



Policies for agricultural sustainability in northern Thailand



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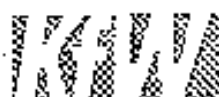
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A country case study report for:

Policies that Work for Sustainable Agriculture and Regenerating Rural Economies



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Royal Danish Ministry of Foreign Affairs (DANIDA), Department for International Development (DFID, UK), Kreditanstalt für Wiederaufbau (KfW, Germany, Senegal case study), Swedish International Development Cooperation Agency (SIDA), Swiss Agency for Development and Cooperation (SDC)

IED is particularly grateful to Lucy Ambridge and DFID, who contributed generously to the final stages of the project, and without whom the case studies could not have been published.

Copies of this report and others in the Policies that Work series are available from:

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Design by Eileen Higgins. Layout by Bridget Tisdall.

Printed by Folium, Birmingham, UK.

A collaborative research project of the
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Khanya, South Africa; GREEN Senegal, Rodale Institute, Senegal;
Tegemeo Research Institute, Kenya; Chiang-Mai University, Thailand;
Development Support Centre, India; SPEECH, India; AS-PTA, Brazil;
Diego Muñoz, Bolivia.

Policies that work for sustainable agriculture and regenerating rural economies series

There are enough examples world-wide to suggest that agriculture which is pro-sustainability and pro-people is working. We now understand the concept of 'sustainable' agriculture is not confined within the farm boundary, but has strong links (and a potential to be a dynamic force within) a wider rural economy. So, 'sustainable agriculture' not only contributes to greater agricultural production, but also environmental regeneration and local economic development.

IIED's Sustainable Agriculture and Rural Livelihoods Programme has undertaken collaborative research to look at 'Policies that work for sustainable agriculture and regenerating rural economies'. The overall objective of this research is to understand the policy contexts and instruments that can promote sustainable agriculture and social change. This has been done in high, medium and low income countries in both the South and the North. 'Success stories' have been identified and the policy environment that has permitted these to emerge has been investigated. Are there lessons we can learn from these 'islands of sustainability' that will help us turn islands into continents?

This paper is one of a series of reports from the Policies that Work project, which give the research and methodological background and country specific findings. *The views and opinions reflected in this material do not necessarily reflect those of IIED, it's partners or the project donors.*

Acknowledgements

Thanks are due to Pratantip Karnol and Nuttamon Teerakul for their computation and data collection.

Acronyms

BAAC	Bank for Agriculture and Agricultural Co-operatives
CF	Contract Farming
CPMHG	Committee of Policy and Measures to Help Growers
DCP	Department of Cooperative Promotion
DIT	Department of Internal Trade
DoA	Department of Agriculture
DoAE	Department of Agricultural Extension
DoC	Department of Commerce
DoIP	Department of Industrial Promotion
ha	Hectare
HAU	Home Activity Unit
HWG	House-wife Group
IIED	International Institute for Environment and Development
MoAC	Ministry of Agriculture and Co-operatives
MoC	Ministry of Commerce
MOF	Marketing Organisation for Farmers
MoPH	Ministry of Public Health
NESDB	National Economic and Social Development Board
OAE	Office of Agricultural Economics
PGC	Potato Growers' Group
PTW	Policies That Work (for sustainable agriculture and regenerating rural economies)
RFD	Royal Forest Department
SARL	Sustainable Agriculture and Rural Livelihoods
SLG	Society of Longan Growers
TAO	Tambon Administrative Organisation
TSPVE	Thai Society of Fruit and Vegetable Exporters

Conversions

1 hectare = 6.25 rai

1\$ = 25 Baht before floatation of the Thai Baht on 2 July 1997

1\$ = 36 Baht in 1999

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Executive Summary

With the collapse of Thai financial institutions in 1997 and its chaotic consequences for the industrial sector, agriculture is now regarded as the main strength for economic recovery. Food security and economic self-reliance, particularly for the excluded, have received high priority to cope with this economic crisis.

For the first time, sustainable agriculture has been included in the 8th National Social and Economic Development Plan (1997-2001). Sustainable agriculture is expected to be the major thrust of agricultural development policy.

With these new changes, it is anticipated that policies that would enhance integrated land use systems, and production systems for economic self-reliance involving small and medium scale rural enterprises, as well as strengthen local organisations, will continue to be the main development objectives. The goal of this research is to identify those "Policies That Work" (PTW) through understanding "islands of success" – farming communities that have evidence of integrated land use, economic self-reliance and strengthened organisation.

The study area covered the main agricultural landscapes of northern Thailand, with Chiang Mai Province being used for case studies to represent and highlight characteristics of sustainable agriculture in the region. In northern Thailand, rice farmers have been encouraged to transform their rice monoculture into integrated farming systems. The adoption and extension of the "New Theory" integrated rice-based farming system in the lowland by the governmental ministries has helped promote the principle and practice of sustainable agriculture and rural livelihoods (SARL).

Three main physiographic features were selected. The *highlands*, which constitute 72 per cent of land types and are inhabited by hill tribe ethnic groups, are facing many development dilemmas. They possess comparative advantage for production of temperate fruit crops for the market economy, but struggle to achieve food security and are often deprived of access to land and forest resources for sustainable livelihoods. The *hillslope and rainfed uplands* constituting 17 per cent of land and settled mainly by the ethnic northern Thai, are seen as future prospects for developing sustainable land use and agricultural production. At present the areas are considered under-utilised due to mismanagement of land resources in the early settlement period. The *lowland rice-based ecosystem* occupying about 10 per cent of land and representing the most intensive and diversified land use system, is regarded as an advanced agricultural zone with a market-oriented production system. Integration of production with marketing arrangements is seen as one approach to achieve agricultural sustainability.

Methodology

Several methods of client- and developmental-oriented research were employed. The on-farm experimentation was carried out with different levels of researcher-farmer partnership, ranging from less farmer-managed to fully farmer-managed. The on-farm adaptive research was used to generate and disseminate sustainable agricultural practices to the target farmer groups. It was an effective entry point when farmers' goals and objectives were considered in the design of land use technology, such as sustainable rice production for the Karen's goal of food security, or conservation farming with tree crop-based systems for the hillslope farmers to achieve both ecological and economic benefits. The periodic monitoring by the meeting of researchers and farmer groups to review the production process, problems and potential solutions, expected outputs and next season production plan helped motivate farmers to continue to participate in the research process.

The results of on-farm experimentation were presented in different fora with and without farmer participation. The on-farm adaptive research was able to link the on-station studies, mainly of disciplinary scientists, to the local village-based NGO workers; for instance in the case of rice biodiversity, where detailed characterisation was conducted on-station, and testing was done both on-station and on-farm.

The participatory rural appraisal (PRA) with effective facilitation helped generate farmer response and make relevant and workable proposals for the community. During the PRA process among clients of different social status, appreciation of individual experience and knowledge, positive interaction within and among groups enabled the participants to gain individual or group commitment to perform certain tasks. The PRA was found to be very successful in the technology generation and transfer process when individual farmers were able to present their views among others and receive a response. It is now commonly used by development projects as ways to empower local groups and to strengthen local organisation.

Several short case studies through farmer or entrepreneur interviews – either informal or formal – were found to be effective tools for the policy formulation process when lessons of success and failure could be highlighted.

The IED working definition of sustainable agriculture and rural livelihood system was adopted, because it has strong dynamic links between field, farm, community and community-external sectors. The definition thus encompasses various stakeholders in the policy process. The success of sustainable agriculture should then reflect what has happened in the field, farm household, community and the community-external sector partnership. The definition is found to be similar to the principle of “self-reliance economy” as proposed by His Majesty the King’s “New Theory” for overcoming the economic crisis in the country since July 1997. The “New Theory” approach to self-reliance economy has now been adopted and implemented by various governmental agencies. The activities are still in the first stage of promoting sustainable agriculture with an emphasis on integrated farming systems.

The outcomes of case studies were used in several ways with the aim of presenting their strength and policy implications. First the on-farm case studies were presented to the farmer community to get feedback and the proposed action plan. The main participants in the forum were the local groups, such as farmers, farmer leaders, and Tambon (subdistrict) administrative officials. The finding was then presented in the local seminars and workshops organised jointly by the NGOs and the Regional Agricultural Research and Development Office.

The cases on contract farming, off-season commodity production, and group marketing received more attention from wider audiences, both from the farmer producers, private and governmental sectors, particularly from the Departments of Commerce, Agricultural Co-operatives, etc. The cottage food industry was attended by high-level officials from the Department of Industrial Promotion (Ministry of Industry), the provincial representatives of the Food and Drug Administration (Ministry of Public Health) and Department of Business Economics (Ministry of Commerce).

The process from policy research to recommendations in the PTW study involved case studies, farmer fora and seminars and workshops involving more stakeholders from public and private sectors, local NGOs and universities.

Government policy

The government policies affecting sustainable agriculture practices that were examined included price, fertiliser, irrigation and agricultural credit policies. Econometric methods were employed for analysis of historical data to evaluate the impacts of policies on agricultural production growth. The rice price policy which was predominant compared to other commodities such as sugarcane, maize and rubber, did not have *significant impact on raising and stabilising the rice price for farmers*. The increase in rice yield was consistent with fertiliser, irrigation and credit policies which tended to enable the agricultural sector to be more economically sustainable. The growth rate of agricultural production in

northern Thailand was mainly due to the total input growth, such as fertiliser, which contributed 73 per cent of the total agricultural growth rate, and the improvement of efficiency.

Production systems

The case studies selected to highlight the key features of sustainable agriculture cover a wide spectrum of land use patterns, production systems, and production-marketing arrangements. Each case represents specific target groups that possess their own unique problems and potentials. Three cases looked at integrated production systems:

- Upland farmers can demonstrate diversified cropping systems that fit farmers' circumstances, integrating farming and forest utilisation to overcome food deficit adaptive strategies, such as developed by the Karen hill tribe, which is striving for self-reliant agricultural systems.
- Hillslope farmers can use their ecological setting, which provides a specific niche for certain commodities, and have developed a comparative advantage, such as the *Miang* tea system on sloping hills



Mango trees and fishpond

which manipulates and exploits species-environment interactions to achieve sustainable land use through developing marketing niches for farm products.

- In the lowlands, strong farmer organisation and good managerial skills can speed up the process of success. For example, contract potato farmers are able to deal with the private sector on almost equal terms and share the benefits and risks in a production-marketing arrangement.

Marketing systems

Four cases of "islands of success" related to marketing were selected. They showed the following:

- Contract farming can allow small and resource-poor farmers, who make up the majority of the farm labour force, to provide more opportunities to earn from cash instead of subsistence enterprises. The larger farmers also have more alternatives, either having contract or non contract enterprises (or both) in their farming systems to capture higher and more stable incomes.
- Early-Season Farmer Groups in Chiang Mai demonstrate the efforts of farmers to avoid production and market risk and the uncertainty and impacts of government policies. The joint farmer-government endeavour towards sustainable agriculture is pronounced. They demonstrated their capability of rather rapid diversification of varieties and adjustment to market conditions.
- Group marketing has been widely accepted as a means to solve marketing and price problems of individual farmers and of those supported by agricultural development programmes. A limited number are successful. The case of longan groups illustrates long historical efforts of growers' groups and government to reduce marketing problems, to maintain production growth.

- Cottage food industries surveyed in four provinces of northern Thailand demonstrated that housewives could earn higher income when the cottage food industry expands, and benefits could accrue to farm families while farm productivity was maintained.

Elements of success

The most important elements of “success” in terms of *policies, policy instruments*, and policy process include the following.

The integrated production-marketing arrangement, either established by private initiatives or government policy support, help to achieve the government policy of promotion of export of high value-added, high quality products, such as contract farming, group marketing etc.

The successful adoption of conservation farming on hillslopes could be attributed to the understanding by the local forest authority of the plight of hillslope farmers, the initial rice aid programme as an incentive for land transformation, and the policy of land rights for adoption of sustainable land use practices. The close collaboration between hillslope farmers and forest officials helped promote the success of conservation farming.

The “top-down” policy, when based on local needs, can be successful when it is accepted and implemented by strong farmer groups with close collaboration of local authorities, such as off-season mango or longan production.

Elements of success in terms of *institutional practices/dynamics* are observed when a community or farmer organisation works towards the same goals. The Karen community copes with food security by protecting and utilising forest resources with cultural rules and regulations, and by sharing food grains with those in need. The resource use conflicts within a community will be first attended by the senior citizen or respected individuals, and in very few cases are the conflicts handed over to the state authority. The culture of sharing and the attitude of maintaining the balance between man and nature help create

environmentally concerned, low-input production systems of the community in the highlands.

The potato contract growers have set up the potato grower cooperative (PGC) to diversify potato production system. The PGC is the only organisation that has been authorised by the government to import cooking potato tuber seeds. The local officials also help regulate the contract arrangement between growers and the processing companies; in return, the companies could estimate the production capacity that each company could share in the area. This "win-win" situation, or interdependent relation between the contract growers and companies, helps stabilise production and farmer income.

The case of potato production exemplifies government policy on supply control of the cooking potato, an integrated production-marketing system running from central governmental level to local practices. It also exemplifies the process of bargaining and conflict resolution (prices, grading, etc) between farmers and processing companies.

Elements of success in terms of decentralisation and community empowerment are found in the government policy of decentralisation and the process of local empowerment that was implemented when the Tambon (sub-district) Administration Organisation (TAO) was established in 1994. The TAO has great potential for agricultural development if the organisation can formulate its own action plan on sustainable agriculture and seek support from the Ministry of Agriculture and Co-operatives (MoAC). The TAO can also deal directly with governmental institutions for support services, such as credit, information, inputs, and sites for development projects. Since their inception, the TAOs throughout the country are still concentrating their efforts on infrastructure such as road construction, water supply, etc. The members of a TAO will be elected from the local community; the chairperson is generally politically active and an influential community leader.

The financial resources of each TAO are different – the TAOs in the lowlands with high agricultural potential will be better off than those in the highlands, and so will have more bargaining power when dealing

with external private investors, as in the case of contract farming, or group marketing of high value commodities such as potato, longan etc.

The production groups or marketing groups within a Tambon could have strong farmer organisation. The potato grower group in the contract farming at San Sai and the longan grower group in Chiang Mai were very effective in dealing with government authorities or local politicians. Since the commodities are major income earners and price instability will have an adverse effect on large numbers of farming communities, their problems are normally looked after by the authority.

On the other hand, the ethnic hill tribe communities who are less powerful, will always find it difficult to get their message across to the authority. These excluded and less privileged communities seek support from local NGOs and academics to voice their hardships, such as being deprived of their land rights, access to community forest, and citizenship. Several fora concerning sustainable resource management on the highlands were organised either by NGOs or jointly by NGOs, research institutions and universities to allow the hill tribe ethnic groups to openly discuss with the representatives of government implementing agencies. Although the impact was not spectacular, the public has become aware of the issues and there are growing concerns about the welfare of those highland ethnic communities.

Recommendations

In the course of the “policies that work for sustainable agriculturally based rural livelihoods” project, we have been looking for policies that develop safe production systems, increase rural employment, enhance household food security, produce value-added products or processed products, and strengthen local organisation.

To achieve these objectives, there needs to be a combination of key system components interacting together as follows:

- Agrobiodiversity: genetic resources for food and agriculture

- Sustainable intensification
- Small and medium rural enterprise: development and management
- Household and community capability building
- Decision tools and information management for agricultural development
- Supporting policies (policies that work)

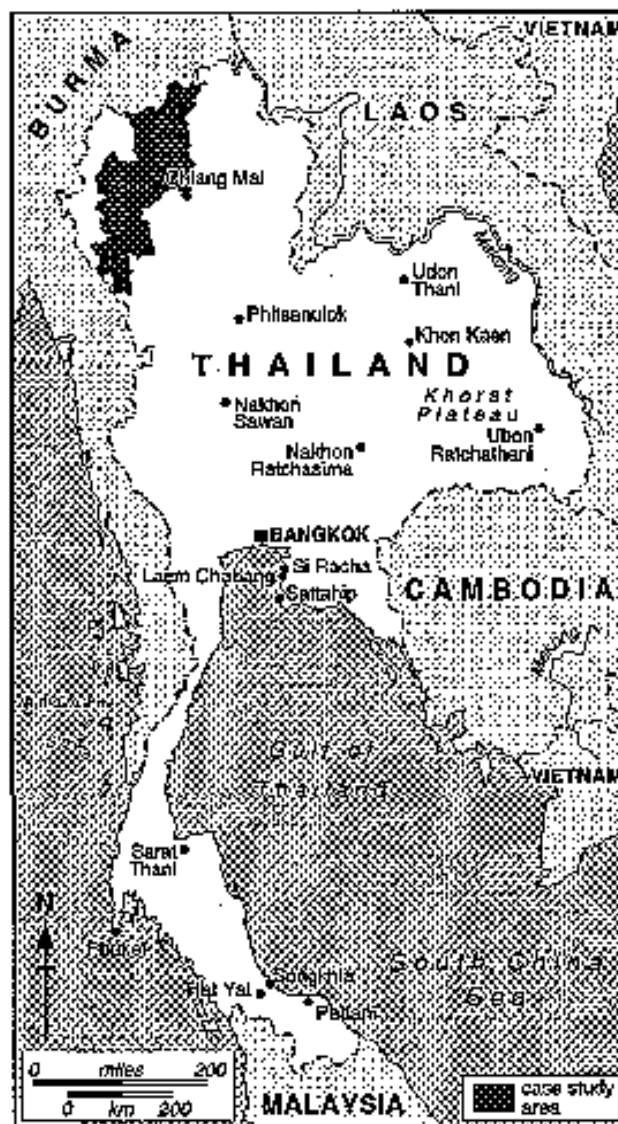
All these require external intervention but should be built upon the existing local knowledge and experiences. The role of the public sector would change to a position of providing the right services to the rural poor. Information and management that help farmers' decision making should be designed for improving efficiency. The post-production food processing cottage industries have been shown to be powerful means of social development in the rural community by creating employment, *stopping out-migration and promoting family togetherness*. The policy process that involves participation of various stakeholders will be more effective than the conventional top-down approach.

The case studies have indicated that the above guidelines are achievable, although they have not happened in all cases. Given the Thai political context (coalition government) and economic context (long process to recovery), integrated land use, either rice-based or non-rice-based systems, will continue to be the most viable production practice for food security and economic self-reliance for small farmers.

The *policy recommendations* are as follows:

1. *Development of production alternatives to produce high value, high quality products that are competitive in export markets through the integrated production-marketing arrangement*, such as contract farming group marketing. Local government offices that oversee such arrangements should be equipped with information and technology-based management skills that could help farmers in making decisions. The emphasis is on developing decision tools and management of information systems. The training of local officials such as agricultural extension agents, community development workers and NGOs should be incorporated.

2. *Promotion of post-production, small and medium scale agro-food processing cottage industries* to create rural employment, and to increase value-added food production. Most food processing cottage industries are operated and managed by housewife groups, from processing to marketing. The system could also enhance closely linked social structures and better household relationships. The food processing and packaging technologies should be further emphasised. The roles of biotechnology in agro-food processing also offer potential for quality products and efficiency improvement.
3. *Strengthening local organisation through human capability building.* A number of successful cases of contract farming and group marketing have shown that the top-down policy could be effective when the action plan or programme is suitable for farmers, and when farmer organisation is strong enough to be able to commit and execute it effectively. More action plans should be directed towards empowering the excluded.
4. *Environment-oriented production systems should be the recommended land use practice for the highland ecosystem.* The ethnic communities should be given land title and the right to the control of, and access to, forest resources. The Karen case has shown that the community is capable of protecting forest resources, and integrating it with the household livelihood system.
5. The price instability of major export commodities has caused farm gate prices to fluctuate, leading to fluctuations in farm income. The establishment of *futures markets* for export commodities would reduce price risk and so the expected price received by farmers would be more stable. The futures markets of selected commodities are already in the plan. The government should speed up the process and have the systems operated to include more commodities. The information network at the subdistrict (Tambon) level should be established so that information on supply, demand and price of agricultural commodities could be accessible.





Introduction

The history of Thai agricultural policy in economic development

By many standards, Thailand is an agricultural success story.

