Slash and burning cultivation system in northern mountain area in Laos

Presented by Somphet Phengchanh “Regional Orientation Workshop on Globally Important Agricultural Heritage System (GIAHS) for Asia and the Pacific 12-13 November 2013, Bangkok, Thailand.
Luang Prabang is ancient city, a UNESCO World Heritage Site since 1995, is permeated with legends, mythical kings and miraculous events. Its unique setting and tranquil environment attracts visitors from around the world who come to relax and enjoy true Lao culture.
Agriculture ecotourism sites

- In Luang Prabang town, it has created site for preserving Indigenous lowland rice cultivation site in community and area for producing organic vegetable garden in Pong wan village. (WWW.livinglandlao.com)
- Create ting Pha Tad Ke Botanical Garden, the first botanical garden in Laos. (WWW.pha-tad-ke.com)
  - Provide a natural setting for visitors to enjoy the beauty of the region while promoting eco-tourism that creates local employment opportunities and increases tourism, stimulating economic development in the region.
  - Promote sustainable ecological preservation and contribute to biodiversity conservation and awareness programs in Laos and internationally through extensive research, education, social outreach and resource building.
Slash-and-burn agriculture system is a major production used in upland environment in northern region of Lao PDR. This subsistence system commonly integrates crop production, animal husbandry, and forestry.

**Slash:**
- Removing debris
- Ash provided nutrients for crops
- Control weeds
- Insect pests, diseases

**Fallow**

**Burn:**
- Removing debris
- Ash provided nutrients for crops
- Control weeds
- Insect pests, diseases

**Reburn:**
- Using unburned woods/stones to prevent erosion
- Firewood

**Planting**

**Harvesting**

**Weeding**

**Husbandry and forestry**
In this system, upland rice is the major crop, followed by maize, job’s tear are planted mixing with sesame, finger millet, foxtail millet, sweet stalk sorghum, green vegetables: cucumbers, chili, eggplant, cowpea, herb to insure a wide variety of food products for upland household subsistence.

The crops are planted on specific landscape based on their wealth of knowledge about those crops.
Diversity in upland crops for food, animal feed and for generating income
After cropping: First year natural fallow:
- Able to gather eatable vegetables: taro, cassava, loofah, Yam bean and other wild green vegetables.
- The trees are re-grow from stump and initial regenerating soil fertility.
Fallow is part of an integrated farming system for household livelihood:

- Providing the opportunity to gather a number of forest products for daily food, medicinal plants, construction—weaving materials (bamboo), firewood,
- Providing shelter and fodder for cattle, buffalo, goats and wild animals like deer and etc.
- Providing place for hunting
- Restoration of soil fertility after cropping (more than 5 year fallow)
- Control of weeds, insect pests and diseases

Note: The significance of mentioned above was interrelated with fallow periods, upland farmers said that a fallow period should be extended at least 5 – 7 years before re-cultivating in order to restore soil fertility and reduce problems from insects and weeds and more diversity of non-timber forest to collect.
2-3 year natural fallow
Upland rice, the most important crop in the hilly regions of northern Laos, is typically grown under a rotational re-vegetation system of slash-and-burn cultivation with inter-crop fallow, without fertilization by resource-poor farmers for subsistence.

Currently increasing population growth in combination with government policy on reducing area under such systems had resulted in reducing fallow periods to 2-3 years.

This has led to increases in soil erosion and weed pressure and a resulting decline in fertility and rice yields.

Although over the years considerable research effort has been devoted to the development of sustainable upland technologies such improving agronomic practices (fallow improvement, weed management and using traditional upland varieties with stable yields from year to year), adoption by farmers has been limited due to high diversity encountered in the uplands.

Farmers use their knowledge of the characteristics of traditional rice varieties and the conditions under which such varieties are grown to select the most stable varieties for their particular circumstance and livelihood strategy.
Laos is home of glutinous rice; many of its wild relatives of rice occur abundantly.
### Rice germplasm collected from Laos

<table>
<thead>
<tr>
<th>Endosperm</th>
<th>Lowland</th>
<th>Upland</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutinous</td>
<td>5044</td>
<td>6238</td>
<td>11281</td>
<td>85</td>
</tr>
<tr>
<td>Non-glutinous</td>
<td>781</td>
<td>1130</td>
<td>1912</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5825</strong></td>
<td><strong>7368</strong></td>
<td><strong>13193</strong></td>
<td></td>
</tr>
<tr>
<td><strong>%</strong></td>
<td><strong>44</strong></td>
<td><strong>56</strong></td>
<td></td>
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</tr>
</tbody>
</table>

