

## ラオス北部における伝統的作物および有用植物の 共同現地調査（2011年）

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## The Laos-Japan Joint Field Study on Traditional Crops and Useful Plants in Northern Areas of Lao PDR, 2011

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### Summary

A field survey was done Laos-Japan joint team in northern areas of Lao PDR to study crops diversity including less-utilized crops in traditional agriculture and useful plants in November 2011. The team observed agricultural fields and interviewed farmers in Luang Prabang Province, Oudom Xai Province, Luang Namtha Province and Bokeo Province. The team chose 41 crops for interviewing. Presence/absence and vernacular name of each crop were recorded in addition to cultivation practices and uses. Considerable diversity of crops was suggested in northern Luang Namtha Province, particularly the surrounding areas of Muang Sing, and hilly areas of Bokeo Province. At the same time it is concluded that collection and conservation of plant genetic resources should be done as soon as possible, since there have been quick socio-economic modernization and urbanization giving a strong impact in an irreversible way on agricultural local villages in the areas. Systematic survey of crops genetic diversity, under-utilized crops and /or useful wild plants is needed as soon as possible for two reasons described below - pragmatic and academic. They should be conserved as useful crop genetic resources for crop improvement for Lao PDR as well as for other countries, and studies on the traditional

agriculture of the areas will promote our deeper understandings on origins and development of Agriculture Basic Complexes in Asia.

## **1. Introduction**

In the COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE ([http://www.fao.org/docrep/013/i1500e/Lao Peoples Democratic Republic. pdf](http://www.fao.org/docrep/013/i1500e/Lao%20Peoples%20Democratic%20Republic.pdf)) prepared by the national authorities in the context of the preparatory process for the Second Report on the State of World's Plant Genetic Resources for Food and Agriculture (FAO, 2010) stated that "Diversity of plant genetic resources in Lao PDR is vast and its products are closely associated with the livelihoods of rural communities."

Rice is the most important crop in Lao PDR, while there are a lot of vegetables, pulses and beans and root and tuber crops traditionally grown particularly in hilly and mountainous areas. Some minor crops have been studied. For example, Ochiai (2002) reported job's tears cultivation in Luang Prabang Province of the country. Tomooka and his research group repeatedly did field research on wild relatives of cultivated legumes in the country (Tomooka et al. 2004; 2005; 2006 & 2007). Sakata et al. (2008), Saito et al. (2009), Matsunaga et al. (2010) and Okuizumi et al. (2012) did field studies focusing on some vegetables and other crops there.

Concerning traditional crops and less-utilized useful plants in Southeast Asian agriculture, we have done field studies especially in northern areas of Myanmar where traditional agricultural systems have been maintained (Watanabe et al. 2007; Kawase et al. 2011; Yamamoto et al. 2011). The results indicate that there is a variety of traditional crops cultivated particularly on slash-and-burn cultivation fields, and therefore need comparison with neighboring hilly areas such as Lao PDR.

The present field study was planned and then carried out as a part of a Grant-in-Aid Program (KAKEN) for Overseas Academic Survey of Basic Research Type B titled "Conservation of Endangered Plant Genetic Resources and Associated Traditional Knowledge Maintained by Minorities Dwelling Across Borders" (Program code No. 21405017, Program Leader: Prof. Dr. Kazuo Watanabe, Tsukuba University) granted by the Japan Society for the Promotion of Science (JSPS) under the jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan. We conducted surveys in Myanmar and other Southeast Asian countries, which implied the necessity to study traditional crop diversity in adjacent Lao PDR. The present study was done in close cooperation with the National Agriculture and Forestry Research Institute (NAFRI), Ministry of Agriculture and Forestry of Lao PDR.

Southeast Asia including Lao PDR, Myanmar and Thailand is located in an important region in regard with centers of origin and diversity of cultivated crops first proposed by Vavilov (1926) and with development of Agriculture Basic Complexes proposed by Nakao (1966). He proposed that Root and Tuber Crops Agriculture Basic Complex in early agriculture of the region, which had play a role as a cradle for Laurisilva Forest Agriculture Basic Complex (Shoyojurin bunka) after receiving millets cultivation from Savanna Agriculture Basic Complex. Nakao's hypothesis has been discussed easily like a fantasy and often misled for seeking the roots of the Culture of Japan, although it is worth of precise reexamination based on evidences only available by field studies to think about origins and development of cultivated plants and agriculture.

