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ラオスにおけるマメ類および共生微生物遺伝資源多様性の保全，2005 年

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Conservation of Legume - Symbiotic Rhizobia Genetic Diversity in Laos, 2005

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Summary

A field survey was conducted in Laos (Xieng Khouang, Vientiane, Xaisomboune, Houa Phan, Luang Prabang and Sayabouli Provinces) from November 6 to 24, 2005. For cultivated legumes, 1 accession of black gram (*Vigna mungo*), 5 of mungbean (*V. radiata*), 10 of rice bean (*V. umbellata*), and 7 of cowpea (*V. unguiculata*) were collected. For wild legumes, 3 accessions of *V. angularis*, 6 of *V. hirtella*, 3 of *V. minima*, 1 of *V. reflexo-pilosa*, 4 of *V. tenuicaulis*, 4 of *V. trinervia* and 10 of *V. umbellata* were collected. Three wild *Vigna* species, *V. angularis*, *V. trinervia* and *V. umbellata* were found for the first time in Laos.

Seed samples as well as root nodules were collected if they are available and were deposited in the country of origin.

Introduction

The National Institute of Agrobiological Sciences, Japan and National Agriculture Research Center, National Agriculture and Forestry Research Institute, Lao PDR have collaborated since 2003 on the survey of legume genetic resources in Laos. This is the report of the third survey trip. Trip report for 2003 and 2004 have been published (Tomooka *et al*., 2005; Tomooka *et al*.,

2004). Conservation of traditional legume crops, wild relatives and their symbiotic root nodules (rhizobia) are the main objectives.

Methods

We surveyed Xieng Khouang, Vientiane, Xaisomboune, Houa Phan, Luang Prabang and Sayabouli provinces from November 6 to 24, 2005 (Table 1, Fig. 1). Seeds, herbarium specimens and if available root nodules were collected. Information on collection sites including village name, altitude, latitude, longitude, habitat and other ecological data together with detailed sketch map of the collection sites were recorded as passport data. Identification of *Vigna* spp. was done based on the key prepared by Tomooka *et al*. (2002).

Results and Discussion

A summary list of collected materials is shown (Table 2). A total of 62 accessions consisting of 14 species were collected. Detailed information of each accession is listed in the passport data table (Table 3). The locality of the collection sites is shown (Fig. 1).

Cultivated legumes

Eight cultivated legume species were collected. Among them, soybean (*Glycine max*), rice bean (*Vigna umbellata*) and cowpea (*V. unguiculata*) are the most commonly cultivated legume species. The main use of soybean in the surveyed area is to produce fermented paste. Rice bean is eaten mixed with rice. Boiled immature rice bean pods are also commonly sold in the market. In Houa Phan Province, 2 escaped weedy populations of rice bean were found in a paddy field area. At site no. 31 near Muang Et, Houa Phan Province where weedy type of *V. umbellata* was collected, farmers said they collect and eat young pod and flowers. Mature seeds of black seeded cowpea are used to produce sweets. In Luang Prabang Province, a population of escaped cowpea was found along the road (L68). Escaped cowpea have easy shattering pods containing considerably smaller black seeds compared with black seeded cowpea in the market.

Hyacinth bean (*Lablab purpureus*) and winged bean (*Psophocarpus tetragonolobus*) are commonly cultivated in the home gardens as vegetables. Mungbean (*V. radiata*) is found in several markets but it seems not to be a traditional crop. In Xam Nua market in Houa Phan Province, farmers said the seeds of mungbean (L37) were brought from Vietnam and harvested mungbean are mainly sold back to Vietnam. A farmer who produced mungbean (L69) said she bought mungbean seeds from Luang Prabang market and will sell the products in Luang Prabang market. Black gram seeds were sold in a market of Sayabouli. The shop keeper said the seeds were recently introduced from Thailand.

Wild legumes

Seven wild *Vigna* species (31 accessions) were collected (Table 2). Among them, *V. angularis, V. trinervia* and *V. umbellata* are reported for the first time in Laos.

