# Case Study on the marketing group of bitter bamboo shoots in Nam Pheng Village, Oudomxai Province.

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## Abstract

Forest foods are very important for the predominantly rural population of Lao PDR. Among forest foods, local people consider edible bamboo shoots as the most important product. An overview is given of the most popular bamboo species which produce edible shoots.
While most bamboo shoots are harvested and consumed in the rainy season (May-September), the species *Indosasa sinica,* found mainly in Northern Laos, provides shoots that can be harvested in the dry season (January-April). This off-season product provides market opportunities to local communities close to the border with China.
This case study describes how a relatively poor local community in Oudomxai, North Laos, set up a marketing group to improve its income. Initially the group was assisted by a local project team from IUCN/NTFP. The steps of the ground formation are described. Women were the key activity implementers.
The outcome of the group formation was that village income from selling bamboo shoots increased at least six-fold. The community has improved its cash income, reduced its debts, and reduced its dependency on rain-fed upland rice, from shifting cultivation. The successful marketing strategy has led to the community showing increased interest in managing its bamboo resources sustainably. With assistance from local researchers, trials were set up to study the effect of various cutting regimes on the yield of shoots. A summary of the status of these trials is given.

## Introduction

Bamboo is a product of great importance to village populations throughout Laos. Villagers collect bamboo for use as a building material, and its shoots for consumption and selling. Houses in rural areas are often mainly constructed using bamboo, with bamboo roofs, wall partitions, panelling, mats, ladders, blinds and furniture. Bamboo is also used in the production of certain fishing tools, paper and is sometimes used to make musical instruments such as the flute, angklang and khene. Recognising the importance of this NTFP (non-timber forest product), the IUCN (World Conservation Union)/NTFP project has worked with villagers in Nam Pheng to develop a model for its sustainable harvesting and better marketing.

## Bitter bamboo, an off-season bamboo shoot-producing species.

Taxanomic studies on bamboo species in Lao PDR have been conducted since 1992. So far, a total of 52 species from 15 genera have been documented. The mountainous northern part of Laos is one of the richest areas for bamboo. Surveys show it holds at least 50 species, 30 of which differ from those in central and southern Laos. Some of these species are bitter bamboo.
Bitter bamboo belongs to the group of bamboos with a monopodial or leptomorph rhizome system. The young reddish-black shoots are located underground, growing off mature root stock. The shoots gain bitterness with age, hence their name 'bitter bamboo shoots'. Bitter bamboo is found in the North of Laos, in evergreen forests, some 400m above sea level.
One of the most important bamboo species is mai khom (*Indosasa sinica*), or charchang. This species is important not only for eating, but also in the production of handicrafts, and as a building material.

Its characteristics are described in box 1.

**Box 1** Bitter bamboo's selected characteristics.

**Family**: *Graminae.* Subfamily: *Bambusoideae*
**Species**: *Indosasa sinica*
**Local name**: Mai khom, Charchang

**Description**: Mai khom has a monopodial, or leptomorph rhizome system (single system). Culm-sheaths are pale green, 13-15cm in diameter and 29-39cm long. They are non waxy, with a glabrous inner part and a scattered, short, hairy part. They have a reflexed, smooth blade, 13-15cm long, 2cm wide, with bristly ligules.
Culms: grow to be 10m tall. The harvested part is about 5-6m, and stiffly erect, except for the slightly out-curved tips 4-6cm in diameter; internodes are 40-55cm in the middle, 20-30cm at the top and bottom of the stem. The wall is 0.7-0.8cm thick (mid section); green when young with white patches when older; nodes have two prominent rings.
Branches: open, mainly on upper stems.
Leaves: 20-22cm long, 3-3.5cm wide, glabrous.
Flowers: none
Shoots: edible shoots appear during winter, or dry season (December-April), until the start of the rainy season. This is a relatively long shooting period. Taste: underground part is bitter sweet, while the top is bitter. Bitterness increases with the age of the shoot.