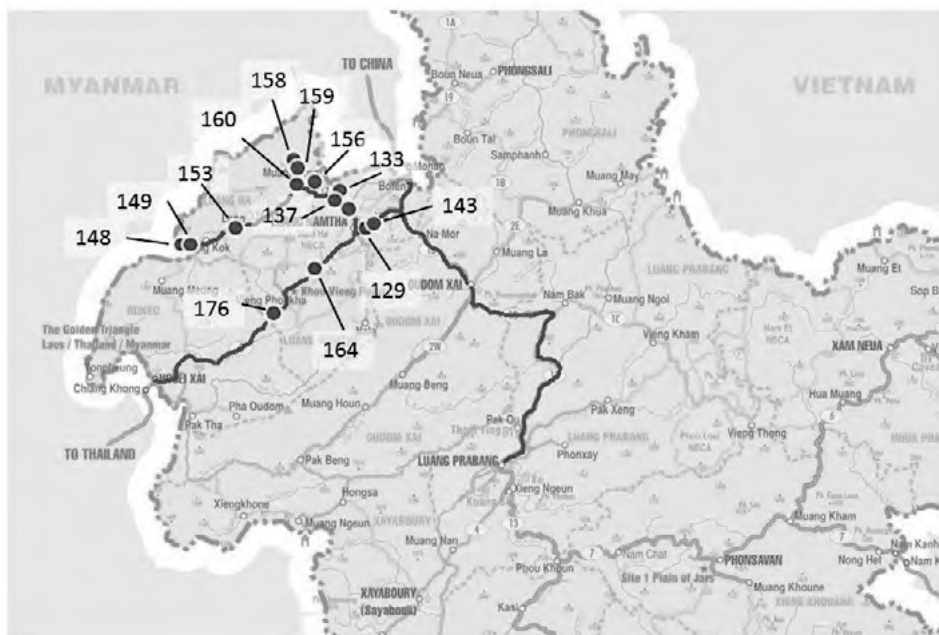


Fig. 1. The route of the field study (blue lines) and sites where interviews to local farmers were made (red circles). (A free map on the GMS Sustainable Tourism Development Project in Lao PDR was used.)

## 2. Planning and Achievements

The joint study mission members met at Vientiane for preparation, and first flew to Luang Prabang airport, from where survey was done using a car in Luang Prabang Province, Oudom Xai Province, Luang Namtha Province and Bokeo Province along the route indicated in Fig. 1.

### 2.1. The mission members were;

Prof. Dr. Kazuo Watanabe, Gene Research Center, University of Tsukuba, Japan,  
 Mr. Souvanh Thadavong, Head of Diversity Unit, Rice and Cash Crops Research Center,  
 National Agriculture and Forestry Research Institute, Ministry of Agriculture, Lao PDR, and  
 Dr. Makoto Kawase, Director, Genetic Resources Center, National Institute of Agrobiological  
 Sciences, Japan.

### 2.2. Itinerary of field study in Lao PDR;

22 Nov 2011	Vientiane- Luang Pravang (QV111) Luang Pravang - Oudom Xay (by car)
23 Nov 2011	Oudom Xay - Luang Namtha (by car)
24 Nov 2011	around Luang Namtha (by car)
25 Nov 2011	Luang Namtha - Muang Sing - Xieng Kok (by car)
26 Nov 2011	Xieng Kok - Muang Sing - Mom - Muang Sing (by car)
27 Nov 2011	Muang Sing - Luang Namtha - Houei Xai (by car)
28 Nov 2011	Houei Xai - Luang Namtha (by car)
29 Nov 2011	Luang Namtha - Vientiane (QV602)

### 2.3. Observation focus;

We focused on the traditional crops in the target areas, particularly in hilly and mountainous areas. Based on the experiences from field studies in Myanmar, Thailand, India and Pakistan, traditional crops and indigenous varieties are often cultivated in hilly and mountainous areas where slash-and-burn cultivation is frequently practiced. We visited farmers' fields and made an interview from them about their crops. We showed photos of 41 crops to the farmers for the crop names. They were chosen for covering crop diversity in Indian sub-continent and Myanmar, which are not always suited for all local farmers in Lao PDR, because reliable answers are not expected for any plants that are not familiar to informants. The 41 crops are rice, maize, common wheat, durum wheat (*Triticum aestivum* and *T. diccocom*), barley (*Hordeum vulgare*), sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum americanum*), finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), Indian barnyard millet (*Echinochloa frumentacea*), kodo millet (*Paspalum scrobiculatum*), *Setaria pumila*, common millet (*Panicum miliaceum*), little millet (*Panicum smatrense*), korne (*Brachiaria ramosa*), soybean (*Glycine max*), common bean (*Phaseolus vulgaris*), mung bean (*Vigna radiata*), black gram (*Vigna mungo*), rice bean (*Vigna umbellata*), winged bean (*Psophocarpus tetragonolobus*), cowpea/yard-long bean (*Vigna unguiculata*), chickpea (*Cicer arietinum*), pigeon pea (*Cajanus cajan*), lablab bean (*Lablab purpureus*), moth bean (*Vigna aconitifolia*), sword bean (*Canavalia gladiata*), buckwheat (*Fagopyrum esculentum*), guar (*Cyamopsis tetragonoloba*), *Amaranthus curentus*, *A. caudatus*, *A. hypochondriacus*, sesame (*Sesamum indicum*), kenaf (*Hibiscus cannabinus*), roselle (*Hibiscus subdariffa*), bitter melon (*Momordica charantia*), snake melon (*Trichosanthes cucumerina*), elephant foot yam (*Amorphophallus campanulatus*), banana (*Musa* spp.), perilla (*Perilla frutescent*), and niger seed (*Guizotia abyssinica*). Concerning rice, we also showed photos of grains of NIAS Global Rice Core Collection ([http://www.gene.affrc.go.jp/databases-core\\_collections\\_wr\\_en.php](http://www.gene.affrc.go.jp/databases-core_collections_wr_en.php)), which consists of just 69 accessions, retained a wide range of the genetic diversity of whole accessions maintained by the NIAS Genebank Project.

