagers feel that the trees belonged to their own community, especially in Si Saket. This situation is due mostly to a lack of understanding concerning project goals.

In the hope of increasing an understanding of such problems and encouraging villagers to participate in the project and learn to solve their own problems, conclude that the following social issues be examined.

4. Recommendations.

1. Results from the village woodlot project study indicate that sample villages were chosen without any consideration of the social factors involved. Since this is an experimental project, the objective was to spread the idea of woodlot cultivation to other villages. It becomes essential to show that the project can be implemented successfully. This means that other factors, besides the availability of planting space, must be considered, such as local conflicts and encroachment into the area prior to the start of the project. On the surface these factors may not seem problematic, since the government has the legal right to expel encroachers on government land. However, this may have underlying effects which will affect project success in a long-term perspective. Therefore, it is suggested that some kind of feasibility study prior to the selection of project villages is indispensable.

2. Contact with the subdistrict council should be minimal, only to inform it that certain villages will be chosen as experimental project sites. The village committees in the chosen sites should be responsible for project administration.

3. Social scientists should visit the area to familiarize villagers with the project prior to implementation. Encouragement in forming groups and solving their own problems are a few of the concepts which social scientists should attempt to convey.

4. Villagers should learn to appreciate the importance of having a woodlot and should be encouraged to grow more trees on their own land as well. Furthermore, school and temple grounds should be converted into woodlots, since they are normally spacious and always have someone available to maintain the trees.

5. No more than one village should be selected for woodlot implementation to avoid conflicts among villages. Furthermore, it should be a rather small village, in order to facilitate participation and the internalization of the ideas and objectives of the project. This is much harder to accomplish in a number of villages at the same time.

6. Since all woodlot projects implemented to date are in areas with poor soil quality, such as *Tung Kula Rong Hai*, and on grazing grounds which are unsuitable for any type of cultivation, it is quite probable that trees will not be ready for felling within the planned five-year period. Therefore, it is recommended that villagers be encouraged to apply fertilizer, plow the land, and generally take more complete care of the woodlot trees. Villagers should undertake these responsibilities themselves, and officials should provide only advice or consultation on the most appropriate techniques.

7. There should also be government committment to village forestry, as embodied in the village woodlot project. This committment must be expressed in three ways: the priority of reforestration plans; budgetary support; and the provision of staff.

Tung Kula Ronghai Groundwater and Wells

Abha Sirivongs na Ayuthaya

Introduction

Thung Kula Ronghai has been identified as the most depressed area in the Northeast of Thailand. Flood and drought are endemic to the area and they occasionally reach disastrous proportions. The major problems which have a negative impact on the area are flood waters saturated with sedimentary materials and salt contamination. These affect soil fertility and also cause well water to be unfit for household consumption.

Many development programmes and studies focus on Thung Kula Ronghai. In 1976, the Australian Government was requested by the Government of Thailand to provide assistance for planning and implementing development programmes in Thung Kula Ronghai. Among others, the objective of the assistance was to up-grade agriculture by the development of technology and the extension of help. The groundwater and well development program considered by the present study has been proposed for implementation by the Australian expert team. The proposed pilot areas for groundwater and wells development are in Amphoe *Rasi Salai*, Changwat Si Sa Ket, and Amphoe *Chumpon Buri*, Changwat Surin. A social aspects study was consequently undertaken in these two areas in order to identify why, in some locations, groundwater is used to irrigated dry season crops and, in other locations, it is not.

Objective of the Study

It some parts of Amphoe Rasi Salai, Eastern Thung Kula Ronghai, there is wide use of groundwater to irrigate dry season crops while in Amghoe Chumpon Buri to the West, there is no use of groundwater for any crops. The study was conducted in order to understand the reasons for the present distribution of groundwater utilization for dry season crops in the two areas by comparing both situations. The study results are intended to assist in the formulation of subsequent implementation programs.

The specific purposes of the study are as follows:

1. to identify the factors accounting for the present distribution of groundwater utilization for cultivation in the two study areas;

2. to define the major factors that need to be attended to in future project development;

3. to describe existing groundwater use by villagers in the study areas,

4. to make recommendations for the future groundwater irrigation program development.

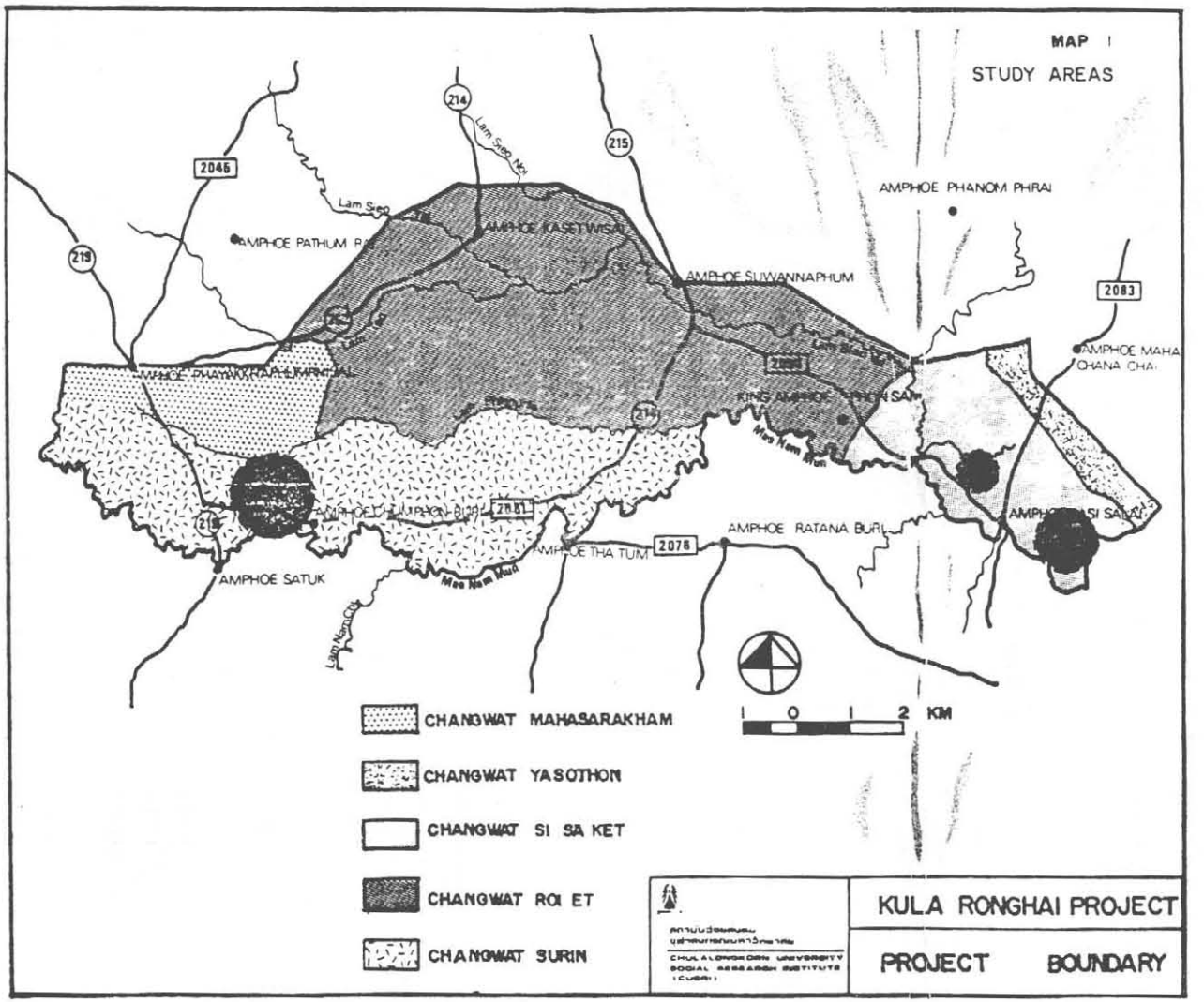
Study Areas

The study areas were selected in consultation with an Australian expert team on the basis of the hydrogeological study of existing and potential areas of groundwater irrigation. Among the twelve Tambons of Rasi Salai, *Som Poi*, an intensive shallot cultivation area which uses dug well irrigation, was selected, while in Chumpon Buri, many villages cultivating vegetables close to the Maè Nam Mun were selected.

The following table presents the survey sample by location and name of villages covered, the total number of households and the number of study sample households.

Location	Village No.	Village name	Total Households[1]	Somple (38 %) Households
RASI SALAI				
T. Som Poi	9	Ban Bung Mok (BM)	178	52
T. Muang Kean	1	Ban Muang Kaen (MK)	159	51
T. Muang Kaen	6	Ban Yang (BG)	326	46 (15 %)
T. Muang Kong	4	Ban Yai (BI)	105	32
T. Nong Kae	8	Ban Hua Chang (HC)	44	13
T. Chick Sang Thong	11	Ban Sabaeng (ST)	47	15
		Total		209
CHUMPON BURI				
T. Si Narong	1	Ban Som Rong (SR)	236	36 (15 %)
T. Si Narong	2	Ban Bing (BB)	85	24
T. Si Narong	3	Ban Tha Lat (TL)	104	30
T. Si Narong	5	Ban Non Chot (NC)	59	18
T. Si Narong	7	Ban Kok Mek (KM)	90	27
T. Si Narong	8	Ban Yang Chum (YC)	195	29 (15 %)
T. Chumpong Buri	14	Ban Kaen Koet (KK)	45	13
		Total		183
	13 Villages		1676 HH	392

[1] Source : Amphoe office pre-election census 1983.


MAP I
STUDY AREAS
AMPHOE PHANOM PHRAI
AMPHOE KASETWISAI
AMPHOE SUWANNAPHUM
AMPHOE PATHUM R
AMPHOE MAHA CHANA CHAI
AMPHOE RATANA BURI
AMPHOE THA TUM
AMPHOE SATUK
KING AMPHOE
2046
214
215
219
2083
2076
Lam Sreo
Mae Nam Mun
1 0 1 2 KM
CHANGWAT MAHASARAKHAM
CHANGWAT YASOTHON
CHANGWAT SI SA KET
CHANGWAT ROI ET
CHANGWAT SURIN
CHULALONGKORN UNIVERSITY
SOCIAL RESEARCH INSTITUTE
KULA RONGHAI PROJECT
PROJECT BOUNDARY

As there is great variation in the size of villages, each one was divided into two categories to determine the relative size of the household samples. For villages with less that 200 households, a 30 percent sample was selected. For villages including more than 200 households, a 15 percent sample was used, except for Ban Yang Chum (8) in Chumpon Buri. In this village, the community is very homogenous, therefore, a 15 percent sample was considered adequate.

Method of the Study

As mentioned, the study sites selected are in *Rasi Salai* and *Chumpon Buri* where the hydrogeological survey has been conducted. The major research tool was the interview schedule complemented by focussed interviews and observation. Five researchers spent 18 days in Rasi Salai and 16 days in Chumpon Buri. Besides the villagers of the study sample, Village and Tambon Headmen, Agricultural Officers at the Amphoe level, traders who deal in agricultural produce, the Manager of the BAAC, the Manager of the Agricultural Cooperative, and the Officers of the Land Reform Agricultural Cooperative in Chumpon Buri were also interviewed.

Descriptive statistics such as percentages were used in the data analysis and bivariate correlations were established using the Spearman test.

I

Social and Economic Conditions

Both in Amphoe Rasi Salai and Amphoe Chumpon Buri, the areas selected to conduct the socio-economic survey, are located near the Mae Nam Mun. The villages selected in Rasi Salai are at the easternmost end of Thung Kula Ronghai, while the Chumpon Buri villages are situated in the west. The Lamplapphla is another source of water in this area.

Population

As in most rural families in the Northeast, households include most commonly only one conjugal unit consisting of husband, wife, and their children. The average size is almost 6 persons in both areas. The survey reveals that on an average, 3 of these are of labour force age and actually working, one person is studying, and another is not in the labour force because he/she is too young or too old to work. The average age of the household head is 42 in Rasi Salai and 42 in Chumpon Buri.

Population Characteristics of the Household Samples

	RASI SALAI	CHUMPON BURI
Average age of household head (years)	44.7	42.1
Household size (persons)	5.7	5.8
Labour force (persons)	3.3	3.1
Studying (persons)	1.1	1.4
Not in labour force (persons)	1.3	1.3

More than 95% of the people in the study areas are reported to be farmers. The others, however, also work at farm related activities such as hired labour during the planting or harvesting periods, mostly because they have no land of their own.

Off-farm wage labour away from the home village is popular in some villages of both areas. Mine work in Phu Ket and Phang Nga is popular among young villagers of Ban Yang, Ban Bung Mok and Ban Sabaeng Tak in Rasi Salai. In Chumpon Buri, younger villagers of Ban Som Rong and Ban Tha Lat engage in construction work in Bangkok, and in wage labour in rice mills in Nakhon Phathom as well as in cassava plantations in Chon Buri and Sara Buri. The survey data reveal that the average annual income per household from off-farm work Rasi Salai is 7,178 baht, while in Chumpon Buri it is 4,569. However, after deduction of expenses (transportation, subsistence at the work site), only about 60 percent of this income is take-home pay.

Land tenure

As in the rest of the Thung Kula Ronghai area, land-owners are in the majority. About 96% of the households interviewed owned their own land. The average size, however, of individually owned land varies very widely from village to village. According to the survey, 10.6 rai is the average size of land holding in Rasi Salai, compared to the average of 40.4 rai in Chumpon Buri. However, the average size of land holding of individual villages shows considerable variation among the villages as the following data indicate:

RASI SALAI	Average per household (rai)
Bung Mok	20
Ban Yai	9
Muang Kaed	25
Ban Yang	19
Sabaeng Tak	36
Hua Chang	15
CHUMPON BURI	
Som Rong	32
Yang Chum	31
Non Chot	62
Ban Bing	33
Kok Mek	28
Tha Lat	45
Kaen Koet	52

The quality of the land is poor, although the size of land holding as reported for Chumpon Buri is very high compared to that of the Northeast as a whole. Some of it is constantly flooded low land for which no land title deed is issued. Villagers in this situation do not pay any taxes to the government.

Public facilities

Schools providing 6 years of elementary education are provided in all the villages of study. In order to pursue studies at the secondary level, village students have to go to the Ampheo where such schooling is offered. Very few students attend, however.

Health center services provided in the two areas are not popular among the villagers. They prefer to use the facilities of the hospital at the Amphoe. However, the village Health Volunteers can provide first-aid before patients go to the hospital.