Harvesting: Both culms and shoots are harvested. Culm harvesting occurs all year, shoot harvesting from December-April only. Culms should be harvested at the age of 3-4 years. Heavy shoot harvesting may reduce growth. Shoot growth is stimulated by cutting the culms.
Propagation: it is possible by rhizome, stamp but no domestication observed.
Habitat and destruction: this bamboo species is found in the mixed forests of Northern Laos. It is most often found on hills, 300-900m
Main uses: Culms are used for many handicraft and construction purposes. Shoots are eaten in delicious local dishes and also exported in large quantities to markets in China and Thailand.

**History of the village of Nam Pheng, Oudomxai.**

In early 1996, RRA (rapid rural appraisal) exercises were carried out by the NTFP/IUCN project staff in Nam Pheng village. These exercises focused on the forest, NTFPs, and socio-economic issues.
Nam Pheng village was established in 1973, when people from a village on Phou Tong mountain, with no road access, moved there. Nam Pheng is located in the Namo district, about 70km north of Xai town, Oudomxai's capital. There is year round access to the village.
Nam Pheng consists of 43 households, and has a population of 244 people, of which 135 are female. The villagers are members of the khamou ethnic group, and are animist. Most of them are employed in upland rice cultivation, and use slash and burn to clear the forest for this purpose. Due to mountainous, rugged terrain, lowland paddy fields cannot be built. Each year, 45 hectares of forest are destroyed through slash and burn.
The yield of the rice is approximately 1.2 tonnes per hectare. This yield is not an annual figure, because the fallow period of shifting cultivation must be considered. This yield is highly insufficient for consumption needs. In 1996, villagers told project staff that 36 out of 42 families were short of rice for 4-6 months of the year.
Due to insufficient rice for the villagers, poultry cannot be kept, as they need grain for feed. When attempts have been made in the past to keep poultry, they quickly become diseased and die. The main form of livestock kept is cattle. Cattle are very easy for the villagers to keep, as they roam in the

forest and find their own food. However, this leads to the trampling and destruction of saplings, so it is detrimental to the forest.
The village has a school, in the form of one building to house all three classes. The building is highly inappropriate for this purpose. There is nothing in the way of educational equipment or facilities. As a result, the children usually choose not to go to school, but instead to go to the forest and gather NTFPs (especially bitter bamboo and cardamom).
Health: The two main health problems in the village are malaria and diahorrea. It is difficult for sufferers to get treatment of any kind as the nearest clinic is 7km away. Expenditure rankings place medicines in first place in terms of family expenditure. This is illustrated in the table below:

**Table 1** Expenditure rankings

| | | Women's group | | Men's group | |
|---|---|---|---|---|---|
| **Rank** | **Item** | **Score** | **%** | **Score** | **%** |
| 1 | Medicine | 10 | 50 | 6 | 30 |
| 2 | Clothes | 5 | 25 | 5 | 25 |
| 3 | fuel | - | - | 3 | 15 |
| 4 | food stuffs | 3 | 15 | 3 | 15 |
| 5 | school equipment | - | - | 2 | 10 |
| 6 | building equipment | 2 | 10 | - | - |
| 7 | beauty products | - | - | 1 | 5 |

Nam Pheng is surrounded by forest rich in NTFPs, including bitter bamboo, cardamom, rattan and broom grass. Cash income ranking shows that NTFPs are the most valuable source of income, as indicated in the table below.

**Table 2** Cash income rankings

| | Women's group | | Men's group | |
|---|---|---|---|---|
| **Item** | **Score** | **%** | **Score** | **%** |
| Bitter bamboo shoot (*Indosasa sinica)* | 5 | 25 | 6 | 30 |
| Cardamom *(Ammonium sp.)* | 3 | 15 | 4 | 20 |
| Rattan *(Calamus sp.)* | - | - | 3 | 15 |
| Sapan *(Debregeasia hypoleuca)* | - | - | 1 | 5 |
| Bay lai *(Sanseviera zeylania)* | 2 | 10 | 3 | 15 |
| Bone Home *(Colocasia esculentum)* | 1 | 5 | 1 | 5 |
| Rice | 3 | 15 | - | - |
| Wildlife (various) | 3 | 15 | - | - |
| Livestock | 1 | 5 | 2 | 10 |
| Sesame | 2 | 10 | - | - |