### 2.4 Results of observation;

We have realized that traditional shifting cultivation or slash-and-burn cultivation is limited due to recent policy and that wide areas are used for rubber plantation, cassava plantation, banana plantation (Photo 1) and contract cultivation of pumpkin, water melon and some other vegetables. Rubber and cassava might have been introduced and supported by the Government of Lao PDR, but banana and vegetables are mainly promoted by Chinese companies. Agricultural development and urbanization are prominent, since farmers came to depend more on cash crops than self-sufficient agriculture. The trunk roads connecting villages are mostly paved and well maintained, and there are many satellite TV antennas in every village. Roadside bushes are repeatedly cleaned under a governmental slogan to make a beautiful country. Therefore, most of traditional crops which served as important food crops in self-sufficient agriculture have been disappearing (Photo 2 & 3). Systematic exploration and collection of indigenous landraces should be carried out as soon as possible.

We visited morning marketplaces in order to observe diversity of local agricultural products at Oudom Xay, Luang Namtha, Muang Sing, and Houei Xay. Various wild plants

collected and animals hunted were sold in the marketplaces together with cultivated crops (Photo 4). Modern varieties of vegetables grown in adjacent areas and/or transferred from remote areas were also sold there. We saw that a few Myanmar locals crossed the Mekong River by boat to Xieng Kok to sell several kinds of vegetables, steamed waxy rice and others in early morning.

Crop names obtained through interviews to local farmers at several places indicated on Fig. 1 were summarized in Table 1. Different names were obtained for each of several crops, which suggested that there are many ethnic groups having different languages and dialects. Some photos shown to informants made some confusion, since those were neither common there nor familiar to them. Crops familiar to them might have given more incentives to answer, and a shorter list would not make them boring. Since their ethno-taxonomy is, of course, not based on the botanical taxonomy, several names were obtained for different local varieties in important crops like rice and maize. They often tried to identify each of the 69 rice cultivars of the NIAS Global Rice Core Collection. It indicates that they recognize several different rice landrace in their agriculture. Therefore, we had to often ask informants to make sure whether they provided crop names or cultivars names.

### **3. Discussions**

Judging from the present observation, the areas for future field studies are identified. Considerable diversity of crops was suggested in northern Luang Namtha Province, particularly the surrounding areas of Muang Sing, and hilly areas of Bokeo Province, although traditional agriculture in the areas is on the verge of extinction. Some farmers insisted that some traditional crops should be still grown in remote places such as Phongsali Province. It is concluded that collection and conservation of plant genetic resources should be done as soon as possible, since there have been quick socio-economic modernization and urbanization giving a strong impact in an irreversible way on agricultural local villages in the areas.

Systematic survey of crops genetic diversity, under-utilized crops and/or useful wild plants should be needed for two reasons. First, they will be useful genetic resources in crop improvement for Lao PDR as well as for other countries. Second, the traditional ways of life especially on hilly and mountainous areas, where traditional slash-and-burn agriculture, hunting and gathering are practiced in forests, will provide clues to promote understanding of development of Agriculture Basic Complexes in Asia.

Some technical problems arose through interviews. The photos of crops that are not familiar with informants result only in haphazard answers although they are needed to compare folk taxonomy between sites. The photos should be carefully chosen and magnified pictures are often misleading.