Agriculture has historically contributed about one fourth of Thailand's GDP, 60 per cent of exports, and 70 per cent of employment. Thailand is the world's largest exporter of rice, providing about one third of overall supply. Its strengths are the quality of its rice, particularly jasmine rice, and its reputation as a reliable supplier. Thailand is the largest cassava producer in Asia and third in the world after Brazil and Nigeria. High yields and an increase in area planted have made Thailand the world's biggest rubber producer. Thailand is Asia's leading food exporter, ranking first in world exports of canned tuna, frozen shrimp, tapioca products, and canned pineapple. It is also important in sugar, frozen chicken, other canned fruits and vegetables, and fresh tropical fruit. Indigenous companies dominate Thai agribusiness and almost half of Thailand's 50 biggest companies are food processors.

The development of Thai agriculture from the mid-19th century has been, until recently, a story of expansion of the agricultural frontier rather than increasing productivity. Up to the 1950s, the swamps were drained for rice production, and then maize, cassava, jute and sugar production moved into felled forestland. In the process, 20 million hectares (ha) of forests were cleared over 150 years (Phongpaichat and Baker, 1998). The central government's role in the countryside was limited until the 1950s. Rural society was fairly egalitarian, and most farmers owned their land.

From the late 1950s, the government sought to finance industrial growth through driving expanded agricultural exports. A mixture of public and private policy initiatives was used. The government invested

in roads, agricultural research and institutional credit, promoted agribusiness, and increased government administration in the villages. Few of the profits from crop exports were returned to the countryside.

In the 1970s, a communist insurgency and peasant agitation swept through rural Thailand. Violent suppression of this insurrection in the late 70s and early 80s gave way to a short pro-agriculture period in the early-mid 80s, when policies for price support, infrastructure and irrigation development were implemented. Agricultural development focused on technology transfer and production, using a centrally planned Training & Visit extension system. But low commodity prices and an overvalued currency saw the momentum of agriculture-led growth start to falter.

The closing of the agricultural frontier and the wave of export-oriented industrialisation in the Bangkok area in the "boom decade" of 1987-1996 led to a major increase in migration from rural to urban areas. In that decade, when real GDP was growing at an annual rate of almost 10 per cent, 6-7 million Thais moved into non-agricultural jobs. In 1980, 60 per cent of exports originated from agriculture. By 1995, over 80 per cent came from manufacturing. Agriculture was no longer perceived as vital for driving urban growth. Rural programmes went into decline and resources were concentrated on the urban economy.

In 1996, this showcase economy began to slide into recession. The stock market lost two-thirds of its value. In the last months of 1997, the Baht suffered a drastic devaluation after a very long period of stability. For the second time in recent history (the first being the recession of the early 80s), the village and agricultural sector was expected to absorb large numbers of returning rural migrants. But the rural sector had not the same resilience as 15 years earlier, with low farm prices and depleted natural resources.

There are still over 40 million people left in the villages of Thailand, a far greater involvement in agriculture than that foreseen by former Prime Minister Chuan Leekpai, who spoke of an ideal peasantry comprising only 5-10% of the population. The Thai countryside has

become diverse – the boom had converted Thailand into a very unequal society. At one extreme are the commercialised villages growing for export, plugged into the world market, vulnerable to fluctuations in world prices, and often with high levels of debt. At the other extreme are farmers on the frontiers – many from ethnic minorities in forest areas – suffering from insecurity of land tenure and a declining resource base.

The economic crisis brought together rural groups and NGOs (mainly from the impoverished Northeast) who, since the early 1990s, had been increasingly vocal in their protests against dams, land insecurity, low rice prices, farm debt (now standing at around 300 billion Baht), failed development schemes and urban pollution of the countryside. A three-week “Assembly of the Poor” in Bangkok in April 1996 was followed by a larger 97-day protest starting in January 1997 with thousands camping in the heart of the city, in which Assembly leaders negotiated directly with the government. The Eighth Plan was amended, and in September 1997, the constitution rewritten.

The protests of 1997 mark a turning point in Thai politics, unveiling a battle between city and countryside over resources. They highlight the growing influence of NGOs and peasant organisations, who are voicing their opposition to the rural sector being treated as a source of export earnings and labour for industrialisation (and a social safety net for inevitable downturns). There are strong echoes in the budding urban environmentalism and concern over the loss of traditional “Thai” values. Farmers are demanding rights and political power.

The Thai farm economy

The growth of agriculture production has been understood as the outcome of mainstream production systems. While maintaining the economic significance, its producers suffer from various problems running from resource availability, physical/biological environmental stresses, market and other economic problems.

In Thailand, production scale varies considerably. However, like other developing countries, most farms are small, with a country average of 4.06 ha. Thus, the average household income of a farm family was only US\$ 854 (21,350 Baht) per year. Evidently, net farm income of US\$ 280 (7,000 Baht) was less than non-farm income (Table 1.1). The average household saving was negative (OAE, 1996). The picture of an average farmer depicts the small and poor farming situation and expected low farm investment. Farm improvement and thus high productivity and output growth are limited. However, Thailand's agricultural production growth is pronounced, especially in food, and consequently Thailand is one of the world's food bowls. This is partly because the majority of its resources are engaged in agriculture (58% of population in 1996). Besides, the net farm income is actually positive (US\$ 854 per year) showing encouraging signs in the farming sector.

Table 1.1 Farm cash income and farm saving in crop year 1991/1992

	Region				Country average
	North eastern	North	Central plain	South	
Farm Size (Rai)	102.50	91	125.50	88.25	101.50
Cash farm income (Baht)	19,027	33,270	79,215	36,736	35,043
Cash farm expense (Baht)	12,964	19,135	59,916	18,157	23,812
Net farm income (Baht)	6,063	14,134	19,300	18,579	11,231
Non farm net income (Baht)	19,148	17,276	35,736	31,057	22,931
Farm household cash expense (Baht)	24,005	28,255	66,370	50,695	35,433
Cash saving (Baht)	1,205	3,156	-11,334	-1,057	-1,272

Source: OAE (1996), Agricultural Statistics of Thailand, Crop Year 1995/96.

Definition of sustainable agriculture and rural livelihoods (SARL)

The IIED working definition of sustainable agriculture and rural livelihood system was adopted, because it has a strong dynamic links from field, farm, community and external sectors. The definition thus encompasses various stakeholders in the policy process. The success of sustainable agriculture should then reflect what has happened in the field, farm household, community and the community-external sector partnership.

The working definition thus consists of:

1. Field level

The practice of sustainable agriculture incorporates agro-ecological principles and processes such as enhancing agro-biodiversity, nutrient cycling, pest-predator relationships, etc.

2. Farm level

The farm household:

- optimises the use of external and non-renewable resources,
- makes full use of local knowledge as well as incorporating introduced information and technology for full benefit,
- diversifies the production system to increase food and income generating capacity over time.
- The practice allows households and community to increase self-reliance capacity

3. Community and beyond community level

The agricultural system has strong links to the local rural economy, ensures more equitable access to entitlements, and encourages full participation of producers and consumers in problem solving and innovation.

The SARL definition here is found to be similar to the principle of self-reliance economy as proposed by His Majesty the King's "*New Theory*"

for overcoming the economic crisis in the country since July 1997. The key features of the New Theory are:

- First emphasising self-reliance production systems, i.e., sustainable intensification through integrated farming systems to stabilise food production and to enhance income-generating capacity of production surpluses.
- The second stage is concerned more with capability-building at the community level to achieve independence through self-help civic programmes such as rural health care, education, rural enterprise, saving funds etc. The stage advocates strong links between rural households.
- The final stage is for the community to provide incentives for the external private sectors to join and form partnerships in trading activities and delivery systems for the farm products, and to help expand the market, so that both parties become more interdependent.

The "New Theory" approach to economic self-reliance has now been adopted and implemented by various governmental agencies. The activities are still in the first stage of promoting sustainable agriculture, with emphasis on integrated farming systems. The joint venture of private sector farming communities has been established by a few private institutions, such as the Bang Chak petrol company to promote "green products" under the franchise of "Lemon Farm" at Bang Chak petrol stations, to help distribute and sell safe farm products.

To achieve agricultural growth based on SARL and/or the New Theory, certain conditions would be expected, namely, *incentives* for farmers (*desirable price level and stability*), and efficiency in production. Furthermore, we would expect that conservation of *natural resources*, *diversity* of farming systems, farmer organisation and *bargaining power* would be key ingredients of SARL.

Objectives of the study – Policies that work for rural development based on SARL/New Theory

With these requirements for SARL, our goal was to understand which policies (private or public, formal or informal) support the transition to rural development based on sustainable agricultural and/or New Theory systems. The approach of this study – consistent with the other nine countries of the international “Policies that Work” (PTW) project – was to work backwards from “islands of success”. Research into seven apparently successful case studies in a wide range of agro-ecological, economic (marginal or mainstream) and social settings was conducted with the following specific objectives:

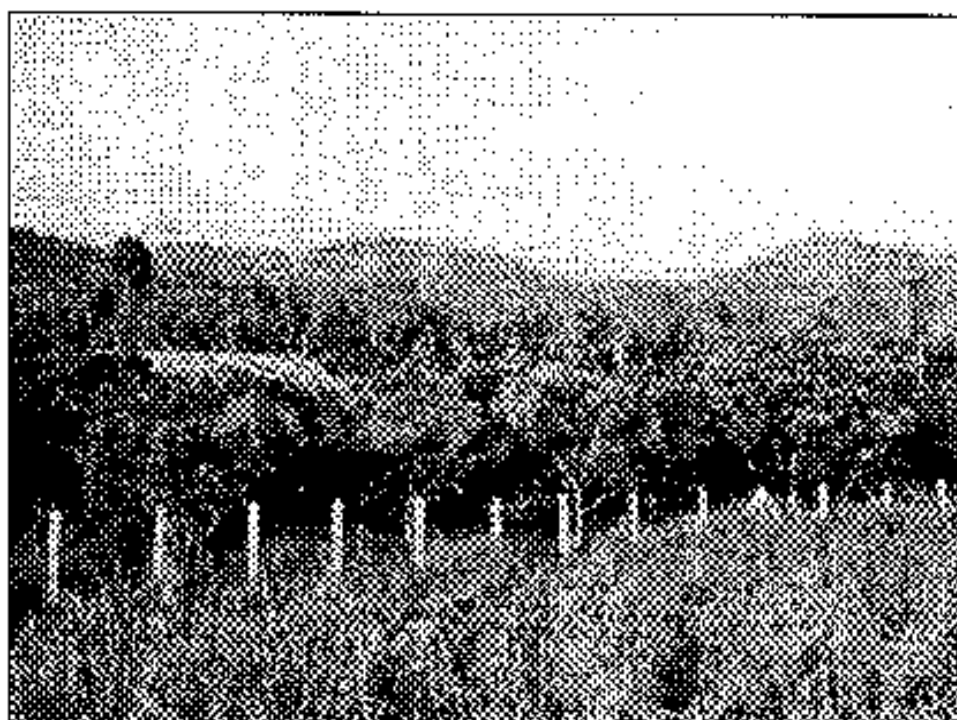
1. To analyse the selected sustainable *land use systems and marketing arrangements* in major landscapes of northern Thailand with respect to resource utilisation and their impact on household livelihood;
2. To identify *policy measures* that support or constrain the implementation of sustainable and New Theory agriculture;
3. To understand the *policy process* and identify problems related to policy implementation that would hinder the practice and spread of sustainable agriculture and rural livelihoods;
4. To identify *alternative policies and policy processes* that would promote the practice and spread of sustainable and New Theory agriculture

Three of the case studies focused on *production* systems, and four focused on *marketing* systems.

Study area

The study area covered the main agricultural landscapes of northern Thailand with Chiang Mai Province (17° 10' and 20° north latitude, and 98° 30' and 99° 30' east longitude) being used for case studies to represent and highlight characteristics of sustainable agriculture in the region. Three main physiographic features were selected.

The highlands which constituted 72 per cent of land forms and are inhabited by hill tribe ethnic groups, are faced with many development



Study site showing mango orchard

dilemmas: striving for food security, possessing comparative advantage for production of temperate fruit crops for the market economy, but deprived of access to land and forest resources for sustainable livelihoods.

The hillslope and rainfed uplands, which constitute 17 per cent of land and are occupied by mainly by the ethnic northern Thai, are seen as future prospects for developing sustainable land use and agricultural production systems. At present the areas are considered under-utilised due to mismanagement of land resources in the early settlement period.

The lowland rice-based ecosystem occupies about 10 per cent of land and represents the most intensive and diversified land use system, and is regarded as an advanced agricultural zone with a market-oriented production system. Integration of production and marketing arrangement is seen as one approach to achieve agricultural sustainability.

Across the ecosystems, different farmer groups with different resource endowments, skills, goals and objectives were observed. The highland Karen – one of the ethnic groups – is more conservative and is striving for self-reliant agricultural systems.

Methods

Several methods of client- and developmental-oriented research were employed. The on-farm experimentation was carried out with different levels of researcher-farmer partnership, ranging from less farmer-managed to fully farmer-managed. The on-farm adaptive research was used to generate and disseminate sustainable agricultural practices to the target farmer groups. It was an effective entry point when farmers' goals and objectives were considered in the design of land use technology, for instance sustainable rice production for the Karen's goal of food security, conservation farming with treecrop based systems for the hillslope farmers to achieve both ecological and economic benefits. The periodic monitoring by the researchers and farmer group meetings to review the production process, problems and potential solutions, expected outputs and next season's production plan helped motivate farmers to continue to participate in the research process.

The results of on-farm experimentation were presented in different fora with and without farmer participation. The on-farm adaptive research was able to link the on-station studies – mainly of disciplinary scientists – to the local village-based NGO workers, for instance the case of rice biodiversity, where detailed characterisation was conducted on station, and testing was done both on station and on farm.

The participatory rural appraisal (PRA) with effective facilitation helped generate farmer response and make relevant and workable proposals for the community. During the PRA process among clients of different social status, appreciation of individual experience and knowledge and positive interaction within and among groups led to individual or group commitment, enabling certain tasks to be performed. The PRA was found to be very successful in the technology generation and transfer process when individual farmers were able to present their views among

others and receive a response. It is now commonly used by the development projects as a way to empower local groups and to strengthen local organisation.

Several short case studies through farmer or entrepreneur interviews – either informal or formal – were found to be effective tools for the policy formulation process when lessons of success and failure could be highlighted.

Econometric methods were employed for analysis of historical data. The aim was to evaluate the impacts of price, fertiliser, irrigation and credit policies on agricultural production growth.



Analysis of selected agricultural policies in Thailand

Thailand has experienced eight National Economic and Social Development Plans since 1961. In the early stage of national economic development, Thailand's agricultural and non-agricultural policies were aimed only at economic growth without consideration of natural resource and environmental conservation. One of the important policies in the first National Economic Development Plan was to expand the irrigated area sufficient for agriculture. The growth rates in the first plan were targeted at 5% and 3% for the overall economy and agricultural sector respectively.

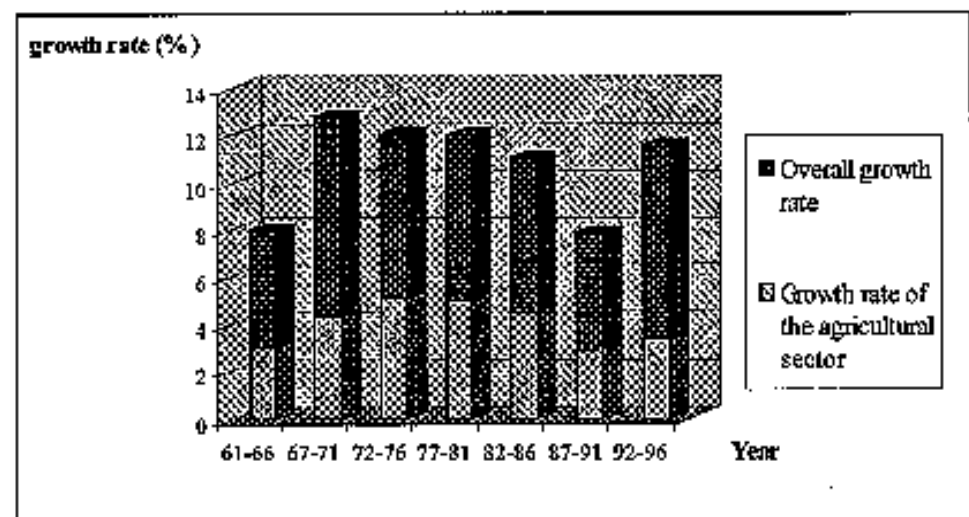
During the First and Third Plans (1961-1966 and 1972-76), a top-down centralisation strategy was employed. This made policies the same for all, despite the differences in resources, cultures, occupations as well as the other backgrounds over the country.

In the Second Plan (1967-1971), the agricultural sector was planned to grow at 4.3% per annum compared with 8.5% for the overall economy, with the main emphasis on rice, maize, rubber, cassava, and jute. For the irrigation policy, large-scale irrigation projects received greater attention.

The Third Plan (1972-1976) aimed to achieve a slightly higher rate of growth of 5.1% per annum in the agricultural sector while the overall growth rate was targeted at 1.5% – lower than the previous plan at 7%. The irrigation policy was still very important. The government accelerated the development of irrigation projects from the previous plans.

The Fourth Plan (1977-1981) began to consider the problems of natural resources and environment after 15 years of exploitation without any natural resource rehabilitation or environmental conservation plan. The situation was that the forest area was reduced substantially to 19.8 million hectares in 1976 from 27.4 million hectares in 1961 while the demand for water had increased. Agricultural productivity tended to decline. A forest encroachment prohibition law was enacted. Several projects to conserve natural resources and environment were initiated. However, the overall economy was planned to grow at the same rate as the third plan at the average of 7.0% per year while the agricultural sector was planned to have a slightly lower rate at 5.0%.

Figure 2.1 Overall economic and agricultural sector growth rates from national economic and social development Plan I to Plan VII



Source: NESDB (1995).

The Fifth Plan (1982-1986) was geared to develop natural resources by using an area-oriented integrating approach. However, there was still no concrete environmental policy and plan along with the natural resource utilisation plan. The average annual growth rate for the economy as a whole was aimed at 6.6% and 4.5% for the agricultural sector. Within the agricultural sector, this plan placed more emphasise on raising yield per hectare than on expanding the planted area, in order to conserve natural resources, particularly forests and watersheds. Degraded forest was classified as either appropriate or inappropriate land for

agriculture, for allocation to farmers or for forest rehabilitation respectively. There was also a policy to accelerate the development of small water sources dispersed to the non-irrigated area as well as to accelerate the development of watersheds. Measures to prevent the expansion of urban areas to fertile agricultural land or the irrigated area in which the government had invested, were issued in this plan.

The Sixth Plan (1987-1991) did more to take into account the problem of increasing conflict over natural resource utilisation and environmental conservation. The economy was opened more to international trade along with the acceleration of industrial and export promotion, which caused more natural resource utilisation. More land, about 2.24 million hectares, was employed for agriculture. High value forestry, including fast-growing trees, was promoted. The plan was directed at the development and improvement of small and medium water sources. The government also planned to expand more credit to agricultural co-operatives particularly short-term credit to individual farmers and farmer institutions.

Plan VII (1992-1996) gave importance to income distribution and the development of human resources, natural resources and the environment, since problems in these areas had become more severe. This national economic and social development plan was a stronger

Table 2.1 Overall economic and agricultural sector growth rates from national economic and social development Plan I to Plan VII (1961-1996)

	Plan						
	1	2	3	4	5	6	7
Economic growth rate							
Planned	5.0	8.5	7.0	7.0	6.6	5.0	8.2
Actual	7.2	7.2	6.2	7.3	4.4	10.5	8.5
Agricultural growth rate							
Planned	3.0	4.3	5.1	5.0	4.5	2.9	3.4
Actual	5.0	4.1	3.9	3.5	2.1	3.4	2.5

Source: NESDB (1995).

response to the degradation of natural resources and the environment. Objectives and targets were determined specifically and clearly so that natural resources would be developed to strengthen their potential in order to help develop the economy sustainably and be a foundation for rural peoples' living.