Road communications within Rasi Salai are not a problem. Laterite roads provide access to all villages. On the other hand, in Chumpon Buri, the villagers stated that in the wet season prior to the survey, there was no access by road to the villages. While the survey was in progress however, the ARD was improving some of the main feeder roads.

II

Water use Situations

Thung Kula Ronghai has been identified as a depressed area because of water shortage in the dry season, among other reasons. This section of the report intends to provide an understanding of the way in which the water is used by villagers in this area. The types of water uses will be discussed under the following cate gories: water for cultivation, water for drinking, water for livestock and water for domestic use.

Water for cultivation

In spite of the fact that the Thung Kula has a southwest monsoon rainy season from mid-May to mid-September, the rainfall is classified as "tropical low rainfall". The amount of rain that falls is usually greater at the beginning and the end of the season than in the middle. During some years the rainfall begins in May or June, and in other years as late as July or August. The people in the study area are familiar with these fluctuatians. They stated that if the broadcast method of growing rice is used, their paddies will have to be sown in April and ploughed in May when the rain comes, followed by a 3 month waiting period for the second rainfall. If the trans-plant method is used, the planting must be delayed until July. Otherwise the rice seedings would die due to the lack of water.

In Rasi Salai, the National Energy Administration (NEA) has set up 3 electric pumps along the Mae Nam Mun. Water is pumped from the river to irrigate the dry season rice in Ban Tha, Ban Lup Mok and Ban Pung. The irrigable areas are estimated at 3,000 rai for each site but in fact, only 1,000 rai of these are cultivated. The reason is that for the second crop, a high yield variety (RD 105) has been promoted. This variety requires more care and more expense for fertilizers, insecticides, etc. than other varieties.

Shallot and garlic are widely grown in Tambon Som Poi, Rasi Salai. In Ban Bung Mok, one of the study villages, it is reported that all households have grown shallot. The growers dig shallow wells to irrigate the shallot plots. Two shallow wells are needed on a average to supply a shallot plantation of one quarter rai. Therefore, if one rai is planted in shallots, eight shallow dug wells are required for watering.

In Ban Bung Mok, the shallow dug wells are usually good in terms of quality and quantity of water. The villagers say that most of the water from dug wells in the paddy field is good for drinking as well. The water level is at a depth of approximately 2 to 3 meters. However, the good conditions described do not prevail everywhere in Rasi Salai. Villager dug wells in some localities are deeper and collapse easily. The villagers reported that they had to repair their wells twice a year and consequently could not grow as much shallot as in Ban Bung Mok. The shallots and other vegetables are grown on very small plots for home consumption only.

Complaints about deep water levels, collapsed wells, and saline water are common among the villagers in Chumpon Buri. Consequently, they grow very small amounts of vegetables used for home consumption only. The water to supply such crops are drawn from natural ponds, man-made ponds, fish trap ponds in the fields and along the Mae Nam Mun. (Tables 2.1 to 2.4)

Water for Drinking

Sources of drinking water in the study area are limited. During the rainy season, rainwater is stored for drinking in big jars. However, the amount of water storred is never enough for a full year. Therefore, from October to May, the source of drinking-water is shallow dug wells. Most of the drinking-water wells are located on the periphery of the villages. Villagers said that they preferred not to drink water from the wells in the village because of concern that it might be polluted by sewage from the houses.

Within both Rasi Salai and Chumpon Buri, the number of drinking water wells were found to be very limited, more so in the latter area than in the former.

One or two wells are available per village. During March to April, the water almost dries up and the villagers have to wait up to an hour for the water to percolate up from the bottom.

Both unlined and lined wells have been used as sources of drinking water. Normally, unlined wells are more popular among the villagers because they do not have the cement smell and taste characteristic of lined wells. But in the areas in which the soil collapses, the use of concrete rings is inevitable. One well lined with wood was observed in Ban Tha Lat, Chumpon Buri, which appeared to be very effective. (See illustration)

Water for livestock

The main animals in the study area are cattle and water buffaloes. Cattle are raised for meat and are sold live to traders while buffaloes are raised for draft purposes within the village. In Chumpon Buri, the number of animals raised per household is rather high compared to That of Rasi Salai. During the dry season, providing water for both cattle and buffaloes is a problem. Generally, cattle and buffaloes are released in the fields with one or two family members taking care of them. Rice stubble in the harvested paddy field is fodder and shallow wells or fish trap ponds in the fields are water sources for these animals.

In Ban Bung Mok and Ban Yai, Rasi Salai, the Mae Nam Mun is the main source of water for the animals. In Ban Tha Lat, Ban Yang Chum and Ban Bing, Chumpon Buri, the animals are also driven to the Mae Nam Mun to drink, while in Ban Non Chot and Ban Kaen Koet, the Lam Phlapphla is used for that purpose. The Royal Irrigation Department (RID) has set up a diversion weir in the two villages in order to store water for livestock in the dry season.

Water for Domestic use

Because of salt contamination in the study areas, the ground water in some locations is brackish or salty. The survey revealed that most of the water used for home consumption is water from shallow wells among the village buildings. Water from wells equipped with hand pumps provided by government agencies have been used for home consumption only in areas in which there is no problem of salinity and rust.

Table 2.1 : Sources of water for dry-season crops distributed by number of sample household users.

	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL / %	SR	YC	NC	BB	KM	TL	KK	TOTAL / %
Dug well	48	30	20	42	8	4	152(72.7)	-	6	2	7	-	-	-	15(8.2)
Lined dug well	-	-	2	-	-	4	6(2.9)	-	3	3	-	11	2	1	20(10.9)
Pumped groundwater	-	-		-	-	-	-	-	-	-	-	1	-	-	1(0.5)
Man-made reservoir	-	-		1	-	-	1(0.5)	-	3	-	4	4	20	-	31(16.9)
Natural reservoir	-	-	1	1	-	-	2(0.9)	19	2	1	1	-	3	-	26(14.2)
River/canal	-	-	-	-	-	-	-	-	1	3	-	-	-	-	4(2.2)
Fish-trap pond	2	-	7	1	5	2	17(8.1)	-	2	2	-	4	-	7	15(38.8)
None (No cropping)	2	2	21	1	2	4	32(15.3)	17	13	8	12	10	5	6	71(38.8)

Table 2.2 : Sources of water for drinking distributed by numder of sample household users.

	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Unlined dug well	50	32	24	36	15	-	157(75.1)	2	28	-	18	-	2	1	51(27.8)
Lined dug well	2	-	27	10	-	13	52(24.9)	29	2	19	6	30	28	13	127(69.4)
Well with hand pump	-	-	-	-	-	-	-	5	-	-	-	-	-	-	5(2.7)

Table 2.3 : Sources of water for livestock distributed by number of sample household users.

	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Dug well	38	3	7	33	2	-	83(39.7)	-	1	1	-	-	-	-	2(1.1)
Lined dug well	8	-	5	5	11	13	42(20.1)	-	3	-	-	17	-	1	21(11.5)
Pumped groundwater	1	-	-	-	-	-	1(0.5)	1	-	-	-	1	-	-	2(1.1)
Man-made reservoir	-	-	-	-	-	-	-	-	2	-	-	6	4	-	12(6.5)
Natural reservoir	-	-	13	5	1	-	19(9.1)	35	4	-	-	2	-	-	41(22.4)
River/canal	2	29	4	2	-	-	37(17.7)	-	20	16	24	-	26	12	98(53.5)
Irrigation canal	2	-	-	-	-	-	2(0.9)	-	-	-	-	-	-	-	-
Fish-trap pond	1	-	22	-	1	-	24(11.5)	-	-	-	-	2	-	1	3(1.6)
None (No answer)	-	-	-	1	-	-	1(0.5)	-	-	2	-	2	-	-	4(2.2)

Table 2.4 : Sources of water for domestic use distributed by number of sample household users.

	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Dug well	30	24	24	27	3	-	108(51.7)	2	1	6	19	-	-	4	32(17.5)
Lined dug well	15	3	23	19	12	13	85(40.7)	13	23	8	-	27	18	9	98(53.5)
Pumped groundwater	-	-	-	-	-	-	11(5.2)	14	3	-	-	3	-	-	20(10.9)
Man-made reservoir	-	-	-	-	-	-	-	-	3	1	3	-	12	-	19(10.4)
Natural reservoir	-	-	-	-	-	-	-	7	-	-	-	-	-	-	7(3.8)
River/canal	-	4	-	-	-	-	4(1.9)	-	-	3	2	-	-	-	5(2,7)
Fish trap pond	-	-	1	-	-	-	1(0.5)	-	-	1	-	-	-	1	2(1,1)

III

Agriculture

Rice is the major crop in the area. In Rasi Salai both glutinous and non-glutinous rice are popular for home consumption and for sale. Villagers in these areas indicated that glutinous rice is consumed in the morning and at noon, while non-glutinous rice is served in the evening. In Chumpon Buri, most villagers have non-glutinous rice at every meal. Some glutinous rice is produced but only for sale as an additional source of income. However, both glutinous and non-glutinous rice are grown in each locations.

Besides rice, shallots are grown in Rasi Salai in large plots in Ban Bung Mok but are cultivated in smaller quantity with other vegetables in other villages. In Chumpon Buri, it is more usual for several such vegetables to be grown together in small kitchen garden plots for home consumption only.

The kinds of crops grwon in the two study areas are indicated in the following table :

Crops	Rasi Salai		Chumpon Buri	
	Wet season	Dry season	Wet season	Dry season
Non-glutinous rice	×	×	×	
Glutinous rice	×	×	×	
Shallots		×		×
Kenaf			×	
Corn		×		×
Garlic		×		×
Chili	×	×	×	×
Tobacco		×		×
Cow pea	×	×	×	×
Sweet Potato		×		
Cucumber				×
Thai melon		×		×
Chinese white cabbage				×
Ground nut		×		
Kitchen Garden (several vegetables)	×	×	×	×

The schedule of crop cultivation depends mostly on the rainfall. The villagers begin to plough their land when the rains come. Normally, May is the beginning of the rainy season so that the areas assigned for rice broadcasting are ploughed around the end of April. Because of the fluctuation of rainfall, rice planting techniques have been developed by the villagers to suit conditions prevailing during periods of flooding and drought. The planting period of the main crops is decided by the villagers on the basis of their own experience.

As mentioned earlier, both non-glutinous and glutinous rice are planted in the study areas. A 1981 CUSRI survey indicated that three quarters of the rice grown in Thung Kula Ronghai is transplanted while the rest is broadcast. The present study revealed that the broadcasted rice area is larger than that of transplanted rice. Because of the flooding problem, villagers have had to develop special cultivation techniques in order to manage their paddy crops. According to the CUSRI Kula Ronghai study, the flood plain area of Thung Kula Ronghai is approximately 15% of the total. Most of the area affected is along the Mae Nam Mun and small streams such as the Lam Sieo Yai, Lam Sieo Noi, Lam Tao and Lam Phlapphla. Their width varies from 2 kilometres to 5 kilometres on either side. In the study area, Ban Non Chot, Ban Non Kaen Koet, and Ban Yang Chum in Chumpon Buri are affected by this problem. There, the villagers select the low-lying areas for broadcasting non-glutinous rice (Khao Dok Mali 105), while higher land is used to transplant both glutinous and non-glutinous rice because this land suffers less from flooding and water levels can be controlled more easily. Moreover, the rice strain used matures rapidly and the period during which water is needed is relatively shorter.

CROPS

The following description and discussion of schedules and techniques of crop cultivation in the study area are presented in both diagram and narrative form.

Non-glutinous rice

Khao Dok Mali 105, is the most popular rice variety in the study areas. It is considered to be highly resistant to flood and drought conditions. It is therefore used for broadcasting in areas classified as low lying fields, but it is also transplanted elsewhere. In Rasi Salai, the farmers begin sowing their rice paddies in April, while farmers in Chumpon Buri begin in May (see diagram). Tractors from Kenthalak, Amphoe Phanom Plai, are hired to plough the broadcast areas. Fertilizer is applied in June. According to the villagers, the paddy matures enough to survive when the floods come in October and November. The period of rice harvesting lasts almost three months.

The official name of Dok Mali 105 rice is RD 105, which is one of the improved varieties produced by the Rice Department. As it was developed for transplanting, planting by broadcasting contributes to the low yields achieved by the farmers. It is so used, nevertheless, because of the high demand for RD 105 on the market.

Glutinous rice

Luang Boon Ma and *San Patong* glutinous rice varieties are widely transplanted in the study areas. Water buffaloes are used for ploughing which normally begins in May in Rasi Salai and in June in Chumpon Buri. The land preparation for farmers who operate a big holding involves a three month period. The period from June until August is taken up by planting activities. As previously mentioned, the size of land holding is rather large in the study area when compared to the Northeast as a whole. Because of this, cultural practices and weed control are inadequate. The rate of fertilizer application of many farmers is still too low to increase the yields. It follows then that, as the survey data indicate, the volume of rice production is low.

Shallots

Shallots have been grown for more than ten years in Rasi Ralai, particularly in Tambon Som Poi. No one seems to know how it started. The area became famous for shallots because of the volume of production and the over-lapping of growing seasons with in the Northern Region, Chiang Mai and Lamphun in particular. The shallot growing season in the Northeast is from November through January whereas, in the Northern Region, it is from January through March. Shallot planting bulbs are exchanged between the two regions due to the different timing of growing seasons in each area. In Rasi Salai, shallots are planted in November, usually, at the same time as the harvesting season. The areas selected for shallot growing are on higher ground. Sometimes waste lands, i.e. lands not usable for other crops, are utilized for this purpose. The application of termite hill soil and rice husking is practiced only in Som Poi. Villagers indicated that the application of termite hill soil and rice husking on clay soil makes it more brittle and moisture retaining. Shallow dug wells are the source of water for shallot growing. Two dug wells are required on the average for a one quarter rai plot of shallots.

The water level of dug wells in Tambon Som Poi is 2 or 3 meters. Power pumps are used to water the shallot plots. There is less shallot grown in other villages due to the deep level of water in wells and the tendency of the well walls to collapse because of the sandy soil. More labour is required to engage in shallot cultivation under these conditions, especially if power pumps are not used. Villagers pointed out that it normally takes at least two persons to take good care of a

quarter rai plot of shallots after it has been planted. The rice harvest which takes place at the same time also creates work demands on the whole family. The study team found that in villages having collapsing wells with water levels deeper than 3 or 4 meters, farmers cannot operate even a quarter rai plot of shallots as the family labour force cannot cope with this and the rice harvest simultaneously.