Mostly sticky rice, Diversity more in uplands
Diversity of rice germplasm

- Centuries of Lao farmers' selection, as well as rich cultural and ecosystem diversity, have allowed the development of an amazing diversity of traditional rice varieties. The richness and diversity of rice (lowland and upland) in Laos is reflected in the 3,160 distinct names given to the traditional varieties in the collection (Appa et al. 2000).
- The greatest diversity in the indigenous traditional varieties is found in upland rice fields, where ethnicity plays a role in maintaining diversity.
- This diversity can be seen in range of variation on a large number of characteristics, including: crop duration, plant height, tillering ability, pigmentation, panicle shape, compactness and size, grain shape, size, color and eating qualities reflecting preferences for different traditional food preparations (NAFRI and IRRI 2000).
Factors affecting decline in upland rice germplasm

• Changes in soil fertility and in the government policy on land allocation
  Recently, increasing population pressure in the traditional slash and burn rice based upland systems has shorten fallow periods (2-3 years) leading to rapid decline in soil fertility and increasing weed problems resulting to declining crop yields (Roder et al., 2001).

• Change in rainfall pattern

• Marketing demand

• Substitution of other cash crops and industrial trees (rubber)

• Village resettlement
  In order to sustain the crop yield in shorter fallow periods, upland households have to select rice varieties that are well adapted to low soil fertility conditions and discard poorly adapted ones.

• To address this situation, the country needs to develop strategies and precautionary measures to safeguard against further loss of rice diversity, particularly valuable varieties that are rarely grown. Local farmer and communities should be supported in traditional upland rice conservation, management and use on-farm.
INDIGENOUS KNOWLEDGE IN SELECTING TRADITIONAL UPLAND RICE VARIETIES AMONG THREE ETHNIC GROUPS, IN LUANG PRABANG PROVINCE, LAO PDR

• Farmers’ decisions regarding their crops or varieties which they should plant, relate to the nature of the landscape as well as soil fertility.

Hmong Khaaw tend to plant their favorite varieties—usually non-glutinous varieties yielding well and staple for home consumption in the best soils with less slope gradient, while glutinous varieties are planted in whatever other soils are available. Regardless of favorite varieties, both Khmu and Tai Khaaw farmers often tend to plant early maturing variety in high fertile soil which coincide to the bottom terraces where there is with higher clay content and high water holding capacity. Medium maturing varieties are often planted in normal soil, at the middle terrace. While late maturing varieties are often planted in the upper terrace after choosing the terrace for early and medium maturing variety.

• Farmers continued to plant traditional rice varieties as long as the preferred agronomic traits of such varieties were compatible with their management practices such as harvesting methods, suited to low fertile condition, ability to compete with weed growth or to tolerate to insect pests and adapt to drought stress common in the locality. The most important varietal traits perceived by farmers in selecting efficient plant type for uplands were early and vigor seedling, long broad-dropping leaves, moderate-high tillering ability, tall and thick culm, moderate-high panicle number; big grain in size and deep-thick root system.

• The knowledge about outstanding traits gained from farmers of this study could be used in rice improvement and sustainable deployed in Lao agriculture by researchers and plant breeders to fulfil the diverse needs and preferences of all upland farmers.
Upland rice is grown mixed with
Sesame
Finger millet
Foxtail millet
Sweet stalk sorghum
Vegetables: cucumbers, chili, eggplant, beans
Rice production is mostly manual. It varies among different ethnic groups - sickle, metallic blade or even hand stripping. Encourage appropriate tools to increase efficiency and productivity.
Upland Varieties selected by farmer

Mae hang

Do Vieng

Kon Dam
Indigenous Knowledge: Grain Processing
Early Varieties for delicacy and “hungry period”
Seed Selection, Uplands

Harvesting is by cut stalks with sickle

Large, attractive, healthy panicles with good grain filling selected, kept in bamboo baskets wrapped around waist at harvest time.

**Gender:** No bias, both are involved.

Many types of panicle are in their baskets.
IK: Seed Storage Methods and Containers

Seeds on a bed of neem leaves, Environmentally friendly
Indigenous Knowledge: Grain Processing Early Varieties for delicacy and “hungry period”
IK: Seed Selection and Storage Methods

**Upland**: good panicles of different types selected

Smoke dry seeds keeps insect away
Upland farmers grow mixtures of varieties, they have names

Left to right: Pa, Mak Kheua Khaw, Makhaeua deng Vieng, None, Kam, Kok deng, Vay, Khao leuang
Thank you for your attention