Agricultural price policy

There were five major agricultural commodities on which the government had price policies for a long time especially when their prices slumped. These commodities – rice, sugarcane, sugar, maize and rubber – had involved the majority of farmers and consumers in the Thai economy.

Rice price policy

Historically the rice price policy had two major goals. The first was to support rice farmers through price support, enabling farmers to sell their rice at a higher price than that determined by the free market. The second objective was food security for poor consumers especially in the urban areas; the measure allowed the rice reserve to be sold to consumers at a price lower than the market price – especially during 1973-1974 because of the hike in the price during that period. These two measures, which had a high public profile, were very politically important, but had rather low economic impacts (Siamwalla and Setboonsarng, 1987). However, there were other intervening measures at the export level, which affected the domestic price during 1960-1985. These measures were:

1. Collecting a rice premium from rice exporters by the Department of Foreign Trade and the Ministry of Commerce,
2. Collecting an export duty by the Department of Customs,
3. Compelling rice exporters to sell their rice reserves at a price lower than the market price, and
4. Limiting export quantity by restricting export permits to exporters.

Siamwalla and Setboonsarng (1987) found that the burden from these four measures was about 30-40% of the rice price during 1950-1972;

this increased to 50-60% during 1973-1974, and gradually declined to zero in early 1986 when the rice premium, export quota and export stock measures were cancelled. The burden was separated into two parts and divided between foreign importers and Thai farmers. However, only 25-33% of the total burden could be shifted onto foreign importers, and the majority 67-75% was borne by farmers in terms of the lower price. Consequently these four measures had a negative effect on the resilience of the rice sector.

In September 1965, the government appointed a "Farmers Aid Committee", which was chaired by the Prime Minister, to accelerate the support to farmers in three aspects, namely,

1. to increase the yield per rai,
2. to support the rice price and
3. to support agricultural credit to farmers (La-lad, 1988).

The bank for Agriculture and Agricultural Co-operatives (BAAC) was established in 1966 and effectively operated in 1967 to provide credit to farmers and agricultural co-operatives. In order to achieve the price support policy, a subcommittee chaired by the Minister of Economics was appointed to determine the price at which rice should be bought each year and to assign organisations to buy rice.

In 1973 rice production decreased, while the world demand for rice expanded; hence rice prices in the world market, and paddy and white rice in the domestic market early in the year were substantially higher. To prevent a rice shortage in the domestic market, the government had to control rice exports rigorously, and consequently lowered the white rice and paddy prices in the second half of the year, causing the farmers to complain. The government then issued a regulation to prevent paddy being purchased at a price lower than that set by the government, and meanwhile controlled the ceiling retail price of white rice in the whole of the Bangkok area, as the paddy price was fairly good. The only export measures that the government used in this year were rice premium and rice reserve.

In 1975-1976, rice production in the world and Thailand increased by 8% and 20% respectively. World prices were showing a decrease, so the government used the price support policy again by assigning the Marketing Organisation for Farmers (MOF), a state organisation, to buy paddy from farmers, and the Ministry of Commerce to sell white rice to control the price of white rice for the benefit of consumers. In 1976, the government employed a price assurance instead of price support policy. Later in June of the same year, the price assurance policy was cancelled because of a change in government. The new government resumed the price support policy; however, the policy was removed later in September the same year because the price in the market was close to the support price.

In 1977 the government resumed the price support policy, but did not intervene in the market at all in 1978, because of the higher price due to the lower domestic production that year. The government just only announced the price that the government wanted to buy. In 1979-1980, the government employed the price support policy again. In 1981-1982, the government appointed a rice policy committee chaired by the prime ministry to set rice policy and to be in charge of the rice price with the following objectives:

1. for farmers to receive the price determined by the government;
2. for consumers to buy white rice at the appropriate price that was consistent with the paddy price determined by the government;
3. for lower income people to buy white rice at a cheaper price; and
4. for exporting as much of the excess of rice as possible.

Many measures, including the plan to establish 15 central rice markets in each region, were issued to achieve these aims.

In 1983-1986, the government intervened in the market again by using the price support policy, but this time in both the white rice and paddy markets. In the white rice market the government, via the Public Warehouse Organisation, bought white rice at the higher price when converted to paddy price from Marketing Organisation for Farmers and groups of farmers. A rice commodity credit policy – designed to provide

credit at a low interest rate to farmers waiting for higher prices – was implemented in 1984, but was not concretely effective until 1986. To support rice exports, the Ministry of Finance and the Bank of Thailand were responsible for export credits at a low interest rate. The government also issued a measure to support higher rice stocks by compensating rice mills who borrowed credit from commercial banks to buy and stock paddy from the beginning of the harvesting season.

Sugarcane and sugar

Sugarcane and sugar were the most complicated commodities and were totally different from other agricultural commodities in which the government had ever attempted intervention. The predominant aspect of this intervention was that the government tried to raise the price of sugar for producers above the world price (except 1973-1976, which was a period of extraordinarily high world sugar prices). The profit from the rise in the domestic sugar price was to be used to compensate sugar exports, as the export price was lower than the production cost. To make this policy successful (after its failure until 1968), the government enacted a law to control sugar production. From 1968 to 1982 the government controlled the production of white sugar (for domestic consumption) and raw sugar (for export) at the factory level by setting production quotas for both kinds for each factory. This enabled the factories to transfer the profit from selling white sugar in the domestic market to compensate for the loss from exporting raw sugar abroad. It could also be observed that the production structure of the sugar industry in Thailand changed tremendously during 1964-1972 from small- to large-scale production factories, each with a production capacity of more than 4,000 tons a day. This made the total number of factories relatively less (42 factories in 1976). The limited number of factories enabled the government to control production more effectively. In general, it could be said that the government was successful in raising the domestic price of sugar higher than the world price (Siamwalla and Setboonsarng, 1987).

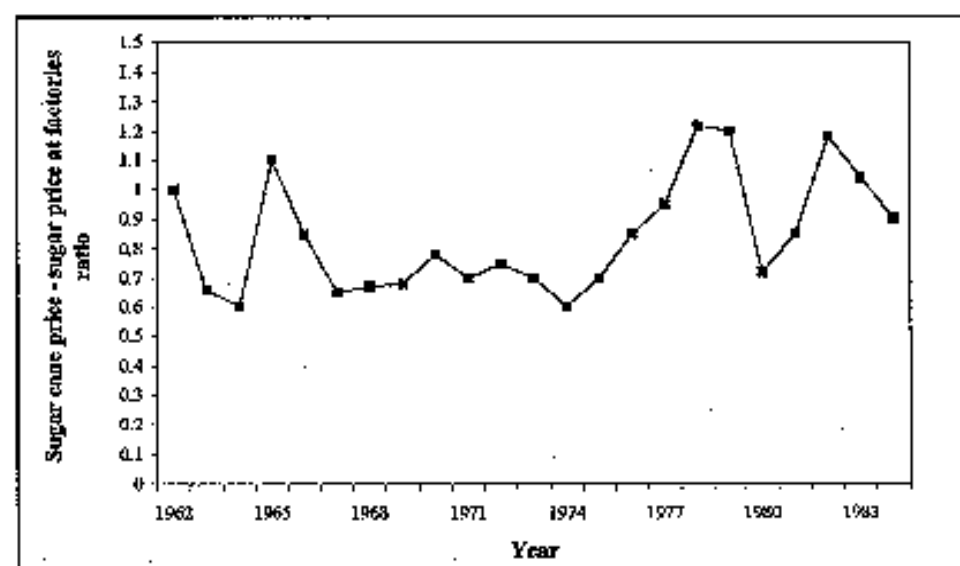
The structural change in the size of the factories forced the process of buying sugarcane to change. Farmers who wanted to sell their sugarcane had to make contracts with the factories to assure sugarcane supply. In

the early stage of the implementation, only the quantities were agreed in the contracts, not the price. This gave the factories opportunities to suppress the price easily. As a result, sugarcane farmers founded an association. It should be noted that the factors that made the founding of the sugarcane farmers' association successful were:

1. the concentration of farmers planting sugarcane around the factories, due to the large scale of the factories, which made it easier for the farmers to collect, and
2. the farmers who initiated this association were large-scale farmers, with the power to establish the association (Siamwalla and Setboonsarng, 1987).

Siamwalla and Setboonsarng (1987) have also shown that the ratios between prices of sugarcane and sugar for factories started to show an increasing trend after 1974, despite the previous 10 years of negotiation between the association and the sugar factories. Siamwalla and Setboonsarng (1987) argue that the association itself did not have much influence to increase the price of sugarcane compared with sugar price. Since 1974, the government has joined in the process of sugarcane price negotiation; as a result the farmers received a higher price relative to the price of sugar for factories (see Figure 2.2).

Figure 2.2 Ratio of sugarcane price: sugar price at factories



Source: Siamwalla and Setboonsarng (1987)

Maize

Government intervention for maize during 1965-1981 aimed to compel maize exporters (by means of export licenses) to comply with a long-term contract with Japan. Export was regulated by the Department of Foreign Trade and the Ministry of Commerce through quotas for both the contract market (Japan and Taiwan) and for other markets. This measure was cancelled in December 1981 when maize exports were liberalised.

Siamwalla and Setboonsarng (1987) indicate that this government intervention meant that exporters captured the rent from the quotas. During 1967-1981, the intervention caused the domestic price to be lower than the world price, ranging from -1.6 to -9.7% of the export price, except for 1972 and 1977 when domestic prices were higher by 6.2 and 0.3% respectively. The higher domestic price implied a loss for exporters. This could happen because the government compelled the exporters to export to the contract market an amount exactly equal to the quota received.

Rubber

The government intervened in rubber exports by collecting two types of taxes:

1. an export tax at a progressive rate, and
2. a rubber farm aid tax, a special tax collected for the Rubber Farm Aid Fund in accordance with the 1960 Rubber Farm Aid Fund Act.

The objective of this fund was to help rubber farmers who wanted to replace old rubber trees with better varieties. This tax rate was also progressive (Siamwalla and Setboonsarng, 1987). The burden of these taxes in terms of the percentage of the export price between 1960 and 1984 ranged from 10.6% - 26.1%.

Analysis of yield improvement policy

Yields per rai of rice and maize increased 71.4% and 73.9% respectively from before the first National Economic and Social Development Plan to Plan VII (i.e., from before 1961 to 1996, a period of around 36 years); this represents an increase of 2.1% and 2.17% a year respectively, in comparison with cassava which had a negative growth. It is observed that from Plan IV to Plan VII, a period of 12 years, rice yields increased by 2.61% per annum and maize by 2.82%, compared with 1.27% and 1.25% respectively in the first 24 years of National and Social Development Plans. These increases are consistent with credit, fertiliser, irrigation and technology policies that apparently tended to make agriculture more economically sustainable. However, the poor rural areas (17 provinces out of 23 provinces were from north-eastern Thailand) associated with cassava appeared to be less sustainable in terms of yield per rai, even though the government had increased the yield-per-rai target from 2,300 kg in 1989 to 2,525 kg in 1993. The measures relating to cassava implemented during 1989-1993 were:

1. to support research to improve yield and quality,
2. to introduce existing good varieties, which were Rayong 3 and Rayong 60 effectively to all cassava farmers, and
3. to promote use of organic fertiliser and soil conservation to improve soil fertility.

The latest yield per rai in 1997 appeared to be only 2,276 kg. It might be considered that the cassava yield improvement policy did not work (Table 2.2).

In the first three Plans, rubber yield was constant at around 58 to 59 kg per rai. It improved a little – to 63.3 kg per rai – in the Fourth Plan. However the yield per rai improved greatly after Plan IV, increasing from 81 kg to 210.6 kg in the Seventh Plan. The improvement from 63.3 kg to 210.6 kg per rai had taken 16 years. Therefore the yield improvement per year had grown 14.6% during the last four Plans.

Yields of sugarcane increased substantially from 5,020 kg per rai in the First Plan to 8,151 kg in the Third Plan. The yield dropped to 6,265 and 7,204 kg per rai in the Fourth and Fifth Plans. After that it returned to approximately the same level as in the third plan at around 8,189 to 8,223 kg per rai in Plans VI and VII. It is observed that in terms of the yield of sugarcane, there was no improvement from Plan III to Plan VII – or for about 16 years – which did not help strengthen the economic resilience of sugarcane farmers.

Table 2.2 Yield (kg per rai) of rice, maize, cassava, rubber, and sugarcane

National Economic and Social Development Plan	Rice	Maize	Cassava	Rubber	Sugarcane
Before Plan I	213	257	na.	na.	na.
Plan I	264	312	2,498	60	5,020
Plan II	265	378	2,413	60	6,100
Plan III	273	308	2,189	59	8,151
Plan IV	278	334	2,328	63	6,266
Plan V	304	378	2,319	81	7,205
Plan VI	335	395	2,259	150	8,189
Plan VII	365	447	2,236	211	8,223

Source: Office of Agricultural Economics (in Panyamung, 1998).

Fertiliser policy

The government realised the importance of fertiliser in agriculture and tried to subsidise farmers by providing cheap fertiliser or fertiliser on credit. For example, in 1955 the government used the revenue from the rice premium to buy fertiliser and sold it to the farmers at 2 Baht/kg. The farmers who bought the fertiliser on credit had to pay it back after the harvesting season. In 1964 the Ministry of Agriculture and Co-operatives lent groups of farmers working capital to buy fertiliser, and the farmers had to return the credit after their harvesting season. Later in 1969, the Department of Agricultural Extension provided working capital to each province to allow groups of farmers to buy fertiliser by themselves, or assigned some relevant government organisations to sell

fertiliser at a cheap price. The fertiliser subsidy programmes mentioned above were not efficient or extensive enough because of budget limitations (Khao-sa-ard, Mingsarn and Jaroonsak Namahong, 1992). The government started its important role intensively after the oil crisis in 1973 because of the shortage of fertiliser, which caused a 3.5-fold rise in the price of 20-0-0 fertiliser between 1972 and 1974, and a proliferation of fake fertiliser.

The government then established the Marketing Organisation for Farmers (MOF) in 1974 to provide production inputs for farmers at fair prices. The MOF sold fertiliser at a price lower than the market, bore the transportation cost and aimed to supply one third of the total demand for rice fertiliser (Khao-sa-ard, Mingsarn and Jaroonsak Namahong, 1992). The following table (Table 2.3) shows the quantities of fertiliser provided by the MOF.

The cabinet set the price of fertiliser sold by the MOF at 200 Baht/ton lower than the market price for each fertiliser formula; Table 2.4 compares the MOF price with the market price.

Khao-sa-ard, Mingsarn and Jaroonsak Namanong (1992) found that during 1987-1990 the total cost of the fertiliser subsidy programme was 557 million Baht and provided 656,834 tons, only 18.23% of the total demand for rice fertiliser. This implies that the cost of the fertiliser subsidy programme per ton was 848 Baht, which was substantially higher than the benefit received by the farmers in terms of lower prices.

Table 2.3 Fertiliser quantities supplied by the Marketing Organisation for Farmers (MOF)

Year	Total fertiliser used (tons) (1) ^{1/}	Total rice fertiliser used (tons) (2) ^{1/}	Fertiliser provided by MOF (tons) (3) ^{2/}
1987	1,548,765	640,000	183,383
1988	1,992,633	852,000	124,896
1989	2,297,733	1,110,800	135,167
1990	2,648,910	1,000,000	169,637

Sources: 1/ Office of Agricultural Economics (Khao-sa-ard, Mingsarn and Jaroonsak Namahong, 1992).
2/ Marketing Organisation for Farmers (MOF), (Khao-sa-ard, Mingsarn and Jaroonsak Namahong, 1992).

Table 2.4 Fertiliser price (Baht/ton) comparison between the Marketing Organisation for Farmers (MOF) and the market^{1/}

Year	Source	Fertiliser formula			
		21-0-0	16-20-0	16-16-8	15-15-15
1987	MOF	2,000	3,800	3,900	4,400
	Market	2,340	4,088	4,650	5,217
1988	MOF	2,000	4,400	3,900	5,450
	Market	2,892	4,742	5,010	5,538
1989	MOF	3,000	5,000	5,200	5,450
	Market	3,076	5,046	5,300	5,596
1990	MOF	2,400	4,000	4,600	5,500
	Market	2,825	4,950	5,183	5,617

Source: Office of Agricultural Economics (in Khao-sa-ard et al., 1992).

Note: 1/ The market price was the wholesale price at the Bangkok market.

The rice collateral credit policy

The rice collateral credit policy began in 1984 but did not, in fact, come into effect until 1986. The policy attempted to provide financial liquidity to farmers with the argument that farmers could afford to wait longer for higher prices rather than sell their rice at the beginning of the harvesting season at the lower price.

The irrigation policy

The government has had a concrete policy to accelerate the development of irrigation since the first national economic and social development plan of 1961-1966. The irrigated area expanded from 9.80 to 29.01 million rai from 1961 to 1995, with an average of 5.77% per annum while the second rice crop, which relies on irrigation, grew 7.25% per year on average during 1975 - 1996.

The effect of the agricultural credit policy on fertiliser utilisation

The credit policy aimed to help farmers with a financial liquidity problem to buy agricultural inputs. Agricultural credit was mainly provided by BAAC for both individual farmers and farmers' groups. The credit for individual farmers had grown very rapidly and outnumbered the farmers' groups after 1968. The total credit from BAAC to the individual farmers increased from 121.3 million Baht in 1967 to 118,765 million Baht in 1996, an average of 33.7% per annum. The credit per household from BAAC increased from 3,095 Baht in 1976 to 24,173 Baht in 1995. The credit per rai had tremendously increased from 37 Baht per rai in 1976 to 849 Baht in 1995, while fertiliser used per rai had also increased in the same direction from 6.90 kg in 1977 to 24.75 kg in 1995. The credit and fertiliser were highly correlated.

Conclusions

The rice price policy was the most important of the agricultural price policies, though it seems to have had insignificant impacts on raising and stabilising the rice price for farmers. However, the yields per rai of rice, rubber, sugar and maize increased substantially from the First to the Seventh National Economic and Social Development Plans. The increase of rice yield was consistent with credit, fertiliser and irrigation policies, which apparently tended to make the agricultural sector more economically sustainable. The poor rural areas associated with cassava appeared to be less sustainable in terms of yield per rai in spite of several measures to improve the yield. Among the growth rates of these five commodities, rubber was the highest. This study also showed that the variance of the total agricultural output was constant over time, resulting in reduction of the variance per unit of output. Hence, overall the agricultural sector tended to be more physically sustainable. Moreover, the study found that the growth rate of agricultural production in northern Thailand stemmed from two major factors: the total input growth and the improvement of efficiency. Among inputs, fertiliser played an outstanding role in contributing 72.7% to the total

agricultural growth rate. This was consistent with the fertiliser policy supported by the credit policy, which increased growth instead of expanding the area of land used, as in the early stages of the Development Plans of the Thai economy. This explicitly strengthened the resilience of the agricultural sector.



One of the farmers standing in the plot of young mango trees. His mature trees in the background.

Integrated production – case studies of production systems

Case 1: Adaptive strategies for sustainable livelihoods of the Karen community in northern Thailand

Introduction

The highland ecosystem of the Upper North of Thailand covers about 6.2 million ha or 72 per cent of the total land area encompassing watershed areas. This mountainous region is inhabited by different ethnic hill tribe communities and Chinese immigrants from World War II, commonly known as Chinese Haw. The major hill tribe communities include Karen, Hmong, Yao, Lahu, Lisu, Akha, Lua, Htin and Khamu, constituting about one million people.

