On-Farm Testing of Alternative Farming Systems Technologies in Selected Villages in Luang Prabang and Udomxay: Off–Season Tomatoes and Frog Culture1

Monthathip Chanpengxay2, Phayvanh Siphanhdouang3, Vison Phounsavath3 Bounhom Thepphavong4, Blesilda M. Calub5 and Paul Overgoor5

ABSTRACT

Several farming technologies are being tested on-farm in selected uplands in Phonsay, Luang Prabang and Namo, Odoumsay based on village problem diagnosis. This study aims to assess jointly with farmers the performance of technologies that can reduce poverty and likewise provide alternatives to shifting cultivation. These include lowland and upland annual crops, sloping land integrated fruit tree systems, small and large livestock feeding systems, integrated pig-fish pond system, frog culture and wet season vegetable production. In 2002, 72 farmers tried 9 technologies while in 2003, these grew to 345 farmers trying 15 technologies. Initial results show that among these technologies, off- season tomato production and frog culture generated the greatest farmer interest and adoption. Income generation was a major factor for technology adoption. In 2002, tomato production provided an additional net income of 469 US$/1,000m². In 2003, the income from tomato ranged from 21-240 US$/1,000m². Frog culture gave farmers an additional net income range of 28 US$/100 frogs in 2002 and 30-35 US$/100 frogs in 2003. Other factors influencing the success or failure of these alternative technologies include farmers’ local knowledge and previous experience, technical support, availability of suitable land, capital and labor, ethnicity and market opportunities. Participatory monitoring and evaluation will look further into farmers’ adoption behavior and their system of evaluating technology options.

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1. Introduction

The National Agriculture and Forestry Research Institute through the Lao-Swedish Upland Agriculture and Forestry Research Program implements the Farming Systems Research/Extension (FSR/E) approach as one of its primary strategies for carrying out on-farm research relevant to government efforts of stabilizing shifting cultivation and eradicating poverty.

In the last two years, researchers from a number of different technical backgrounds have been conducting FSR/E research in two districts of Northern Laos. On-farm research provides a process where technologies or farming system options are jointly tested and improved under local conditions by farmers, researchers and extension staff. In 2002, there were 9 technologies tested with 72 participants. In 2003, a total of 15 technologies for upland and lowland areas were tested with 345 participating families.

Phonsay in Luang Prabang and Namo in Udomsay are among the 47 priority targets out of the 72 districts identified as poor under the National Poverty Reduction Program of the Lao government (NPEP 2001). Farmers in these areas generally practice traditional slash-and-burn agriculture, also called shifting cultivation. Because of population pressure and shortening of the fallow cycle, the system has led to land degradation and poor agricultural productivity which then contributes to poverty.

On closer look, the agricultural livelihood activities of these people are not only focused on shifting cultivation. The farming system also includes management of “family gardens” in and around the village and the “agroforest areas” located along the slopes above the village (Laffort and Jouanneau 1998). If properly managed, these other land uses can be made more productive to complement and perhaps alleviate pressure from the slash-and-burn areas.

The on-farm trials focused on identifying and developing profitable farming systems that can diversify and increase productivity of the family gardens, particularly the riverbed gardens. Specifically, the objectives of the on-farm trials are to determine the productivity, profitability and farmers’ acceptability of the alternative technologies.
On-farm trials for off-season growing of vegetables like tomatoes, cabbage, lettuce, cucumber, onion, dill, pakchoi and coriander were undertaken. Fish and frog culture were tested in the areas around households. While other technologies were tried, the most promising ones were off-season tomato growing and frog raising. Thus this paper focuses on the results and experiences gained from these two activities.

2. Methodology

In collaboration with the Socio-economic Component, a diagnostic survey was conducted in the target villages to identify farmers’ problems and opportunities. Based on this diagnosis, research topics were selected and were subsequently presented to the target villages in the two districts. These resulted to actual implementation of 11 trial topics by 72 farmers in the 9 target villages in July 2002 and 15 technologies tried by 345 farmers in 2003. The technologies included lowland and upland rice varietal trials, riverbed off-season vegetables, fish or frog culture, crops and small livestock, forage crops and large livestock, fruit tree agroforestry, sloping land management, improved fallow and cultivation of non-timber forest products.

2.1 Off-Season Tomato Trials

Cooperating farmers were given on-the-job training on production of tomatoes during the rainy season from June to September. This included preparation of raised beds, use of plastic mulch, raising of tomato seedlings, transplanting, care and maintenance of the tomato plants (Figure 1). The use of stakes was introduced to prevent the tomatoes from sprawling on the ground. Inputs like Hybrid 382 tomato seeds, black plastic sheets and fertilizers (15-15-15 at 300 kg/ha and 46-0-0 at 200 kg/ha) were provided by the project. Average size of the experimental plots was 1,000 m² per farmer. Technical support was given by the researcher and the district staff.
2.2 Frog Raising Trials

Standard methods for frog raising developed by researchers at the Living Aquatic Resources Research Center (LARReC) were taught to farmer participants. Use of earthworms as feed with some commercial concentrate supplementation was recommended. Two stocking rates were tested: $T_1=160$ frogs/4 m$^2$ and $T_2=240$ frogs/4 m$^2$. Close technical support was provided by the researcher and the district staff.

