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**Marketing Local Biodiversity in Thailand: Identification of a Possible Good Practice for On-farm Biodiversity Management of Tropical Fruit Trees**

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**Abstract**

In Asia a rich diversity of approximately 500 species of tropical fruits are important in people's lives by providing a range of livelihood options and contributing to the stability of ecosystems. This diversity is threatened by increased deforestation, indiscriminate harvesting practices and land use conversion. Increasing attention is being given to conserving agrobiodiversity at farm level and in the wild, by creating forward market linkages by processing a range of products of different varieties. Monitoring of sustainable use and management of diversity has been insufficient, especially among perennials. It is therefore necessary to identify a set of good practices that support conservation and sustainable utilization of diverse tropical fruit species, to understand the situation in which these practices are successful, and to identify their role in terms of responding to pressures urging farmers to switch to modern plant varieties. It is especially important to identify good practices that benefit farmers. Market-based approaches to biodiversity management are considered to have large potential in this area.

This paper presents the experience of a good practice in Thailand, where four farmer or women groups are successfully processing and marketing products derived from native tropical fruit tree varieties. These products are providing income to groups of less than 50 members by procuring their fruits, paying wages for their labour, and distributing profits, and are giving them an incentive to maintain or expand local fruit tree varieties in their homegardens and fields. Groups were established because of unmarketable fruits, due to oversupply or damage caused by storms, have specialized in locally important products, and have received training and financial support from the government. These similarities indicate the factors playing a role in bringing together and empowering these groups, and facilitating the successful marketing of their products. Also some obstacles are identified such as difficulties faced to obtain food safety certificates and lack of attractive packaging and promotion. Although more in-depth research is necessary, important lessons can be learned and tools can be identified that can be tested and implemented for the benefit of farmer income and biodiversity.

**Introduction**

In South and Southeast Asia a rich diversity of approximately 500 species of tropical fruits are present and contribute to people's livelihoods through food security and the generation of income. They also provide a range of social and cultural attributes and contribute to the stability of ecosystems. This diversity is threatened by increased deforestation, indiscriminate harvesting practices and land use conversion. Increasing attention is being given to the management of agrobiodiversity at farm level and in the wild. Incentives that encourage farmers to maintain diversity on-farm can for example consist of certain characteristics of diversity that increase resistance to pests, enhance the diversity of food intake, or reduce farm risks. Recently, attention has increased for the creation of direct economic incentives by improved marketing of agrobiodiversity products. This approach, in which forward market linkages are created by processing a range of products of different varieties, is considered to have high potential (Rietbergen et al., 2002). Especially among perennial species, the monitoring of on-farm management and use of biodiversity has been insufficient and this is certainly the case for these market-based approaches. It is therefore

necessary to identify a set of good practices that support conservation and sustainable utilization of diverse tropical fruit species and to understand the situation in which these practices are successful. Pressures urging farmers to switch to modern plant varieties and reduce on farm diversity are manifold and it is important to understand the role that the identified practices can have to respond to these pressures (Sthapit et al., unpublished). Most importantly good practices have to be identified that benefit farmers and contribute to their livelihoods.

In Thailand a good practice was identified that has the potential to meet the criteria identified. Womengroups, supported by a governmental program, are successfully marketing locally specific agricultural products. A study was conducted to increase the understanding of the context in which this potential good practice functions and the impact it has on people's livelihoods and the agrobiodiversity maintained on farm. Informal interviews were conducted with three women groups and a community group to understand the situation in which their processing activities have become successful. In this paper these four cases are described and compared in order to come to conclusions about the driving forces behind these groups and their impact on biodiversity.

### Thailand's OTOP program

The 'One Tambon One Product' (OTOP) program is based on a similar Japanese program and was put in place by the Thai government in 2001 to improve the locally available resources and produce goods that are acceptable internationally in order to help encourage and promote tourism in Thailand down to the village (tambon) level and increase rural income from the sale of their products (OTOP website).