### **4. Acknowledgements**

It is our great pleasure to have done a field survey on cultivated and useful plants in northern areas of Lao PDR. We would like to express my sincere gratitude to Dr. Bounthong Bouahom, Director General of National Agriculture and Forestry Research Institute (NAFRI), Ministry of Agriculture, Lao PDR, Mr. Phoumy Inthapanya, Director of Rice and Cash Crops

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## References

- anonymous (2010) The Second Report on the State of World's Plant Genetic Resources for Food and Agriculture (compiled by FAO). (<http://www.fao.org/agriculture/crops/core-themes/theme/seeds-pgr/sow/sow2/en/>).
- Kawase M., Wunna K. and Watanabe (2011) Second Field Survey Collecting Traditionally Grown Crops in Northern Areas of Myanmar, 2009 (in English with Japanese summary). Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol.27: 83-93.
- Matsunaga, H., M. Sumiyama, K. Tanaka and C. Deuanhaksa (2010) Collaborative Exploration of the Vegetable Genetic Resources in Laos, 2009 (in English with Japanese summary). Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 26: 65-81.
- Nakao, S. (1966) 栽培植物と農耕の起源 (岩波書店) (Origins of Cultivated Plants and Agriculture)(in Japanese) (Iwanami Shoten, Tokyo) pp. 192.
- Ochiai, Y. (2002) Minor Crops in Globalizing Agriculture: A Note on Edible Job's Tears Cultivated in Louang Phabang Province, Laos. *Asian and African Studies* (Graduate School of Asian and African Area Studies, Kyoto University, Kyoto) 2: 24-43 (in Japanese with an English summary).
- Okuizumi, H., C. Deuanhaksa, S. Tagane, Y. Terajima, S. Uwatoko, T. Noguchi, E. Nonaka, K. Intabon, and M. Gau (2012). Collaborative Exploration of Sorghum, Zea, Saccharum and Their Relative Wild Genetic Resources in Laos, January, 2011 (in English with Japanese summary). Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 27: 129-155.
- Saito, A., K. Tanaka and C. Deuanhaksa (2009) Collaborative Exploration of Vegetable Genetic Resources in Laos, 2008. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 25: 111-145 (in English with Japanese summary).
- Sakata, Y., K. Kato, T. Saito, K. Tanaka and C. Deuanhaksa (2008) Collaborative Exploration of Vegetables Genetic Resources in Laos, 2007. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 4: 161-183. (in English with Japanese summary)
- Tomooka N., S. Inn, X. Tan, C. Li, S. Kham, P. Inthapanya, D. A. Vaughan, A. Kaga, T. Isemura and Y. Kuroda (2005) Ecological survey and conservation of legume-symbiotic rhizobia genetic diversity in Southern China and Northern Laos, 2004. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 21: 167-177 (in English with Japanese summary).
- Tomooka N., S. Thadavong, C. Bounphanousay, P. Inthapanya, D. A. Vaughan and A. Kaga (2004) Field survey of *Vigna* genetic resources in Laos, November 15 -26, 2003. Annual Report on



- Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 20: 77-91 (in English with Japanese summary).
- Tomooka N., S. Thadavong, P. Inthapanya, D. A. Vaughan, A. Kaga, T. Isemura and Y. Kuroda (2006) Conservation of Legume - Symbiotic Rhizobia Genetic Diversity in Laos, 2005. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 22: 149-161 (in English with Japanese summary).
- Tomooka, N., S. Thadavong, K. Kanyavong, P. Inthapanya, D. A. Vaughan, A. Kaga, T. Isemura, and Y. Kuroda (2007) Conservation of Legume - Symbiotic Rhizobia Genetic Diversity in Laos, 2006. Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 23: 177-183 (in English with Japanese summary).
- Vavilov N. I. (1926) Tzentry proiskhozhdeniya kulturnykh rastenii (Studies on the origin of cultivated plants). Bulletin of Applied Botany and Plant Breeding (Institute of Applied Botany and Plant Breeding, Leningrad) vol. 16, (2). 248pp (in Russian & English).
- Watanabe K., Ye Tin Tun, Kawase M. (2007) Field Survey and Collection of Traditionally Grown Crops in Northern Areas of Myanmar, 2006 (in English with Japanese summary). Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 23: 161-175.
- Yamamoto, S., Moe Kyaw Aung, K. Watanabe, Wunna, M. Kawase (2012) Third Field Survey Collecting Traditionally Grown Crops in Northern Areas of Myanmar, 2011 (in English with Japanese summary). Annual Report on Exploration and Introduction of Plant Genetic Resources (NIAS, Tsukuba) vol. 27: 95-109.

## 和文摘要

ラオスの北部地域の伝統的な農業における低活用作物や有用植物を含む作物多様性を研究するために2011年11月にラオス-日本の共同調査隊で現地調査を行った。調査隊は、ルアンパバーン県、ウドン・サイ県、ルアン・ナムタ県、ボケオ県で農耕地を観察し、現地の農家に聞き取りを行った。聞き取りのためにあらかじめ41作物を選んでおいた。各作物の有無と方名について聞き取り、栽培方法や利用法などとともに記録した。特にルアン・ナムタ県北部、ムアンシンの周辺地域、ボケオ県の丘陵地域で栽培されている作物の多様性が観察された。同時に、これらの地域において社会経済的近代化と都市化が急速に進み、不可逆的な強い衝撃を農業村落に与えているので、植物遺伝資源の収集・保存は、できるだけ早く行うべきであると結論づけられた。作物の遺伝的多様性、低活用作物及び/又は有用野生植物の組織的調査は可及的速やかに実施すべきであり、それには後述する実利のおよび学術的というふたつの理由からである。すなわち、ひとつにはラオスそして他の国においても作物改良に利用しうる有用な作物遺伝資源として、さらにはこれらの地域の伝統的農耕を研究することによって広くアジアにおける農業文化基本複合の起源や発達についての理解を深めることができるからである。