The IUCN/NTFP project began in Nam Pheng in early 1996. To begin with, RRA exercises were used to gather information, with particular focus on the forest, NTFPs and socio-economic factors. Secondly, PRA (participatory rural appraisal) was carried out, during which villagers were given the chance to take part in planning village activities. Around 20 activities were discussed and later ranked into order of importance. The top 5 rankings were prioritised for immediate implementation.
The first priority was to introduce a rice bank. This was of clear importance due to the general rice shortage. As the situation stood, in times of shortage, families would borrow rice from outside the

village, and consequently get into debt. This debt would serve to fuel increased forest destruction as villagers tried to grow more rice. Alternatively, they would over-harvest their rattan to gain more money with which to buy rice. To prevent this over-harvesting, the project established a rice bank for periods during their upland work. This meant that immediately the villagers could see the benefits of the project. From this point they became much more enthusiastic and willing to work with the project staff than at the outset, when they had some doubts.

Following the introduction of the rice bank, other activities including land allocation, cardamom planting, and marketing of NTFPs began

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**Income and social effects of the marketing group**

There are many factors which have an impact on the villagers' income. These include the size of the area a group has rights over, the status and type of forest, the richness of NTFPs, the number of family members available to collect NTFPs, and most importantly, the method of marketing. Also, weather can have a profound impact on income. For example, in 1999, particularly cold weather meant bamboo shoots grew at a much slower rate than is normal for December. Then, early rainfall in February caused rapid growth, creating an abundance of supply, leading to diminishing selling prices.

Prior to the start of the project, despite the fact that huge quantities of NTFPs were being collected, the marketing of the produce was poor, and consequently selling prices were low. At this stage therefore, NTFPs were not an important source of income. The box below highlights this with an example of bitter bamboo.

**Box 2** Case study: Bitter bamboo, pre-project.

| |
|---|
| Every day from December to the end of April, women and children would go out to the forest and collect bitter bamboo shoots. They would then meet with traders who came from the Lao-China border, or elsewhere in the Namo district, and sell their shoots in bunches. The villagers would receive very little money for their bamboo, and often adults would barter with clothes, and children with sweets. This meant that however many bamboo shoots the villagers collected, they still did not have enough money to buy sufficient rice for their needs, thereby giving them no incentive to collect more, or manage their stocks. In fact, it seemed to show that the only way to get rice is to grow it, so this led to slash and burn becoming more common, and forest destruction continuing so upland rice plots could be created. There are no regulations preventing this destruction. |

The establishment of marketing groups has been very successful and has made a great impact on the villagers' livelihoods. In 1998-9, 47,060 kg of bitter bamboo was sold for 51,768,900 kip. This compares to 46,370kg for 54,656,460 kip in 1999-2000. See table 3 for detailed analysis.

**Table 3** Off-take and income from bitter bamboo shoots in Nam Pheng village 1998-2000.

| | **1998-1999** | **1999-2000** |
|---|---|---|

| Month | Sold (kg) | Selling price (kip/kg) | Income (kip) | Sold (kg) | Selling price (kip/kg) | Income (kip) |
|---|---|---|---|---|---|---|
| December | 4,359 | 1,100 | 4,794,900 | 2,537 | 1,906 | 4,778,040 |
| January | 9,065 | 1,100 | 9,971,500 | 5,086 | 1,881 | 10,508,000 |
| February | 13,557 | 1,100 | 14,912,700 | 13,573 | 1,769 | 23,913,360 |
| March | 14,875 | 1,100 | 16,362,500 | 25,173 | 602 | 15,457,060 |
| April | 5,207 | 1,100 | 5,727,700 | - | - | - |
| **Total** | **47,060** | | **51,768,900** | **46,370** | | **54,656,460** |

Villagers were encouraged to weigh the bamboo shoots they sold, using precise units, i.e. kilograms, as opposed to in arbitrary 'bunches'. This encouragement required quite some training as illustrated in box 3.