The Department of Agricultural Extension (DoAE) is responsible for the support of over 10,000 OTOP womengroups that are producing, processing and/or marketing agricultural products. The Department of Rural Development (DoRD) is responsible for all other OTOP groups, which are involved in the manufacturing of non-agricultural products such as handicrafts. Focus of the OTOP program is the improvement of rural women's income and the promotion of the use of village specific material. Distribution of the OTOP villages depends on the availability of potential local products and is therefore not equal over the country. There are approximately 7,000 offices of the DoAE in the country, which are easily accessible for a majority of farmers. The availability of this assistance is widely known among rural communities. The program provides processing equipment and capacity building and training in areas such as organisational skills, processing techniques and food safety and hygiene. With the latter it is also supporting the attainment of a certification of the Food & Medicine Department (FMD), which is a food safety and hygiene label. Government is investing heavily in the program, although it has been reducing in recent years. Table 1 shows the investments of the years 2003-2006 in Thai bath<sup>1</sup>. In order to improve the targeting of investments each year the investments have a specific focus. In the year 2005 for example this was training of the OTOP groups.

Groups supported in the OTOP program have been rated into categories, identified by stars (\*) with \*\*\*\*\* as the highest category, based on certain quality aspects such as organisation, hygiene certification and packaging. The rating is decided upon yearly by a committee including officers of the DoRD and DoAE (DoRD, personal communication).

**Table 1. Total government investment in OTOP program 2003-2006**

Year	Amount Thai bath	Focus
2003	22,000,000	
2004	64,000,000	Equipment
2005	22,000,000	Training
2006 (predicted)	10,000,000	Improvement of *, **, *** products

### Case descriptions

#### *Kumsai community group processing lime, \*\* OTOP*

The community of Kumsai consists of 85 families and is located in a buffer zone of a national forest. The group, which is producing pickled limes that are used for a traditional dish with chicken or pork, consists of 10 families and is headed by the head of the village and can be considered as a small enterprise owned by the

<sup>1</sup> 100 Thai bath = US\$ 2.60

head rather than a cooperative. Members are presently unable to buy shares, there are no credit facilities and there is no profit distributed at the end of the year. The members however do have a guaranteed outlet for their limes and a source of non-farm employment.

The group was established in 1972, based on the ideas of a newspaper column promoting jobs for the poor. Since the establishment the group has been processing on a 'learning-by-doing' basis. It was not until the group joined OTOP in 2004 that the head attended a training-workshop and learned new skills for the production of new products such as dish-wash-detergent. Only recently the group was trained by several governmental departments on different aspects of processing including the design of a label.

The member families have each planted 300-500 lime trees of the following three local cultivars: 1) Pan, a fragrant lime which has the highest market value and is used to produce the pickled lime product; 2) Piubang (thin skinned), which is also used for the pickled limes; and 3) Piuna (thick skinned), which is used for the production of dish-wash-detergent. Area planted under lime has expanded, but mostly of the Pan cultivar. Total yearly harvest is approximately 5 tonnes, of which 1 tonne is processed and the rest is sold fresh. Raw material is only procured from the members. Prices are subject to major fluctuations ranging from over 200 Thai bath per kg (US\$ 5.20) in April, to 10 bath (US\$0.26) per kg in June owing to oversupply in the latter month.

The limes are graded according to size and separately processed. Raw material is treated with a salting procedure which takes approximately seven days and depends on the availability of sunshine for the drying process. The end-product is packed in jars and can be stored up to two years. The product is available in three different package sizes based on the size of the fruits (jar content 200, 400 and 1500 grams). Table 2 presents the costs and benefits of each of these product types. Profits per jar range from 8 bath for the largest to 47 bath for the medium sized jars.

**Table 2. Description and costs and benefits of three pickled lime product types**

<b>Unit content</b>	<b>200 grams</b>	<b>400 grams</b>	<b>1500 grams</b>
<i><b>Description</b></i>			
Number of fruits	11	30	55
Size of fruits	Medium	small	large
Type of jar	Glass	plastic	plastic
<i><b>Costs (bath/unit)</b></i>			
Raw material	15	15	25
Labour	15	20	75
Jar	5	3	7
Seal	2	2	2
Label	3	3	3
<b>Total production costs</b>	<b>40</b>	<b>43</b>	<b>112</b>
Sales price	70	90	120
<b>Profit</b>	<b>30</b>	<b>47</b>	<b>8</b>
<b>Margin</b>	<b>42.9%</b>	<b>52.2%</b>	<b>6.7%</b>

Each year approximately 3000 jars are produced. The final product is sold to the districts OTOP shop, the local market, small retailers (such as petrol stations) and at the OTOP festival in Bangkok. It forms the basis for a traditional local recipe and is therefore popular with local restaurants. The smallest jars are preferred by local customers, while the larger ones are mostly bought by restaurants. After joining the OTOP program sales have gone up about 20%, due to increased attention, advertisement and the OTOP festivals. Peak season is during March and April when fresh limes are not available.