Corn

Corn, a minor cash crop in both Rasi Salai and Chumpon Buri, is mainly grown for home consumption. It is usually planted amidst other crops such as chili, cow pea and tobacco. In Ban Yai, Rasi Salai, corn is a third crop sown after shallot harvesting. It could be the main source of income there if there was enough market demand. Villagers pointed out that although it was possible for them to grow much more corn, it was not done because it could only be sold at local markets in boiled ready to eat form. This form is in limited. demand.

Chili

Very often, chilies are classified as a kitchen garden item but in this study, chilies are classified under two categories. Chilies which are grown with other vegetables in a small area are classified in the kitchen garden category When they are the only crop grown on a plot, they are classified under chili. Although, chilies of both categories are produced ultimately for home consumption, the quantity produced in the first case is sufficient only for home consumption of the producer. In the second case, a surplus is produced which can be used to barter with village neighbors for other things. In Ban Tha Lat, Chumpon Buri, for example, the planted area in exchange of chilies is considerable. Some of these chilies are kept by the producers for home. consumption. The rest are used for bartering because the villagers have no market place in which cash transactions take place. Chilies, therefore become a medium of exchange to obtain salt, fermented fish and other items.

Kitchen Garden

Almost all households grow their own vegetables, usually on a very small plot of land near or on the house ground. These vegetables are Thai parsley (phakchi), cucumbers, lettuce, cowpeas, and chilies, and are produced for family consumption. The water requirement of these crops is not much and is provided by shallow wells dug for this purpose.

Other crops

Besides the crops mentioned, there are others which are cultivated by some households as a source of cash. These are garlic, tobacco, ground nuts, kenaf, sweet potatoes, cowpeas and melons. The area on which each crop is grown is very small because the source of water is limited to shallow dug wells in which the quantity of water available decreases during the dry season.

Yields

The volume of crop production in the study area is low compared to that of the Northeast as a whole. This is because of soil salinity problems and flooding at the end of the planting season. Even when improved varieties are used, crop yields are still low. The field survey data indicate that the average rice yield for non-glutinous and glutinous rice is approximately 200-250 kilo per rai.

Most of the rice seed used is that which is retained from the previous harvest. Another reason for low crop yields, poor land preparation and poor weed control is because of farmers use of seeds with poor quality.

Table 3.1, presents the number of sample households engaged in the production of various crops. It shows that the number of growers of non-glutinous and of glutinous rice in Rasi Salai is not very different while in Chumpon Buri, there is almost 40% more households growing non-glutinous rice than glutinous rice.

During the planting season, the paddy area is divided into two parts for each kind of rice. In Rasi Salai, for a 20 rai holding (average for households there), 6 rai are assigned to glutinous rice and 13.2 rai to non-glutinous rice. In Chumpon Buri, where the average land size is 40 rai, 9.5 rai are planted in glutinous rice and 29.7 rai in non-glutinous rice. Roughly one third of a holding operated by a household in Rasi Salai is used for glutinous rice while in Chumpon Buri, it is one fourth. The rest of the area is planted in non-glutinous rice (Table 3.2).

Table 3.2, also indicates that the rice yield per household per rai is almost the same in Rasi Salai and in Chumpon Buri. For glutinous rice it is 215 kg/rai in Rasi Salai and 213 kg/rai in Chumpon Buri. For non-glutinous rice it is 249 kg/rai in Rasi Salai and 232 kg/rai in Chumpon Buri. (Note: the average yield per rai per household is calculated as: *Total Production* of the household)

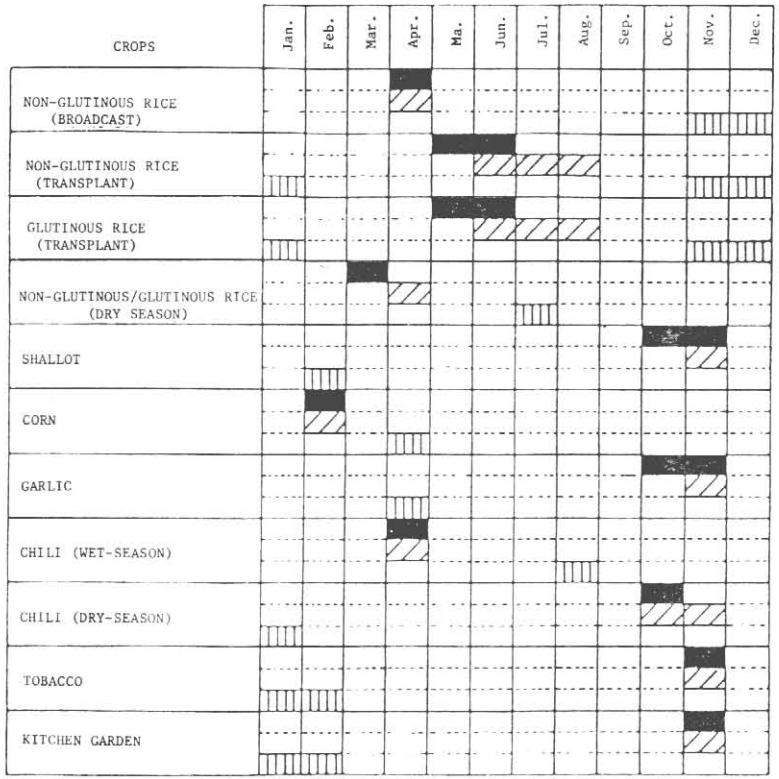
Harvested Area

The causes of damage accounting for the low crop production in the study area are identified in Table 3.3. It is apparent in Rasi Salai that worms in the rice fields is the main cause for damage crops. In Chumpon Buri, the causes are both worms and flooding. Besides the reasons mentioned, the infertility of the soil and poor cultivation practices are also important factors contributing to the low production in the area.

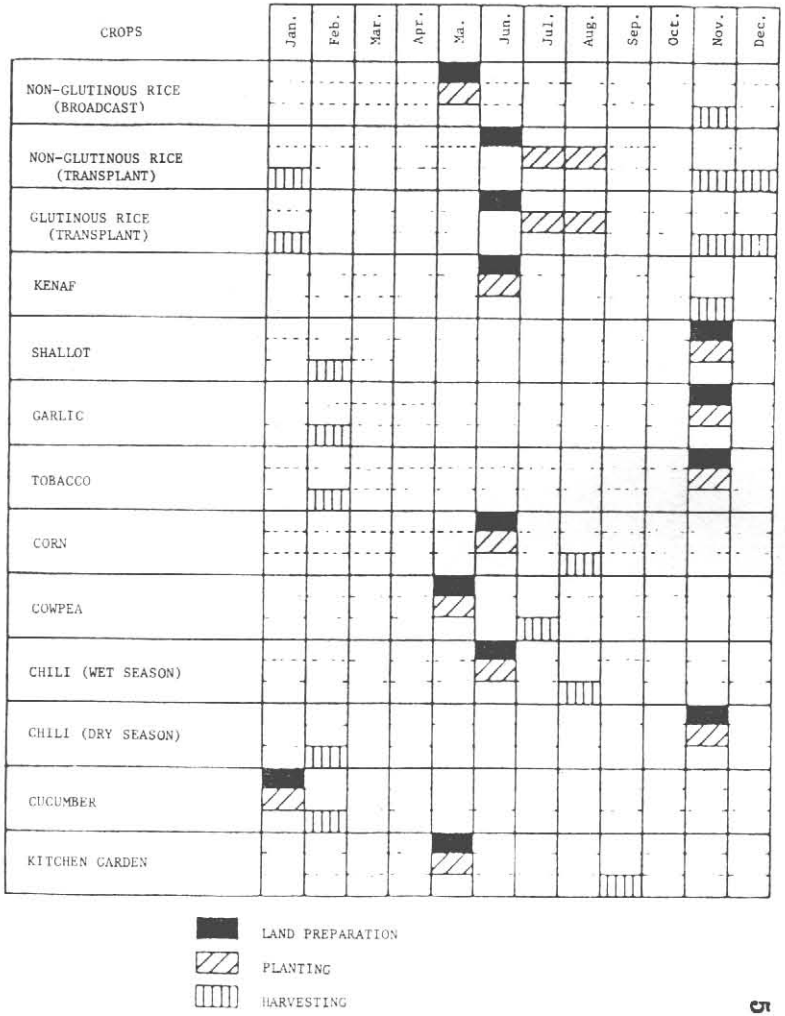
Maketing

The main source of income is the sale of rice and other cash crops such as shallots, corn, garlic and so on. Most farmers sell their rice to merchants or to Cooperatives representing the government Marketing Organization for Farmers (MOF). In Rasi Salai, there are many shops operating as rice traders. Actually, those shops

RASI SALAI CROPS CALENDAR



CHUMPON BURI CROPS CALENDAR



are general stores selling groceries, construction materials, and agricultural supplies. The shop-owners have their own storage facilities for the agricultural produce purchased. They sell the paddy to rice mills in Chachoengsao when the price goes up. The villagers often sell their paddy at a low price to these traders because they do not want to have to wait a long time for their money. This is also true when dealing with the MOF Cooperative because they have to spend extra money to transport their produce to the town. On the other hand, if the transaction is made with the traders in the Amphoe area they can get immediate cash and do not have to pay much for transport.

In Chumpon Buri, most farmers sell their paddy to the rice mills in Amphoe Satuk, 12 km. from Chumpon Buri. There are 3–4 rice mills in Amphoe Satuk which purchase paddy, but only one, operated by a miller called Jek Ke is popular among the farmers in Chumpon Buri. Villagers say that Jek Ke's weighing scales are accurate, and sometimes villagers can receive a cash advance from him before delivering their paddy.

Transportation for the delivery of farm produce during the harvest season is adequate in Chumpon Buri. Many trucks come from Satuk to transport goods to the market. Villagers have to pay five to ten baht per sack of paddy (75–80 kg), depending on the distance. The truck operators collect 3 baht per sack from the rice millers as a brokerage fee. This system is very common in Chumpon Buri.

Shallot has been a popular crop in Amphoe Rasi Salai, particular in Som Poi where it has been grown for over 10 years. The market demand was high, with India and Malaysia as the main importers. In 1982, the price of shallots was very high, sometimes as much as 20 baht a kilo. This provided the farmers with an incentive to expand production. In 1983, the shallot growing area expanded to nearby villages in which shallow dug wells were available. Unfortunately, the price of shallots plunged to one or two baht per kilo at the time of the survey. The farmers themselves admit that the problem is of their own making. Shallots normally take 90 days to ripen. Last year the shallots were ripened artificially by boiling after 60 days of growth in order to sell them when the price was high. The quality of the product, therefore, was not good and spoiled rapidly. Because of this assumption orders from Malaysia were not renewed. A second reason for the depressed price is shallot over production.

Usually, the shallot trade is handled by local entrepreneurs who are rich farmers in Tambon Som Poi. These entrepreneurs provide the farmers with shallot bulbs, fertilizer and insecticide in the form of credit advance. When the shallots are ripe enough to harvest, the entrepreneurs collect them and pay the farmers the market price while deducting the value of the production inputs provided at the begin ning of the growing seasons. The villagers say that there is no requirement to sell

their shallots to the entrepreneurs. They are free to sell anywhere, but the villagers prefer the arrangements made with the entrepreneurs because thus they do not have to transport their shallots to the market. If the farmers so desire, they can sell their shallots directly to Sitthikondi, the biggest shallot firm in Changwat Si Sa ket.

Sitthikondi operates as a shallot purchasing center. The firm exports the shallots to India and Malaysia and also provides bulbs, fertilizer and insecticide to the farmers. Another firm, Ketkaew in Rasi Salai, also deals in shallots and operates in the same way as Sitthikondi. Their stock however is eventually sold to Sitthikondi as well.

In March 1983 when CUSRI conducted the survey, the price of shallots was only 2 baht per kilo. The shallot growers were trying to improve their situation by organizing themselves as a group and shipping their shallots directly to Bangkok, Prachin Buri and Chachoengsao where they believed they could get a better price.

Garlic is usually sold at the same places as shallots. The market demand for garlic is fairly good this year due to the fact that only a very small amount is produced in Rasi Salai. The price, therefore, is up to 13 baht per kilo. Garlic is grown for home consumption throughout the study area but some farmers in Ban Yai, Ban Bung Mok and Ban Yang, Rasi Salai, also produce it for sale.

Corn, which is widely grown in Ban Yai, is a source of income as well. But as previously mentioned, the market is very limited, making any further expansion of production of this crop unprofitable.

Cow peas, cucumbers and chilies which are grown in Ban Sa Bang Tak also can only be marketed in nearby villages. The Village Headman mentioned that because of the poor condition of village roads, the vegetable growers can only sell what can be carried in baskets to villages nearby. Table 3.4 and 3.5 indicate the number of sample households which sold agricultural produce in 1982, classified by their market outlets and reasons for selling.

IV

Constraints of Dry Season Cultivation

In the course of the survey, the farmer respondents were asked to state the reasons why little cultivation is practiced in the study area during the dry season. The following is a list of the reasons given, ranked according to the frequency with which they were mentioned.

1. lack of water
2. lack of funds

Table 3.1 : Crops distributed by number of sample households producing.