All the highland communities use agriculturally-based livelihood systems. The land use practices, however, can be classified into various categories. The Karen, who account for about 47 per cent of the hill tribe population, are the main wet rice cultivators. The community is skilful in developing water resources for production of highland paddy, or transforming upland fields into rice terraces. The Chinese Haw are least populous, but have long experience in cultivation of sub-temperate fruit trees, vegetables and tea and have developed permanent land use and settlement in selected mountainous areas. The community is more progressive and has adopted advanced production technology for commercial farming systems. The Hmong are also engaged in market-oriented agriculture, but the farming systems are less diversified, mainly concentrating on commercial vegetable production, particularly cabbages. The forest is cleared for continuous vegetable farming until pests are so severe that production is not economically viable; the field is

then abandoned and new forest patches will be cleared for cultivation. The decline in soil nutrients is remedied by heavy application of chemical fertiliser. The Lahu and other tribes are partially commercialised, cultivating subsistent rice and maize as a staple food crop and a few cash crops of vegetables and fruit trees. The levels of technology and inputs used for commercial production are lower than the levels used by the Chinese Haw and the Hmong. Shifting cultivation, through abandoning the resource-exhausted land for new farming area, was common until the last decade, when the opening up of forest land for farming became more restricted by the forest authority; the community is more permanently settled and practising bush-fallow with short duration (about 2-3 years). With less inputs and no conservation measures, the land quality degrades rapidly.

The land use intensification and farming practices on the highland ecosystem among various ethnic communities are varied, ranging from low input to high input production systems, from conservation to over-exploitation of natural resources, from subsistence rice-based to non-rice commercialised systems, creating a number of controversial issues concerning the fate of the highland communities. Among these, an issue that is frequently raised is whether the hill ethnic communities should be evacuated from the class IA and IB watersheds as originally delineated by the Royal Forestry Department (RFD). Since the areas under these categories have been designated as protected forest areas, no farming and settlement are allowed. Would issuing land title deeds to ethnic communities that adopted conservation farming practices overcome watershed degradation? Would community-based resource management provide equal shares and benefits to every member of the community?

This highland case study will examine the adaptive strategies of the Karen community, which is regarded as the most resource-conserving group, describing the ways in which the households and community have changed their productive activities, and identifying factors that promote such changes.

Agricultural systems

The Karen have been settled in the Wat Chan watershed for over two hundred years, developing the river valley, and clearing forest land for subsistence agriculture. The land-based, labour-intensive farming system used mainly for rice production is confined to the rainy season. Cash cropping is limited to only a few commodities such as taro and ginger. It is only with the initiatives of the Royal Project that an increasing trend in cash crops of subtemperate fruit tree species and vegetables has been observed. The Wat Chan site has been selected for development by the Royal Project for almost two decades, promoting high value cash crops to supplement family incomes. The extension of cash crops is also accompanied by contract marketing arrangements. The Royal Project exerts supply control on adapted commodities by providing quota seeds to selected farmers. All input costs are deducted from the final sale for individual farmers. However, because of the poor accessibility and road transportation during the rainy season, only selected commodities which suffer less transport damage will be promoted. The main crop is Japanese pumpkin with a few vegetable crops such as head lettuce and red cabbage.

Selected sub-temperate fruit trees such as peach and plum have been introduced with the supply of seedlings. The adoption is slow and where adopted, the fruit quality is less appealing than other Project sites. However, farmers are showing a keen interest in establishing a fruit-tree-based land use system. The common fruit trees grown for home gardens are mango (*Mangifera indica*) and jack fruit (*Artocarpus heterophyllus*). The purpose is for home consumption; the sale, if any, is within the community. The fruit quality will not be accepted by the lowland market.

We have witnessed the agricultural transition in the Wat Chan area since the inception of the Royal Project initiative. The response to production of high value cash crops, which have area advantages, has provided alternatives for developing permanent land use systems and additional family income to attain household food security.

Managing land resources

To meet household food security, the Karen will invest in land acquisition. The first priority is the river valley for paddy rice production. All valleys have long been occupied. Each household owns not more than a one-hectare plot. The upland fields with shallower slopes have been cleared for upland rice production. One-year cultivation of upland rice alternates with a 2-3 year fallow period. The adoption of non-rice cash crops such as taro, ginger, etc, has changed bush fallow into upland rice-cash crop rotations. The practice of upland rice-legume (such as soybean) rotation has not been observed. A few

Table 3.1 Availability of land resources and its productive functions contributing to household livelihoods of the Karen community in the Wat Chan area

Land type	Function	Productivity
1. Paddy field	provides annual rice production	2 t/ha, no chemical fertiliser
2. Bush-fallow upland plot	upland rice production in 2-3 years fallow production of cash crops: ginger, taro etc	1.5 t/ha with no chemical fertiliser
3. Fruit orchard	fruit trees with vegetables as intercrop in the early stage	fruit quality and productivity are low
4. Home garden	provides food crops for household consumption	low production and less available in dry season because of lack of water
5. Forest-fallow	produces upland rice in 7-yr forest-fallow	2 t/ha
6. Shared forest access by a few farm households	provides timber and non-timber products	timber and wood are for household use
7. Community forest	provides food, fuel woods timber and non-timber products	important sources of food, medicine, timber, fuel etc
8. Protected forest	provides protection for water resource	community rules and regulations forbid farming activities

households have cleared upland fields not distant from the homestead and with secure water resources, and have developed the plots into permanent fruit-tree-based systems. High value vegetables are also incorporated as an intercrop in the early stage of fruit tree establishment.

The fruit tree species and cultivars introduced by the Royal Project have been selected to adapt favourably under various highland sites, but are found to be less productive with present management practices. This would require specific selection at the site together with modified and improved management practices. The potential use and benefit of upland fields would depend on the interaction of genotype and management, and well-trained farmers.

About three forest fallow plots are owned by each household for cultivation of upland rice. The common practice is to plant one season of upland rice alternating with 7-year fallow. The forest is cleared by cutting or slashing in February. Some useful and big trees such as *Gmelina arborea* and *Castanopsis* species are sometimes left standing with light pruning. The slashed biomass is exposed to sun-dry for about one month and is burned in March. A firebreak is prepared around the cultivated plot before burning. The forest fallow plot normally becomes a large area, and owned by a number of households from the same village. The "slash and burn" cultivation technique is carried out collectively, and fallow duration is a group decision. The team effort includes making the firebreak and burning the plant debris.

We have seen a number of forest fallow plots recover into secondary forest. The farmers who have achieved food security will abandon the forest fallow plots and allow the plots to recover as natural forest. Landless farmers, new immigrants, or those with less land to cultivate are allowed to use it on request without any obligation. In essence, the Karen has made use of forest fallow plots with long fallow period (7 years) to supplement rice requirement. To develop alternatives to slash and burn agriculture, one approach is to develop improved rice production technology to sustain household need.

The alternative land use studies in the Wat Chan area have indicated that the 7-year forest fallow could only support upland rice yields of 1.87 t/ha for one season. The continuing cultivation of upland rice would result in yield decline to the level of 0.87 t/ha by year four. The biodiversity study of forest recovery patches with different fallow periods revealed that the benefit from four year old forest regrowth patches would be higher than the benefit from planting upland rice by the slash-and-burn technique. The benefits were in the form of fuel wood, poles for fencing, etc, through selective cutting.

The other land types, such as home gardens, shared forest, community forest and protected forest, are important food sources for the Karen households. The homegarden covers a wide range of fruit trees, vines and vegetables. The other forest areas provide almost year-round food supply. The preliminary survey of food availability revealed that the Karen used over 100 species for food, mainly in the form of young leaves and inflorescences.

It is evident that the Karen have valued the forest resource and treated it as part of community property. Therefore the community has set up rules and regulations to protect the forest so that individual households can get access and benefit. It is also shown that community-based resource management is workable and can be implemented without external influence. This is perhaps the strength of the Karen community, which integrates natural resource management as one element of their livelihood systems.

Use of agro-biodiversity

The importance of agro-biodiversity in the Karen livelihood is perhaps best illustrated in rice genetic diversity. In the Wat Chan area, it is found that all the paddy rice varieties are local or land races, but are all of the *indica* variety. Our on-farm trials also revealed that the modern high-yielding varieties (HYVs), as developed for irrigated lowlands, could not grow well in a cooler environment and with low light intensity. The Karen have a collection of diverse rice germplasm but have names based on plant and grain morphological characters. The most preferred

varieties are Bue Por Moh, Bue Poh Loh, Bue Shaw Me, Bue Wa Po, Bue Pee-I. The non-glutinous rice diversity study has shown that the 49 rice samples collected from the Karen farmers' fields at Wat Chan could be clustered into 34 groups based on zymogram patterns tested with 4 enzymes. This would indicate that farmers have planted their rice with mixed lines of similar phenotypes. The use of population mixtures or blended varieties in other crops, such as wheat and oats, has proved to provide stable yields under varying environments.

The Karen have always planted more than one variety of paddy rice for several reasons, for instance hedging against crop failure, eating preferences, or selecting a variety to fit field environments. The variety Bue Pee-I has been selected to adapt to waterlogged, low-lying areas where a strong stem and the high tillering ability of the variety has provided better flood tolerance.

However, not all varieties are resistant to leaf blast caused by *Pyricularia* spp. The 1998 rainy season at Wat Chan had shown the widespread incidence of blast at the tillering stage, but the degree of severity varied from field to field. In addition, the rice fields were heavily infested with white-back planthopper (*Sogatella furcifera*) and brown planthopper (*Nilaparvata lugens*). The insect infestation was so serious that the Karen had to spray the fields with insecticides, which is not commonly practised in Karen rice production.

Among the 34 genetically different lines, there were 26 lines that showed reduced photosensitivity and could produce yields in the dry season ranging from 1.0 to 4.3 t/ha when planted in the lowland environment at the Multiple Cropping Centre (MCC) station. However when the selected lines were tested in the highland environment in 1998, the cool temperature in March did not encourage vigorous growth, thus delaying the harvesting time till June, the optimal planting time for local rice. Delaying planting until August would cause over 60 per cent yield reduction. Therefore double rice cropping, using local non-photosensitive varieties to provide supplementary rice production for food security, would not be so productive. Early maturity (90 days) and

cold tolerance are two important traits necessary for developing dry season rice varieties for the highland environment.

1998 is considered to be the worst year for paddy rice production in the Wat Chan study area. The rainfall sufficient for rice cultivation was delayed until August, and about 20 per cent of land lying on the upper terrace was abandoned. Poor vegetative growth due to late planting (in August) led to yield reduction. The heavy infestation of white-backed and brown planthopper and the incidence of leaf blast further suppressed the paddy rice production. It is evident that the existing rice germplasm as accessible by the Karen community in Wat Chan has limited buffering capacity with delayed planting and is vulnerable to blast and planthopper attack.

The majority of the highland paddy rice varieties showed high yielding potentials when planted in the lowland environment at the MCC experiment station. The overall grain yield was more than double when compared to that grown under highland conditions. A few varieties provided better yields than the modern HYVs.

It is evident that the highland paddy rice possesses a wide range of diversity. Although the varieties are selected and adapted to low-input production systems and a less favourable growing environment, the varieties have shown great yielding potential in a more favourable lowland environment. When there are no improved varieties available, the Karen have to depend on the existing highland paddy rice varieties. The initial trial using *Sesbania rostrata* as a green manure crop before rice has shown some promising yield increases. It is estimated that if the current highland paddy rice production could be increased by 30 per cent, the cultivation of upland rice on forest fallow with slash-and-burn techniques could be abandoned. This would indeed help enhance forest regeneration.

In addition to the cultivated species for cash cropping, as promoted by the Royal Project, the Karen have also collected from the Wat Chan area edible nuts of the Fagaceae family. The domestication study

revealed that the Wat Chan watershed contains six species that produce edible nuts, and they are the dominating species in the evergreen forest. The Karen have good practical knowledge about the value of both edible and non-edible species. The Fagaceae family provides important sources of fuelwood, fence poles, and has other domestic uses. In times of rice shortage crisis, the Karen mix the edible nuts and rice for cooking. The tree produces harvestable nuts during September-October, but in alternate years. The species are under-exploited, and the Wat Chan area shows a wide range of diversity of Fagaceae family. The trading of Fagaceae nut in the area has shown an increasing trend.

A preliminary survey of niche differentiation of Fagaceae family was initiated with farmer participation. The study exposed the wealth of accumulated knowledge possessed by the Karen community. The specific niche of each edible species within the Fagaceae family has been identified. In addition, the livelihood-supporting value of the evergreen forest in the Wat Chan watershed is appreciated for its diversity of food sources. Over 120 species are used as food by the Karen in the form of young leaves, inflorescences and fruit. This helps explain why the Karen are known as "keepers of the forest". The community claims that the requirement for non-rice food products within the household can be obtained from the home garden and the forest throughout the year. Only rice is in deficit in the area.

The community effort of forest conservation as found in the Wat Chan area is one piece of evidence among many cases that has been used to provide support for the establishment of community forest in the country.

Market-driven agricultural production system

To keep up with the household food consumption demand, the Karen have now adopted cash cropping, as promoted by the Royal Project; this activity has been working in the area for almost two decades. The Royal Project has introduced and extended selected vegetable crops such as head lettuce, sweet (green) pepper, and Japanese pumpkin, and fruit crops such as plum, peach and persimmon. So far, the farmers are more

successful in managing the vegetable crops than the fruit trees. The area is well known for its Japanese pumpkin production. The Royal Project helps design supply control by controlling planting area. Based on performance, the farmer members are given seeds and chemical inputs on credit. The Royal Project also provides transportation of farm produce, markets the farm produce and makes the marketing arrangement. A service cost of about 20 per cent is charged to the farmers. This is perhaps an example of development-oriented contract farming where the other non-member farmers can also grow the crops on their own initiative and sell their products to the traders.

Over the last five years we have witnessed the successful transformation of traditional agriculture to commercialisation of selected elements of the highland environment, and technical as well as managerial support of the Royal Project. The development progress of sub-temperate fruit crops in the area is less obvious. Only a few farmers have adopted the system, which requires more technical skill. Besides, the introduced grafted materials are not locally tested for their adaptability.

Conclusion

The Karen in the Wat Chan area have demonstrated their adaptive strategies to the changing world to supplement their food security by transforming the traditional farming systems into commercialised, specific crop-based farming systems.

The on-farm study in rice-based, land use systems has revealed that the low productivity of the current farming practice is not able to provide rice support to the community. However the rich rice genetic resources have not been fully utilised, although they have shown great potential in the lowland environment.

Low-input farming practice is possible under the extensive, land-based production system. It is no longer feasible with an increasing population and with growing pressure from the RFD authority to prohibit the slash-and-burn cultivation technique. There is an urgent need to develop sustainable land use as an alternative to slash-and-burn agriculture for

food security. The current commercialised crop production system is one option.

The Karen at Wat Chan also demonstrate their ability to manage the forest resources successfully. The community forest law, currently under draft, should allow the local people to get access to, and control of, the forest resources.

The exploitation of niche advantage as seen by the commercialisation of vegetable crops in Wat Chan is effective when the delivery and marketing systems are also being structured to benefit the community. This people-centred contract farming approach would require technical and managerial support, and long-term human resources development in terms of farmer training. At the present time it can be done only by non-profit foundations. The Royal Project is seen as one example.

Case 2: Conservation farming practices on the hillslopes of northern Thailand

Introduction

The upper terraces and hill slopes lying between 600-800m above mean sea level have been settled by landless lowland farmers in northern Thailand. In Chiang Mai province, the forest area has been cleared for farming with slash-and-burn cultivation technique similar to that practised by the other highland ethnic communities. Useful and big trees are often left standing. Two crops that are commonly planted by the farmers are upland rice, for household consumption, and banana, which is known as a pioneer crop designating land occupancy. Most of these areas are now easily accessible, with a road network being extended into the area during the last two decades. The traditional practice of slash-and-burn followed by forest or bush fallow is no longer possible. The Royal Forest Department (RFD), which is the sole government organisation overseeing the conservation and utilisation of forest area, has advised the farmers to change their farming practices. The cultivation of upland rice on the hillslopes, which are erosion-prone, is

not permitted. Instead, a rice bank is established by the RFD to supplement rice requirements. Meanwhile the cultivation of perennial crops and conservation farming practices are encouraged. The rice bank scheme in certain areas will be supported for 10 years until the farm families are able to generate incomes from the sale of farm products.

The tea plant (*Camellia sinensis*) is adapted to hillslope environments. The crop has been cultivated and processed as either green tea or/and steamed tea (*Miang*¹) for about one hundred years. The *Miang* production system can be found all over Chiang Mai in the forest hillslope with an elevation of 600-800m. The product is well accepted by the domestic market, and by both the northern Thai and the Karen ethnic communities. The *Miang* market has been extended to many provinces in the North such as Lamphang and Tak. The *Miang* farmers, who are forest settlers, have been granted the land use right (SK1²) by the RFD as an incentive for managing sustainable land use systems, and for protecting the watershed.

The hillslope *Miang* production system at Ban Phadeng, Pa Pac sub-district, Mae Taeng district in Chiang Mai province is used as a case study to examine the way farmers develop adaptive and integrated land use technology for sustainable livelihood systems even when it is not possible to cultivate the rice crop.

Traditional *Miang*-based land use system

The sustainable farming practices on the hillslopes have to consider a number of essential features such as slope, erosion control, aspect, tree-crop interaction (above and below ground), and continuing ground cover throughout the year.

1 The chewing of *Miang* (fermented tea leaves) is peculiar to Thailand. Young tea leaves are picked and wrapped together, inserted in a jar and steamed until cooked. They are then fermented for 3-6 months in woven bamboo containers until the leaves are pickled. Consumers will add some salt and put it in the mouth after each meal. The *Miang* may be chewed and sucked from 30 minutes to one hour.

2 The SK1 certificate makes it legitimate for the land occupant to have land use rights. The certificate is only transferable by descent, but it cannot be used as document for a collateral loan.

The *Miang* production system fits all the above criteria. The study site is situated in mixed forest and permanent farming area with a slope of 35-40 per cent and an altitude of about 800m above sea level. The tea is planted as an under storey in existing permanent agricultural land with a number of big trees that remaining standing, such as *Lithocarpus calathiformis*, *Schima wallichai* and *Dipterocarpus alatus*. Traditionally the tea is not planted with proper spacing. But recently a few farmers have adopted a hedgerow tea planting technique, with row spacing of about 4m. Fruit trees such as apricot, jack fruit, lichi, mango, peach and pomelo are planted between the hedgerows.

The tea plants grown for *Miang* processing are the large-leaved Assam type. The leaves are picked during the day, graded, stacked and processed by steaming during the night-time. The processed materials are stored anaerobically in pits or sealed baskets. The production does not require any chemical inputs.

The seasonal activities of the *Miang* production system start in late March. At the study site, there are four picking seasons for *Miang* with varying productivity and quality. The early season picking during April-May, known as *Miang Huapi* constitutes about 30 per cent of the annual production. The mid-season picking during June-July is of good quality, known as *Miang Klang*, producing about 30 per cent of yearly production. *Miang Soi*, the late season product, is harvested during August-September, yielding about 25 per cent. The last picking season known as *Miang Moei*, occurs when the temperature is becoming cooler. It generates about 15 per cent of the total harvest.

The total productivity per unit area of tea leaves for *Miang* processing depend on planting density and tree maturity. The randomly and spaced planted *Miang* from old orchard could grow over 2.5 m in height and could yield 2-3 *kum* (a *kum* is one bundle, equivalent to 400g) in one picking, but is not easy to pick. The hedgerow planting with closer tree spacing within the rows provides better and more convenient picking conditions. The density is mainly due to gradual replacement of *Miang* plants by the farmers with fruit tree species, as *Miang* consumption is declining.

The *Miang* growers at Ban Phadeng have an average farm size of 6 hectares. With good management such as hedgerow planting and pruning, *Miang* productivity is high and can generate an annual income of over Baht 40,000 from a six-hectare plot as shown in Table 3.2.

Table 3.2 *Miang* harvesting season, production and quality

Type	Picking period	Production (%)	Quality	Price (Baht/kum)*	Net income Baht/ha
Early	Apr-May	30	Thick, dark green	6.00	7600
Mid	Jun-July	30	Thin, yellow	6.50	8070
Late	Aug-Sep	25	Thin, yellow	7.00	7100
Cool	Oct-mid Dec	15	Thin, yellow	7.00	4176

* kum is one bundle, equivalent to 400g.

Although *Miang* cultivation does not require any external chemical inputs, the production process is labour-intensive because of picking. The hired labour and the owner-operator work on a shared crop basis. The equal share basis has provided enough incentive for the waged labourers to work near their home base, particularly for those who prefer to do so; the contribution of significantly skilled farm labour is still the main constraint. The *Miang* growers pointed out that the non-harvestable loss due to an inability to pick as a consequence of labour shortage was about 30 per cent.