The group does not have a hygiene and food safety certificate of the FMD which severely hinders their marketing activities. They are expected to receive financial support from the provincial government to build a processing unit in the near future, which will create opportunity for the production of new products such as shampoo and facilitate the attainment of the food safety certificate and a subsequent enhancement in OTOP category.

*Banhindad women group processing bananas, \*\*\*OTOP*

The womengroup was established in 1995 as a harvest group because of severe banana oversupply and a consequent drop in price. Women came together and requested for assistance from the extension office in the

district. The group presently has 32 members, who each can buy shares at 100 bath (US\$2.60) per piece as an investment in the cooperative. Profits to their investments are distributed annually. The womengroup also provides credit to its members at 6% interest per year, which is about half of regular credit schemes. The group was assisted by two governmental departments in terms of capacity building, to improve the organisation of their group and their processing techniques. Financial support was provided to build their processing facility and purchase processing equipment.

The group's main product is baked banana. Raw material, banana of a local cultivar named Maliaong, is bought from both members and non-members. Banana bunches (of about 10 kg) are bought at 3 bath per kg. The area of banana is expanding and fresh banana is sold to other provinces. The banana oversupply that triggered the women to organise therefore no longer exists, although the area of banana in the region is expanding. This is mainly due to the fact that fresh banana is also sold outside of the province. However, the direct and indirect income provision of the value adding activities and the success of their undertaking has been a sufficient incentive for the group to continue their processing activities.

The bananas undergo an elaborate baking process and a week is required to process 300 kg of raw material. The product is then packed and labelled. Processed in this manner the final product can be stored for 3 months. For exports product can be produced that can be stored for 6 months. The product is available in three different sizes, small (300gr), medium (300 gr) and large (400 gr). Profits of the different package sizes are 5, 7 and 14 bath and margins 25, 29 and 40% respectively. The exact costs of the medium sized unit for one batch of 300 units in bath are shown in table 3. In 2005 the quantity produced was approximately 10 tonnes, processed into 5 tonnes of final product and sales equalled 2,194,500 bath (US\$ 57,057).

**Table 3. Costs and benefits of medium sized unit of banana product (in Thai bath for a batch of 300 units)**

<b>Item</b>	<b>Cost/300 units</b>	<b>Average cost/unit</b>
Bananas (7 bath/unit)	2100	7.00
Gas	280	0.93
Labour (5 persons, 100 bath/person)	500	1.67
300 boxes (1.5 bath/box)	450	1.50
300 stickers (1.5 bath/piece)	450	1.50
2 bottles of honey (100 bath each)	200	0.67
300 plastic packages (1.5 bath/piece)	450	1.50
3 trips of transport (200 bath each)	600	2.00
Insurance (1 bath/ unit)	300	1.00
<b>Total costs</b>	<b>5330</b>	<b>17.77</b>
Sales price (25 bath/unit)	7500	25.00
<b>Profit</b>	<b>2170</b>	<b>7.23</b>
<b>Margin</b>		<b>28.9%</b>

The product is sold in the head's own shop, at the local markets in the province, in tourist shops, in supermarkets. Peak season is during New Year and in January and February coinciding with the peak tourist season. The group has not yet received a food safety certificate of the FMD. Obtaining this would upgrade them to a \*\*\*\*OTOP.

#### *Lad Thong Patana women group, processing mango, \*\*\*\*OTOP*

The most important product this womengroup is producing is pickled mango made of a native mango cultivar, named Kaew. Other products produced are chilli paste and soy bean balls. The group was established in 1991 with 42 members, but later split up, specialising in different products, and presently consists of 20 women. All members can buy shares at 100 bath per piece as an investment in the cooperative. The womengroup also provides credit to its members at a lower interest rate. The formation of the group was triggered by a period of oversupply and damaged fruits, which led the village leader to bring together the female community members to stimulate them to organise themselves. The assistance of the DoAE was sought who trained them in processing techniques, later refined by a local university.