**Box 3** Weighing methods

A few days after the project staff had helped the villagers to implement a new weighing system for selling bitter bamboo shoots in kilograms instead of bunches, members of the staff were approached by some of the women in the village and told that they did not like this new method, and no longer wanted to use it. It was however difficult to understand why this was the case, as the women were shy, and not forthcoming with answers. In an attempt to discover the problem, staff spent a day with the women, observing them in their activities, and asking them questions. It soon transpired that none of the villagers could properly use the weighing scales. They did not know how to read the scales and so were not confident in using them at all.
Once the problem was realised, project staff arranged for more sets of scales to be brought to the village, and for lessons to be given in how to use them. Lessons were given to all village members, but special concentration was placed on the women, who would be the main users of scales.
The villagers quickly became used to the scales and could easily use them. They became confident in this respect, and in role plays, showed they would charge more for a greater weight, and not accept less. The benefits therefore became apparent to them, and they embraced the new system eagerly.

**Socio-economic effects**

Before project initiation, 36/42 families were short of rice for 4-6 months of the year. Two years into the project, rice shortage occurred in only 12/42 families, and lasted for only 1-2 months prior to harvesting. The improvement has been dramatic with incomes rising steadily over the period.
Originally, most members of the village were very poor, and they put the vast majority of their income towards the purchasing of rice. Now standards have improved, and many of the families have money left over after rice is bought. This has meant that some families have been able to save enough to buy such things as electricity generators, hand tractors and even televisions. Their standard of clothing has improved, and so has their general appearance. Project staff have noticed the villagers seem happier and smile more, perhaps a reflection of their better health due to the prevention of undernutrition.
All these improvements are obviously strongly welcomed by the villagers who now place a great deal of trust in the project, and are much more motivated towards managing their forest for the production of NTFPs.

Development Fund
One major activity which the IUCN/NTFP project helped to set up was a development fund, which has proved to be successful. Before the fund, villagers sold shoots to any trader who would buy them.

In 1998, they were assisted in the organisation of a marketing group to which everyone sold their shoots for a price of 1000kip per kilo. The group then sold the shoots on to traders for 1100kip per kilo. The extra 100kip per kilo was contributed to the group fund and was then used for the following purposes:

- Administrative and running costs including wages for trade-unit employees.
- Small financial incentives for the group committee.
- Welfare support to members.
- Implementation of development activities.
- Provision of loans to members.

Between 1998 and 2000, the group fund accumulated 17,000,000kip through sales of bitter bamboo, and later, also cardamom. It was decided the funds from 1998-99 would be spent on improving the village's water system, and for providing loans for development of agriculture and livestock. In the year 2000, 15 families received loans from the fund, for a variety of purposes, both agricultural and non-agricultural. Examples of items bought include generators, hand tractors and house building materials. In May of 2000, the development fund was put towards the building of a new school and this was made possible through the provision of extra materials from the IUCN/NTFP project.

**Sustainable harvesting trials**

Making harvesting of bitter bamboo sustainable has become of great concern to the villagers as they discover the potential income it can lead to. They are therefore keen to experiment with different methods to achieve this.

Experimental tests on the impact of harvesting of bitter bamboo.

Two experiments were carried out in the hope of achieving better management. The first experiment was designed to study whether harvesting the culms has an impact on the production of shoots, because both products are valuable. The second of the experiments was designed to discover how much the culms changed when dried after harvesting.

Methods

(a) Shoot Production
A study area in the community forest that had many bamboo plants in it was divided into 15 plots, each 20m x 20m in area. A 100% enumeration of all plots was made on 25/02/98. The estimated age of each culm was recorded, from 1-4 years. Year 1 culm had recently emerged.
Five treatments were tested, with three plots randomly assigned to each treatment. The randomly allocated positions are shown in figure 1.