Figure 2. Farmer fixing the frog culture pond.
3. Results and Discussions

3.1 Study sites

The off-season tomato trials were conducted with 15 farmers in Ban Nambo, Huaymanh and Thapo Neua in Phonsay, District, Luang Prabang. The frog raising trials were also conducted in the same villages in Phonsay with 15 farmers in 2002 and 22 farmers in 2003. Additionally trials were made with 8 farmers in Ban Namo Neua, Namo District, Udomxay.

3.2 Tomato trials

Farmers’ practices of tomato production involve planting in October towards the end of the rainy season. Tomato seeds together with other vegetable seeds like mustard, cabbage and some legumes are directly broadcasted in a piece of prepared land. There are no seed beds and all vegetables grow randomly together (Figure 2). With this practice, germination of seeds is low. Some of them are lost in the soil while some are transported by ants elsewhere. Weeding is difficult and many small vegetable plants are trampled during the weeding operation. No mulching or staking is practiced. Vegetables start to be harvested around December.

![Figure 3. Mixed random growth of various vegetables as farmers usually directly broadcast various vegetable seeds in one plot.](image)

Tomatoes are harvested in January. This coincides with those of many other farmers in most of Laos thus a seasonal over-supply in the market. Consequently the price of the product is very low.
3.2.1 Productivity, profitability and acceptability

Table 1 provides a summary of the production and economic returns from the off-season tomato trials in the project villages in Phonsay, District. In 2002, yields of 1.9 tons/1,000 m² were obtained from farmer’s small plots aggregating to 1,600 m² (LSUAFRP, 2002). The net income obtained was 4.69 M kip/1,000 m² or US $469 /1,000 m². In 2003, there was an increase in the number of participating farmers thus a higher total area of 1.2 ha planted to off-season tomatoes. Yields ranged from 0.2 – 1.3 tons/1,000 m². Net incomes ranged from 0.2 – 2.4 M kip/1,000 m² equivalent to US$ 21 – 240/1,000 m². Higher incomes obtained in 2002 was due to the higher selling price of tomatoes and higher yields per unit area. In 2003, some droughts occurred which negatively affected plant growth and subsequent yields. The selling price of tomatoes was also lower and unstable.

Table 1. Summary of production and economic returns from off-season tomato trials in 2002 and 2003, Phonsay District.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
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<tbody>
<tr>
<td>Total area planted to off-season tomatoes</td>
<td>1,600 m²</td>
<td>1.2 ha</td>
</tr>
<tr>
<td>Off-season tomato yields</td>
<td>1.9 tons/1,000 m²</td>
<td>0.2 – 1.3 tons/1,000 m²</td>
</tr>
<tr>
<td>Net income obtained M kip/1,000 m²</td>
<td>4.69</td>
<td>0.30 – 2.40</td>
</tr>
<tr>
<td>$ US/1,000 m²</td>
<td>469.00</td>
<td>31.00 – 240.00</td>
</tr>
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</table>

There is good acceptability to farmers because they got good income from it. Despite high cost of inputs, they are able to realize good profits. Because it is off-season, they can sell the tomatoes at a much higher price than during the usual peak season. There is little competition from other farmers in the country thus they are able to command better prices. The stakes resulted to better quality tomatoes than if left sprawling on the ground. This better quality again translated to better prices. Plastic mulching made it easy to control the weeds and saved labor for weeding. Some farmers had previous experience growing tomatoes thus did not hesitate in trying out the technology.
In Namo District, however, the off-season tomato trials were setback by late rains which delayed the establishment of the seedlings. When the rains came, the seedlings were destroyed by damping-off. Lack of technical coordination and support between researcher, DAFO staff and farmers resulted to problems on how to take care of the young seedlings.

3.2.2 Remaining challenges

While many farmers were excited enough to try the technology by themselves, there were some farmers who also wanted to do it but couldn’t because they do not have land. This brings then the question whether this technology is helping better-off farmers become better while poorer farmers are being left out. Obviously, land is a major requirement for crop production but the reality is that most of the “poorest of the poor” are landless. This does not imply however a simplistic solution by giving land to the poor. There are documented cases where land allocated for the poor were sold to better-off farmers. A better understanding of the social and cultural factors affecting land ownership or distribution is pertinent.

Other farmers have some land but do not have money to buy the inputs. There are two options to address this. One could be to provide some credit to enable farmers to purchase inputs but what about sustainability? Another option is to review the technology and look at ways to make it into a “low external input technology”. Use of indigenous materials instead of plastic mulch is more environment-friendly. Development of open-pollinated varieties instead of dependence on hybrids; use of farmyard manure instead of commercial fertilizers and promotion of Integrated Pest Management (IPM) are some aspects that can be looked into further.

Success of a technology is often gauged by wide spread acceptance by farmers. But when many farmers are practicing the technology and producing the same crop, researchers and extensionists should be on the look out for its implications to marketing. There are many cases of good technologies for improving productivity of certain crops but which farmers have stopped adopting because they cannot sell the extra produce.