Raw material is procured from members and other farmers in the community. During the mango season, approximately one month at the end of April and beginning of May, as much fruit is procured as the group can afford which is approximately 20 tonnes per year. The price of raw material is 4 bath per kg. Upon arrival at the processing unit, fruits are sorted and washed and immature fruits are returned to the delivering

farmer. Fruits are graded according to their size; large fruits (250-300 gr each) are processed into semi-processed products and small fruits (200 gr each) are processed into final products. Then they are stored in salted water for at least a month. In these conditions the mangoes can be saved up to a year. All labour is provided by group members at a wage rate of 150 bath per day. Containers for storage were provided by the DoAE and the assisting university. All processing activities are done manually. The semi-processed product is packed in plastic bags of 10 kg each and sold to two wholesalers that sell it to small retailers (operating on motor bikes and roadside stalls). The remaining share of mangoes is treated with salt, citric acid, sugar, and water and then peeled, cut and packed in glass jars or plastic bags. In the glass jars it can be refrigerated up to 6 months. Table 4 presents the costs and benefits of the pickled mango product for a batch of 90 kg and packed in glass jars. Profits are approximately 15 bath per jar. The product is also packed in plastic bags (of 1 kg) which cost 40 bath to produce and are sold at 80 bath but can be stored for a shorter duration of time. Semi-processed product costs 6 bath per kg and is sold at a price of 12 bath per kg.

**Table 4. Costs and benefits of pickled mangoes (in Thai bath for a batch of 90 kg)**

Item	Cost/container of 90 kg	Average cost/jar of 100 gr
Fresh mango (4 bath/kg)	360	1.20
Other ingredients (bath) (approx.)	4200	14.00
Labour (4 persons, 150 bath/person)	650	2.17
300 jars and seals (16 bath/each)	4800	16.00
300 labels (1.5 bath/piece)	450	1.50
<b>Total costs</b>	<b>10460</b>	<b>34.87</b>
Sales price (50 bath/unit)	15000	50.00
<b>Profit</b>	<b>4540</b>	<b>15.13</b>
<b>Margin</b>		<b>30.3%</b>

Total production is 20 tons per year of which 15 tonnes is processed into approximately 5 tonnes of final product and 5 tonnes is processed into semi-processed product. Gross income is approximately 120,000 bath on an annual basis. The final product is sold at OTOP festivals and at 25 local markets. Peak season is June-August when supply of other fruit products is low.

The Department of Science Services assisted with the design of the label and an officer of the FMD provided food safety training and certification. Major constraints for the group include the vacuum packing of the product, which could be solved by a appropriate equipment (a sterilizer), and the availability of working capital to buy raw material and other inputs.

#### *Klongnarai women's group processing garcinia cowa leaves, \*\*\*\*\*OTOP*

The group is based in Chanthaburi province in Thailand and is processing several products derived from a range of tropical fruits, one of which is *Garcinia cowa*, commonly known as cowa-mangosteen or cowa and in Thailand as 'cha muang'. *Cowa* is a small to medium-sized tree that in Thailand is found in lowland, undulating areas and peat swamp forests. Both the young shoots and the fruit (berry) are edible. Data indicates that the young cowa leaves contain a high level of vitamin A and vitamin C (Yapwattanaphun et al. 2002).

The group, which was established in 1983, was the first cooperative group in the district. In recent years it has joined the OTOP program. Presently the women's group consists of 40 members, who each can buy cooperative shares at 100 bath each. Members provide wage labour for processing, mostly at night, while their days are spent tending to their orchards. Time spent depends on the orders that are placed. The cooperative also provides low-interest-rate credit facilities to its members.