V. angularis var. *nipponensis*, the wild ancestral species of azuki bean, was found at high altitude in the south of Xam Nua, Houa Phan Province. The altitude of the collection sites ranged from 1,122 to 1,370 m. The area along the road is now used as paddy field. These collections represent the southern most area in the distribution range of this species.

V. trinervia is found in Xieng Khouang and Houa Phan Provinces. The altitude of the

collection sites ranged from 650 to 1,475 m. At collection site No.27 (near the Vietnam border in Houa Phan Province, alt. 650 m), *V. trinervia* (L39) was distributed together with *V. tenuicaulis* (L40). The habitat was beside a small stream in the paddy field area. At another collection site (No. 32, alt. 1,122m), *V. trinervia* (L46) was found sympatric with *V. angularis* (L45). The habitat was a paddy field. *V. trinervia* is considered to be a genome donor to the allo-tetraploid species *V. reflexo-pilosa*. However, the other genome donor species is not known (Egawa *et al*., 1996). *V. angularis* and *V. tenuicaulis* which were distributed together with *V. trinervia* in Laos could be candidates for the other genome donor species.

The wild form of *V. umbellata* was found in Vientiane, Xieng Khouang, Houa Phan, Luang Prabang and Sayabouli Provinces. The altitude of collection sites ranged from 345 to 1,300 m. This wild species sometimes forms large natural populations such as site No. 18 and 46. At site No. 18, near Muang Kham, Xieng Khouang, a farmer said they collect and eat flowers. At site No. 9 located north of Vang Vieng, Vientiane, a natural *V. umbellata* population was found growing beside a road. Collected seeds from this population have yellow seed coat which indicate the occurrence of natural gene flow between wild and cultivated population in this area.

In addition, 6 accessions of *V. hirtella*, 3 of *V. minima*, 1 of *V. reflexo-pilosa* and 4 of *V. tenuicaulis* were collected. Five accessions of *V. hirtella* were collected at high altitude (773 - 1,385 m) in mountains, but 1 accession was found at low altitude (385 m) at Sayabouli Province (L59). Two accessions of *V. minima* were collected at high altitude (1,240 - 1,340 m) in Houa Phan Province and 1 accession was found at low altitude (430 m) in Sayabouli Province. An accession of *V. reflexo-pilosa* was found growing in a open grassland near the river in Luang Prabang Province. Four accessions of *V. tenuicaulis* were collected at altitude between 350 m and 1,122 m. They were all growing at open habitats in or beside paddy field.

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和文摘要

本報告は，ラオスにおいて行っているマメ科植物遺伝資源共同調査の 3 年目の報告である．本年度の調査では，ラオスの Xieng Khouang 県，Vientiane 県，Xaisomboune 県，Houa Phan 県，Luang Prabang 県および Sayabouli 県を 11 月に探索し，伝統的マメ科作物，その近縁野生種および共生している根粒菌の収集保全を行った．その結果，栽培種としてケツルアズキ (*Vigna mungo*)1 系統，リョクトウ (*V. radiata*) 5 系統，ツルアズキ (*V. umbellata*) 10 系統，ササゲ (*V. unguiculata*) 7 系統を，野生種としてヤブツルアズキ (*V. angularis* var. *nipponensis*) 3 系統，*V. hirtella* 6 系統，コバノツルアズキ (*V. minima*) 3 系統，オオヤブツルアズキ (*V. reflexo-pilosa*) 1 系統，*V. tenuicaulis* 3 系統，*V. trinervia* 4 系統，ツルアズキ 10 系統を収集した．このうちの 3 種の野生種 (*V. angularis* var. *nipponensis*, *V. trinervia*, *V. umbellata*) は，今年度の調査によってラオスでの分布が初めて確認された種である．