Constraints to *Miang* enterprise

Several studies including our own farmer interviews at Phadeng have indicated that *Miang* enterprise is facing several constraints. These include shortage of labour and fuelwood, increasing production cost and declining market demand.

The labour shortage was ranked first among various constraints. About 78 per cent of *Miang* growers had faced the problem of labour shortage affecting the harvesting schedule and production of *Miang*, despite the shared crop basis of wage rate.

Fuelwood becomes a serious problem for those farms whose forest tree component in the *Miang* plantation is limited. Those who have practised agro-forestry in the existing forestland can still manage their own fuelwood consumption for household use and *Miang* processing. However the fuelwood requirement is available within the village.

The production cost includes costs of materials that are used for *Miang* enterprise, which include bamboo lath (for tightening the *Miang* into bundles), banana leaf, plastic bags, and baskets, constituting about 12 per cent of production costs. Labour costs for picking *Miang* during the season and off-season for first prevention were about 7 per cent.

Perhaps the situation that concerns *Miang* growers most is the declining trend of *Miang* consumption among the young generation. *Miang* is generally consumed after meals by chewing. It is commonly served in all kinds of ceremonial occasions by the northern Thai and the Karen communities. To overcome market uncertainty, the *Miang* growers at Phadeng have to re-orient their production strategies, by incorporating diverse perennial species into the existing *Miang* orchard.

Miang in transition

Despite recognising the declining popularity of *Miang* consumption among the young generation, 88 per cent of *Miang* growers at Phadeng intended to continue with *Miang* cultivation. Only 12 per cent decided to stop *Miang* production and to change completely to new land use patterns. The major incentives for those determined to continue are the facts that:

- *Miang* production is easy to operate by young and old,
- The Phadeng community has acquired good knowledge and practical skills in *Miang* production,
- *Miang* can still generate a stable income, and with a good marketing arrangement, high income can be secured, as observed in a few cases.

The other factors in its favour are that the introduced fruit trees, such as longan, lichi, plum and peach, require high inputs and require more water during the first two years of tree stand establishment. To achieve

complete tree survival, a watering system is necessary, and this would incur higher costs particularly on the hill slopes. On the other hand, *Miang* is a low-input system; therefore those who are not risk-takers will continue to cultivate and process *Miang* for a living, but will gradually incorporate other potential perennial species into their land use system.

At present all *Miang* growers have transformed their traditional *Miang* orchard into an integrated agro-forestry land use system with a multi-storey planting arrangement. The most common fruit crops that are adapted in the hillslopes include mango, pomelo, Japanese apricot, peach, jackfruit and banana. But the most significant contribution to the success of land use transformation is the adoption of the forest species *Zanthoxylum rhetza* as an economic cash crop.

The introduction of the *rhetza* tree at Phadeng is not well established. The tree is traditionally grown as a home garden species. Its seed is used for spice. The tree seedling is vulnerable to waterlogged conditions and latitudinal change. It is well-adapted to the well-drained soil on the hillslope at 800 meters above sea level. The Phadeng hill forest environment has provided a specific niche for *Z. rhetza*. It forms the top storey of the *rhetza*-fruit trees-*Miang* integrated system. The success also rests on the ability of farmers to propagate by seed at a high germination rate. The tree begins to produce marketable seed after five years and yields remain stable after year nine.

The season of *rhetza* seed production is during late September to late October. The income from *rhetza* seed sale for one typical farmer at Phadeng could gross Baht 85,000 as shown in Table 3.3.

The gross income from various commodities in Table 3.3 also shows the potential of the *rhetza* tree to be used as a cash crop in the process of land use transformation.

Table 3.3 Gross income of a farmer adopting *Miang*-based agro-forestry system at Phadeng, Chiang Mai, 1997

Commodity	Gross income* (Baht)	Per cent
<i>Miang</i>	140,000	54.2
<i>Zanthoxylum rhetza</i>	85,000	32.0
Green tea	23,000	8.6
Mango	5,000	1.9
Japanese apricot	5,000	1.9
Peach	2,000	0.8
Pomelo	1,000	0.4
Banana	500	0.2
Total	265,500	100.0

* obtained from 6 ha plot with different tree density and maturity.

Contribution of *Miang* to village livelihoods

Eighty per cent of the farm households at Phadeng have engaged in *Miang* production. The production system also provides an opportunity for the older generation to work for a living, with better field working conditions than arable annual crop production.

Picking and processing require a continuous working schedule, from day to night-time, and are labour demanding. The wage rate agreement is a shared crop basis between the owner-operator and the hired labour. Thus the wage system has provided equal benefits for the landless farmers in Phadeng.

The *Miang* production system lasts 8 months from April to December, providing stable income and helping to prevent out-migration. Those farmer operators who have adopted the *Miang*-fruit trees-*rhetza* agro-forestry system, have been shown to generate a better income distribution with different crop harvesting periods as shown in Table 3.4.

With the incorporation of *rhetza* trees into the *Miang*-fruit tree system, the spatial arrangement has perfected sustainable land use on the hillslopes through the selective planting of crop diversity.

Table 3.4 Distribution of harvest products in *Miang*-based land use system

Commodity	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Miang</i>												
<i>Rhetza</i>												
Mango												
Pomelo												
Japanese apricot												
Peach												
Jack fruit												
Banana												

The dependency of the *Miang* enterprise on forest conservation and utilisation has directly encouraged *Miang* growers to protect forest resources. The contribution of trees to provide shade, fuelwood and nutrients to the undergrowth is being understood by the *Miang* growers.

Conclusion

The case of an integrated *Miang*-based agro-forestry system on the hillslopes at Ban Phadeng, Chiang Mai province has indicated the farmer adaptive strategies in transforming the traditional *Miang*-dominated land use system to a more diversified system that is environmentally sound, economically viable and socially acceptable. It also signifies the willingness of both the RFD authority and the hillslope farmers to cooperate and to make necessary land use adjustment so that the practice does not degrade the hilly environment.

The conservation farming practice is made possible in the forest area through the selective utilisation of crop and forest species, and the ability to make a spatial planting arrangement that is synergistic. The domestication of *Z. rhetza* at Ban Phadeng also shows the farmers' ability to cultivate and develop an economic cash crop that is ecologically compatible with agricultural commodities.

The sustainability of hillslope agriculture illustrated in Ban Phadeng has confirmed that in a vulnerable and erosion-prone landscape, priority should be given to the development of permanent land use that is environmentally sustainable. The economic benefit is then achieved through land use adjustment that is adaptive to socio-economic changes. The decline in *Miang* demand has prompted farmers to search for other land use alternatives, but at the same time to improve the *Miang* productivity and quality, so that the product from the area remains competitive. The farmers also initiate their own *Miang* marketing channels by developing new *Miang* outlets in the nearby provinces such as Lampang and Tak. This is one reason why the majority of farm households at Ban Phadeng has continued engaging in *Miang* enterprise.

Case 3: Sustainable intensification of the rice-potato system

Introduction

The rice-potato production system is considered to be one of the most intensive forms of land use in the Chiang Mai Valley. The system requires a sandy loam soil with reliable irrigation water supply throughout the season. The potato is considered as a new cash crop and was first introduced into Chiang Mai in the early 60s, but was successfully established as a commercial crop in San Sai district in the early 70s, when it was adopted as an alternative to tobacco. The introduced varieties adopted in the irrigated lowland and grown after rice were the cooking types Bintje and Spunta. The tuber seeds were imported from the Netherlands. The Spunta variety is still being planted as a cooking potato with an annual domestic consumption of about 8,000 tons.

In the years since its first adoption as a commercial crop, the farmers have acquired production skills through trial and error, as the crop was not considered an important economic cash crop nation-wide, and no research support or extension service was provided by the MoAC. The

Potato Growers Cooperative (PGC) was later formed to act as the only authorised agent for importation of Spunta tuber seed from the Netherlands, and to help develop markets or to seek government price support when the market price was too low.

So in the early period of development in Chiang Mai of the cooking potato, farmers acquired production skills, and were able to achieve price stability by controlling planting area through controlling seed supply. For instance, each member is allowed to have access to 25 kg of introduced Spunta seed each growing season. The PGC does not handle the marketing arrangements. Therefore the distribution of cooking potatoes is essentially under the free market system. Those farmers who are able to have a market arrangement prior to production will invest on Spunta tuber seed supply. This could be arranged in various ways, such as:

1. purchasing tubers from neighbours at a higher price (about a four-fold difference),
2. bidding from the PGC seed trading, or
3. planting the materials kept under cold storage over a six month period.

The third choice is possible when cold storage facilities are made available by private companies.

Development of agro-processing industries

The development of agro-processing industries using potato as raw material in the late 80s changed the potato industry in the Chiang Mai Valley. The new product development requires processing potatoes, with different quality and varieties. Contract farming has also been introduced to secure a supply of raw material, which ensures quality from the growers and private firms.

New processing varieties were introduced for testing by the processing firms. The growers also are exposed to new production technology, particularly fertiliser management and pest/disease control. Technology

transfer is carried out by the field supervisors of the firms, with assistance from the experienced growers who are selected as the contract farmers.

The combined knowledge, between the farmer's past experience with cooking varieties of potato and the new management practice from the processing firm, has helped speed up production stability and quality assurance.

At present there are three main food processing companies actively establishing contract farming with the farmers in the San Sai district to produce processing potato. These are Frito Lay, Siam Snack and Unichamp. All provide the same processing variety – Atlantic, from Scotland – to the farmers. The farmer variety, Kanebeg, which is suitable for both cooking and processing, was first introduced in the early period of the processing industry, and will no longer be available from the 2000 season, simply because the companies want a uniform product.

Farmer management of the rice-potato system

The farm-holding size in the rice-potato production area ranges from 2-13 rai (0.32-2.08 ha), with an average of 0.72 ha, which is slightly less than the Chiang Mai average of 0.8 ha. The farmers plant glutinous rice for household consumption, with high quality varieties, Niew San Pa Tong and the more recently, modern RD6. Those with a larger farm size also grow high quality, non-glutinous, Kao Dok Mali 105 (KDML 105) for export. Because of a favourable irrigation system and growing environment, the district is able to export 20 per cent of its rice production.

In terms of nutrient management, farmers will invest more chemical fertiliser on potato and less or no fertiliser input in the wet season rice crop. The residual nutrient from the potato crop or subsequent crop of sweetcorn is enough to produce over 5 t/ha of rice yield, which is about 60 per cent higher than the national average.

The potato farmers will not use the rice straw for mulching. The straw is normally sold to garlic farmers who will use it as mulch material, or

to rice mushroom cultivators. The straw has value. The glutinous varieties with a lower harvest index than the modern HYV, non-glutinous rice, are tall plant type, and are still preferred by the Chiang Mai rice farmers.

The wet season rice and cool season potato provide a synergistic growing condition of crop rotation. The high rice yield is obtained by the residual fertiliser from the potato crop, while the submerged condition of the paddy field has provided protection from nematode infestation which is a serious pest of wet season potato growing on the uplands at Tak province (about 350 km south-east of Chiang Mai).

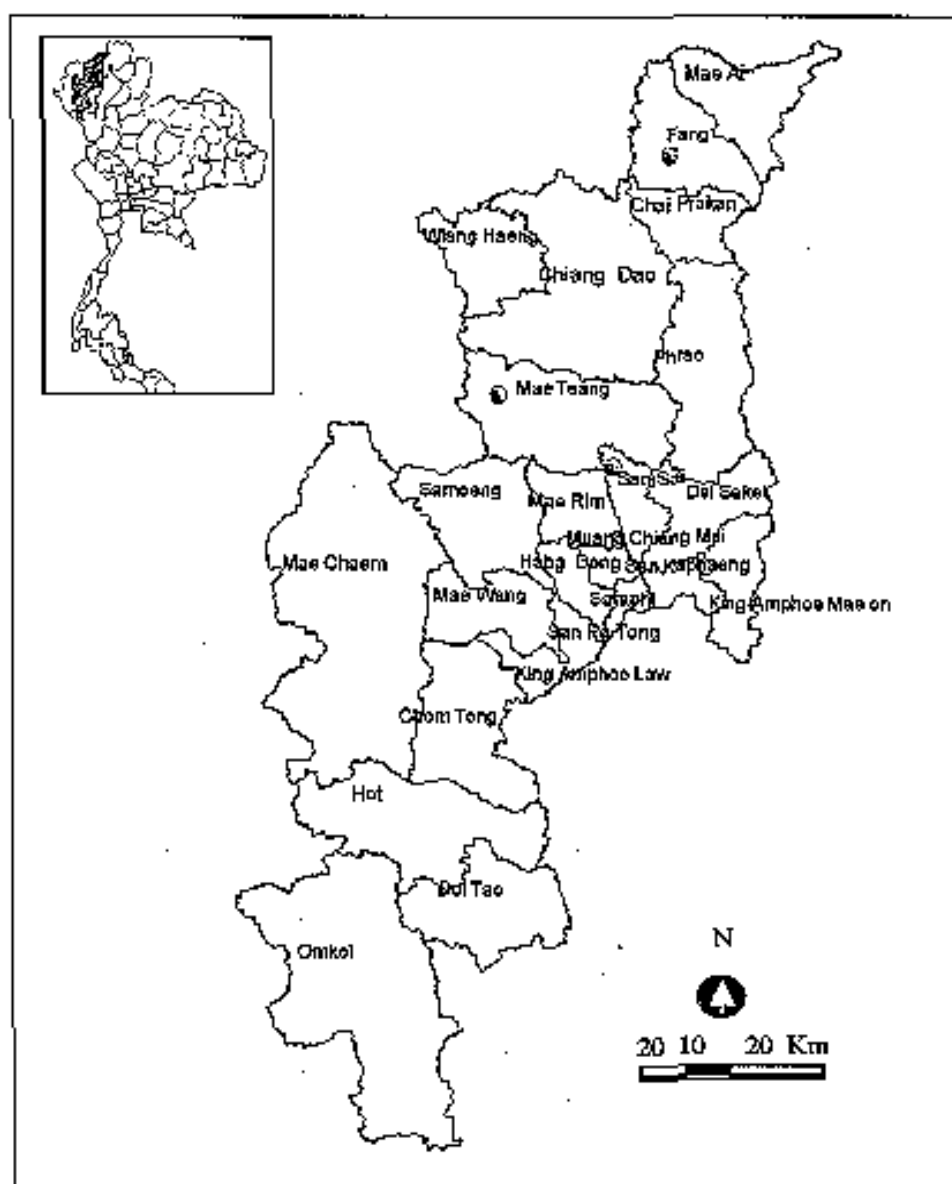
The potato production system

The main cool season potato crop in Chiang Mai province is planted sequentially after the rainy season rice. San Sai district alone contributes about 1,200 ha. The other two districts, Mae Taeng and Fang, have a combined planted area of about 600 ha (Figure 3.1). When the food processing companies introduced the processing potato, a constant supply of raw material became necessary. So the companies have developed new production areas under rainfed conditions with supplementary sprinkler irrigation in the upland of Tak province. The rainy season production begins in May followed by subsequent monthly planting arrangements until September. Then the production moves to Chiang Mai with the first crop in November, but the main planting season is in December. So the Tak and Chiang Mai production is able to cover seven months with a staggered planting sequence. The demand for processing potatoes is increasing, but the favourable production area is less developed.

The production of processing potatoes is all under contract between the food processing companies and the growers, under the jurisdiction of the district agriculture extension offices. The companies provide all input credits such as imported potato tuber seed (at 30 Baht/kg), chemical fertiliser, pesticides and fungicides. The product price was guaranteed at 6.50 Baht/kg in 1999. The recommended seeding rate is 100 kg/rai (625 kg/ha). All the credits are deducted when the farmers deliver the raw material.

Since the market and price for processing potato has been assured before planting, and production is managed with low risk by the experienced growers; credit institutions such as the Bank of Agriculture and the Agricultural Cooperative (BAAC) are keen to provide credit to growers. In fact the BAAC at the San Sai district has been awarded the outstanding governmental credit institution for prompt payback. The BAAC at San Sai has provided loan money of 300-400 million Baht annually.

Figure 3.1 The three main potato growing districts in Chiang Mai Province



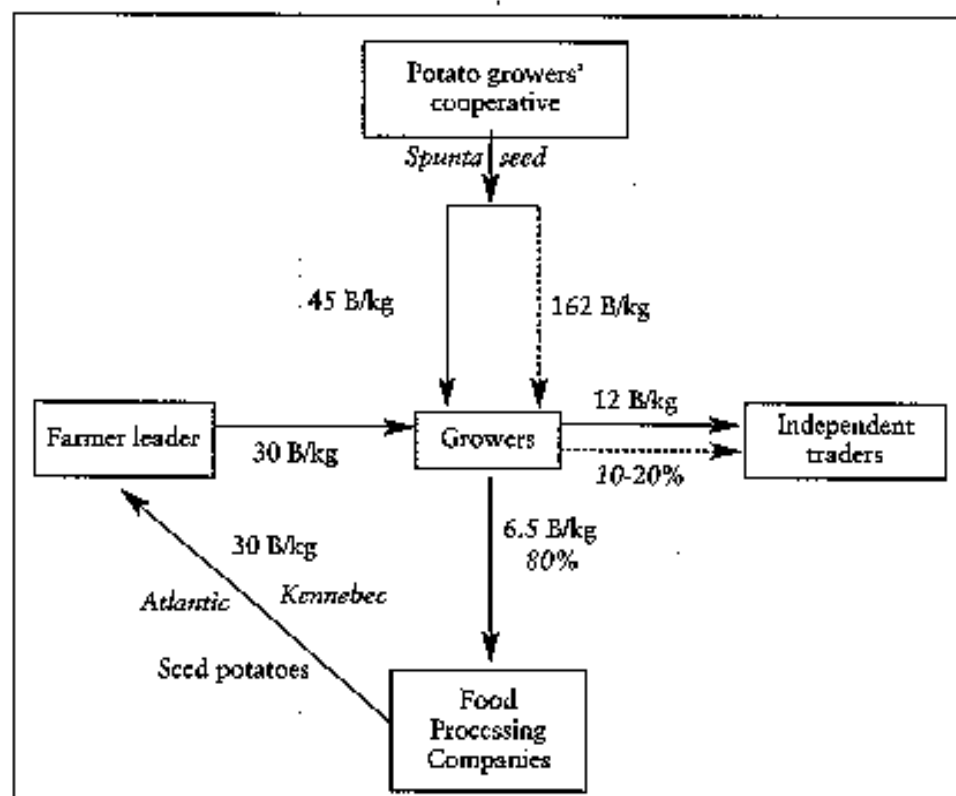
All potato growers in the San Sai district produce both cooking and processing potatoes; the former is under the free market system, while the latter is under contract as described earlier. To be able to plant cooking potato, a farmer has to be a member of the PGC, otherwise he or she will not have access to imported tuber seed at 45 Baht/kg, or will have to pay a higher seed price under bidding. Each member is given 25 kg of the Spunta variety tuber seed, enough to plant one rai (0.16 ha). The imported tubers have to be pre-treated in a sand or sand-coconut-saw dust mixture for 7-10 days for bud emergence. The tuber is removed and sliced and treated with fungicide before transplanting in a double-row hill plot. The planting is done by hand. To cut down on labour costs, the farmers have adopted a labour exchange system.

A 90-day crop can produce 4000-4500 kg/rai (25-28 t/ha) of the Spunta variety under optimum growing conditions. In the 1997 and 1998 seasons, farmers could get a minimum price of 10 Baht/kg, and in the 1999 seasons, the agreed price between the traders and farmers was 12 Baht/kg, which is 88 per cent higher than that of the processing potato. The product is only supplied for the domestic market. Those growers who could secure the market before the season would prefer to plant the cooking type. To obtain seed from sources other than the PGC, the growers select the non-marketable tubers at harvest and keep them in cold storage for next season's planting. The cold storage tuber seed is only good for one season's planting, producing acceptable tuber yield and quality. However, seed quality deteriorates quickly within 6 months of storage. Farmers who prepare for early planting of the cooking variety with their own tuber seed normally have to store about twice the amount needed for planting. Early planting in early November leads to an early harvest. The early production provides good incentive of highest price. The imported new tuber seeds of the Spunta variety from the Netherlands are normally made available for planting in December, almost one month later than the planting of cold storage seed. For the last two years the price of cooking potato has been above 10 Baht/kg, considered to be satisfactory by the growers.