The start of the process of cooperative establishment can be attributed to a major storm that damaged the community's durian and mangosteen trees and caused the still immature fruits to drop. Quality of these fruits was considered to be too low to be marketed as fresh products and therefore it was decided by some of the female members of the community to process the fruits in their homes. Products produced included durian sugar concentrate and mangosteen paste. The districts agricultural extension office assisted them in the establishment of the cooperative and provided capacity building on processing. This encouraged the group to process more frequently from their homes and start including other species. In 1996 the group had managed to streamline the organisation and had become an example for other groups, illustrated by the receipt of a

provincial award for the conduct of their organisation. At this time the cooperative was producing and packing a local Thai dish with cowa leaves (Moochamung), shampoo from citrus cultivar Bergamoc and durian, tamarind and mangosteen paste. Supported by the department of agricultural extension (and aided by the fact that they had received the award) equipment was purchased and in 2002, with partial support from the district government, a shop and processing facility were built.

Capacity building of the group was also conducted by several governmental and non-governmental institutes on packaging of the product (from glass jars to cans) and hygiene and food standards and acquired the food safety certification.

Raw material for the Moochamung is procured from the members of the cooperative, who harvest the fresh, young shoots from their homegardens and in some cases from the wild. When trees become too high to easily harvest the leaves, trees are either cut halfway or new seedlings are planted. Other ingredients (such as pork, lemon grass, garlic, shallots, carrots, ginger, dry chilli, chilli paste, fish-sauce, sugar) are either collected from the homegardens or bought at the supermarket. The final product is canned in cans of 230 grams each and labelled with a label designed by the cooperative itself. Table 5 gives an overview of the costs and benefits of a batch of 100 kg of Moochamung. Profits are estimated at approximately 5 bath per can.

**Table 5. Costs and benefits of cowa dish Moochamung (in Thai bath for a batch of 100 kg)**

<b>Item</b>	<b>Cost/100 kg batch</b>	<b>Average cost/can of 230 gr</b>
45 kg of cowa leaves (25 bath/kg)	1125	1.13
Other ingredients (bath) (approx.)	10000	10.00
Labour (9 wage days, 100 bath/day)	900	0.90
1000 cans (11 bath/each)	11000	11.00
1000 labels (1.5 bath/piece)	1500	1.50
<b>Total costs</b>	<b>24525</b>	<b>24.53</b>
Sales price (30 bath/unit)	30000	30.00
<b>Profit</b>	<b>5475</b>	<b>5.47</b>
<b>Margin</b>		<b>18.2%</b>

In 2005 nearly 30.000 cans were produced with peak season around New Year. The final product is sold to tourist shops across the country, Bangkok's central market and at OTOP festivals at a fixed price of 30 bath per can. The most important constraint in the marketing of the product is the attractiveness of the label and promotion.

### **Discussion and conclusions**

The cases described in this paper illustrate how the formation of a collective can improve the market chain and smallholder participation in markets with their biodiversity products. The cases illustrate that, triggered by an immediate problem such as oversupply or a natural hazard, and supported by a conducive government policy, a group can be established to create high value products. The specific problems the groups faced in the OTOP quality categories demonstrate the level at which obstacles take place as organisations develop. The problems ranged from food safety certification at the lowest quality level, to capital constraints at the intermediate level, to lack of marketing skills in the highest OTOP category. Collective action and institutional support offered the needed economies of scale and provided access to capacity building and financial support that would not have been available for individual farmers. The formation of collective action is a social process that requires shared values and attributes. The \*\*OTOP is clearly still at the early stage of the formation of collective action.

Besides direct benefits resulting from the sale of locally important high value products and a stable outlet for the members' tropical fruit tree products, the members also received wage employment options, access to affordable credit and returns to investments. Improved income in turn resulted in an increased incentive for biodiversity maintenance on farm as is shown by the planting of seedlings of those locally important fruits species by the groups.

It is obvious that for the design of effective policies for biodiversity conservation and livelihood improvement trade-offs between income generation, livelihood security, and biodiversity conservation need

to be taken into account. The formation of a collective clearly can be a major factor in facilitating community based efforts and institutions such as IPGRI can play an important role in supporting these groups. A further understanding of the underlying mechanisms of the trade-offs is necessary in order to find solutions that support sustainable development of poor communities that manage agricultural biodiversity. Another important factor that needs to be examined further is how to protect these small-scale entrepreneurs from more powerful competitors once a product becomes successful.

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