CROPS	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Non-glutinous rice	52	32	49	46	15	11	205(98.1)	36	29	19	24	30	29	14	181(98.9)
Glutinous rice	48	11	46	46	15	7	173(82.8)	12	27	17	4	9	29	8	106(57.9)
Shallot	43	28	3	29	4	-	107(51.2)	7	3	1	2	1	5	-	19(10.4)
Corn	1	23	-	-	1	-	25(11.9)	1	-	-	2	2	9	1	15(8.2)
Chili	-	4	3	12	1	1	21(10.0)	-	-	-	-	-	1	-	1(0.5)
Garlic	-	-	-	3	1	-	4(1.9)	6	2	-	2	1	3	-	14(7.6)
Kitchen garden	1	4	23	8	6	7	49(23.4)	13	12	11	14	16	23	10	99(54.1)
Dry season non-glutinous rice	20	-	-	-	-	-	20(9.5)	-	-	-	-	-	-	-	-
Kenaf	-	-	-	-	-	-	-	-	-	-	4	-	2	-	6(3.3)
Melon	-	8	-	-	-	-	8(3.8)	-	-	-	-	-	1	-	1(0.5)
Tobacco	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4(2.2)
Ground nut	2	-	-	-	-	-	2(0.9)	-	-	-	-	-	-	-	-
Sweet potato	-	-	-	-	-	-	-	2	-	-	-	-	-	1	3(1.6)
Cow pea	-	1	-	-	-	-	1(0.4)	-	-	-	-	-	1	-	1(0.5)

Table 3.2 : Number of sample households growing non-glutinous and glutinous rice, average cultivation area and yields per household per rai

	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL	SR	YC	NC	BB	KM	TL	KK	TOTAL
Glutinous rice															
Households	48	11	46	46	15	7	173(hh)	12	27	17	4	9	29	8	106(hh)
Average area/HH	7.0	2.5	7.5	6.8	8.0	4.0	6.0(rai)	3.6	9.7	16.3	7.3	4.2	19.6	5.2	9.5(rai)
Yields/HH/rai	288	106	202	242	169	285	215(kg)	221	238	178	150	283	188	231	213(kg)
Non-glutinous rice															
Households	52	32	49	46	15	11	205(hh)	36	29	19	24	30	29	14	181(hh)
Average area/HH	12.8	6.8	16	7.8	24	11.8	13.2(rai)	29.0	19.7	41.0	27.2	24.0	23.7	43.0	29.7(rai)
Yields/HH/rai	314	234	213	235	229	254	246(kg)	282	274	202	186	256	213	215	232(kg)

Table 3.3 : Causes of crop damage in 1982 distributed by number of sample household farms affected.

CAUSES OF DAMAGE	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Lack of water	9	1	1	6	-	2	19(9.1)	2	-	1	2	1	4	1	11(6.0)
Flooding	5	6	12	2	-	1	26(12.4)	7	4	7	9	3	12	3	45(24.6)
Worms	27	26	33	29	10	10	135(64.6)	8	8	5	2	13	20	4	60(32.8)
Crop disease	12	10	1	11	1	-	35(16.7)	-	-	1	2	-	3	-	6(3.3)
2. and 3.	-	-	-	-	-	-	-	2	1	1	-	1	-	-	5(2.7)
Insects	5	2	-	-	-	-	7(3.3)	2	4	-	-	-	-	2	8(4.4)
Unfertile soil	4	-	2	5	-	-	11(5.2)	1	-	-	-	-	-	-	1(0.5)
Fertilizer	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1(0.5)

Table 3.4 : Distribution of sample household which sold farm produce in 1982 by market outlets.

FARM PRODUCE MARKET OUTLETS	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Marketing Org. for Farmers (MOF)	14	-	3	-	1	-	18(8.6)	2	3	-	-	-	3	-	8(4.4)
Rice mill	1	-	-	1	-	-	2(0.9)	9	9	7	10	9	10	5	59(32.2)
Middleman in village	35	21	1	21	2	-	80(38.3)	3	-	-	-	-	-	-	3(1.6)
Middleman in Ampnoe	51	13	33	28	10	3	138(66.0)	-	1	-	-	-	-	-	1(0.5)
Trader from outside	15	4	4	13	-	6	42(20.1)	15	18	12	14	18	16	9	102(55.7)
Consumer	2	30	1	3	-	1	37(17.7)	5	2	1	2	2	4	2	18(9.8)
MOF and Rice mill	-	-	-	-	-	-	-	2	-	-	-	-	1	-	3(1.6)

Table 3.5 : Distribution of sample households which sold farm produce in 1982 by reasons for selling

CONDITIONS	RASI SALAI							CHUMPON BURI							
	BM	BI	MK	BG	ST	HC	TOTAL/%	SR	YC	NC	BB	KM	TL	KK	TOTAL/%
Custom	5	12	12	17	1	-	47(22.5)	7	4	5	5	6	12	2	41(22.4)
Indebtedness	32	4	3	10	1	-	50(23.9)	-	1	2	1	-	2	-	6(3.3)
Guaranteed price	12	-	3	-	1	-	16(7.6)	2	1	4	4	-	1	1	13(7.1)
Only one trader	4	12	1	2	1	-	20(9.5)	4	2	1	2	2	5	4	20(10.9)
Broker	-	1	3	6	2	2	14(6.7)	10	13	2	8	13	1	2	49(26.8)
Nearby village due to low yields	2	21	7	6	1	1	38(18.2)	1	1	-	-	-	2	-	4(2.2)
High price	59	9	12	15	5	5	105(50.2)	9	6	4	6	4	9	5	43(23.5)
Honest scales	-	-	1	1	1	-	3(1.4)	-	4	2	-	2	1	-	9(4.9)
Convenient : farm-gate purchase	4	9	-	9	-	-	22(10.5)	3	1	-	-	2	1	2	9(4.9)

3. shortage of workers
4. infertility of the soil
5. alternative employment
6. remoteness of fields, unsuitability of land
7. crop damage by cattle and buffaloes
8. no contact with agricultural extension officers.
9. lack of knowledge
10. other (no market, other sources of income, etc.)

While these responses reflect the farmers' point of view, it is useful to further investigate the causes underlying the factors identified by the farmers to understand the real situation in the area. This was done by the research team through informal conversations with the villagers and on the basis of observation. The conclusions are provided in the following discussion.

Physical Problems

(1) Sandy soil causes wells to collapse. Wells dug in and around Ban Bung Mok, one of the main shallot growing areas in Rasi Salai, do not collapse because the soil is clay, and water of good quality is reached at levels of only 2–3 meters. Elsewhere in Rasi Salai however, and in Chumpon Buri as well, the soil is sandy and the walls of dug wells have the tendency to cave in. Moreover, villagers have to dig down to about 5 meters before reaching the water table. If deeper wells have to be dug, the water is turbid with sand. Such wells have to be reconditioned and cleaned out at least twice a year. If the wells are lined with concrete liners, these have to be readjusted periodically. As the water yield of the wells diminishes radically during the dry season, it is necessary for the villagers to refurnish the wells in order to get the most of the little water that percolates up from the base.

(2) Deep water level of wells. Deep water levels in wells is a problem for farmers who have no power pumps. More labour and time are required to draw water to irrigate cultivation plots in areas that have deep wells than in areas that have the shallow wells. The cultivation of a large area by drawing water from a deep well is possible only if there are many workers available in a household and/or if the work is assisted by the use of a power pump.

(3) Salinity effects. Crops do not grow well in areas containing saline soils. These occur in the study area and have adverse effects on crops. Farmers interviewed revealed that rice production had decreased in the dry-season rice cropping areas irrigated by the NEA pumping scheme as the water drawn from the Mae Nam Mun is saline during the dry season.

(4) Unsuitable land. In some villages of the study area, the cultivated lands are on very low-lying flat plains. Often during the harvesting season in November the paddy fields are covered with water. Therefore, the planting of cash crops which should be done in November is not possible. The planting cannot be done later because by then, the water from dug wells is insufficient.

(5) Site of good quality water sources located far from living areas. Many farmers dig shallow wells in their paddy fields as a source of drinking water at planting and harvest time in order not to have to carry water from their inhabitations. The water or these shallow wells is usually good for drinking and for irrigating vegetable crops as well. Many instances were found of vegetable such as chilies, onions, lettuce and parsley being grown around these wells for home consumption, however, only during the ricegrowing season. During the dry season after the rice harvest, the wells are no longer used for what are considered to be relatively minor crops because of their inconvenient location which is far from the farmer's homes. We note however that this factor is operative only in relation to the low value the farmers attach to these crops.

(6) Poor communications. Although this factor was not mentioned by the farmers, it is not without relevance to the point at issue for several if not all of the communities of the study area. As was mentioned, some villages are without road access from the village at certain times of the year. When roads are passable, pick-up trucks making one trip a day out of the villages often provide the only means of transportation. When space is unavailable on these vehicles and especially when roads become impassable, the only option for villagers to sell their produce is to carry it in a basket and walk to other villages in the vicinity.

Social Problems

(1) Off-farm employment. In most communities of the study, at least some household members leave their villages to find employment in other changwats during the dry season. Some spend two periods a year working away from home in the intervals between rice planting and harvesting. Granted that income from this employment is not high, it is more than what they could earn at home during this time. Psychological factors are perhaps more important to explain this periodic exodus however, namely, the desire to excape the boredom of village life during this inactive period and the adventurous spirit of Northeastern people attracted by new experiences.

(2) Conflict with rice harvest labour requirements. The farmers usually grow rice on all land available, but are sure that at least some paddy is spared by the flooding and can be harvested. As mentioned, the time planting takes place varies according to the method used, (broadcasting or transplanting), which in turn depends on the characteristics of the field. The result is that all paddy planted does not

mature at the same time and the period for harvesting extends over three months from November to January. Given the scarcity of water after January, if cash crops and vegetables are to be grown, it would have to be during this interval also. Farmers maintain, however, that they cannot spare the family labour to engage in both activities at the same time, hence, they give priority to the rice harvest. There is security in rice, assuring at least basic subsistence even if none is sold. Dry season crops provide no such guarantee. It was noted however that under optimal conditions, farmers in Som Poi can successfully handle both the rice harvest and shallot growing. With access to abundant water in shallow wells and the use of a power pump, the time needed to water the shallots beds during the morning and night is negligible, once the bulbs have been planted. Not all dry season crops would lend themselves to such arrangements however.

(3) Crop destruction by livestock. This problem is felt more in Chumpon Buri where there is much raising of cattle as water buffaloes. As fodder and water for them are scarce in village areas, they are rounded up and driven to graze around ponds and reservoirs away from the village which is where vegetables are grown. The damage these animals cause to the crops discourages the farmers from pursuing this cultivation. It would seem that this reflects more from the lack of interest of the villages in the crops than the seriousness of the problem, however, it could be overcome easily enough with better grazing management.

(4) Marketing problems. This is a key issue as there is little hope that villagers, either on their own or at the urging of agricultural extension officers, will want to engage in dry season cultivation unless this activity generates an income that is substantial enough to be attractive. As implied many times in the report, marketing institutions involving cash transactions are poorly developed in the area. Small crop surpluses e.g. of chilies, are produced not for external markets but for bartering in the village area. Corn production in Ban Yai could be greatly expanded but is not because of the great volume of produce which could not be sold under existing conditions. The above statements not withstanding, the study revealed instances of effective marketing system operations under certain circumstances and for certain produce even in this area, which could provide clues for further development. These are the marketing of rice, shallots, garlic, cattle and fish.

(5) Other sources of income in the area. This factor is related to the already discussed physical factor of unsuitability of land for dry season cultivation because of flooding. In the affected low-lying areas, fish harvesting offers an attractive alternative to dry season cultivation. The villagers in such areas dig pits in their paddy fields to entrap flood water fish when the water subsides. These fish traps are drained of water after the rice season and the fish harvested. There is a reliable market for such fish. The average income derived from this enterprise is at least 2,000 baht per fish trap pond. Some households dig many such pits and can earn as much as 10,000 baht a season.

Discussion of the study findings in relation to the proposed groundwater and wells development technical project.

Three types of wells proposed for implementation were discussed at the May 1983 seminar at the DLD Center in Suwannaphum :

(1) The Office of Accelerated Rural Development (ARD) which has a well drilling center in Khon Kaen would take responsibility for *cable tool drilled tubewells*. The irrigation capacity of the tubewell depends on the quantity of ground water available at the drilling site. The cost is estimated at 70,000 baht per well.

(2) Manually drilled tubewells were proposed by the Australian consultant. At least five workers are required to conduct the drilling operation. The cost is roughly 3,000–5,000 per well.

(3) Shallow dug wells designed to avoid well collapse are proposed by the Thung Kula Ronghai Land Development Center. The design is simple enough for the villagers to manage themselves. The cost is 2,000 baht per well.

The appropriateness of each technology in relation to the physical conditions of the area, their effectiveness to provide water in the volume and of the quality required, and the safegards that need to be taken to avoid water salt contamination and depletion of ground water sources are the technical problems that need to be addressed but are beyond the competence of the social evaluation team. The comments that follow are based on socio-economic considerations.

(1) Cable tool drilled tubewells. Because of its cost, this option needs the most scrutiny from the aspect of cost effectiveness. If funds are limited as they most certainly are, fewer wells will be provided if this is the only technology used and this is clearly undesirable. Its use is justified only if the economic benefits derived from the use of the groundwater provided are commensurately substantial or, when it is the only technology by which water can be made available in a given locality and the water needs of the population are acute.

Post-implementation problems need to be planned far in advance. If the volume of water that becomes available is sufficient to irrigate a large area of, say, several rai, water management is needed to assure fair allocation of water. The farmers must be made to understand the necessity of organizing themselves as a water user group with regulations and provisions for control and system maintenance.

There would be advantages in getting the farmers to share some of the costs of the well drilling and to provide materials and labour for the water distribution system in order to give them a feeling of proprietorship and hence a greater sense of responsibility for the groundwater irrigation system.

(2) Manually drilled tubewells. In this option, provisions need to be made to train villagers in the operation of the equipment. The trainers should try to assure that these villagers have a sense of responsibility. As they will be the only ones with drilling skills in the village, they are in a position to take advantage of the farmers by exacting drilling fees, playing favorites, and so on. If the volume of water made available warrants it, provisions might need to be made for water management as for the preceding option.

(3) Shallow dug wells. This option is the simplest and involves the least complication. The wells can be dug and consolidated by individual farmers with minimal instruction provided by the Land Development Center. The cost is within the farmers means. The operation is small enough for all activities such as crop growing, watering and occasional well repairs to be handled by one or two farmers. No institutional arrangements for water management are needed.

Whichever option or mix of options are selected for implementation, no opposition to the digging or drilling of wells by village populations are anticipated as no one is required to give up anything, land or otherwise. On the contrary, the wells, especially if located on their land, will be seen as an unqualified blessing. Whether or not the wells will be used to cultivate dry-season crops, or, to state the same problem differently, whether or not the villagers will be sufficiently motivated by the benefits of dry season cultivation made possible by the availability of water to indeed want to engage in it is another matter. One does not necessarily follow from the other.

Let us assume for the purpose of discussion that it is possible to provide the farmers of the area with durable non-collapsing wells yielding water of adequate quality and in sufficient volume all year round, and that these wells are in fact provided. The present scenario of dry season cultivation constraints can be revized as follows.

Physical problems

(1) Well collapse due to sandy soils - - solved.
(2) Deep water level of wells - - mitigated as more workers are available after the harvest when the water can be used.
(3) Salinity - - remains, but it is unevenly distributed.
(4) Unsuitable land - - solved, as dry season cultivation can be practiced after flooding subsides.
(5) Wells located far from village - - solved or eliminated as a problem if good income can be derived from crops in the same location.
(6) Poor communications - - remains.