Table 1. Itinerary of the field survey in Laos, 2005

Date	Day	Itinerary	Stay
6-Nov	Sun	Narita 10:45 -- TG641 -- 15:45 Bangkok -- Kampaeng Saen	Kampaeng Saen
7-Nov	Mon	Kampaeng Saen -- Chai Nat -- Bangkok	Bangkok
8-Nov	Tue	Bangkok 8:15 -- TG690 -- 9:25 Vientiane	Vientiane
9-Nov	Wed	Vientiane 15:30 -- QV401 -- 16:00 Phonsavan (Xieng Khouang)	Phonsavan
10-Nov	Thu	Phonsavan -- Vang Vieng -- Ngam Ngon	Ngam Ngon
11-Nov	Fri	Ngam Ngon -- Xaisonbun -- Vang Vieng	Vang Vieng
12-Nov	Sat	Vang Vieng -- Phou Khoun -- Phonsavan	Phonsavan
13-Nov	Sun	Phonsavan -- Muang Kham -- Nam Kanh -- Muang Kham	Muang Kham
14-Nov	Mon	Muang Kham -- Xam Nua	Xam Nua
15-Nov	Tue	Xam Nua -- Na Meo -- Xam Nua	Xam Nua
16-Nov	Wed	Xam Nua -- Xiang Kho -- Muang Et -- Xam Nua	Xam Nua
17-Nov	Thu	Xam Nua -- Phou Lao -- Vieng Thong	Vieng Thong
18-Nov	Fri	Vieng Thong -- Vieng Kham -- Pak Mong	Pak Mong
19-Nov	Sat	Pak Mong -- Luang Prabang -- Sayabouli	Sayabouli
20-Nov	Sun	Sayabouli -- south of Sayabouli -- Sayabouli	Sayabouli
21-Nov	Mon	Sayabouli -- Luang Prabang	Luang Prabang
22-Nov	Tue	Luang Prabang -- Vientiane	Vientiane
23-Nov	Wed	Vientiane 10:30 -- TG691 -- 11:35 Bangkok	Bangkok
24-Nov	Thu	Bangkok 11:20 -- TG640 -- 19:00 Narita	