Table 1. A summarized list of interviews on some traditional crops

		date	2011/11/23	2011/11/23	2011/11/24	2011/11/24	2011/11/24	2011/11/25	2011/11/25
		village	KOK-MI	HONG-LUAI		NAM MAT KHAO	KHIN-MING	KHALANG	JAYII
		location	near Boten	near LUANG NAMTHA	near LUANG NAMTHA	near LUANG NAMTHA	near LUANG NAMTHA	near XIENG KOK	near XIENG KOK
		map location	near WP129	WP133	WP137	WP140	WP143	WP148	WP149
		latitude (N)	20° 58' 37.8"	21° 2' 48.1"	21° 2' 29.0"	21° 7' 51.9"	20° 57' 26.5"	20° 53' 16.1"	20° 52' 47.7"
		longitude (E)	101° 28' 36.1"	101° 24' 28.8"	101° 24' 24.1"	101° 21' 4.4"	101° 26' 52.5"	100° 35' 1.7"	100° 33' 39.7"
		altitude (m)	591.8	597.6	588.7	766.5	576.0	452.4	447.6
No.	crop name	Latin name							
1	rice	<i>Oryza sativa</i> L.	GU-TSU	BURAO	NGO	CHE	BRE	KHAO / CHAN-NO-OH	JA-SI
2	maize	<i>Zea mays</i> L.	IMMER	MAI	SALI / SALEE	ADU / ADU TU NIAO / ADU PU SUMA	PAKU / PAKU TSWA / PAKU BRAO, etc.	SAMA	SA-MA-CHEI
3	common wheat	<i>Triticum aestivum</i> (L.) THELL. ssp. <i>vulgare</i> (VILL.) MACKEY	past	no	KOI ?	no	no	no	no
4	durum wheat	<i>Triticum turgidum</i> (L.) Thell. ssp. <i>turgidum</i> conv. <i>durum</i> (Desf.) Mackey	no	no	no	no	no	no	no
5	barley	<i>Hordeum vulgare</i> L.	no	no	no	no	no	no	no
6	sorghum	<i>Sorghum bicolor</i> (L.) MOENCH	KHAO-LIAN	GU / MAE	no	no	PAKON-CHA	10 years ago, ME-NI-ME-TU	NU-KO
7	pearl millet	<i>Pennisetum americanum</i> (L.) LEEKE	no	no	no	no	no	no	no
8	finger millet	<i>Eleusine coracana</i> (L.) GAERTN.	BAI-TSU	no	KOI-PET	no	PIA	no	no
9	foxtail millet	<i>Setaria italica</i> (L.) P.BEAUV.	WE-PAR-SUI	BRAO-TAI	no	LOLU	KHAO PIA	no	no
10	barnyard millet	<i>Echinochloa</i> sp.	no	no	RAO	SHOMA	SHON	no	no
11	kodo millet	<i>Paspalum scrobiculatum</i> L.	no	no	no	no	no	no	no
12	yellow foxtail millet	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	no	no	no	no	no	no	no
13	common millet	<i>Panicum miliaceum</i> L.	no	no	MAK-DU-AE	SHALONG	CRI	no	no
14	little millet	<i>Panicum sumatrense</i> ROTH ex ROEM. et SCHULT.	no	no	no	no	past?	no	no
15	korne	<i>Brachiaria ramosa</i> (L.) Stapf.	no	no	no	no	no	no	no
16	soybean	<i>Glycine max</i> (L.) Merrill	DAR-SU	TABEI-VAN	MAK-TUA-LUANG	NUM-PEAR	TUA-PAO	no	GO-MA-SI
17	common bean	<i>Phaseolus vulgaris</i> L.	YANG-TU	TAP-PRIET	PRE-SIBAI	ABE	TAO-LA	NO-SI	NO-SI
18	mung bean	<i>Glycine max</i> (L.) Merrill	MAK-TUA-CHAO	no	PRE-TUA-NIO-AE	NUM-GONG	TAO-BO-SHA	no	NO-TA-SI
19	black gram	<i>Vigna mungo</i> (L.) Hepper	no	no	PRE-TAP-HIANG	no	(TAO-PAO ?)	no	NO-SI
20	rice bean	<i>Vigna umbellata</i> (Thunb.) Ohwi & Ohashi	MAK-TUA-CHAO	no	PRE-SEPAI-LIAT ?	ADU	(TAO-HA-ZON ?)	NO-TA-SI	no