Social problems

(1) Off-farm employment - - remains, pending development of good income from dry season crops.
(2) Conflict with rice harvest - - solved.
(3) Crop destruction by livestock - - remains, but easily solved if more value is given to dry season crops.
(4) Marketing problems - - remain.
(5) Other sources of income (first trapping) - - remains as a constraint to dry season cultivation but not as a problem in itself; it is a viable alternative to dry season cultivation and is perhaps not incompatible with it in the new context.

Of the problems in the original scenario, we are left with only two serious problems which are in fact interrelated: poor communications and marketing problems. As mentioned, communications were a problem in Chumpon Buri, not in Rasi Salai. We are told that the ARD are currently engaged in an extensive program for the improvement of main feeder roads and that communication problems should be considerably alleviated by next year. As to marketing, only two dry season crops have been successfully marketed in the recent past in Rasi Salai : shallots and garlic. The shallot market is currently depressed. Apparent reasons are the inferior quality of the product due to poor harvest and post-harvest practices, and over-production. The product can easily be improved by better crop management. In terms of over production, it is difficult to establish whether it is the cause or the effect of market demand. International markets for agricultural produce are notoriously fickle.

Problems of volume of agricultural production in relation to market demand are certainly not new in Thailand or in any agricultural nation for that matter. In the early 1960's prices for kenaf were very high and many Northeastern farmers began producing it and earned a good income. Within a couple of years, supply exceeded the demand with the result that prices dropped to a level that made even the harvesting of existing crops unprofitable. The present cassava bonanza of the Northeast is completely dependent on the willingness of the EEC nation to purchase Thai cassava and could crumble overnight. Garlic prices have fluctuated wildly over the years bringing considerable hardship to farmers even in the fertile Northern Region, the main production center.

In early 1983, the Ministry of Agriculture and Cooperatives issued a policy statement establishing agricultural zones for commercial crops such as garlic throughout the whole Kingdom. The purpose is to control the quantity of garlic production to keep it in line with market demand, to assist and provide extension services to the garlic growers including the setting of a guaranteed price. The market

situation is to be monitored in order to provide the farmers with guidelines for production volume, distribution, and pricing. The overall objective is to assure that farmers growing garlic have a constant market providing fair prices. The current garlic production zones determined by the Ministry include some Amphoes in Changwats Chiang Mai, Lamphun, and Chiang Rai in the North, and in the Northeast, Amphoes Kantharom, Yong Chum Noi and Rasi Salai in Changwat Si Sa Ket. In order for the scheme to be implemented, farmers in the designated areas wanting to grow garlic are requested to register with the Amphoe Agricultural Office where a record is kept of the area of garlic cultivation in that Amphoe.

We think that the study has provided a convincing answer to the original question of the Australian expert team as to why farmers grow shallots in Rasi Salai but not in Chumpon Buri. It is not because the latter are more stupid or lazy of less enterprising. It is a rational decision based fundamentally on the inadequacy of groundwater sources and of farmer techniques to tap them. As to the follow-up question--will the farmers produce shallots or other dry season crops if reliable groundwater sources are provided--the answer cannot be an unqualified yes. They certainly will not produce shallots and probably not garlic under present market conditions. Whether they produce these or other dry season crops in the future depends on market opportunities mainly, although other factors discussed below also need to be considered. In other words, the provision of reliable groundwater sources is a *necessary but not sufficient* condition for income generating dry season crop cultivation. The main argument in favor of groundwater and wells development is to make it possible for local farmers to take advantage of good opportunities for income when they occur as was done for shallot production in Rasi Salai. It is not possible within the framework of this study to produce hard economic data on the cost effectiveness of the groundwater and wells project. More detailed economic studies on market conditions could help but there are so many intangibles in this situation that it is difficult to do more than conjecture. The best indications could probably be obtained from a study of the remarkably dynamic Northeastern regional marketing network which is very sensitive to local conditions and to profitable local agricultural production possibilities. Logical places to start in relation to the study area are Amphoe Rasi Salai and Amphoe Satuk : find out what produce local dealers are dealing in or would be interested in dealing in, and who their trading partners are in other locations. This information would be invaluable for planning a dry season crop promotion program in the study area.

In wanting to promote the production of dry season crops for income generation in relation to groundwater development, the project must be aware that it is introducing a new element in the present scenario. Except for the relatively limited area producing shallots and garlic in marketable volume in Rasi Salai, this

population has virtually no experience in commercial production and marketing of dry season crops. As described, crops are produced in very small quantities and surpluses are used as a medium of exchange within a very narrowly circumscribed bartering network. They have very little idea of which crops to produce for a wider market. They have little knowledge of crop management, especially for larger scale production. They do not have the capital needed for initial investments for seed, fertilizer, insecticide, power pumps, etc. They have little understanding of the marketing process and of market opportunities. It follows then that if the groundwater and wells project is to achieve its objective of generating income for this population, not only wells but a package of services will need to be provided as well. These include market intelligence on profitable crops and market support, agricultural extension on crop production and management, and finally agricultural credit.

It would be unrealistic to have great expectations on the outcome of this activity, which is unlikely for anyone familiar with the Thung. Its best agricultural land is classified as "moderately suitable for cultivation" with various constraints, and even this includes only a fraction of the area. Its potential for agricultural development even after all possible improvements have been made will always be low. It would be useful to bear in mind in making decisions on development projects that the Thung was not targeted for development because of its agricultural potential in a national perspective but because of national concern for the population of this depressed area. At least one would hope that as a result of development efforts, living standards of Thung Kula Ronghai villagers could be brought closer to Northeastern Region averages which are already low by national standards. The groundwater and wells project could contribute to this.

Recommendations

(1) As indicated above, in order to achieve the objective of income generation from groundwater irrigated dry season crops by the farmers of the study area, reliable wells are needed and should be provided, but they will contribute to the achievement of the overall objective only to the extent that other needed supportive action is implemented as well. It exceeds the scope of the present study to develop a comprehensive development strategy for the area but this certainly should be done.

(2) In regard to groundwater and well project implementation as a specific element in this overall activity, the study team recommends on the basis of the social study, that the project be implemented gradually, taking into consideration the physical and social constraints identified. The main thrust of the recommendation

is to specify a concrete strategy by which project implementation has the greatest likelihood of success in the shortest possible interval.

Initially then, the groundwater and wells project should be implemented in *some villages* (not all), and dry season crop cultivation should be limited to *small scale* cultivation. The following criteria are proposed for the selection of implementation villages :

a. Villages in which relatively fewer villagers engage in off-farm out-of-village employment, thereby assuring that an adequate work force for dry season cultivation is available.

b. Villages in which there is some experience in growing cash crops so that there will be more interest in making use of additional available water.

c. Villages in which there are villagers recognized as progressive farmers who can play a leadership role in dry season crop cultivation.

d. Villages which have good access roads from which produce can be transported to the market and which traders can use to come to the villages.

e. Villages having areas suitable for cash crop growing close to the village proper.

If these pilot projects are successful, the project activity can then be expanded as road conditions are improved and as supportive services can be provided.

Socio-Economic Study of Villages Affected by Soil Salinization in Kaset Wisai

Napat Sirisambhand

The Problem Structure of the Study Areas.

Of the many physical constraints affecting the livelihood of farmers in Thung Kula Ronghai, one of the most serious is the problem of soil and ground-water salinization. As part of the Australian government's program of technical assistance to Thailand, this problem among others has been addressed by a team of Australian advisers provided by McGowan International Pty, Ltd., working in the framework of the Thai-Australian Thung Kula Ronghai Project. Soil salinity studies have been carried out throughout TKR. The worst affected area has been identified at that lying northwest, west and southwest of Amphoe Kaset Wisai, Changwat Roi Et. of this 400 km^2 area drained by the Lam Sieo Yai and the Lam Tao rivers, approximately 45% of paddy land is affected by varying degrees of salinity.

A number of soil management options have been recommended by the Australian advisory team to deal with the problem of salinity. These include :

- reforestation of higher sloping lands
- pasture improvement of higher sloping land
- removal of bunded paddy rice from higher sloping lands
- use of soil nulches and amendments
- within low lying paddy lands, the redesign of paddy fields to achieve a more equitable distribution of surface water
- levelling of paddies
- land reform.

While the measures proposed were believed by the Australian advisory team to be technically viable and expected to produce both long and short term benefits, their social feasibility in terms of the villagers acceptance of involvement in the proposed technical project's implimentation and management had yet to be ascertained. The Chulalongkorn University Social Research Institute was therefore commissioned by the Thai-Australian Thung Kula Ronghai Project through McGowan International Pty. Ltd. to conduct a study on this issue.

The Study Sample

Population distribution of the villages and samples of study by households and individuals.

Location	Village No.	Village name	Total households		Sample households	
			No.	Population	No.	Population
Tambon Lao	14	Ban Nong Khaen	62	385	12	54
Luang	11	Ban Som Hong	97	605	19	109
	7	Ban Pham	123	699	26	158
Tambon Dong	1	Ban Dong Krang Yai	195	1,466	26	264
Krang Yai	14	Ban Dong Krang Yai Pa Fai	79	486	15	
Tambon Kaset	9,13,17	Ban Nam Om	562	3,021	25	149
Wisai	8	Ban Yang Chong	70	394	15	166
	15	Ban Nong Waeng Noi	50	265	10	
		Total	1,238	7,321	148	900

Sources : ARD census 1983
CUSRI survey

Community Characteristics

All communities in the study area share common characteristics with rural Isan (Northeast) villages. People are related to one another either by blood or marriage. Village leaders and older persons are well respected. People, however, tend to be more or less individualistic. This trait becomes more obvious in situations involving risks or benefits. For example when there is illegal use of communal public land, no action is taken by the people in the community to exercize communal pressure on the offenders to prevent their encroachment on to public land. Some crop promotion projects failed because the model farmers responsible for them did not for example disseminate information or share seeds with others. This is accepted, however. There have not been any conflicts among the villagers resulting from this behavior. In a village such as Ban Nam Om which was divided into 3 villages because of its size, the close community relationships of the people are weakening in some respects. A contributing factor is the development of infrastructure e.g. electricity and better road communication. People become more exposed to the outside world and their interests

are no longer concentrated only on the village. Some well-to-do farmers are changing their life style. More children are sent to receive higher education and seek jobs outside the village. On the other hand, in the more isolated communities such as Ban Yang Chong and Dong Krang Yai, there is more integration and interreliance.

Community Institutions and Organizations

Community life in general is more or less the same in all rural Northeastern villages. People live in a close society of kinsmen. The *wat* and school as well as communal property such as ponds or grazing land are commonly shared. All villages studied have these characteristics.

Since the Isan villages have become less isolated due to the many development programs launched in the area, communal cooperation and organization in the community are in one way or another directed from the outside by external, usually government, change agents. This is a change from former times. Now-a-days, one can clearly see that nearly all villages have many formal groups or associations initiated by different government agencies (see Table 2.9). The purpose of these organizations, among others, is to promote a sense of belonging and participation, and leadership training. According to the villagers, these groups are not very successful and some are not viable. This is not because the people lack cooperation within the community. It is rather because the programmes do not satisfy their felt needs and very often are not consistantly followed through after they have been initiated. There are different degrees of community cooperation and it can vary from one community to another. Cooperation can be manifested in small immediately implemented communal projects e.g. the clearing of viliage school or temple. So far in the study area, there has not been any instance of communal cooperation in major projects requiring long term managerial and organizational commitments, except for the co-op store pilot project in Ban Som Hong which started only recently.

Regarding leadership, leaders are important to bring people to think or work together. In Ban Dong Krang Yai, leaders are active and work closely with the people, especially the individual employed by ARD as the community worker. This person is a native of Ban Dong Krang Yai and lives in this village which gives him the opportunity to work closely with the village leaders and the people. He is very much accepted by the villagers. The widespread practice of making compost fertilizer is partly due to the influence of these leaders and the ARD community worker.

To conclude with an observation. In the communities studied, there is potential for cooperation. The action of the local leaders can lead to development only if those involved provide advice and strongly support the efforts of these leaders as change agents.

Community Livelihood

Agricultural production.

A feature common to all the communities studied as well as the rest of Thung Kula Ronghai, is that agriculture is the main occupation of the population. The major crop is paddy, both non-glutinous (Hom Mali variety), and glutinous (Sanpathong variety). Glutinous rice is grown for home consumption while non-glutinous rice is grown as a cash crop. Other rice varieties besides those mentioned are also cultivated but not to a significant degree. Second crops such as water melons, shallots, chilies, phum beans and other garden vegetables are cultivated during the cool months from October to January. These crops are grown on small plots, mainly for home consumption and the surplus is bartered or sold to fellow villagers or to traders. Only a few farmers (about 10 in the whole study area) grow upland crops, i.e. cassava, kenaf or sugar-cane, because of space limitations and the farmers' concern about depletion of soil fertility. Mulberry trees are also grown for silk worms, especially in Ban Nam Om.

Perenial crops such as fruit trees, i.e. mango, jack fruit, coconuts, papaya, and banana are grown on the house grounds or on household garden plots. These trees serve as a wind break and provide a fruit supply to the households. Kapok is also grown on every house ground. This is a good source of cash income as 1,000 dry cobs can be sold for 100-110 baht. A 4 year old tree can yield up to 3,000 fruits.

Regarding paddy crop yields, the output per *rai* ranges from 100 kg. to 200 kg., depending on rainfall, location of plots, and quality of soil. Ban Dong Krang Yai produces more rice than the other villages because the cultivated area is larger but the yield per *rai* is the lowest. This is due to the problems of soil salinity and flooding which ravage the low land fields. The extent of loss due to flooding or other causes in Ban Dong Krang Yai was 24 percent of the total area planted in rice in 1982. In Ban Nam Om, it was nearly 30 percent, the highest of the study area.

Livestock raised in the study area includes cattle, buffalo, chicken, ducks and swine. Buffaloes are raised for draft purposes in the village and cattle are generally kept as an asset for sale when the farmers need cash. Of the villages studied, Ban Dong Krang Yai as well as Ban Dong Krang Noi nearby have the most grazing animals. The number of cattle and buffaloes in these two villages exceeds two thousand. There is a problem of inadequate feed or pasture, especially during the dry months from February to July. During this dry period, the animals are fed straw or left to graze in the paddy fields. Sometimes the children who mind them have to drive them long distances, e.g. from Ban Dong Krang Yai to Lam Tao or from Ban Pham, Ban Som Hong to Lam Sieo Yai, since water is also essential for these animals.