**Figure 1** Randomly assigned treatment positions.

| | | |
|---|---|---|
| 1 | 2 | 3 |
| T2 | T4 | T1 |

| | | |
|---|---|---|
| 4 | 5 | 6 |
| T2 | T3 | T1 |
| 7 | 8 | 9 |
| T3 | T4 | T5 |
| 10 | 11 | 12 |
| T1 | T5 | T2 |
| 13 | 14 | 15 |
| T3 | T4 | T5 |

(Plot numbers and treatment numbers [T])

The null hypothesis (Ho) stated that treatments T1-T5 would have no impact on the production of new shoots for 1-2 years after treatment takes place. The two year time sample is necessary because shoots take this long to mature. The treatments used are described in figure 2:

**Figure 2** Treatments

| **Treatment no.** | **Treatment Description** |
|---|---|
| T1 | Remove 50% of 3 year-old stems |
| T2 | Remove 100% of 3 year-old stems |
| T3 | Remove 50% of 4 year-old stems |
| T4 | Remove 100% of 4 year-old stems |
| T5 | Control. No treatment |

The plots were re-enumerated on 25/02/1999 and 22/12/1999. Although not exact, these dates adequately represented the intervals of 1 and 2 years after treatment began. Shoots are actually harvested before they emerge from the soil, but the number of recently emerge shoots in October was taken to be an accurate indicator of how many shoots were available for harvest earlier in the same year.

(b) Culm weights
A set of 33 culms of various ages, was cut, measured and weighed in 1998. They were dried in the sun and remeasured after 30 days. Any changes were analysed.

Results

(a) Shoot production
To measure impact of treatments, changes in annual shoot production in each plot. This use of paired measurement, i.e. before and after treatment helps prevent distortion of results through natural plot variation. Table 4 shows the results after 1 year.

**Table 4** Number of new culms per plot at the first and second counts, and the net increase.

| | **Treatment** | **Number of new culms in each plot** | | | **Mean** |
|---|---|---|---|---|---|
| **First** | 1 | 65 | 136 | 48 | 83 |

| | | | | | |
|---|---|---|---|---|---|
| | 2 | 86 | 59 | 84 | 76 |
| | 3 | 126 | 34 | 11 | 57 |
| | 4 | 63 | 117 | 65 | 82 |
| | 5 (control) | 70 | 50 | 25 | 48 |
| **Second** | 1 | 89 | 102 | 182 | 124 |
| | 2 | 118 | 156 | 195 | 156 |
| | 3 | 218 | 146 | 200 | 188 |
| | 4 | 82 | 223 | 102 | 136 |
| | 5 (control) | 159 | 181 | 101 | 147 |
| **Increase** | 1 | 24 | -34 | 134 | 41 |
| | 2 | 32 | 97 | 111 | 80 |
| | 3 | 92 | 112 | 189 | 131 |
| | 4 | 19 | 106 | 37 | 54 |
| | 5 (control) | 89 | 131 | 76 | 99 |

Analysis of these results using a single factor analysis of variance (ANOVA) test, produces a p value of p=0.33. This value suggests the treatments are not having an effect any greater than chance, and therefore the null hypothesis is retained.

Table 5 shows changes arising after 2 years.

**Table 5** Number of new culms per plot at the first and third counts and the net increase.

| | **Treatment** | **Number of new culms in each plot** | | | **Mean** |
|---|---|---|---|---|---|
| **First** | 1 | 65 | 136 | 48 | 83 |
| | 2 | 86 | 59 | 84 | 76 |
| | 3 | 126 | 34 | 11 | 57 |
| | 4 | 63 | 117 | 65 | 82 |
| | 5 (control) | 70 | 50 | 25 | 48 |
| **Third** | 1 | 188 | 253 | 67 | 169 |
| | 2 | 131 | 97 | 157 | 128 |
| | 3 | 142 | 50 | 22 | 71 |
| | 4 | 155 | 170 | 55 | 127 |
| | 5 (control) | 171 | 120 | 81 | 124 |
| **Increase** | 1 | 123 | 117 | 19 | 86 |
| | 2 | 45 | 38 | 73 | 52 |
| | 3 | 16 | 16 | 11 | 14 |
| | 4 | 92 | 53 | -10 | 45 |
| | 5 (control) | 101 | 70 | 56 | 76 |

Analysis of the results shown in table 3 using a single factor ANOVA test, gives a p value of p=0.22. Therefore, the null hypothesis is retained, as variation is almost certainly the result of chance factors as opposed to treatment.