Table 1 (Continued).

		date	2011/11/23	2011/11/23	2011/11/24	2011/11/24	2011/11/24	2011/11/25	2011/11/25
		village	KOK-MI	HONG-LUAI		NAM MAT KHAO	KHIN-MING	KHALANG	JAYII
		location	near Boten	near LUANG NAMTHA	near LUANG NAMTHA	near LUANG NAMTHA	near LUANG MTHA	near XIENG KOK	near XIENG KOK
		map location	near WP129	WP133	WP137	WP140	WP143	WP148	WP149
		latitude (N)	20° 58' 37.8"	21° 2' 48.1"	21° 2' 29.0"	21° 7' 51.9"	20° 57' 26.5"	20° 53' 16.1"	20° 52' 47.7"
		longitude (E)	101° 28' 36.1"	101° 24' 28.8"	101° 24' 24.1"	101° 21' 4.4"	101° 26' 52.5"	100° 35' 1.7"	100° 33' 39.7"
		altitude (m)	591.8	597.6	588.7	766.5	576.0	452.4	447.6
No.	crop name	Latin name							
21	winged bean	<i>Psophocarpus tetragonolobus</i> (L.) DC.	SU-LEN-TU	TAP-CHONG	PRE-TUA-PU	BE-YA-BEYAH0	TAO-KAN-JI	NO-KO-FA-SI	NO-KO-FA-SI
22	cowpea/yard-long bean	<i>Vigna unguiculata</i> (L.) Walpers	CHAI-GAN-TU	TAP-BRAO	PRE-SEPAI-LE	ABE-BE-JA	TAO-NA-CHO	NO-SI	no
23	chickpea	<i>Cicer arietinum</i> L.	no	no	no	no	no	no	no
24	pigeon pea	<i>Cajanus cajan</i> (L.) Mill sp.	SAN-YE-TU	TA-BAI-YANG	PRE-SALENG	HABE-NUN-PEAR	TAO-TSAI	KO-JI-NO	no
25	lablab bean	<i>Lablab purpureus</i> (L.) Sweet	TUIN-TU	PAO-YIM	Pre-TAP-CROK	MASI-NUN-MA	TAO-DAI	NO-SI-PAI-WE	NO-SI
26	moth bean	<i>Vigna aconitifolia</i> (Jacq.) Marechal	no	no	no	no	no	no	no
27	sword bean	<i>Canavalia gladiata</i> (Jacq.) DC.	nop	TA-MOP	PRE-TRE-MAK	DI-BU-LU	TAO-DAT / TAO-N-DAT	no	(NO-SI)
28	buckwheat	<i>Fagopyrum esculentum</i> MOENCH.	CHAO	no	no	no	no	no	no
29	guar	<i>Cyamopsis tetragonoloba</i> (L) Taub	no	no	no	no	no	no	no
30	amaranth	<i>Amaranthus cruentus</i> L.	HAN-SAI	TON-DUT-FAN	no	JA-BO-ROIE	TSON-DU	no	SI-BE
31	amaranth	<i>Amaranthus caudatus</i> L.	HAN-SAI / I-MIN-SAI	FAN-FI	no	JA-BO-ROIE	SHON	(SI-VE) may beconfused with <i>Celosia</i>	no
32	amaranth	<i>Amaranthus hypochondriacus</i> L.	no	FAN-WAN	past, LANG-AONG	BO-HO	TSUON-DU	no	no
33	sesame	<i>Sesamum indicum</i> L.	CHI-MA	TA-KYA	TUT-LAN-LANGA	NUN-SI-SHE	CHI-MUA	NU-SI	NU-SI
34	kenaf	<i>Hibiscus cannabinus</i> L.	HOA	no	TUT-LAN-CHO	no	no	no	no
35	rosselle	<i>Hibiscus sabdariffa</i> L.	SON-PO-DI	SON-PO-TI	TUT-LAN-CHO-CHAT	SOM ?	SI-KHAO-HINE	HO-CHEI	no
36	bitter gourd	<i>Momordica charantia</i> L.	KU-KUA	HA-RUI	PRE-NOI-HOI-NAM / PRE-NOI-HOI-NE	SI-KUA-KHA	DI-EA	SU-KO-MA-SI	SHU-KO-MA-SI
37	snake gourd	<i>Trichosanthes anguina</i> L.	PAK-KUA	HARUI-NANG	PRE-NOI-NGU	no	TAU-TSAI	MA-NO-SI	DA-KA-SI
38	elephant foot yam	<i>Amorphophallus</i> sp.	MO-ZE	HOU-DANG	TUT-SERT	SE-BO	KHAO-CHI-HA	no	PA-SI-FU
39	banana	<i>Musa</i> spp.	PA-CHO-KWAE	HUM-CHAO	TUT-PRE-TAROI	NGA-BE	JI-CHOU	APU-KU	APU-KU / APU-TULU
40	perilla	<i>Perilla frutescens</i> BRITT.	SU-SU	no	TUT-LANGA-PREAR / TUT-LANGA-LAN-GEIN	LU-SI	no	NU-NA	NU-NA-SI
41	niger seed	<i>Guizotia abyssinica</i> (L. f.) Cass.	no	MA-FANG	no	no	(PAT-YA ?)	no	no