Chickens of local breeds are commonly raised by the households. They roam freely on the house ground. Chickens are kept both for home consumption and for sale. One household in Ban Nong Khaen raises 250 chickens in proper cages for egg production, the sale of which in the main source of income of this family. This is the only instance of scientific chicken raising in the study area.

Ducks are raised in a few households mainly for their eggs for home consumption as well as for sale in the village. Hogs are raised only by households who have access to rice bran and broken rice i.e. village rice millers.

Fish is abundant during the wet seasons, especially in the middle of the Thung, e.g. in Ban Dong Krang Yai. Farmers do not raise the fish, but trap them in pits at the end of the yearly floods. Fish is the main source of protein. It is preserved in the form of the traditional *pla-ra* which can be kept for years. However abundant, fish is not a source of cash income for Ban Dong Krang Yai. The value of fish in the economy of the people is more in kind than in cash. Fish in the form of *pla-ra* is bartered for other products or goods from other areas. In villages with good roads which are not very far from the Amphoe, fish is also sold for cash e.g. in Ban Nam Om. The fish harvesting season usually starts after the rice harvest and may last until April, depending on the size of the fish trap ponds.

Non-farm/off-farm employment

Non-farm/off-farm employment plays an important role in the economy of the study area. It is engaged by 87.8 % of the sample households of the study villages and involved 45.3% of their labour force over the last year.

At the village level, non-farm work performed at home includes cottage industry such as silk weaving and basketry, and petty trade such as selling groceries and prepared food. Off-farm work involves employment generated by the government's Rural Employment Generation Program such as digging ponds, labour on neighbors' farms, carpentry work and other casual work.

In the past, salt making was a major economic activity. In the last five years however, the number of households making salt has diminished due to the shortage of firewood. In Ban Pham, the main salt producing village of the sample, only 20-30 percent of the households engage in this activity. Salt production takes place after the rice harvest from December to February. The producers are usually landless farmers or farmers with small holdings. The salt produced is not generally sold but bartered for paddy and other commodities. Besides its value as a medium of exchange, salt is an important item in TKR because of its extensive use in the preparation of *pla-ra*.

Off-farm work away from the village area is much more important as a source of cash income for the households however. In fact, almost 50% of sample household members engaging in off-farm employment in 1982 did so outside of the

Northeastern Region. The vast majority worked in Bangkok, and the rest in the Central Region, with two adventurous souls working in the Middle East. Some worked in factories, others drove taxis or engaged in domestic work as maids. Still others were agricultural labourers on sugar cane plantations. There were some who left the village to work full time in Bangkok, sending money back home once in a while.

Income and expenditures

The discussion that follows relates only to cash income and expenditures of the sample households during the 1982 agricultural year. One needs to be aware that in the local context, such an account provides an incomplete picture of the local economy since cash is not the only component. There is also income which is not sold for cash but is either consumed by the producer's households or used as a medium of exchange to obtain other commodities. While no suggestion is made that this is an affluent society by any standard, it would be unrealistic to draw conclusions on the poverty of the area on the basis of low cash income only.

There are two main sources of cash income in the study area : agricultural enterprise and off-farm employment. Paddy growing, especially Hom Mali non-glutinous rice, is an important source of income. Hom Mali rice was cultivated by more than half of the sample households and 73.2% of these sold it for cash. In Ban Dong Krang Yai, which produces more paddy than most, the median income of the sample from paddy cash sales was 4,335 baht, 35.3% of the sample being in the range of from 3,000 to 5,000 baht, and 26.5% from 5,000 to 10,000 baht. These percentages are of the sample households *selling* paddy, not of the whole sample. In other villages of observation, the percentage of households selling paddy was significantly lower than in Ban Dong Krang Yai, and with the exception of Ban Pham, most incomes were in the 1,000-3,000 baht range. However, in most of these villages, there were farmers who earned considerably more bringing the median income of the Nong Khaen paddy selling sample, for example, up to 4,890 baht, the highest of all villages. Ban Pham stands apart in this sample of villages in that only 5 of its 21 sample households sold any paddy at all.

Others cash crops such as kenaf, water melon, and phum beans are not very significant in terms of cash earning and cultivation area. Only some farmers in Ban Nong Khaen and Ban Som Hong earn additional income from these crops, since higher ground is available in these locations for upland crops.

Another agricultural enterprise which yields some income to some farm families is livestock raising. Only about 30 percent of the sample farm households in the study area earned cash income from this source in 1982. As mentioned, farmers do not raise the animals for immediate sale but as an asset. The sales do not occur every year but only at times when a farmer needs cash.

Off-farm employment and on-farm non-argricultural played an important part in cash income generation in the study area. Most of the sample farm households had at least one or two family members engaged in off-farm work.

Land and Land-Use Patterns

Land types and location.

An important category of land in the context of the present study is public land. Public land is that which is granted to certain villages since the 1930's under the Public Land Act to be used as communal property. Public land can be designated as a communal grazing area or pasture for cattle, as an open pond (generally natural), or as a burial ground or village cemetry. Land which was reserved as a public grazing area has, in most cases, been encroached upon by farmers and converted into paddy fields or cultivated land. Since 1976, the Lands Department has been carrying out a public land survey in TKR in order to mark the boundaries of such lands and issue public land documents in order to prevent further encroachment. Because of inadequate annual budgets, however, this scheme is proceeding very slowly and cannot keep pace with the rate of encroachment. Ban Dong Krang Yai, Ban Dong Krang Noi and Ban Som Hong, for example, were allocated public or communal grazing land originally measuring 1,750, 7,000 and 250 rai respectively. At present, no one knows exactly how much of this remains, in fact, public land. It is estimated that in Ban Dong Krang Yai, there is about 800-1,000 rai, but in the case of Ban Som Hong all public land has been encroached upon by landless and small farmers and converted into paddy fields. By law, the occupants of this type of holding cannot be granted ownership documents.

There is a traditional type of public land called "*Don Pu Ta*", which means "the grandparents' land". The existence of this type of land is validated by the people's belief in spirits which is wide spread among Northeastern and Northern rural villagers. In general, one can recognize *Don Pu Ta* land very easily because it is covered with natural forest vegetation. Following the people's belief, this plot is specifically reserved for the spirits of the village's grandparents. No one would dare to cut the trees or otherwise damage the *Don Pu Ta* for the spirits that occupy it protect the people and the village. Not all villages have a *Don Pu Ta*. It depends on whether or not the first group of settlers set it up or whether there was an appropriate type of forest in the village site area. Generally, a deciduous forest area was required. Private and/or land owned by farmers, generally refers to paddy or other agricultural land which is one of the major production factors of farmers. In the study area private land is classified into 4 types according to topographical features, location and use. Locally, these 4 types of land are referred to as:

1) *na lum* which means low lying paddy land.

2) *na don* or *na non*, i.e. paddy fields located on relatively high land which are generally less affected by floods.

3) *na dong* refers to upland fields which were formerly forest land.

4) *suan* generally refers to small plots of land located at the fringe of the village settlement which are planted in fruit trees or vegetables. Garden plots on the house ground are also called *suan*.

In general, the arable land of each village includes several of the 4 types of land, and individual farm- holdings may also include two or more types in a combination of low land and upland paddy fields, or low land paddy field and *suan*, etc. The *na dong* or formerly forested upland land type is found only to the north of Ban Nong Khaen area. The forest has been cleared in the past 15 years.

Land Holding Sizes

Of the villages studied, Ban Dong Krang Yai (Villages No. 1 and 14) has the largest land area, 8,979.05 *rai*, and Ban Nong Khae. the smallest 980.28 *rai*. The average size of holding is also the largest in Ban Dong Krang Yai (32.77 *rai* per household) and the smallest in Ban Nong Khaen (15.8 *rai* per household). The size of holdings in the study villages is indicated in Table 4.2. These data show that more than 50 percent of the villagers in Ban Dong Krang Yai have land holdings in the range of 20 to 40 rai.

From 1976 to 1978, the Lands Department carried out a land survey with the aid of aerial photos and issued land titles to farmers in the TKR. Many farmers took the opportunity to divide up their land among their children. Yet some farmers, especially in Ban Dong Krang Yai, failed to do this and the area is now projected for land reform under the Agricultural Land Reform Office (ALRO). Moreover, there are villagers also who illegally farm on public land for which they cannot obtain any land document. Some people work on their parents' land or are given free use of land by relatives.

Land use pattern

Of the total land holdings in the sample households, more than 90 percent is *Thi Na* or land planted in paddy. The rest is classified according to use as *suan* or garden plot, *Thi Rai* or upland fields and *Thi Pa* or forest land. The latter is found only in the area of Ban Dong Krang Yai, Ban Nong Khaen and Ban Pham. In the local context, *Thi Pa* is a forest only by the farmers' definition as it is only covered by a sparse growth of trees *(non sabaeng)*, shrubs and bushes.

Land use patterns relate significantly to land types and locations. An examination of the farmers' use of their land reveals their rationality and adjustment to the environment. For example *na lum* or low land paddy fields are sowed with

Khao Klang or *Khao Nak*, rice varieties which take 4 or 5 months to mature, while *na non* or upland paddy fields are sowed with *Khao Dor* or *Khao Bao* which take about 3 months to mature. The upland *Thi Rai* or *Na Dong*, as found in Ban Nong Khaen, are generally planted with vegetables such as water melons, *phum* beans, chillies and shallots. Garden plots or Suan are located on the fringe of village settlements or on house grounds. Crops grown here include vegetables, mulberry trees, fruit trees such as mango, jackfruit, papaya, coconut and banana. Kapok trees are also grown on the *suan* and house grounds. In Ban Dong Krang Yai and Nong Khaen, water melons and vegetables are cultivated on *suan* land. *Suan* land can also be used for paddy nursery beds as in Ban Dong Krang Yai. Others prefer to use land which is close to natural water sources for this purpose, either an open pond as in Ban Som Hong and Ban Nam Om or a river, i.e. the Lam Sieo Yai as in Ban Yang Chong. Nevertheless, some farmers also prepare nursery beds in their own paddy fields. Due to the physical constraints of the soil and scarcity of water, paddy fields are usually used only for paddy. There are only some fields north of Ban Som Hong in which farmers grow second crops such as water melons and other vegetables, because of availability of groundwater, but only on a small scale.

In all villages of study there are some areas that have been left uncultivated. The main reasons cited for this are soil problems and lack of water.

Problems and Effects of Soil Salinity

Awareness of the people

Farmers are familiar with the effects of soil salinity in their paddy fields. They know that there is a relationship between water and soil salinity problems and that if there is sufficient water i.e. about 30 cm. to flood the affected fields, the salt effects on soil as well as paddy yields can be reduced. They have no technical knowledge of the causes of soil salinity however. The farmers say they have lived with this problem for generations and the extent of salinity remains the same. They can detect which areas of the paddy fields are affected by observing the salt concentration on the soil surface in the dry season and the places where paddy grows poorly. In their opinion, soil salinity becomes a 'serious' problem when there is not sufficiant water to flood the fields in years when there is less rain. This results in low yield of paddy or, in extreme cases, loss of the whole crops. In good years when the rain is sufficient, the yields can be satisfactory with some application of chemical fertilizer. It appears then that the farmers depend on rain water not only to irrigate paddy but also to lessen the salt effects in the soil. The main risk for paddy loss is the availability of water. The farmers' perceptions of the salinity problem is that it is not too serious since the probability of getting rain is good and remedies such as soil mulching and fertilizer application are available which assure good yields.

Corrective measures

Since the farmers are familiar with the soil salinity problem, measures are taken to remedy it. The practice of soil mulching has been known and practiced for generations. The mulching materials used are kapok leaves, dried kapok shells, rice husk and dried leaves of any kind. Some farmers also use cattle manure and compost fertilizer. Not all farmers are adept at correcting soil salinity. Only about 45 percent of those having this problem know how to deal with it.

Of the materials used, compost fertilizer was introduced only recently. In Ban Dong Krang Yai it was first introduced by an agricultural extension officer. In Ban Nong Waeng Noi, it was recently introduced by the DLD in the form of trial plots. Despite such extension services, farmers still cannot achieve satisfactory results. This is due mainly to the shortage of mulching materials, i.e. rice husk and cattle manure. Another reason is the incorrect method of preparing compost fertilizer. This may be due to lack of supervision on the part of extension officers while corresponding with poor understanding by the farmers. What the farmers did in fact was simply pile up dried leaves, straw and cattle manure.

Another factor contributing to unsatisfactory results in the treatment of saline soils is the improper application of fertilizers and mulching materials. Since these materials are limited, farmers tend to spread them thinly on all of their plots over a wide area. One truck load is applied to 5-6 rai of land. Some farmers with a very limited amount apply them only on the paddy nursery beds. Farmers generally apply the mulching materials on their paddy fields at the time of the first ploughing. By the time the rains come and the second ploughing takes place, the materials are more or less rotten. Only a few farmers can afford to buy dried cattle manure to use in their fields. In Ban Dong Krang Yai where nearly every household prepares compost fertilizer, the farmers have to buy manure from traders in Chumpon Buri and Mahasarakham. The price is 1,400 baht per truck load.

Benefits and disadvantages of salinization

One of the benefits of salinization, as was earlier indicated, is the opportunity it provides for salt making. In the past when firewood was still abundant, the salt making industry was considered almost as important as rice growing because salt could be bartered for almost anything. It was produced in quantity by many communities in the area. Because of the considerable amount of firewood it consumed, this industry contributed importantly to the depletion of forests in the vicinity of the villages to the extent that, at present, there is an acute shortage of firewood even for household use. It follows that salt production has dropped radically. Villages that used to produce salt and barter it for rice now barter rice for salt produced in other areas. The only villages still making salt are those containing saline soils.

There is a folk belief among some farmers that locally grown Hom Mali rice has a better taste than that grown elsewhere because of the saline soils. A less questionable fact concerning the effect of salinization on paddy production is that saline soils are a major cause of crop loss in the area.

Salinization is also responsible for ground water contamination making it unfit for drinking and, in extreme cases, making it unfit even for crop irrigation use.