3.3 Frog culture trials

Frog culture trials were thought of as an option for generating income without the need for large tracts of land. It can be done in a limited space in the backyard. It can be done by women and children. Farmers were excited to try it because they see it as a ready source of food
for the family and as a source of additional income. All the farmers who joined the trials did not have previous experience in frog culture. Normally, frogs are merely collected from paddy lands and some forested areas.

### 3.3.1 Productivity, profitability and acceptability

Table 2 provides a summary of the production, survival and economic returns from the frog culture trials in the project villages in Phonsay, District. In 2002, the survival after 4 months was comparable to that in 2003 with the same stocking rate (T₂). Average weight per frog was 140g/frog. The net income obtained was 279,200 kip/100 frogs or US $28/100 frogs.

Table 2. Summary of production, survival and economic returns from frog culture trials in 2002 and 2003, Phonsay District.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
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<tbody>
<tr>
<td><strong>Initial number of frogs</strong> (number/cage of 4m²)</td>
<td>240</td>
<td>160</td>
</tr>
<tr>
<td><strong>Survival after 4 months</strong></td>
<td>61%</td>
<td>74%</td>
</tr>
<tr>
<td><strong>Average weight</strong> (g/per frog)</td>
<td>139.6</td>
<td>177</td>
</tr>
<tr>
<td><strong>Net income obtained</strong> kip/100 frogs</td>
<td>279,200.00</td>
<td>353,600.00</td>
</tr>
<tr>
<td>$ US/100 frogs</td>
<td>27.90</td>
<td>35.40</td>
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In 2003, the lower stocking rate of 160 frogs/cage (T₁) resulted to higher percentage survival and higher average weights/frog after 4 months than that with the stocking rate of 240 frogs/cage (T₂). Higher net incomes of 353,600.00 kip/100 frogs or 35 $ US/100 frogs were realized with the lower stocking rates. A similar trend was observed from the on-farm trials in Ban Namo Neua in Namo District.
Table 3. Summary of production, survival and economic returns from frog culture trials in 2003, Namo District.

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
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<tbody>
<tr>
<td><strong>Initial number of frogs (number/cage of 4m²)</strong></td>
<td><strong>T1</strong></td>
</tr>
<tr>
<td></td>
<td>160</td>
</tr>
<tr>
<td><strong>Survival after 4 months</strong></td>
<td>71%</td>
</tr>
<tr>
<td><strong>Average weight (g/per frog)</strong></td>
<td>167</td>
</tr>
<tr>
<td><strong>Net income obtained kip/100 frogs</strong></td>
<td>334,000.00</td>
</tr>
<tr>
<td><strong>Net income obtained $ US/100 frogs</strong></td>
<td>33.40</td>
</tr>
</tbody>
</table>

At the end of the trials, farmers were happy to earn additional income from the sale of frogs and also additional food for the family, even if they have only small land. Others say it was a good way to spend time and earn extra income when they don’t have much to do in the fields.

While there are those who favor this technology, many chose not to continue after 2003. Some problems met were: (1) Lack of worms to feed the frogs especially during dry season; (2) High labor demand in terms of digging the soil to find the worms. As the dry season advanced, the worms settled deeper into the ground; (3) The alternative commercial feed is expensive. With limited money, logically they would rather buy rice for direct consumption than buy feeds for the frogs; (4) Snails, another alternative feed, required high amounts of labor to collect and process. Processing involved prying out the snails from the shells and cutting them into small pieces; (4) Hybernation during the cold season. The frogs did not like to eat, thus resulting to slower growth. Many of them even died; (5) Cannibalism. Big frogs ate the small ones. Later this was remedied by subdividing the pen to separate the small frogs from the big ones; (6) Big frogs jumped out of the fence. Thus higher bamboo fences and some overhead netting was done in the second trials; (7) Women and children feel squirmy in handling the worms (LSUAFRP 2003).

### 3.2.2 Remaining challenges

Frog culture could be a good option especially for farmers with limited land or perhaps no land at all. But more basic studies need to be made in terms finding alternative, cheap and
easy to find feed sources. There is a need to determine strategic periods of the year when frog raising would be most favored by climate, when there is high availability of worms for feeding and when there would be a good price in the market. At the moment, frog culture trials are being undertaken on-station. When more knowledge and experience has been gained, on-farm trials maybe undertaken again later.

Conclusions

Off-season tomatoes and frog culture are some viable options that can provide income and food for farmers. However, there is a need to continue refining further these technologies both on-station and on-farm. Farmers’ criteria for evaluating and adopting technologies should be documented. Farmer-to-farmer exchange of results and experiences from the trials can be promoted through cross-farm visits and field days. Scaling-up and its implications on market opportunities and efficiency of extension support services also need to be studied well.

On-farm testing is an effective method where alternative technologies are introduced, tried and evaluated jointly by farmers, researchers and extensionists before they are recommended on a large scale (BAR, 1990). Farmers’ active participation in on-farm trials lead to more refined and relevant alternative technologies that suit their needs and those with similar existing farming systems.

References