Table 1 (Continued).

		date	2011/11/26	2011/11/26	2011/11/26	2011/11/26	2011/11/26	2011/11/27	2011/11/27
		village	DONSAVANG	CHON KAR	MOM	HUAY-LONG-KAO	JIANG YIANG	NAM LUNG	PHAE
		location	near XIENG KOK	near MUANG SING	near MUANG SING	near MUANG SING	near MUANG SING	near MUANG SING	near VIENG PHOUKA
		map location	WP153	WP156	WP158	WP159	near WP160	WP164	WP176
		latitude (N)	20° 57' 11.1"	21° 11' 22.1"	21° 18' 12.7"	21° 16' 8.0"	21° 11' 52.3"	20° 46' 22.8"	20° 31' 28.3"
		longitude (E)	100° 46' 46.6"	101° 13' 45.1"	101° 10' 0.5"	101° 9' 43.1"	101° 9' 9.3"	101° 12' 42.9"	100° 57' 15.4"
		altitude (m)	516.6	744.4	622.1	726.9	645.7	706.9	883.1
No.	crop name								
1	rice	<i>Oryza sativa</i> L.	KHAO	BYO / BYO-CHI / BYO-BYU	KHAO	CHE-PA	KHAO	NGO	NGO
2	maize	<i>Zea mays</i> L.	TAI-DAM	KA-ME	ADU	A-TU / A-SHU	no	SARI / SALEE	SARI
3	common wheat	<i>Triticum aestivum</i> (L.) THELL. ssp. <i>vulgare</i> (VILL.) MACKEY	no	no	no	no	no	no	no
4	durum wheat	<i>Triticum turgidum</i> (L.) Thell. ssp. <i>turgidum conv. durum</i> (Desf.) Mackey	no	no	no	no	no	no	no
5	barley	<i>Hordeum vulgare</i> L.	no	no	no	no	no	no	no
6	sorghum	<i>Sorghum bicolor</i> (L.) MOENCH	no	no	SA	no	KHAO FENG	no	NGOI
7	pearl millet	<i>Pennisetum americanum</i> (L.) LEEKE	no	no	no	no	no	no	no
8	finger millet	<i>Eleusine coracana</i> (L.) GAERTN.	no	TA-TSAN	no	no	no	no	no
9	foxtail millet	<i>Setaria italica</i> (L.) P.BEAUV.	KHAO-FAN	U-TSAI	no	LO-LU	no	no	NGOI
10	barnyard millet	<i>Echinochloa</i> sp.	no	no	no	no	no	no	no
11	kodo millet	<i>Paspalum scrobiculatum</i> L.	no	no	no	no	no	no	no
12	yellow foxtail millet	<i>Setaria pumila</i> (Poir.) Roem. & Schult.	no	no	no	no	no	no	no
13	common millet	<i>Panicum miliaceum</i> L.	no	ME-JIA	ACHU	YA-PRA-DU	no	no	no
14	little millet	<i>Panicum sumatrense</i> ROTH ex ROEM. et SCHULT.	no	no	no	no	no	no	no
15	korne	<i>Brachiaria ramosa</i> (L.) Stapf.	no	no	no	no	no	no	no
16	soybean	<i>Glycine max</i> (L.) Merrill	TUA LIAN	no	NU-PYA	no	no	PRAK-PO	no
17	common bean	<i>Phaseolus vulgaris</i> L.	TUA DEN	TOP	A-BE	A-BE	MAK-TUA-SAI-SIN	no	no
18	mung bean	<i>Glycine max</i> (L.) Merrill	TUA NUA NIE	TOP-HAN	KU-KHA	NG-GU	no	no	no
19	black gram	<i>Vigna mungo</i> (L.) Hepper	no	TOP-HAN	no	MA-SHI-MA-BE-LE	no	no	no
20	rice bean	<i>Vigna umbellata</i> (Thunb.) Ohwi & Ohashi	no	no	NU-KHA	no	no	no	no

Table 1 (Continued).