Only two varieties of cooking types are available at present, Spunta and Kennebec. The keeping quality of Spunta is poor and farmers only store the material for the off-season market at higher price. Kennebec has better storage quality than Spunta, and can be used for planting for another season.

The processing companies have fixed the guaranteed price at 6.50 Baht/kg (\$0.18/kg at 1\$=36 Baht). It is estimated that the growers would deliver about 80 per cent of farm production to the contracting company, and the remaining 20 per cent will be sold to non-contracted buyers who normally offer about 12 Baht/kg. So the grower would expect to obtain the overall average price of 7.6 Baht/kg. Those non-contracted, independent buyers are known among the growers, and the products are eventually delivered to the respective processing companies. They are in fact the company contractors. The 20 per cent of farm production circulated under the free market system provides certain flexibility for the growers (Figure 3.2).

Figure 3.2 Flow of seed and produce in the potato production system



The contract farming arrangement

Three types of contract farming have been arranged in the potato production system at San Sai:

- i. **The broker system.** The processing company signs a contract with the village broker who has long experience in potato cultivation and has become a respected, influential figure. The company provides only the seed material to the broker at 30 Baht/kg, and a guaranteed price of potato tuber at 6.50 Baht/kg. The broker will handle all the contract agreements with growers and provide credit services on inputs such as fertilisers and chemicals. Farmers will pay the same seed price of 30 Baht/kg from the broker and the guaranteed price of 6.50 Baht/kg. The broker together with the company will provide some hands-on technical advice. The broker will receive a commission fee from the company of one Baht/kg of potato purchased from the farmers.
- ii. **The contract farmer system.** The company will approach the farmer leaders who have also good knowledge and experience in potato cultivation. The contract farmer selects the promising growers in the neighbouring fields and helps provide technical and management services to the growers. The company provides all inputs on credit to the growers. For instance, the seeding rate at 100 kg/rai, (625 kg/ha) and the chemical fertilisers at 300 kg/rai (1875 kg/ha) are given to individual grower by the company through the contract farmers. The company has one or two field supervisors to monitor the field production. The contract farmers in return will receive the servicing fee from the company at 0.10 Baht/kg (\$0.028/kg).
- iii. **The direct contract system,** whereby the company makes a direct contract with individual growers. The system is found to be feasible only with large farmers. In this case the company field supervisors contract and monitor all the individual growers.

The potato contract farming as observed in San Sai district has indicated that contract farming has helped promote the production of a quality

product and assured quantity. However, when the single commodity is highly demanded by many processing food companies, the contract arrangement should provide some flexibility for farmers to operate on the free market. In the case of potato, imposing a penalty on growers for not delivering the full potato production increases management costs for the companies. The 20 per cent production that enters the free market has provided overall 1.10 Baht or 17 per cent over the guaranteed price.

The sustainability of the rice-potato system

In conclusion, the rice-potato system is considered to be sustainable, based on the following observations:

1. The system has been adopted by the smallholders for almost thirty years in the intensive rice-based farming system of the Chiang Mai valley.
2. The submerged condition of the preceding rice ecosystem has helped control the incidence of nematode infestation.
3. The San Sai rice ecosystem with sandy loam soil and good irrigation facilities has provided a specific niche for cool season potato cultivation.
4. Farmers' increasing management skills and technological adaptability help stabilise the production of the rice-potato system. For instance, nutrient management for potato (with a high input of chemical fertiliser) also benefits the rice crops; potato tuber seed propagation techniques reduce seed cost, etc.
5. The development of food processing companies using potato as raw material has led to a constant demand of potato throughout the year.
6. The market opportunities for fresh and processing potatoes have provided farmers with flexible production options for stable and high incomes.
7. The contract farming arrangement has been shown to benefit both the growers and the companies.
8. The credit support from the BAAC has enabled farmers to engage in high input and capital intensive potato production systems.
9. Increasing capacity building within the community is evidenced at individual and organisational levels. For instance, (a) trustworthy

contract farmers with good practical knowledge help foster relationships between the growers and the processing companies; and (b) the increasing role of the growers cooperative is helping to provide supplies of fresh potato for the domestic market.

Colotee

Integrated production – marketing arrangement

The underlining principle of mainstream agricultural production systems is market-oriented production, i.e., production to meet consumer demand. In practice, farmers in developing nations usually have limited access to market information for farm planning to reduce price and market risks and uncertainty. Under prevailing systems, there occur conflicting interests between buyers and farmers. However, the problem could be reconciled if production and marketing activities are viewed in a more integrated and co-ordinated manner. There is a need to promote the unity of production and marketing instead of the old dichotomy in which marketing begins where the farmer ends (Nath, 1998).

The inter-linkage between farm production and users of farm produce assists the information flow and co-ordination between the two sub-sectors, which not only reduces risk and uncertainty of the market and price, but also encourages qualified production that directly satisfies consumer's demand. The inter-link is either established by private initiatives or government policy support. The following cases illustrate efforts of both.

Case 1: Contract farming (CF)

Contract arrangements between farmers and merchants might have long been practised informally in Thailand, i.e., in the tobacco business. A more formal and recent arrangement, initially introduced by the food industry, was tomatoes to meet the increasing demand of fish canneries in the 70s. As the world market has become more competitive, processing firms have placed top priority on product quality. Furthermore, expansion of business has depended heavily on the variable supply of good quality raw material at a reasonable cost. Contract marketing and contract farming have been employed to serve

these purposes for some firms. Before 1990, Thailand probably became the most extensively experienced country for contract farming in Asia in the widest range of crops (Glover, 1992). The contract arrangements have increased notably ever since. Several new crops were produced under contracts, including Jasmine rice, organic rice, prawns, new kinds of vegetables for the frozen industry, etc.

Policy process

Expansion of contract arrangements in Thailand was the result of key drivers, notably the increase in export of agro-industrial products as promoted by government policy. The guidelines for development of agro-industries were clearly stated for the first time in the 6th National Economic and Social Development Plan (1987-1991). The guidelines were similar in many respects to contract farming. The government developed the so-called "Four-Sector Co-operation Plan to Develop Agriculture and Agro-industry" comprising of industrial firms, farmers, and financial institutions (the Bank for Agriculture and Agricultural Co-operatives, BAAC). The four parties were to work together. The mandates of the plan were aimed at improving arrangements of the production system so as to reduce price risk, market uncertainty and to improve farmers' technical knowledge, and in turn to raise production efficiency. The Office of Agricultural Economics (OAE) was responsible for monitoring the plan.

The OAE's assessment of the plan during 1987-1993 indicated unsatisfactory performance because some of the projects under this plan relied heavily on government support (e.g., provision of free seed for sunflower growers), rigidity of the terms of contract, readiness of farmers and availability of appropriate extension services (MoAC, 1994). Accordingly, remedial measures were introduced including readjustments of terms of contract and loans (using low interest-rate loans in place of interest compensation).

The "Subcommittee for Improving Government - Private Sector Cooperation" was set up and noted successful and unsuccessful projects of the 4-Sector Plan in its meeting in May, 1995. The subcommittee

concluded that it was not necessary for every farmer to participate in CF and that government agencies should not get involved directly in the contract. Besides, firms' business should be expanded without perpetual support from the government (NESDB, 1995). However, the assurance of fairness as well as risk guarantee for farmers was further emphasised. Consequently, the Subcommittee came up with several measures to modify cooperation between the government agencies and the firms. All measures centred around arrangements for co-ordination and risk sharing, such as setting up a "project fund" to provide compensation for production and marketing risk, or "cost sharing" among farmers and firms.

Since 1995, the subcommittee consented to support agro-industrial projects (under the 4-Sector Plan) that possess three abilities, i.e., to reduce production risk, to reduce marketing risk and to identify potential target areas and farmers. The agro-industrial firms' proposals were approved based on the highest benefit provided to farmer participants by the firms. Two targeted commodity groups were also identified by the Subcommittee:

- High export potentials including high quality rice, fruit, flowers, fresh water and coastal swamp fisheries
- Industrial crops e.g., vegetable, sunflower, maize and fast-growing trees.

In 1994, eight projects covering a production area of 0.55 million ha requiring 4,984 million Baht of credit were approved. These projects involved trees for pulp, sunflower, maize, eucalyptus, teak and dairy production.

The 4-Sector Plan has continued into the 8th National Social-Economic Development Plan (1997-2001).

Success of CF in rural agricultural development

At the national level, the performance of CF could be assessed in terms of the growth in production and export of commodities mostly

produced under CF, and number of farmers and firms as well as varieties of commodities involved. An example is given below on the export of vegetable and vegetable products (Table 4.1). Apart from a reduction in imports of vegetable seed, Thailand could expand exports of some vegetable seed with a 7.8% growth rate. Also, vegetable exports have increased markedly.

At the micro level, the achievement against the goals of CF can serve as an effective indicator. Wiboonpongse *et al.* (1998) revealed the achievement of CF both from farmers' and firms' stand points. However, not all documented cases were successful in spite of having well-known contracts, it was noted that the failures are normally unrecognised.

Table 4.1 Export of some vegetables and vegetable products 1983-1995

Year	Vegetable seeds	Asparagus fresh or chilled	Other vegetables chilled and frozen	Young maize in airtight containers
(unit : ton)				
1983	177	-	65	4,014
1984	581	-	194	4,482
1985	608	-	127	6,281
1986	441	-	48	11,317
1987	442	-	333	17,219
1988	522	207	2,665	23,396
1989	870	999	11,050	33,323
1990	1,119	2,172	14,327	26,777
1991	1,485	2,395	16,578	41,145
1992	1,836	2,185	21,993	36,766
1993	1,204	2,330	30,507	34,557
1994	971	2,275	34,971	46,187
1995	1,571	1,817	34,199	50,426

Source: OAE, 1988 - 1996.

By and large, the studies reviewed by Sriboonchitta *et al.* (1996) showed that contract farming performed remarkably well in terms of assuring a market for farm outputs and reducing price and income risk, as well as provision of technical knowledge, credit, and inputs (Table 4.2). In most cases farmers earned higher income from contract crops as opposed to their previous crops (baby maize, maize seed, vegetable seed) and higher household income while maintaining off-farm employment (75% of sample indicated by Sriboonchitta *et al.*). In fact, contract firms make a pre-calculation to ensure that the contract crops provide reasonably attractive returns to farmers relative to existing activities.

Table 4.2 Advantages and disadvantages of contract farming (CF)

Advantages/Disadvantages	Case of CF
Advantages	
1. Stable income	Baby maize ¹ , pineapple ² , vegetable seed ³
2. Higher income than non CF	Baby maize
3. Market certainty	Baby maize, pineapple, vegetable seed
4. Delivery service for inputs	Baby maize, pineapple, vegetable seed
5. Ease of obtaining inputs	Baby maize, pineapple, prawn
6. Loan made available through financial institutions	Baby maize, pineapple, vegetable seed
7. Learning new technology	Baby maize, pineapple, vegetable seed
8. Infrastructure: road and ditch	Prawn
9. Information news and networking	Prawn
10. Quality development	Vegetable soybean, maize seed
Disadvantages	
1. Lack of freedom on farm management and decision	Prawn, duck ⁴
2. No freedom for buying input	Prawn, duck
3. No bargaining power, low price	Prawn, vegetable seed, asparagus ⁵
4. Slow or delayed transportation from farm damaged the produce	Tomato

Source: Sriboonchitta *et al.* (1996).

1. OAE (1993) 2. OAE (1986) 3. OAE (1990) 4. OAE (1991a) 5. OAE (1991b).

Main disadvantages of contract arrangements mentioned by farmers were relatively low price (as compared to selling on the open market) and lack of freedom of farm management and decision-making, causing farmers to lose their entrepreneurial skill. In addition, when the contract was made informally and/or between small insecure business firms and farmers, these firms might break their promises to purchase the crops when prices of processed products decreased (e.g., tomato in Northern Thailand). One general concern is that the net returns to farmers under contract might decline to such an extent that farmers became little more than farm labour. This concern was discussed in the case of broiler contracts.

To agro-processing firms, there are obviously benefits from CF. Apart from reduced requirements for investing in land, they obtain predictable amounts of quality raw material from contracts at a known cost. To reach a desirable and acceptable quality, each contract farmer is granted only a small quota, 0.32 – 0.64 ha of potato or vegetable soybean and about 2.4 ha for seed-maize. To increase their business, firms expand by contracting with more farmers. Large or multinational firms provide partial compensation when crops are damaged due to uncontrollable factors. This has proved to be a very effective strategy to draw in members.

Generally, contract farming has been successful in Thailand. However, conditions for success vary from case to case. For crops familiar to farmers, (tomato, potato), the contract arrangement is significant since farmers can sell to firms as well as to the open market. For crops new to farmers (vegetable soybean, Japanese cucumber, maize seed etc) and when a market is very specialised, technical management is important in addition to a fair contract. In most instances, efforts of local officers in co-ordinating the contracts between firms and farmers have made initial establishment possible, and in many cases support the progress of the whole industry (e.g., potato). Evidence from Northern Thailand shows that it requires great effort to establish trust between firms and farmers.

Thai agricultural policy has emphasised the promotion of exporting high value added, high quality products. Wiboonpongse *et al.* concluded that implementation of such a policy requires large capital investment and technical skill and contract farming is seen as a promising approach to achieve the goal. However, it requires a long process of development; in Northern Thailand, the modern formal contract took at least 30 years.

Via contract farming, small and resource-poor farmers who make up the majority of the farm labour force have been provided with more opportunities to earn from cash instead of subsistence enterprises. The larger farmers also have more alternatives, either having contract or non-contract enterprises or both in their farming systems to capture a higher and more stable income.

Case 2: Off-season production in response to market and production risks

The case study conducted by Wiboonpongse and Sriboonchitta (1998) on early season mango production in Northern Thailand demonstrates the efforts of farmers to avoid production and market risk and uncertainty, and the supporting role of government policies. Impacts of the joint endeavour on sustainable agriculture are pronounced.

Government policy process

Two major policy programmes directly related to mango production are (1) Improvement Programmes for Fruit Trees and (2) the Agricultural-Structural Adjustment Programme. The former programme was initiated under the 6th National Social Economic Development Plan (1987-1991). It aimed at promoting export of fruits since prices of traditional export commodities had declined markedly. Twenty-seven kinds of fruit including mango were targeted for productivity and quality improvement. Two key agencies were the Department of Agriculture (DoA), responsible for technology improvement, and the Department of Agricultural Extension (DoAE), in charge of technology dissemination and production extension.

The programmes had been carried on to the 7th National Plan (1992-1996). From variety selection, farmers were informed about and recommended different varieties to meet different demands in domestic and export markets. Then, different varieties were recommended for each production zone. Information on technical management was made available by DoAE as well as via the public media. One distinctive programme initiated during the 7th National Plan was the "Production Improvement for Export to Japan". Prior to 1987, Thai mango was not accepted by Japan. Vapour heat treatment was introduced for fruit fly control. However, the Japanese market awarded only 208 ton totally for 1989-1994.

The Mango Improvement Programme has been developed and carried on to the 8th National Plan (1997-2001). Under this scheme, planted areas, productivity and quality need to be expanded and improved. Total production was 885 thousand tons in 1990 and increased by 6.67% per year to 1,125 thousand tons in 1995 (OAE, 1996). The production goal in the 8th National Plan expects total production to reach 1,844 thousand tons in 2001 and raise the quality product to 50% of total production.

The second policy programme "Agricultural – Structural Adjustment Programme" in the 7th National Plan aimed at restructuring farming systems. Farmers were recommended to diversify their farm enterprises by integrating fruit trees and livestock in order to reduce income instability as well as to raise farm income. Most farmers chose mango, which shared about 30% of all recommended species. This programme enhanced the rapid expansion of mango production mentioned above.

Farmers' effort for sustainable production

Despite being a native species and easily grown in almost any type of land and soil, mango yield was rather low. Farmers were lacking in production know-how and good management. Also, mango is susceptible to disease (anthracnose) and insect damage.

As total production increased substantially, the average annual price of mango declined. This was mainly due to the relatively small demand, since 99% of mango is absorbed by the domestic market and only 0.3% was exported fresh and 0.7% as processed. However, with improved know-how, some farmers forced their mango to produce off-season and enjoyed higher prices.

The Early-Season Farmer Groups in Chiang Mai, Northern Thailand adopted a production technique to solve their problems. Since Chiang Mai is one province in the production zone for export, the farmers in this group were targeted and received support for the purpose. They planted an export cultivar (Nang Klang Wan, NKW) which is not preferred by domestic consumers. Prior to 1992, these farmers experienced severe problems and some had turned to other crops. However, most farmers planned to replace mango with other trees as well. The problems faced by the farmers were the following (Wiboonpongse *et al.* 1995):

1. Fruit flies are a major problem affecting the quality and uniformity of size. The in-season production lasts until the early rainy season, a period when mangoes are susceptible to fruit fly attack.
2. Chiang Mai commonly experiences summer storms in April. Many fruits fall off the trees during storms.
3. Mangoes are harvested at the same time and a large supply comes onto market during May-June when the market is saturated. Prices usually drop to the point that farmers are unable to obtain adequate income.

Struggling to survive and overcome these problems, coupled with the efforts of government officers in charge of mango production extension for export, the farmers decided to form the groups in 1992.

Performance of the group's production-marketing system

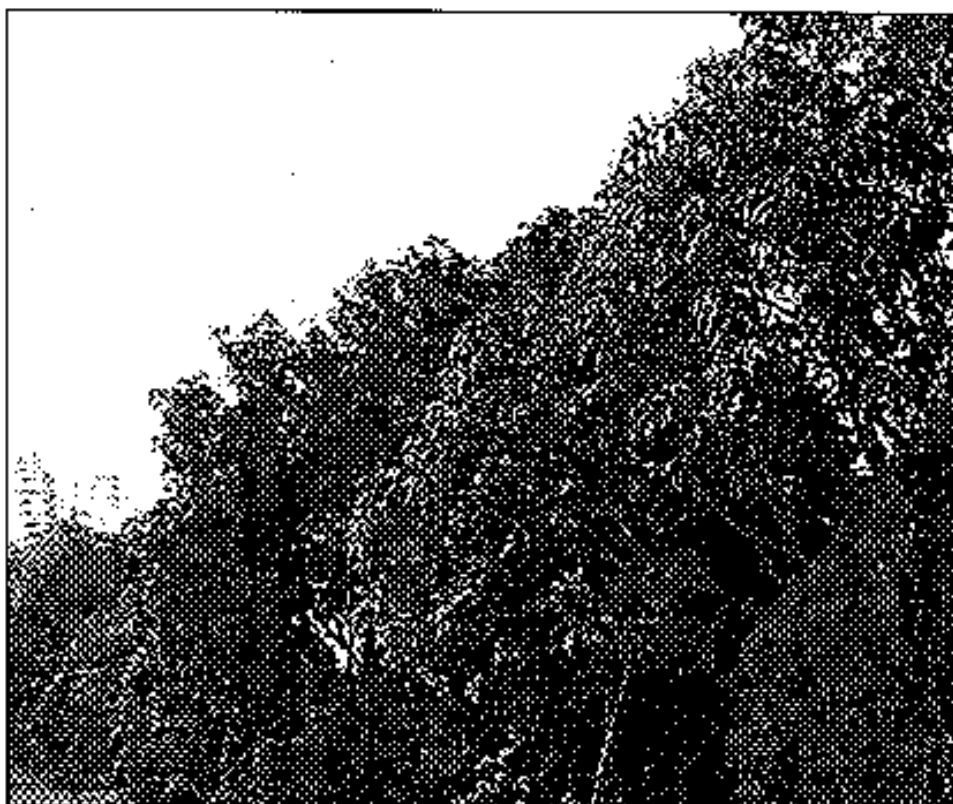
The group was informally organised in 1992 with 30 farmers. Among them, two large farmers appeared to be supportive and influential. In 1998, the members increased to 105. The performance of the

production systems were evaluated by Wiboonpongse and Sriboonchitta (1998) from various aspects – impact on employment, ecology, gender equity, risk, economic viability and sustainability – using case studies of two farmers. One represents a resource-poor farm with poor management level and the other represents an average farmer in both respects.