Other problems

Flooding is perceived by the farmers to be a more serious problem than soil salinity because it is beyond their control. When it occurs, they can lose their whole crop. Flooding is more pronounced in Ban Nam Om. In 1982 large areas of low land fields were damaged by the annual flood. According to the farmers, the flooding has become worse since the contruction of Highway 202 (Pra Thai-Yasothon). This Highway interferes with the natural drainage of the flood water which remains trapped in the paddy fields longer than the crop can stand. This phenomenon tends to repeat itself every year whenever there is a lot of rain. Since the contruction of this highway, farmers in Ban Nam Om have suffered from such flooding in 1979, 1981 and 1982.

Other problems cited by the farmers are sandy or impoverished soils and uneven land surfaces. The latter becomes a problem for plots located on relatively higher land because sufficient water levels cannot be maintained throughout the growing period.

Summary, Conclusions, and Recommendations

Problem structure of project implementation

By way of recapitulation, we now summarize the findings of the socio-economic study that have direct relevance to the implementation of the measures proposed by the Australian consultants to deal with the problems of salinization.

(1) Although local farmers are aware of the relationship between soil salinity and low crop yields and consider it to be a problem, it is a one they have lived with for generations. Despite imperfect knowledge and shortage of materials, they feel they cope with it to a satisfactory extent by means at their disposal such as mulching and reliance on rain water and flooding to flush the top soil. (consequently, they do not consider it as the major problem of their cropland. There are also the problems of sand and low level of soil nutrients, but the greatest problem in their view is major flooding. They have no control over this and, to a lesser degree, drought or inadequate rain during the beginning of the growing season which causes the high level of soil salinity to persist, among other effects.

(2) In this rice culture, paddy growing is a way of life seen as the only real guarantee of survival in the environment. Villagers are consequently vitally attached to their rice land and most unwilling to give it up or to make it available for other uses such as forestry or pasture development, or for the cultivation of field or vegetable crops, especially if their holdings in rice land are already small. They either do not understand or are skeptical about the effectiveness of the measures proposed to alleviate soil salinity. Even with intellectual understanding, reluctance remains. The problem to be solved is not seen as serious enough to warrant this personal sacrifice and they naturally feel that their first responsibility is to their families, to assure their subsistance and survival. To think one can persuade them to jeopardize this for hypothetical improvements to fields in the lowlands, especially if not their own, in an indefinite future, is hardly realistic. With respect to the cultivation of other crops, they are in no way seen as a viable substitute for rice as their reliability as a source of income is beyond the farmers' control.

(3) Reforestation and pasture development are fully supported by this population on condition that it be implemented on public and not on private land. Motivation for the support however does not arise from their perception of the need to alleviate soil salinity. Forests and pastures are seen as desirable in themselves, the former to solve the problem of shortage of firewood for home use, the latter to provide needed grazing for bovines which are raised in relatively large numbers by this population.

(4) Full but qualified support is given also to low-lying paddy land redesign and levelling because the benefits are easy to understand and immediately achieved. However, this activity is approved of on condition that the locations and dimensions of individual holdings not be modified. Moreover, the management of this activity is perceived by the farmers as being beyond their capacity to implement. The government therefore will need to assume full responsibility for the implementation.

(5) Local communities are generally close and cohesive with a well developed, usually effective, but not authoritarian pattern of leadership. Despite the individualistic tendencies of Northeastern villagers, there is good potential for cooperation in many small scale community projects. However, this population has no experience with development projects on the scale envisaged for the reafforestation and pasture development projects. There is a special problem in relation to government initiated projects of this kind. Villagers, until recently, have been mostly passive recipients of such projects and there has been very little village level participation either in the selection of the projects or in their implementation. Having no control over the projects, the villagers also feel that they have no responsibility for them. Granted that official government policy is now to encourage popular participation through

the Tambon Councils in development planning and implementation, old habits die hard and it is not easy to get the villagers (or government officials for that matter) to assume roles, functions, and styles of operation they never had before.

(6) With respect to implementing agencies (because of budgetary and bureaucratic organizational constraints mainly, and irrespective of individuals involved), the supportive system needed to implement the proposed projects is weak. It is difficult to call upon Agricultural Promotion officers and Community Development workers to participate in this activity as their present responsibilities require their full-time involvement. Involvement of many agencies is needed but coordination assuring concerted and sustained action remains difficult. Also lacking is the capacity to combine technical activity with the social engineering aspects of the projects. This is crucial. Development is for people and technological yardsticks to measure success are meaningless if they are not acceptable to, or serve the needs of the people.

Due to constraints outlined in the preceding section, not all technical proposals are socially feasible, at least in their present form.

Efforts need to be made to assure maximum popular involvement in all phases of the project activity through consultations between village leaders and implementing agencies for both planning and implementation of the projects. Setting aside their dependence on government attitudes, they must be made to understand that although assistance is provided by the government, the projects are theirs and they should therefore assume a major share of responsibility for them.

บทคัดย่อ

Social and Economic Aspects of Dryer Use for Paddy and Other Agricultural Produce in Thailand

Jacques Amyot

บทความนี้สรุปผลการประเมินผลของเครื่องอบข้าว ซึ่งออกแบบโดยสถาบันเทคโนโลยีแห่งเอเชีย ทางสถาบันฯ ได้นำเครื่องอบข้าวไปทดลองใช้ในหมู่บ้านภาคกลาง 12 หมู่บ้าน ในช่วงเวลา 2 ปี ผลการศึกษาพบว่า ประสิทธิภาพของเครื่องอบข้าวดีมาก แต่การคาดหวังที่จะให้ชาวบ้านใช้เครื่องอบเพื่อลดความชื้นของข้าวที่ปลูกครั้งที่สองไม่ประสบความสำเร็จเมื่อวิเคราะห์เชิงเศรษฐกิจสังคมและสภาพแวดล้อม ด้วยเหตุผลว่า การที่เครื่องอบจะเหมาะสมที่สุดขึ้นอยู่กับปัจจัยต่อไปนี้

(1) ชาวนาจะต้องเกี่ยวไปพร้อมกัน ควรจะเกี่ยวข้าวคราวละประมาณ 1 ตันเพื่อนำมาอบ การที่ชาวนาจะทำเช่นนี้ได้จะต้องจักระบบการทำนาในแปลงต่าง ๆ ให้มีระยะเวลาไล่เลี่ยกัน เริ่มจากการปักดำ หรือหว่าน การปล่อยน้ำชลประทานตลอดจนการเก็บเกี่ยว

(2) ชาวนาจะต้องมีแรงงานที่จะทำนาและเกี่ยวข้าวในช่วงระยะเวลาที่นานกว่าเดิม

(3) ราคาข้าวในตลาดจะต้องขึ้นอยู่กับคุณภาพของข้าว ข้าวที่อบแห้งด้วยเครื่องและมีความชื้นต่ำจะต้องมีราคาสูงกว่าข้าวธรรมดา

(4) ชาวนาสามารถควบคุมผลผลิตของตัวเองได้เต็มที่จึงจะมีความต้องการที่จะปรับปรุงคุณภาพของผลผลิต การขาย "ข้าวเขียว" คือตัวอย่างของการขายข้าวล่วงหน้าและไม่ขึ้นกับคุณภาพของผลผลิต ชาวนาจึงไม่มีแรงจูงใจที่จะปรับปรุงคุณภาพของข้าว

(5) ชาวนาควรใช้เครื่องอบตลอดปี เพื่อให้ได้ประโยชน์สูงสุด โดยใช้อบผลผลิตการเกษตรอย่างอื่นด้วย

จากการประเมินประสิทธิภาพของเครื่องอบข้าว ไม่สามารถสรุปได้ว่า เครื่องอบข้าวนี้สามารถใช้กับผลิตผลการเกษตรชนิดอื่นหรือไม่ ทั้งทางด้านเทคโนโลยีและทางด้านเศรษฐกิจสังคม ประเด็นที่จะต้องพิจารณาคือ

- ชนิดของผลผลิตการเกษตรที่อาจนำมาพิจารณาได้
- ปริมาณและการกระจายหรือขาย รวมทั้งแนวโน้มในอนาคต
- ราคาผลผลิตที่ชาวไร่ชาวนาจะได้รับโดยตรง
- ประสิทธิภาพของการอบแห้งตามแบบประเพณี เปรียบเทียบกับการใช้เครื่องอบแห้งแบบทันสมัย
- ปริมาณผลผลิตที่เหมาะสมและคุ้มค่ากับการลงทุนซื้อเครื่องอบแห้ง
- สภาพการผลิตและทัศนคติของชาวไร่ชาวนาในการผลิตที่จะส่งเสริมหรือต่อต้านการใช้เครื่องอบแห้ง

"Self–Reliance" and "Participation" in Rural Energy Development

Amara Pongsapich

การวิจัยและพัฒนาเป็นรูปแบบของการวิจัยที่มีตัวอย่างให้เห็นมากขึ้นในช่วงทศวรรษที่ผ่านมา งานลักษณะนี้คือ งานวิจัยเกี่ยวกับการพัฒนาเทคโนโลยีเพื่อประยุกต์ใช้ในสังคม เริ่มตั้งแต่การคิดค้นประดิษฐ์ วิจัยและทดลองทางเทคนิค ทดลองนำไปใช้ในพื้นที่ จนถึงขั้นการยอมรับ บทความนี้อธิบายถึงขั้นตอนการนำเทคโนโลยีเกี่ยวกับพลังงานทดแทนไปทดลองใช้ในหมู่บ้าน โครงการนี้เป็นโครงการที่การพลังงานชาติเป็นเจ้าของ และได้รับเงินสนับสนุนจาก USAID เป็นโครงการ 5 ปี เริ่มตั้งแต่ปี พ.ศ. 2523 โดยที่ผู้เขียนได้มีส่วนเกี่ยวข้องกับการสำรวจชุมชนเบื้องต้น บทความนี้จึงจะมองขั้นตอนการนำเทคโนโลยีไปทดลองใช้จากแง่มุมของสังคมศาสตร์ โดยมองปรัชญาการพัฒนาชุมชนและพัฒนาประเทศควบคู่ไปกับการพัฒนาเทคโนโลยี

ตามแผนงานที่วางไว้เดิม การสำรวจชุมชนเพื่อนำเทคโนโลยีไปประยุกต์ใช้มีทั้งหมด 3 ขั้นตอน คือ (1) การสำรวจข้อมูลเบื้องต้นและพื้นฐาน (2) การสำรวจชุมชนก่อนนำเทคโนโลยีไปติดตั้ง และ (3) การศึกษาผลกระทบของการนำเทคโนโลยีไปใช้ในชุมชน ปรัชญาการพัฒนาที่ใช้ในโครงการนี้ คือปรัชญาที่เน้นเรื่องการมีส่วนร่วมของประชาชนในการพัฒนา และการพัฒนาเพื่อให้ชุมชนสามารถพึ่งตัวเองได้ทางด้านพลังงาน ฉะนั้นในการสำรวจเบื้องต้น ข้อมูลเกี่ยวกับสภาพสังคม โครงสร้างสังคม การรวมกลุ่มและ/หรือความขัดแย้งในสังคม ทรัพยากรธรรมชาติ ผู้นำ ฯลฯ จึงเป็นเรื่องที่ศึกษา

โครงการพลังงานทดแทนที่ใช้ในหมู่บ้าน และรายงานในบทความนี้คือ บ่าพืนชุมชน การปั่นไฟฟ้าจากพลังน้ำ การปั่นไฟฟ้าจากแก๊สชีวภาพ การปั๊มน้ำโดยใช้พลังงานแสงอาทิตย์ และการปั๊มน้ำโดยใช้พลังลม ในการแนะนำโครงการและนำเทคโนโลยีไปใช้ วัตถุประสงค์ของโครงการคือการชักชวนให้ประชาชนมีส่วนร่วมในการนำเทคโนโลยีไปใช้ เริ่มตั้งแต่การติดตั้งหรือก่อสร้าง จนถึงขั้นดำเนินการและขั้นดูแลรักษา

จากโครงการย่อย 5 โครงการที่กล่าวถึงแล้ว พบว่ารูปแบบของการมีส่วนร่วมของประชาชนในแต่ละโครงการไม่เหมือนกัน ในโครงการป่าพืนชุมชน การปลูกป่าเป็นการจ้างปลูก ชาวบ้านไม่ได้มีส่วนร่วมในการปลูกป่า และไม่มีสิทธิ์ที่จะใช้ประโยชน์จากต้นไม้นั้น โครงการปั่นไฟฟ้าโดยใช้พลังน้ำ การมีส่วนร่วมของประชาชนเห็นชัดในการที่ชาวบ้านอุทิศแรงงานในการก่อสร้างมีการจัดเวรกันทำงาน และเมื่อก่อสร้างเสร็จมีการแบ่งหน้าที่ความรับผิดชอบในการเดินเครื่องและดูแลรักษาอุปกรณ์เครื่องใช้ต่าง ๆ โครงการปั่นไฟฟ้าจากชีวมวลใช้แรงงานชาวบ้านในการก่อสร้างถังหมักแก๊ส และติดตั้งอุปกรณ์ต่าง ๆ แต่ในขั้นดำเนินการ ไม่สามารถชักชวนให้ชาวบ้านนำมูลสัตว์มาใส่ในถังแก๊สเป็นประจำทุกวันได้ ทำให้ความดันของแก๊สในถังหมักไม่เพียงพอและไม่สามารถปั่นไฟได้ การมีส่วนร่วมของชาวบ้านในขั้นนี้ขาดหายไปเพราะชาวบ้านอ้างว่า ไม่มีเวลา ส่วนขั้นตอนของการติดตั้งแผงรับแสงอาทิตย์ เพื่อแปลงพลังแสงอาทิตย์มาเดินเครื่องปั๊มน้ำ ไม่จำเป็นต้องใช้แรงงานมากความร่วมมือจึงไม่เป็นปัญหา และในขั้นตอนการดำเนินงานและดูแลรักษาก็ไม่มีความจำเป็นที่จะต้องดูแลมาก เพียงแต่มีคนเปิดและปิดปั๊มน้ำเท่านั้น โครงการสุดท้ายคือ การติดตั้งกังหันลมเพื่อปั๊มน้ำ โครงการนี้ว่าจ้างบริษัทเอกชนให้เป็นผู้ติดตั้ง และชาวบ้านไม่ได้มีส่วนร่วมด้วยเลย ถึงขั้นดำเนินการคนที่มีแปลงผักในบริเวณนั้นก็สามารถใช้น้ำได้ โดยมีการตกลงแบ่งปันน้ำกัน แต่โครงการนี้ทำได้ปีเดียวก็ต้องหยุดชะงักลง เนื่องจากในปีต่อมาเกิดปัญหาน้ำท่วม โครงการจึงหยุดดำเนินการ