		date	2011/11/26	2011/11/26	2011/11/26	2011/11/26	2011/11/26	2011/11/27	2011/11/27
		village	DONSAVANG	CHON KAR	MOM	HUAY-LONG-KAO	JIANG YIANG	NAM LUNG	PHAE
		location	near XIENG KOK	near MUANG SING	near MUANG SING	near MUANG SING	near MUANG SING	near MUANG SING	near VIENG PHOUKA
		map location	WP153	WP156	WP158	WP159	near WP160	WP164	WP176
		latitude (N)	20° 57' 11.1"	21° 11' 22.1"	21° 18' 12.7"	21° 16' 8.0"	21° 11' 52.3"	20° 46' 22.8"	20° 31' 28.3"
		longitude (E)	100° 46' 46.6"	101° 13' 45.1"	101° 10' 0.5"	101° 9' 43.1"	101° 9' 9.3"	101° 12' 42.9"	100° 57' 15.4"
		altitude (m)	516.6	744.4	622.1	726.9	645.7	706.9	883.1
No.	crop name	Latin name							
21	winged bean	<i>Psophocarpus tetragonolobus</i> (L.) DC.	MAK TUA PU	TOP-LONG	A-BE-HO	A-BE-BE-HO	MAK-TUA-PON	TOR-PU	no
22	cowpea/yard-long bean	<i>Vigna unguiculata</i> (L.) Walpers	MAK TUA KAU	TOP-RAI	A-BE	A-BE-BE-AH	no	no	SHABAI-SAN
23	chickpea	<i>Cicer arietinum</i> L.	no	no	no	TA-LE ?	no	no	no
24	pigeon pea	<i>Cajanus cajan</i> (L.) Millsp.	MAK TUA HE	TOP not here but at PONGSALI	MAK-KHA	no	MAK-TUA-HE	no	PE-TAP
25	lablab bean	<i>Lablab purpureus</i> (L.) Sweet	no	TOP-ME-ZIN	ABE-PE-KHA	no	no	TAP	no
26	moth bean	<i>Vigna aconitifolia</i> (Jacq.) Marechal	no	no	no	no	no	no	no
27	sword bean	<i>Canavalia gladiata</i> (Jacq.) DC.	MAK TUA DAP	TOP-PAI	no	TA-PU-LU	MAK-TUA-FUN	no	no
28	buckwheat	<i>Fagopyrum esculentum</i> MOENCH.	no	CHAO	no	no	no	no	no
29	guar	<i>Cyamopsis tetragonoloba</i> (L.) Taub	no	no	no	no	no	no	no
30	amaranth	<i>Amaranthus cruentus</i> L.	no	CHE-KON-GUN	no	CHA-PRO-YE	no	no	no
31	amaranth	<i>Amaranthus caudatus</i> L.	no	CHE-KON-GUN	no	no	no	no	no
32	amaranth	<i>Amaranthus hypochondriacus</i> L.	no	CHE-KON-GUN-KHAO	no	SHI-PI-DU ? Confused with wild sp.?	no	no	no
33	sesame	<i>Sesamum indicum</i> L.	MAK-NGA	SAH	NO-SHI / NOSI	NU-SHI-NE-SHE	MANGA	LANGA-POM	LANGA
34	kenaf	<i>Hibiscus cannabinus</i> L.	SOM-PO-DI	no	no	no	KO-PO	no	no
35	rosselle	<i>Hibiscus sabdariffa</i> L.	SOM-PO-DI	SUN-POI	SUN-PU	no	MAK-SON-PU	SOM-PO-DI	SUN-PO-DI
36	bitter gourd	<i>Momordica charantia</i> L.	MAK-NOI-HOM	PA-TA	LA-HA	LA-HA	MAK-HOI	NOAI	NA-HOI
37	snake gourd	<i>Trichosanthes anguina</i> L.	MAK-NOI-MAO	no	KO-GO-PU	PU-PUT	no	no	MAK-NOI
38	elephant foot yam	<i>Amorphophallus</i> sp.	WA-IBOK	no	PE-MA	YA-YU	no	no	no
39	banana	<i>Musa</i> spp.	MAK-KWAI-NAM	CHIU-PIAO	NGA-PE	NGA-BE	MAK-KOI-CHAN	TA-ROI	PE-TA-LOI
40	perilla	<i>Perilla frutescens</i> BRITT.	MANGA-KIMMU	SA-BANG	NU-SI	NE-SU-NE-MA	no	no	no
41	niger seed	<i>Guizotia abyssinica</i> (L. f.) Cass.	no	no	AI-EI	no	no	no	no



Photo 1. Banana plantations were established at northern areas of Lao PDR. Banana plants were densely grown with a pipe irrigation system and their bunches are encased in plastic bags for protection.



Photo 2. Rice is the staple diet in Lao PDR. This photo shows a traditional slash-and-burn cultivation field on a hill slope in Bokeo Province.



Photo 3. A farmer beating a rice bundle for threshing in the terraced field at NAM LUANG village (WP164). The traditional warehouses in the background of the photo have pillars with rat-guards supporting the raised floors and are used for grain storage.



Photo 4. Various wild plants collected and animals hunted were sold together with cultivated crops in local marketplaces.