Both farmers had diversified their farming systems to different degrees. They integrated other fruits and vegetables, as well as some chicken, and the 'average' farmer also raised fish for demonstration as suggested by government officers. Both farmers indicated that they were prepared to cut down any fruit species found to be non-profitable including mango and keep the profitable ones. They were both proven to be market-oriented producers.

As far as the ecological impact of the production method is concerned, both farmers believed that application of flowering stimulant (paclobutrazol) and chemical fertiliser would damage soil properties. Subsequently, they used manure to improve soil texture and reduce acidity. They were cautious about the application rate of paclobutrazol partly because it was costly and the high rate would have adverse effects on the future growth of trees. Applying this technology, farmers need to have good crop management relative to traditional practices of other farmers, in terms of fertiliser and pest/disease control. None of the farmers observed water pollution but mentioned seeing chicken (and birds) sick (dead) after eating dead insects. However, as compared to other well-managed farms of in-season production, application frequency of insecticides in early-season production is much reduced.

Production risk due to climatic variations at flower initiation stage and fruit fly damage has successfully been solved. A comparison was made between early and in-season production methods in the same village. After 5 years experience, there was only one year, 1996, when all farmers enjoyed good production and only moderate yield difference was observed. In other years, the farmers who did not use paclobutrazol harvested very low yields. Evidently, it was confirmed in the El Niño season of 1997/1998 when most farmers' production was affected



Mango trees after 4 years of paclobutrazol applications

severely. With sufficient water, other farmers harvested only 30-40% as compared to 60% of the production of farmers in this group.

At present, early-season production is highly profitable despite the high investment (cash investment was 73,600 Baht) as seen from the rise of group membership. Gross margin for the average management was 246,720 Baht per ha; when family labour is deducted it is 159,360 Baht. This is equivalent to 796 Baht per day (out of 365 days) from the average production area of 1.04 ha per farm. Note that the typical farmers in the area earned only 12,500 Baht/ha.

Four reasons underlie the success of this business. First, crisis puts strong pressure on these farmers to seek a means of survival. Second, as a group, farmers could easily access technical support from government officers and chemical input suppliers. Third, government officers were highly supportive. Fourth, the farmers groups had strong bargaining power to reduce input prices and raise mango price. For example, in

the first year, the prevailing price of pacolbutrazol was 650 Baht/kg (at 25 Baht = 1 US \$). The group bought it for 540 Baht/kg and 260 Baht/kg in 1998 (at 40 Baht = 1 US\$).

Sustainability of the business depends on the future price and productivity. Future price of off-season mango could decline unless export demand expands at a higher rate than expansion of growers (which is partly constrained by limited capital investment). From the authors' observation, mango trees of several farmers in the group were not well maintained as compared to farmers in other provinces, and thus their productivity could decline to an unprofitable level in the near future. In the broader sense, the sustainability of the whole business of farmers in this group does not rely only on the off-season production of this particular variety. They demonstrated their capability of diversification of varieties and rather rapid adjustment to market conditions.

Case 3: Group marketing

Group marketing has been widely accepted as a means to solve marketing and price problems of individual farmers in general, and of those supported by agricultural development programmes. Some, though not many, are successful. The case of longan groups illustrates long historical efforts of growers' groups and government to reduce marketing problems to maintain production growth.

Longan production and marketing system

Longan (*Nephelium longana*) is one of a few commercial native fruit species that was grown mainly in a few provinces in Northern Thailand. Recently, it has been planted more in other regions. Longan became more popular in the 1980s especially when the price of rice was not attractive. Therefore, farmers who could afford to go for permanent crops started to intercrop paddy with longan and replaced paddy when the trees become mature. So the planted area expanded from 14,318 ha (1979) to 52,472 ha (1996) (Figure 4.1). Longan is an irregular fruit-

Figure 4.1 Planted area, harvested area and total output of longan in Thailand 1979-1997

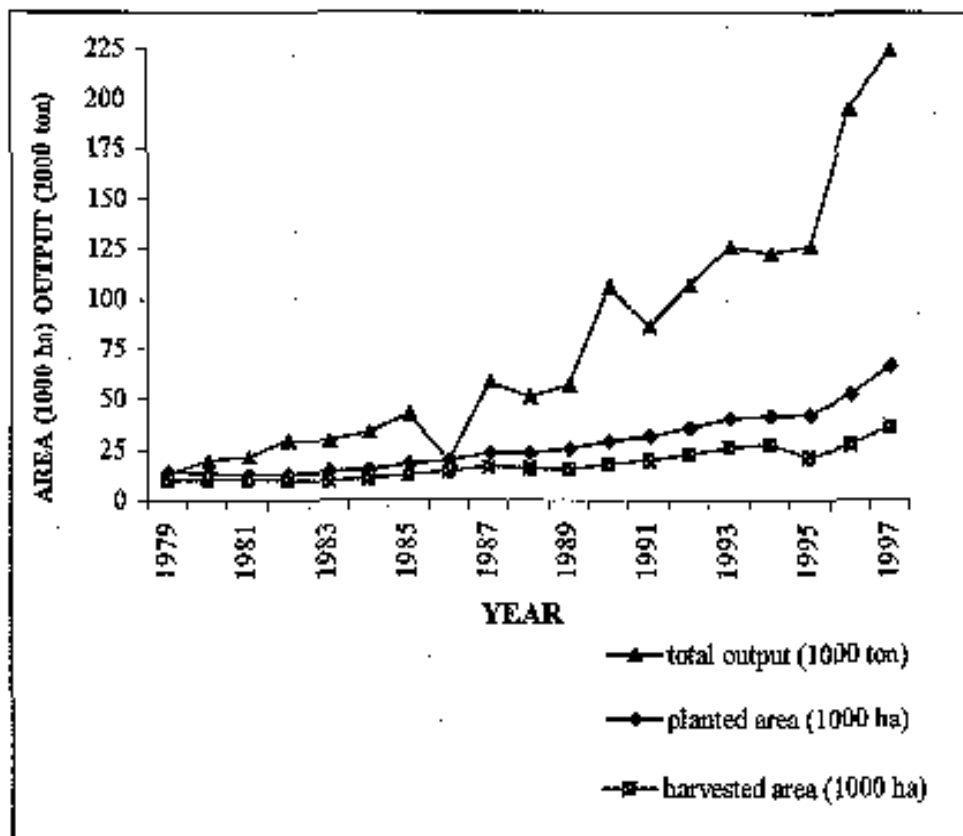
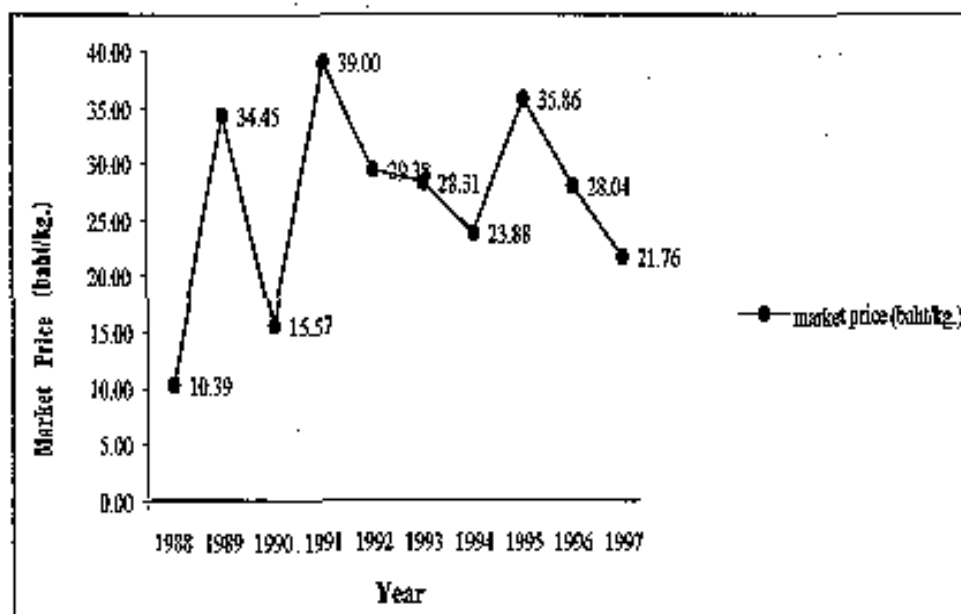


Figure 4.2 Market price and price/CPI of longan, 1988-1997



Sources: OAE (1998).

bearing tree; its production generally fluctuates considerably. Thus its market and real price have varied severely, with a declining trend.

Most longan production was consumed as fresh fruit in the domestic market – over 50% prior to the 1980s – but this declined to 30% by 1996. The export market was considered the most important outlet. Thus volume and price in the export market had a great impact on the domestic price. This problem was well recognised and concerned various parties involved in the longan business. Despite its being a regionally specific species, longan has been the most important export of fresh fruit from Thailand since the 1960s. The significant traditional markets are Hong Kong, Singapore and Malaysia which comprise 80% of total exports. The traditional way of trading to these countries was the consignment system. This created sequential problems. Exporters could not know in advance what prices they would receive since prices depended on supply entering into the markets on particular days. Exporters bore price risk and consequently offered low prices to their suppliers. The central domestic market, Bangkok, determined prices received by local merchants in the same way as export pricing. The pricing method has changed only recently when communication improved and the domestic market became less centralised. Currently, the price in Bangkok is known daily and instantly when local merchants make phone calls to check prices at the other end. Besides, exporters have their representatives assemble and make direct purchases from local assemblers in the production area.

Apart from being served fresh, longan can be canned or dried. Only 8% was processed during the 1980s but this increased to 40% in 1996. The processing sector recently played a significant role in absorbing a huge flush of supply.

The steady expansion of the planted area has brought about a sharp rise in total production (10 fold) and thus reinforced concern about the price problem.

Evolution of growers' organisation and efforts

Tracing back to the 1970s, local price was completely determined by the consignment system. The situation improved in 1980 when the government set a new export policy. As such, three parties – the Society of Longan Growers (SLG), the Thai Society of Fruit and Vegetable Exporters (TSFVE) and government officers – met to set minimum export prices to avoid price-cutting among exporters and suppression of local price. Under this policy, export quotas were only permitted to members of the TSFVE or listed names. But the rule was removed and exports became liberalised in 1984.

The role of the SLG in price bargaining disappeared when exports became freed, and because the SLG had no legal right to conduct trading. Small farmers were then left to stand on their own feet. It is noteworthy that during the time that the SLG was active, longan growers in general – especially large growers – did not participate in the SLG. Besides, they did not want to sell their produce via the SLG, in order to shorten their selling process. Exporters also persisted in buying longan from all possible sources – the SLG, general growers and local merchants.

In order to solve local marketing problems, the government initiated the “local central market” in 1981. Assigned government officers, the SLG, co-operatives and private sector tried to organise a central market for longan. However, the effort failed due to complicated procedures that required good cooperation from sellers and buyers. Besides, it needed the devoted efforts of an operational committee.

Recently, due to the sharp rise in total production, the SLG together with government authorities have attempted to solve the price problem by promoting demand. Prior to 1995, expansion of canned longan partly absorbed excessive supply during the peak period. However, anticipating further increased production and a drastic fall of the future price, leading growers together with the then Deputy Minister of Commerce (who was a member of the House of Representatives and a large longan grower) consulted a Taiwanese drying and exporting firm.

Drying longan from freshly harvested fruit (not free-falling fruit as traditionally practised) was promoted and mainly exported to China.

In 1996, the government granted 55 million Baht credit for growers to buy drying stoves under the Committee of Policy and Measures to Help Growers (CPMHG). The credit was managed by the Department of Cooperative Promotion (DCP), the Department of Agricultural Extension (DAE) and the Department of Internal Trade (DIT). The credit was channelled to co-operatives, women's groups or other farmers' organisations but not to individuals.

Dried longan co-operatives

Existing agricultural co-operatives came back to life after the promotion of the dried longan business and when the CPMHG emerged. In addition to being a credit channel for purchasing stoves, longan co-operatives also played a significant role in buying and selling dried longans. Sriboonchitta and Wiboonpongse (1998) reported on the case of a main longan co-operative which helped stabilise the dried longan price and promote competition in the industry. Furthermore, the co-operative provided grading and additional drying services for small members for product quality control. The final function was to collect repayment from its members and repay the CPMHG.

The co-operative also sold fertiliser on credit to its members and for cash to non-members.

Impacts of the dried longan policy

In addition to a few existing dried longan exporters in 1995, there were the Lamphun Dried Longan Cooperative and about 20 Taiwanese joining the business. This stimulated competition in the market and raised prices paid to growers. Sriboonchitta and Wiboonpongse (1998) showed that due to the expansion of dried longan, the price in 1996 was 28 Baht/kg instead of 20 Baht as feared (Figure 4.2). The price was only 4.4% below the previous 5-year average despite production being 43.8% higher over the same period.

The strategy formulated by the leading longan growers with the close co-operation of the government, expanded exports of dried longan from 3,648 tons in 1995 to 26,909 tons in 1996 and 38,075 tons in 1997. In 1996, the first year of the support change, this processing absorbed about 80,000 tons of fresh fruit (46% of production).

The dried longan business helped stabilise price variations during the harvesting season as seen from comparison of the coefficients of variation (CV) of price during 1992-1995 (before the strategy) and 1992-1996 (including the year of implementation of the strategy) i.e. 13.8% and 15.5% while the CVs of corresponding production were 7.64% and 25.20%.

The dried longan business changed local employment patterns. Before the boom of the dried longan enterprise, a severe labour shortage prevailed during the harvesting season as harvesting, grading and packing and top-dressing for the fresh longan market require skilled labour. However, in the case of dried longan, apart from harvesting, an unskilled workforce can carry out other activities. For example, total employment for a large orchard reduced labour from 21,000 man days (700 workers for 30 days) to 4,000 man days (400 labourers for only 10 days). The wage rate reduced from 200 -300 (depending on the type of activity) to 120 Baht. (This is because there was no need for grading and neat packing since the orchard sold its longan for drying instead of to the fresh market). However, drying longan created employment for unskilled labourers for least 261,000 man days per season of 2 months.

Value added generated by dried longan was estimated at the drying processor's gate at about 37,682 Baht (based on 80,000 tons of fresh longan).

Other effects of the dried longan business have been discussed in Sriboonchitta and Wiboonpongse (1998). It shows that longan growers realised that dried longan demanded a large volume and bid up the price of fresh fruit. In the past, longan was grown naturally and little fertiliser was utilised; however, the growers now are encouraged to apply more fertiliser and chemicals for pest and disease control. The group

committee had trained farmers to use natural control to protect the environment. However, this was not successful for growers with a large production area.

The attractive prices in 1995 and 1996 further increased improvement in growers' production and investment on production input. Presently, growers not only try hard to improve productivity, but also move forward to seek advanced technology. They sought out production techniques for off-season production. The significant shift in the production paradigm was observed only after the dramatic rise in export demand for dried longan in 1995.

Case 4: The cottage food industry

Disguised unemployment and non-productive labour in rural areas are common in developing and less developed countries. Once the non-agricultural sector becomes more advanced, labour migration from rural to urban areas begins. In Thailand, what used to be seasonal migration changed to permanent migration when the share of agriculture in the GDP dropped from 30% to 10% over the past three decades. While the non-agricultural sector was growing, it created seasonal shortages of farm labour and social-economic problems; to name a few, farm households pay less attention to improving farm productivity and increasing value added to their produce. The other main problem of concern to the national authorities goes beyond the economic issue to the social issue of ruined family structure, since most poor farm households were left with only the children and the elderly. Families might be reunited once a year at most. The knock-on effects of the above problems in the future could be tremendous.

To improve rural livelihoods in both the social and economic aspects, the extension of rural small and medium business became a strategic development programme in the 8th National Economic and Social Development Plan. This section is devoted to a description of the evolution and effects of rural cottage food industry based mainly on the study of Wiboonpongse *et al.* (1996).

Structure of the cottage food industry

Thailand's economic development was highly successful during 1985-1995, as observed from the annual growth rate of GDP of 7% to 13.3%. The agricultural sector seemed to decline in its role in generating national income as compared to other sectors. This is also true at the farm household level. Farm household cash income is derived mainly from two sources: cash farm income and non-farm income. The former comprises earnings from farm activities (crops and livestock) and off-farm activities (farm labour and food processing etc). This source accounted for about 25% of total household income. The non-farm occupation evidently became the major source of income (Table 4.3). It directly supports farm families and indirectly supports farming (Kramol, 1998). The role of food processing apparently was negligible in the overall picture in the past. Thus it has potential to help generate income, employment and utilisation of farm produce.

Table 4.3 Average farm household income by source in year 1991/92

Type	Average farm household income (Baht/household)
1. Farm cash income	6,878
- farm	3,583
- off-farm	3,294
2. Off-farm income	19,636
Total	26,514

Source: OAE., 1997.

Despite contributing an insignificant amount of cash income to households, food processing is common in all parts of the country. In 1993, at least a thousand million Baht worth of processed food was reported by the government survey of housewife groups' activities. The products are processed from fruit, vegetables, grains, fish and meat in descending order. They are all simply processed products, such as pickled, sun-dried, deep-fried, sweetened or salted products. Only a few are canned, or air-tight packaged in a factory and only by a handful of processing groups.

The government survey reported that 60% of the processing units were processing groups whereas the remaining 40% were individual processors. Most units (36%) were located in the northern region where fruits and vegetables are the major products. The North-eastern region accounted for the least, and was where family problems were encountered most. In terms of employment, in 1991 cottage industry engaged 7% of total households or 904,900 households (NSO, 1993). It employed 2 million people, 24.5% engaged in wood and furniture making, 16.2% in drink and tobacco processing and 20.5% in food processing. In general, the cottage industry provides supplementary employment and income during the off-farm season. However, in some regions such as the north where food processing is common, labour employment was more regular; that is, it occupied labour throughout the year (53%) compared to periods less than 6 months (3.7%) or shorter (10%). On average, about 1.9 to 2.3 household members became involved when their households engaged in cottage industry.

Government involvement

Sriboonchitta *et al.* (1996) found several government agencies involved in the cottage food industry as well as other cottage activities. However, two major agencies belonging to two different ministries were reported. The "Home Activity Unit" (HAU) under the Ministry of Agriculture and Co-operatives, to a high degree, is directly involved in promoting simple processing and setting up Farm-houswife Groups (HWG). This agency's mandate is to provide technology and promotion of cottage industry (non-food and food), emphasising 3 levels of producers:

1. For those lacking know-how, the HAU promotes utilisation and preservation of excess or unsold farm produce for home consumption.
2. Those with excess processed food are encouraged to be semi-commercialised.
3. Those already marketing their products are encouraged to become a fully commercialised small or medium business for the domestic and export markets.

The second important agency is the Department of Industrial Promotion under the Ministry of Industry whose mandate is to promote small and medium industry. This agency aims to raise the standard of products and support processing units to become commercialised. In other words, the advanced units of the first agency (HAU) become target clients of the second.

Beside both agencies, there are government and non-government bodies directly and indirectly supporting the cottage food industry through various programmes regarding processing technology, marketing, finance, and quality control. Most of the support pertains to the first three aspects and usually comes in extension packages. Without outlets, it is almost impossible for households to adopt the extension programme, and financial support sometimes comes from different sources.

As usually happens, what seems interesting and important today has a slow pace of development. Despite the activities seeming closely attached to farm households, it has taken three decades. The first stage of the work by the HAU to promote preservation for home consumption began in 1968, but the full concept of business management was introduced only recently in the early 1990s. The government policy was made explicit in the current 8th National Plan (1997-2001), in connection with the overall promotion of the agro-industry policy. As for the cottage level, the government emphasis is to establish linkages between the private sector and cottage level by supporting the activities conducted by communities or groups. Support would be provided on research and development of new products and provision of information, production technology, marketing and finance. Presently more budget has been made available for cottage industries and loans are more accessible to group processing units namely, the "Government Saving Bank" and "Small Industry Fund Cooperation". During 1996, supply of loans exceeded the requests partly because group processors did not have information about the loan.