(b) Culm weights

The average change in circumference after the 30 day period of drying was 0.04cm, and the average change in length was 0.3cm. These changes are considered too small to be of any significance.

The average change in weight over the drying period was 1.8kg, equal to 38% of saturated weight.

This change is considered to be very significant. Younger culms lose a greater total weight of water per culm. That means, the linear regression for net weight change vs. age, has a slope significantly different from 0 (weight change = 2.72 - 0.208 age-class, R [adj.] = 0.145, p=0.018). However, if we look at the percentage change in weight, the slope is not significantly different from 0 (p=0.161).
We can therefore conclude that individual young stems lose a greater weight of water than old stems, but that a given weight (e.g. one tonne) of fresh stems, old or young, would probably lose about the same amount of water when dried.

Discussion

The shoot production experiment could not reject the null hypothesis, as treatments created no impact on variation greater than that caused by chance. Therefore it seems to be the case that culm harvesting cannot cause any significant effect on shoot production within a two year time span. It should however be noted that because variation between plots was quite high, any small effects treatments may have had could easily have gone unnoticed. The high plot variation is illustrated by the fact that the coefficient of variation in effect after one year was greater than 60%. To be more certain of the results, it would be necessary to carry out a power analysis based on the information from this study, before another experiment was done. As with all experimentation, the greater the sample size, the more accurate the results. This experiement had a very small sample size, so the accuracy of results has to be doubted.
It is also possible that the effects of treatment may take longer than two years to arise - the plants may become 'tired' after repeat harvesting. It is therefore advised that the treatments should be repeated every year so the experiment can continue over the longer term.

The stem drying experiment showed that on average, stems lose 38% of their weight when dried, yet do not shrink significantly. Younger stems lose more water per stem when dried than older stems but they lose the same proportion of their total weight.

Density and yield survey

In cooperation with the villagers, the project field team carried out a density and yield survey. The survey was done in three blocks. The aim of this work is to assist the user group:

- to be able to assess how many shoots are produced per hectare;
- to understand how these yields are influenced by harvesting and ecology;
- to be able to design a sustainable management system;
- to be able to monitor sustainable management systems.

Each block of bitter bamboo forest was measured for its area. It was decided that from each, 2.5% of the total area would be studied as a representative sample. Therefore 2.5% of land was calculated for each plot, and the resulting area was made into plots measuring 10m x 50m. The number of plots per block obviously depended on the block's total area.

**Table 6** Results of the density and yield study for 2 blocks.

| Local name of bitter bamboo block | Area (ha) | No. of stems 1 year old | No. of stems 2 years old | No. of stems 3 years old | No. of stems > 3 years old | No. of shoots | Average weight of 1 shoot (kg) | Average yield of shoots/ha. |
|---|---|---|---|---|---|---|---|---|
| **Mok Kra** | 19 | 1937 | 2537 | 3925 | 5450 | 3487 | 0.18 | 627 |
| **Seun Rou** | 117 | 1864 | 1353 | 2586 | 3377 | 3693 | 0.22 | 812 |

The results of the study revealed that on average, the yield of bitter bamboo shoots being produced per hectare was 800kg. By multiplying this figure by the land available for growing bitter bamboo, the resulting figure should resemble the total amount of bitter bamboo collected per annum. However, when this sum is carried out, there is a major discrepancy.
The calculated yield per hectare, per annum, was 800kg. Multiplied by 600 hectares (the approximate total land area), the total annual figure should be around 480 tonnes. The actual figure of weight of shoots collected is only 50 tonnes a year. Therefore, there is a difference of 430 tonnes between yield and collection.