จากการวิเคราะห์ในขั้นดำเนินการพบว่า บางโครงการสามารถผลิตพลังงานเพื่อใช้ตามวัตถุประสงค์ที่กำหนดไว้ได้อย่างมีประสิทธิภาพ และทำให้ชุมชนสามารถพึ่งตนเองได้ในแง่ของการมีไฟฟ้าใช้ แต่บางโครงการ การผลิตพลังงานไม่สำเร็จตามวัตถุประสงค์เพราะขาดขั้นตอนของการมีส่วนร่วมของชาวบ้าน และมีผลทำให้ชุมชนไม่สามารถพึ่งตัวเองทางด้านพลังงานได้ ฉะนั้นในการนำเทคโนโลยีไปประยุกต์ใช้ในการพัฒนาชนบท จำเป็นอย่างยิ่งที่จะต้องคำนึงถึงปรัชญาการพัฒนา และขั้นตอนของการประยุกต์ใช้เทคโนโลยี จะต้องสร้างสำนึกให้ชาวบ้านเข้าใจว่า เทคโนโลยีที่เอาไปติดตั้งนี้มีวัตถุประสงค์เพื่อพัฒนาชุมชน และการมีส่วนร่วมของชาวบ้านในชุมชนในการช่วยกันติดตั้งดำเนินการ และดูแลรักษาเป็นสิ่งที่จำเป็น และจะทำให้ชุมชนสามารถพัฒนาและพึ่งตัวเองได้ทางด้านพลังงานทดแทน

ในพื้นที่ชนบทยากจน ถ้าจะส่งเสริมให้ประชาชนช่วยตัวเองทางด้านพลังงานได้มากขึ้น อาจเสนอให้คณะกรรมการพัฒนาชนบทแห่งชาติพิจารณานำโครงการพลังงานทดแทนเข้าเป็นโครงการหนึ่งที่อาจขอเงินสนับสนุนจากโครงการสร้างงานในชนบทได้ โดยให้สภาตำบลเป็นผู้พิจารณาถึงความจำเป็นที่จะต้องมีโครงการพลังงานทดแทนในพื้นที่นั้น เมื่อตัดสินใจว่า พลังงานทดแทนเป็นสิ่งจำเป็นชาวบ้านจะต้องปรึกษากับผู้รู้ทางด้านพลังงานเพื่อเลือกหารูปแบบพลังงานทดแทนที่เหมาะสมสำหรับพื้นที่นั้น และดำเนินการขอความสนับสนุนทางการเงินจากโครงการ กสช. หรือจากหน่วยงานของรัฐที่รับผิดชอบเกี่ยวกับเทคโนโลยีนั้น ๆ

Village Woodlots

Kobkul Phutaraporn

โครงการป่าพืนชุมชนเป็นโครงการย่อยโครงการหนึ่งในจำนวน 10 โครงการของโครงการแม่บทพลังงานทดแทน ซึ่งดำเนินงานโดยสำนักงานการพลังงานแห่งชาติ โดยได้รับเงินลงทุนสนับสนุนจาก USAID ลักษณะของโครงการนี้เป็นการทดลองปลูกไม้โตเร็วเพื่อการใช้สอยในชุมชนมีกำหนดเวลา 5 ปี ตั้งแต่ปี 2524–2528 การจัดการโครงการอยู่ในความรับผิดชอบของกรมป่าไม้ โดยกำหนดให้ปลูกไม้โตเร็วปีละ 800 ไร่ในพื้นที่สาธารณะของชุมชนที่จะเลือกเข้าเป็นชุมชนตัวอย่าง หลักการสำคัญของโครงการก็คือต้องการให้ประชาชนในชุมชนนั้นเรียนรู้การบริหารโครงการด้วยตนเองเพื่อที่จะสามารถรับผิดชอบโครงการต่อไปได้ภายหลังจากคณะเจ้าหน้าที่ถอนตัวจากชุมชนแล้ว

หมู่บ้านที่เลือกทำโครงการทดลองทำป่าพืนชุมชน มี 7 หมู่บ้านจาก 4 จังหวัด คือ จังหวัดศรีสะเกษ จังหวัดร้อยเอ็ด จังหวัดมหาสารคาม และจังหวัดยโสธร พืชที่ปลูกเป็นยูคาลิปตัสพันธุ์คามาลดูลินซีส ลักษณะการดำเนินโครงการของป่าพืนชุมชนในจังหวัดทั้ง 4 นั้น พอสรุปได้เป็น 3 แบบคือ

1. รูปแบบการจัดการโดยมีการควบคุมอย่างใกล้ชิดจากเจ้าหน้าที่ที่เกี่ยวข้อง หรือดำเนินการโดยเจ้าหน้าที่เองโดยตรง ชาวบ้านเป็นแต่เพียงผู้รับรู้ว่าจะเป็นผู้ได้รับประโยชน์ โดยไม่มีความรู้สึกว่ามีส่วนร่วมกับโครงการ ได้แก่ หมู่บ้านตัวอย่างในจังหวัดศรีสะเกษ และจังหวัดร้อยเอ็ด

2. รูปแบบการจัดการโดยมีคณะกรรมการหมู่บ้านและเจ้าหน้าที่ทำงานร่วมกัน ได้แก่ ที่จังหวัดมหาสารคาม

3. รูปแบบการจัดการที่จะรับเฉพาะชาวบ้านที่สนใจโครงการเข้าร่วมโครงการโดยได้รับต้นไม้ที่ปลูกเป็นส่วนแบ่งหรือเป็นในรูปรางวัล ได้แก่ จังหวัดยโสธร

ปัญหาที่ได้พบในช่วงของการดำเนินโครงการ พอสรุปได้ดังนี้

1. ปัญหาความไม่เข้าใจวัตถุประสงค์ของโครงการ ไม่เข้าใจหลักการสำคัญที่จะให้ชาวบ้านได้เรียนรู้การบริหารโครงการเอง ทำให้ชาวบ้านไม่มีส่วนร่วมในโครงการนี้ ความรู้สึกเป็นเจ้าของจะไม่ค่อยเกิดขึ้น ความสนใจโครงการจึงมีน้อย

2. ปัญหาการวิวาทระหว่างชาวบ้านเกี่ยวกับการแย่งผลประโยชน์ ทั้งในด้านการใช้ที่ดินสาธารณะที่นำมาใช้ปลูกไม้ทดลอง และในด้านของการแบ่งปันผลประโยชน์จากต้นไม้เมื่อต้นไม้โตพอใช้การได้

Tung Kula Ronghai Groundwater and Wells

Abha Sirivongs na Ayuthaya

โครงการพัฒนาทุ่งกุลาร้องไห้เป็นโครงการใหญ่ ครอบคลุมหลายด้านและมีเนื้อที่กว้างขวาง บทความนี้เน้นเฉพาะการพัฒนาน้ำใต้ดินและการขุดบ่อน้ำใต้ดินเพื่อนำมาใช้ทางด้านเกษตรกรรม โดยเปรียบเทียบพื้นที่บางส่วนของอำเภอราสีไศล จ. ศรีสะเกษ ซึ่งมีการนำน้ำใต้ดินมาใช้ในการเกษตรโดยการปลูกหอมแดงเป็นพืชในฤดูแล้ง กับอำเภอชุมพลบุรี จ. สุรินทร์ ซึ่งชาวบ้านยังไม่นำน้ำใต้ดินมาใช้ในการเกษตร หลังจากที่ทางรัฐบาลออสเตรเลียได้มีโครงการพัฒนาพื้นที่เขตกุลาร้องไห้ และมีการขุดบ่อน้ำใต้ดินเพิ่มขึ้นเป็นจำนวนไม่น้อย

จากการศึกษาพบว่า มีประเด็นที่จะต้องพิจารณาคือ (1) ทางด้านกายภาพ สภาพดินเป็นตัวกำหนดวิธีการขุดและชนิดของบ่อน้ำ และเนื่องจากพื้นที่แถบนี้มีปัญหาทางด้านกายภาพมาก การขุดบ่อแต่ละครั้งไม่สามารถรับรองได้ว่าจะมีน้ำให้ใช้ตลอดเวลาทุกฤดูกาล และบางครั้งน้ำที่ขุดได้เป็นน้ำเค็มหรือน้ำกร่อยทำให้เพาะปลูกไม่ได้ (2) จากการที่ชาวบ้านไม่สามารถพึ่งน้ำได้ในอดีต ชาวบ้านบริเวณ อ. ชุมพลบุรี จึงอพยพไปหางานทำที่ต่างจังหวัดหรือที่กรุงเทพ ฯ เป็นประจำ และยังไม่ได้คิดที่จะเลิกย้ายถิ่น ถึงแม้ว่าในระยะหลังทางรัฐบาลออสเตรเลียได้มีโครงการขุดบ่อน้ำใต้ดินให้ใช้ได้ และ (3) ปัญหาเรื่องการตลาดยังไม่สามารถแก้ได้ เพราะการที่ชาวบ้านสามารถปลูกพืชในฤดูแล้ง ถ้าขายได้ก็จะเป็นการเพิ่มรายได้ให้แก่ชาวบ้าน แต่หลายครั้งมีปัญหาเรื่องการตลาด ทำให้ชาวบ้านไม่กล้าเสี่ยงที่จะลงทุนปลูกพืชครั้งที่สอง ถึงแม้จะมีน้ำพอที่จะทำการเพาะปลูกได้

จากเหตุผลข้อ (1) – (3) ชาวบ้านจึงยังรีรอและยังไม่สามารถตัดสินใจได้ว่าจะปลูกพืชฤดูแล้งดีหรือไม่ ตราบใดที่ยังตัดสินใจไม่ได้ การอพยพไปหางานทำที่อื่นก็ยังเป็นทางออกที่ดีที่สุดสำหรับในระยะสั้นเมื่อการหางานทำในต่างประเทศ ในกรุงเทพ ฯ หรือจังหวัดอื่นเป็นสิ่งที่ทำได้

ยาก ชาวบ้านคงจะหันมาพิจารณาว่า จะปลูกพืชฤดูแล้งหรือไม่ แต่การตัดสินใจที่จะลงทุนในการปลูกพืชในฤดูแล้งก็จะต้องขึ้นอยู่กับ (ก) เงินทุน (ข) ความรู้เกี่ยวกับเทคนิคการเกษตร (ค) การปรับตัวจากการที่เคยปลูกพืชเพื่อบริโภคมาปลูกเพื่อค้าขาย (ง) ความรู้เกี่ยวกับการทำธุรกิจและการตลาด

จะเห็นได้ว่าการพัฒนาทางเทคโนโลยีซึ่งในกรณีนี้คือ การสามารถขุดน้ำใต้ดินได้ จะต้องถูกนำมาเสนอให้ชาวบ้านรับรู้และให้ชาวบ้านได้มีเวลาปรับตัวและหาความรู้เพิ่มเติมเพื่อจะนำเทคโนโลยีนั้นไปใช้ประโยชน์ การนำเสนอเทคโนโลยีที่เคยมีอยู่เดิมและคาดหวังให้ชาวบ้านตื่นเต้นดีใจ และยอมรับเทคโนโลยีนั้นทันที เป็นสิ่งที่นักวิทยาศาสตร์และวิศวกรคาดหวังเร็วเกินไป คงต้องให้เวลาชาวบ้านเปลี่ยนวิถีชีวิตและหาลู่ทางใช้ประโยชน์จากสิ่งใหม่นี้สักระยะเวลาหนึ่ง

Socio–Economic Study of Villages Affected by Soil Salinization in Kaset Wisai

Napat Sirisambhand

รายงานนี้เป็นการเสนอผลการศึกษาเรื่อง ผลกระทบของดินเค็มต่อสภาพสังคมและเศรษฐกิจของชุมชนในเขตทุ่งกุลาร้องไห้ และมีจุดประสงค์เพื่อนำผลการศึกษานี้ไปใช้เพื่อการวางแผนในการแก้ไขสภาพดินเค็ม ซึ่งเป็นโครงการที่เน้นทางด้านเทคนิค

ผลของการศึกษาพบว่า เนื่องจากชาวบ้านอาศัยอยู่ในพื้นที่นี้มานาน ปัญหาดินเค็มจึงเป็นสิ่งซึ่งเขาคุ้นเคยเพราะเป็นส่วนหนึ่งของสิ่งแวดล้อมในวิถีชีวิต ชาวบ้านมีวิธีการแบบโบราณซึ่งบอกต่อ ๆ กันมาในการบรรเทาความรุนแรงของดินเค็ม ปัญหาทางกายภาพซึ่งชาวบ้านถือว่ามีผลรุนแรงต่อการทำมาหากิน ก็คือปัญหาซึ่งอยู่นอกเหนือความควบคุมได้ เช่น ปัญหาน้ำท่วมและฝนแล้ง ในแง่ของทัศนคติต่อมาตรการแก้ไขสภาพดินเค็ม ชาวบ้านจะเห็นด้วยก็ต่อเมื่อมาตรการนั้น ๆ ไม่ทำให้ต้องเสียที่ทำกิน หรือทำให้ลดน้อยลงถึงแม้โครงการนั้น ๆ จะมีผลดีต่อชุมชนส่วนรวมก็ตาม

สรุปได้ว่า โครงการพัฒนาใดก็ตามที่ใช้เทคนิควิชาการเข้าช่วย ไม่จำเป็นเสมอไปว่าจะต้องเป็นที่ยอมรับหรือปฏิบัติได้ทุกกรณี ถึงแม้ว่าโครงการนั้นจะมีความเป็นไปได้ในทางเทคนิคสูง ปัจจัยทางสังคมนับว่ามีส่วนสำคัญต่อความสำเร็จและความเป็นไปได้ของโครงการเช่นกัน

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2812—104/500

CUSRI Reports, Publications and Documentation

1. CUSRI. A survey of traffic conditions on New Road between Sathorn and Siphaya intersections. (Thai).
2. Charit Tingsabadh. Social and economic effects of petroleum development programme in Thailand.
3. Amara Pongsapich, et al. Traditional and changing Thai world view.
4. CUSRI. Agricultural Land Reform Office planning manual. (Thai).
5. Akira Suehiro. Capital accumulation and industrial development in Thailand.
6. Zierling, Alexis. Mural Conservation in Thailand: Priorities and Alternatives.
7. CUSRI. Agricultural employment creation and the improvement of the quality of agricultural commodities for increased income and export earning in the Southern Region.
8. CUSRI. Participatory action research handbook.