The business

The case study included 4 provinces in northern Thailand. Census figures show 431 groups and 422 individual processors. Most of the groups (93%) were "Housewife Groups" (HWC) under the initiation of the HAU. The remaining 7% are the groups under the supervision of agencies related to rural development/livestock/fishery cooperative extension. Almost 70% of processors (both groups and individual) are small in size according to the Industry Department's definition, i.e., having less than 7 employees. However, businesses can also be large, as it was found that almost 5% of processors had more than 20 permanent employees.

The annual production of an enterprise varied from 5,000 Baht to 22 million Baht. About 50% of the enterprises' production did not exceed 30,000 Baht per year. These businesses processed picked vegetables or fruit, dry chilli or fish, candies and snacks. The larger value businesses are usually in processed meat production. However, a few enterprises are quite diversified; the census shows that 60% specialised in a single product, about 20% produced 2 products, and the remainder processed up to 14 different varieties.

During 1993-1995, the business expanded remarkably. The overall growth rate was 34% *per annum*, mainly contributed by the expansion of groups' production (165% *per annum*). The rate of the individual processors was 5% *per annum*. This indicates the efforts of the HWCs and the HAU, and the expansion of market demand. Seventy per cent of the sampled businesses enjoyed success but 23% were unsuccessful. The former indicated that their success heavily depended on the marketability of quality products. About 50% predicted they could expand their business because of two main factors – increasing demand for their products and availability of raw materials – while the other 50% of the sample businesses did not foresee any expansion because of the limitation of both factors.

The research found potential for the industry due to three important reasons: economies of size existed; the processors seek to improve their



Members of the Housewife Group processing soybean sauce

product quality to meet standards of urban consumers; and lastly the increasing demand for the products due to tourism and promotion of home-made products with no preservatives.

Effects of the cottage food business

Among others, two major impacts of the cottage food industry are reported. Firstly, the business is highly labour intensive. Most processors employed ordinary kitchen tools and equipment and simple production techniques e.g., for cutting, slicing, grinding or packing. As for the HWG, the group leaders mentioned one of the objectives of their groups is to provide work opportunities for housewives, as well as to provide work within their villages so that they can take care of children and run the household. Equally important is for them to earn additional income. Their earnings are mainly from their labour rather than from profit. About 30% of the groups provide jobs for all members. Fifty per cent of the groups have less than 40 members. The largest group had up to 150 members. Therefore, it is possible for large groups to partially employ their members. About 6% of the groups did not have enough labour

and needed to hire non-members, and 30% of individual producers also hired in labour.

Secondly, as expected, almost all of the raw materials are local; 90% of processors used local raw material. As for the HWGs, the groups are attached to the "Farmers Group" which their husbands belong to. Thus, some HWGs (13%) were established with the purpose of solving the problem of selling their farm produces at low prices. Some processors also imported the main raw material (fish) when the local supply became scarce, after their business became established and well expanded. Some raw materials were collected from the forest, e.g., bamboo, and some vegetables were home produced for the purpose of processing by small groups or individuals.

As reported by Kramol (1998) in her study on impact of off-farm employment in the same area, 88% of income earned from off-farm (farm related including food processing/non-farm) activities were spent for family expenditure (54%) on education (15%) and health and



A main outlet is selling at any (agricultural) fairs

others. About 12% were used for farm investment. Off-farm income also allowed net returns from farming to be reinvested in farm activities.

Farmers preferred to earn from two sources than one (farm and off-farm) in order to secure stable and higher income (from off-farm employment) due to the needs for a better standard of living and education. In terms of total employment, males worked about 230 man days/year while females worked 326 man days/year (118 man days/year for off-farm).

From this research, farm production and productivity were hardly affected by off-farm employment of either farmers or their wives. The off-farm employment did not change their cropping systems or production management.

This study implies that housewives could earn higher income when cottage food industry expands and benefits could accrue to farm families while maintaining farm productivity.

Conclusions and recommendations

Process of research: from policy research to recommendation

The case studies, which highlight the key features of sustainable agriculture, cover a wide spectrum of land use patterns, production systems, and marketing arrangements. Each case represents specific target groups that possess their own unique problems and potentials.

The outcomes of the case studies were used in several ways with the aim of presenting their strengths and policy implications. First the on-farm case studies were presented to farmer communities to get their feedback and develop an action plan. The main participants in the forum were local groups, such as farmers, farmer leaders, and Tambon (subdistrict) administrative officials. The findings were then presented in local seminars and workshops organised jointly by NGOs and the Regional Agricultural Research and Development Office. Since 1995, the local and regional networks on sustainable agriculture, spearheaded by NGOs and with the collaboration of governmental research institutions and universities, have become increasingly active in trying to draw conclusions from various cases and to formulate policies.

The case studies on contract farming, off-season commodity production and group marketing received more attention from wider audiences, from the farmer-producers, private, and governmental sectors, particularly from Departments of Commerce, Agricultural Co-operatives. The cottage food industry was attended by high-level officials from the Department of Industrial Promotion (Ministry of Industry), provincial representatives of the Food and Drug Administration (Ministry of Public Health) and the Department of Business Economics (Ministry of Commerce).

The impacts of selected government agricultural policies on agricultural production growth were evaluated by the researchers.

The process from policy research to recommendation in the PTW study involved case studies, farmer fora and seminars and workshops involving more stakeholders from public and private sectors, local NGOs and universities.

The most important elements of "success"

The most important elements of "success" in terms of SARLs include:

- Integrated land use with diversified cropping systems that fit farmers' circumstances, such as the Karen's adaptive strategies, to integrate farming and forest utilisation and to overcome food deficit.
- The ability of hillslope farmers to make use of an ecological setting that provided a specific niche for certain commodities with a comparative advantage, e.g., the *Miang* system on sloping hills.
- Strong farmer organisation and good managerial skill to speed up the process of success, e.g., the contract potato farming system.

In term of *policies, policy instruments, and policy process* the elements of success could be highlighted as follows:

- The integrated production-marketing arrangement, either established by private initiatives or government policy support, would help to achieve the government policy of promotion of export of high value added, high quality products, e.g., contract farming, group marketing etc.
- The successful adoption of conservation farming on the hillslope could be attributed to the understanding of local forest authority on the plight of hillslope farmers, the initial rice aid programme as an incentive of land transformation, and policy of land use rights for the adoption of sustainable land use practices. The close collaboration between hillslope farmers and forest officials helped promote the success of conservation farming.

- The “top-down” policy based on local needs can be successful when it is accepted and implemented by strong farmer groups with the close collaboration of the local authority, such as off-season mango or longan production.

The “institutional practice/dynamics” in supporting success stories

Institutional practices/dynamics are observed when a community or farmer organisation works towards the same goals. The Karen community copes with food insecurity by protecting and utilising forest resources with cultural rules and regulations, and by sharing food grains with those in need. The resource use conflicts within a community will be first attended to by the senior citizen or the respected individuals, and in very few cases are the conflicts handed over to the state authority. The culture of sharing and the attitude of maintaining the balance between man and nature help create the environmentally concerned, low-input production systems of the community in the highland.

The potato contract growers have set up the potato grower cooperative (PGC) to diversify the potato production system. The PGC is the only organisation that has been authorised by the government to import cooking potato tuber seeds. The local officials also help regulate the contract arrangement between growers and the processing companies; in return, the companies can estimate the production capacity that each company could share in the area. This “Win-Win” situation or interdependent relation between the contract growers and companies helps stabilise the production and farmer income.

The case of potato exemplifies government policy on supply control of cooking potato, an integrated-production-marketing system running from central governmental level to local practices. It also exemplifies the process of conflict resolution (prices, grading, etc) between farmers and processing companies.

Communication between people at different levels

The government policy on decentralisation and the process of local empowerment materialised when the Tambon (sub-district) Administrative Organisation (TAO) was established in 1994. The TAO is the lowest in the hierarchy of the local administration (Province-District-Tambon) that legally and administratively makes decisions on the utilisation of local resources, conflict mitigation, community development, etc. Thailand has about 7,000 Tambons, but not all Tambons are eligible to set up a TAO; for instance those villages in the remote areas on the highlands. Each TAO will receive an annual budget of 3 million Baht as operating funds for community development from the central government. The TAO also collects certain fees and taxes such as land tax, billboard tax and abattoir fees for Tambon development funds. The financial resources of each TAO will, as a consequence, be different. The TAOs in the lowlands with high agricultural potential will be better off than those in the highlands, and so will have more bargaining power when dealing with external private investors, as in the case of contract farming, or group marketing of high value commodities such as potato, longan etc.

The TAO can also deal directly with governmental institutions for support services, such as credit, information, inputs, and sites for development projects. Since their inception, the TAOs throughout the country are still concentrating their efforts on building infrastructure, such as road construction and water supply.

The TAO has great potential for agricultural development if the organisation can formulate its own action plan on sustainable agriculture and seek support from the Ministry of Agriculture and Co-operatives (MoAC).

The members of the TAO will be elected from the local community; the chairperson is generally politically active and an influential community leader.

The production groups or marketing groups within a Tambon could have strong farmer organisation. The potato grower group in the contract farming at San Sai and the longan grower group in Chiang Mai were very effective in dealing with government authorities or local politicians. Since the commodities are major income earners, and price instability will have an adverse effect on large numbers of farming communities, their problems are normally being looked after by the government authorities.

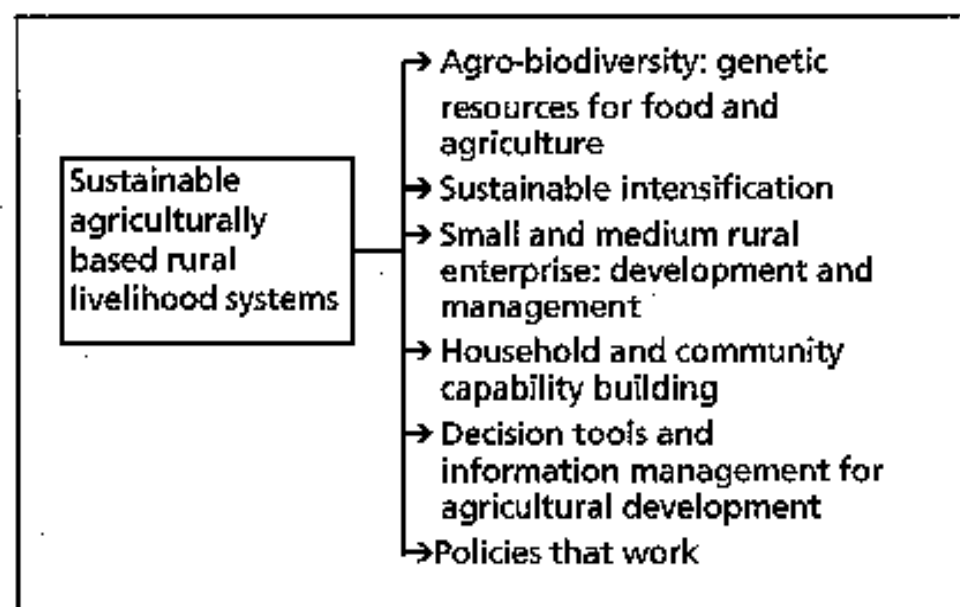
On the other hand, the ethnic hill tribe communities who are less powerful will always find it difficult to get their message across to the authorities. These excluded and less privileged communities seek support from the local NGOs and academics to voice their hardships, such as being deprived of their land use rights, access to community forest and citizenship. Several fora concerning sustainable resource management in the highlands were organised either by NGOs or jointly by NGOs and research institutions and universities to allow the hill tribe ethnic groups to have open discussions with the representatives of government implementing agencies. Although the impact was not spectacular, the public has become more aware of the issues and there are growing concerns about the welfare of those highland ethnic communities.

Positive discoveries from the study

To achieve sustainable agriculturally-based rural livelihood systems, a combination of key system components interact together, as depicted in Figure 5.1. All these recommendations require external intervention but should be built upon the existing local knowledge and experiences. There would be changing roles of the public sector to provide the right services to the rural poor. Information and management that help farmers' decision making should be designed for improved efficiency. The post-production food processing cottage industries have shown to be powerful means of social development in the rural community by creating employment, stopping out-migration and promoting family togetherness.

The policy processes that involve participation of various stakeholders will be more effective than the conventional top-down approach.

Figure 5.1 Components of sustainable agriculturally based rural livelihood systems



Changes in the policy process

The proclamation and implementation of the new national constitution and the economic recession since July 1997 have forced the government and authorities to be more open, and to respond to the excluded sectors of society. Good governance, transparent administration and accountability are a few of the social demands made by the middle class and the representatives of the National Forum of the Poor.

To cope with risk and uncertainty and the degrading of water resources, the MoAC also launched the Agricultural Restructuring Programme in 1994 to reduce rice production in the unfavourable growing areas. Furthermore, the programme aimed to reduce the production of certain crops that show declining export potential such as cassava, pepper, coffee, and rubber.

In northern Thailand, the rice farmers were encouraged to transform their monoculture of rice into integrated farming systems, where the

MoAC provided certain input assistance such as fruit tree seedlings, farm pond excavation service, and vegetable seed materials. The result of Phase I (1994-99) was shown to be satisfactory. The MoAC has decided to launch Phase II by providing loans to farmers of Baht 300,000 per household with a 3-year grace period, beginning the fiscal year 2000.

The adoption and extension of the "New Theory" integrated rice-based farming system in the lowlands by the governmental ministries has helped promote the principle and practice of SARL. With the collapse of financial institutions and the chaotic consequence for the industrial sector, agriculture is now regarded as the main strength for economic recovery. Food security and economic self-reliance, particularly for the excluded, have become a high priority to cope with this economic crisis.

With these new changes, it is anticipated that policies that would enhance integrated land use systems, production systems that are economically self-reliant, small- and medium-scale rural enterprises, and strengthening local organisation will continue to be the main development programmes.

For the first time, sustainable agriculture has been included in the 8th National Social and Economic Development Plan (1997-2001). Sustainable agriculture is expected to continue to be the major thrust of agricultural development policy in the following plans.

Policy options

The policies that work for SARL should include the following frameworks as a guideline:

- Develop safe production systems
- Increase rural employment
- Enhance household food security
- Produce value added products or processed products
- Strengthen local organisation

The case studies have indicated the above guidelines are achievable, although they have not happened in all cases. Given the Thai political context (coalition government) and economic context (long process to recovery), integrated land use, either rice-based or non-rice-based systems will continue to be the most viable production practice for food security, and a self-reliant economy for small farmers.

The policy recommendations are (see Figure 5.1):

- An integrated production-marketing arrangement to develop production alternatives, and to produce high value, high quality products that are competitive in the export market, e.g., contract farming, group marketing, etc. Local government offices that oversee such arrangements should be equipped with information and *technology based management skill that could help farmers making decisions*. The emphasis is on developing decision tools and management of information systems. The training of local officials such as agricultural extension agents, community development workers and NGOs should be incorporated.
- Promotion of post-production, small and medium scale agro-food processing cottage industries to create rural employment, and to increase value added food products. Most food processing cottage industries are operated and managed by womens groups, from processing to marketing. The system could also enhance closed-link social structures and better household relationships. The food processing and packaging technologies should be further emphasised. The roles of biotechnology on agro-food processing also offer potential for quality products and efficiency improvement.
- Strengthening local organisation through building human capability. A number of successful cases on contract farming and group marketing have shown that the top-down policy would be achievable when the action plan or programme is suitable for farmers, and when farmer organisation is strong enough to be able to commit and *execute it effectively. More action plans should be directed towards empowering the excluded.*

- Environment-oriented production systems would be the recommended land use practice for the highland ecosystem. The ethnic communities should be given land title and the right to control of, and access to, forest resources. The Karen case has shown that the community is capable of protecting forest resources, and integrating it with the household livelihood system.
- The price instability of major export commodities has caused farm gate prices to fluctuate and with it, farm income. The establishment of futures markets for export commodities would hedge against price risk and so the price farmers could expect to receive would be more stable. The futures markets of selected commodities are already in the plan. Government should speed up the process and have the systems operated to include more commodities. The information network at the subdistrict (Tambon) level should be established so that information on supply, demand and price of agricultural commodities could be accessible.

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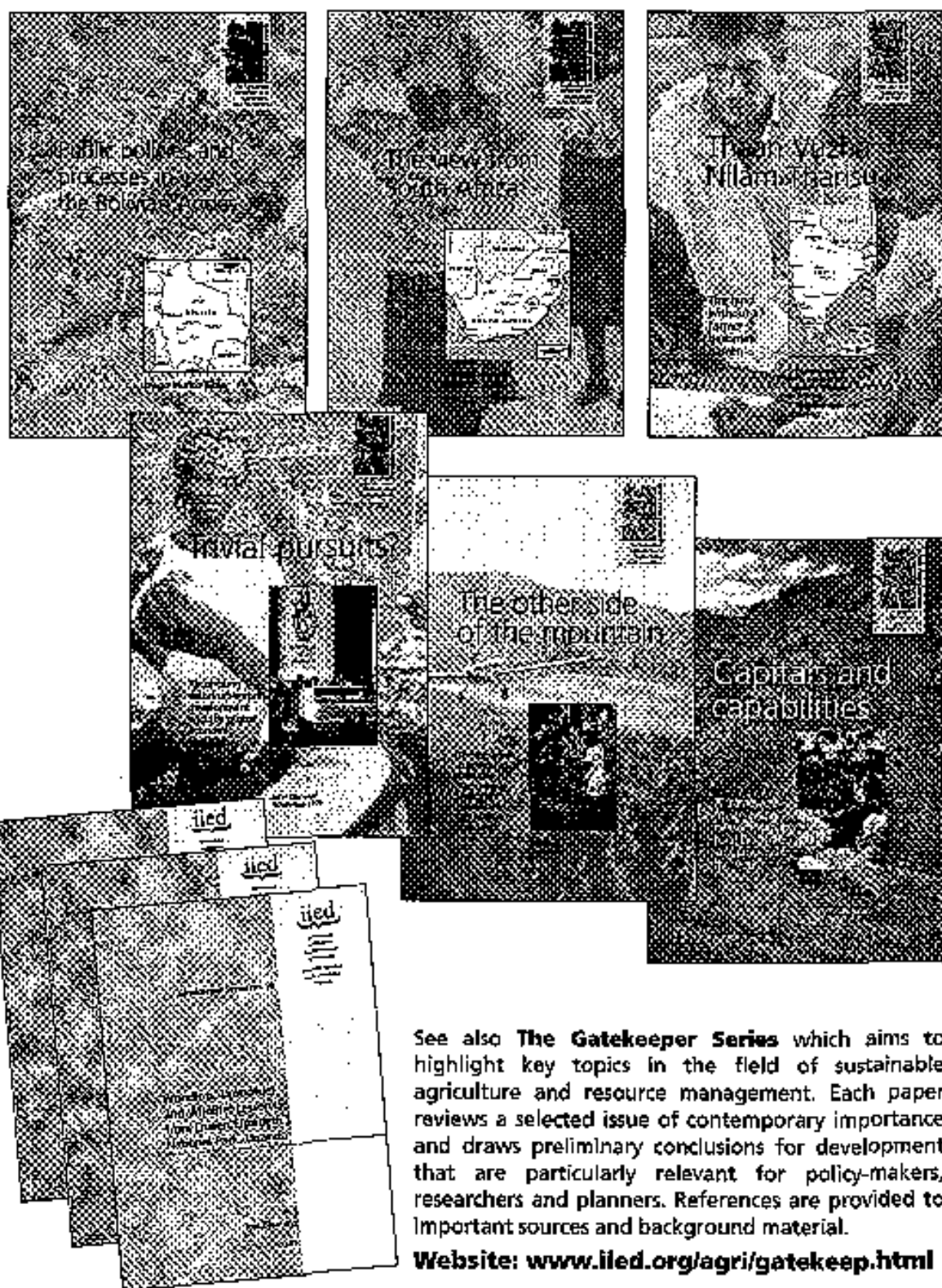
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