The next question is clearly why is this the case?

A poor yield can occur because bamboo is over-harvested. Obviously, the low collection figure indicates under-harvesting as opposed to over-harvesting, but there may well be instances of over-harvesting. The extent to which a plot is harvested depends greatly on its location. The nearer a plot is to the village, the more likely the villagers are to go and collect from that plot. Furthermore, shoots growing in different plots become ready for harvesting at different times. The difference in time scale can be up to a few weeks. When the harvesting season has just begun, the first shoots sold get a much better price, and as the season goes on and the shoots become more abundant, the price gradually drops due to the market pressures of supply and demand. This means that those plots which can be harvested relatively early tend to be over-harvested, whereas those in which shoots develop later may not be harvested to their full potential as the price has become too low to make it worth selling.

The variation in plots in terms of area, timing of first shoots, level of harvesting and soil type are shown in table 7:
**Table 7** Characteristics of bitter bamboo blocks in Nam Pheng

| Local name of bitter bamboo blocks | Year of using for shifting cultivation | Area (ha) | Date of first shoot production | Level of harvesting | Soil type |
|---|---|---|---|---|---|
| Tao Keng | 1982 | 67 | Dec-Jan | xxx | Red, sandy |
| Seun Rou | 1983 | 117 | Dec-Jan | xxx | Black, sandy |
| Lan Ten | 1970 | 80 | Jan-Feb | xx | White, loam, sticky |
| Mok Chuk | 1995 | 39 | Feb | - | Black, sandy |
| Om Brea | 1982 | 41 | Mar | xxx | Black |
| Reang Kong Thao Seuang | 1982 | 42 | Jan-Feb | x | Red |
| Om Yar | 1986 | 75 | Jan-Feb | xx | Red |
| Om Dreua | 1992 | 68 | Jan-Feb | xx | Black |
| Mok lahang | 1975 | 47 | End of Feb | x | Black, sandy |
| Tao loo | ? | 74 | Jan | - | Black |
| Ta Reao | 1987 | 5 | Jan | - | Black, sandy |
| Mok Kra | 1998 | 19 | End of Feb | x | Yellow, sticky |
| Pang Bane | 1983 | 73 | End of Feb | - | Black |

xxx = frequent; xx = less frequent; x = occasional; - = never

Table 6 shows that harvesting is frequent in, for example Om Brea, which is located close to the village, but there is never any harvesting in Pang Bane, which is located about 2 hours away from the village by foot.
Another reason why a block may not be harvested relates to quality. In Mok Chuk for example, the bitter bamboo is very young, as the land was still being used for shifting cultivation in 1995. The

block is close to the village, being about only half and hours walk away, but the shoots are still too small to collect. The other two blocks from which no harvesting occurred are Tao Loo and Ta Reao. These blocks are located near to Na Ham village, and villagers from there steal from these blocks, which is the cause of conflict between the two villages.

**Conclusions**

- The village group has shown itself to be capable of improving income by better organisation of marketing. The evidence suggests that management of collecting NTFPs for sale can reap greater financial benefits than agricultural production of rice, which is currently the main income source for many of the rural people in Laos.

- NTFPs, in this case bitter bamboo, have been shown to be a good alternative to shifting cultivation. Through their collection, the need for slash and burn diminishes and can perhaps eventually disappear altogether.

- A major advantage of sustainable NTFP development, and particularly of bitter bamboo, as an alternative to shifting cultivation, is that NTFPs are already known and harvested by villagers. Some of the proposed alternatives, such as contour farming are not known or understood. This could make setting them up extremely difficult, thereby making success less likely.

- The success of the marketing group has made villagers more interested in forest management. Villagers are now keen to try and establish a sustainable harvesting system through forest management and harvesting experiments.

- The introduction of a development fund has been a very positive step and has led to the creation of a pool of money which is being used to develop various community facilities and amenities, and to provide user group members with loans.