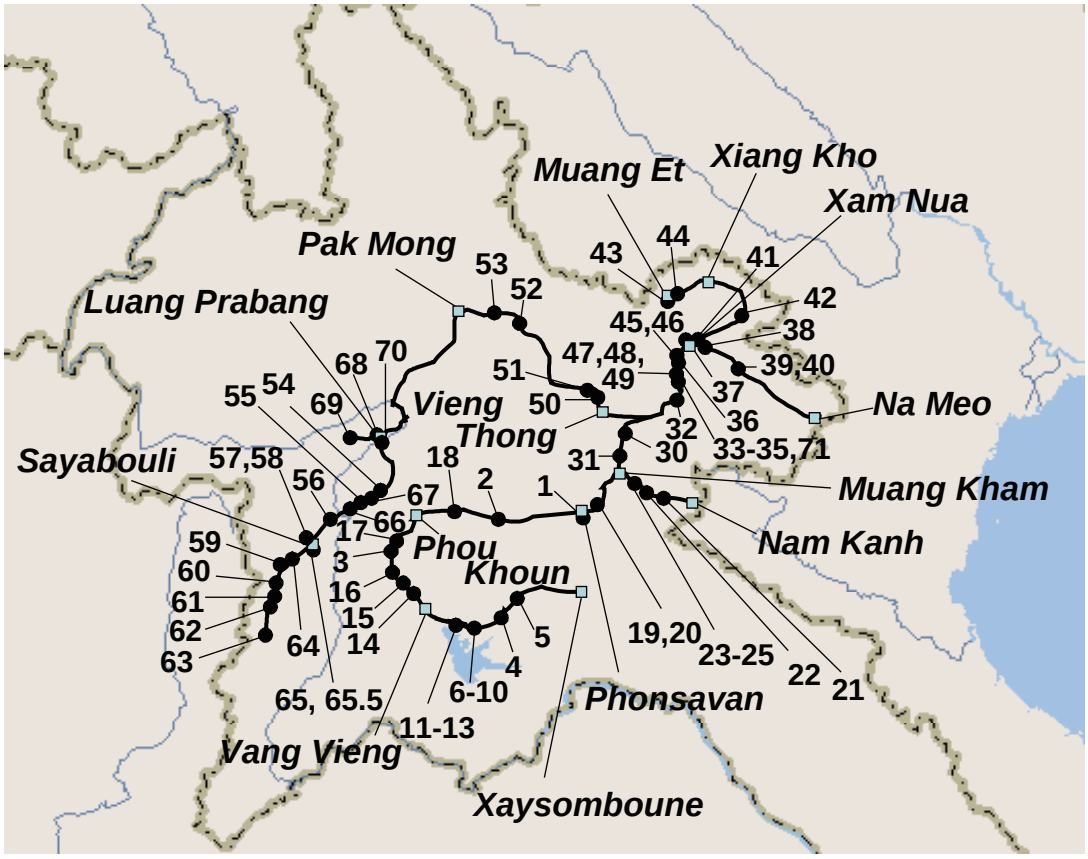


Fig.1. Collection routes and sites. Numbers represent collection number.

Table 2. A summary of collected species during 3 years (2003 - 2005) in Laos.

Species	Japanese name	status	2003	2004	2005	Total
Glycine max	ダイズ	cultivated	0	1	5	6
Lablab purpureus	フジマメ	cultivated	0	1	1	2
Phaseolus vulgaris	インゲンマメ	cultivated	0	0	1	1
Psophocarpus tetragonolobus	シカクマメ	cultivated	0	1	1	2
Vigna mungo	ケツルアズキ	cultivated	0	0	1	1
Vigna radiata	リョクトウ	cultivated	0	0	5	5
Vigna umbellata	ツルアズキ	cultivated**	5	11	10	26
Vigna unguiculata	ササゲ	cultivated**	1	5	7	13
Vigna angularis ＊	ヤブツルアズキ	wild	0	0	3	3
Vigna hirtella ＊	アズキ近縁種	wild	7	9	6	22
Vigna minima ＊	コバノツルアズキ	wild	5	4	3	12
Vigna reflexo-pilosa ＊	オオヤブツルアズキ	wild	1	1	1	3
Vigna tenuicaulis ＊	アズキ近縁種	wild	0	2	4	6
Vigna trinervia ＊	アズキ近縁種	wild	0	0	4	4
Vigna umbellata	ツルアズキ	wild	0	0	10	10
Total			19	35	62	116

＊ ： New record in Laos

** ： include escaped population

Survey area : 2003 Vientiane, Luang Prabang, Champasak, Saravan

2004 Udomxai, Luang Nam Tha, Phongsali

2005 Xaisonbun, Xieng Khouang, Houa Phan, Luang Prabang, Sayabouli

Table 3. Passport data of the collected materials in Laos

収集品のパスポートデータ

No.	Coll. Date	Coll. No.	Species	Status	Collection Site	Site No.	Latitude/ Longitude	Altitude (m)
1	Nov. 10	2005L1	*Vigna unguiculata*	cultivated	Phonsavan Market, Xieng Khouang Province	1	N19-25-59.3 E103-12-30.8	1127m
2	Nov. 10	2005L2	*Vigna hirtella*	wild	Phonsavan, Xieng Khouang Province	2	N19-31-52.4 E102-49-51	1191m
3	Nov. 10	2005L3	*Vigna umbellata*	wild	North of Kasi, Vientiane	3	N19-20-42 E102-23-58.7	916m
4	Nov. 11	2005L4	*Vigna hirtella*	wild	Nam Mo, Xaisomboune Province	4	N18-52-28.2 E102-57-27.1	773m
5	Nov. 11	2005L5	*Glycine max*	cultivated	B. Ton Kun, Xaisomboune Province	5	N18-52-5.6 E102-57-51.4	1018m
6	Nov. 11	2005L6	*Vigna umbellata*	cultivated	Nam Mo, Xaisomboune Province	6	N18-52-13.7 E102-54-45	500m
7	Nov. 11	2005L7	*Vigna umbellata*	cultivated	Nam Mo, Xaisomboune Province	6	N18-52-13.7 E102-54-45	500m
8	Nov. 11	2005L8	*Vigna umbellata*	cultivated	Nam Mo, Xaisomboune Province	6	N18-52-13.7 E102-54-45	500m
9	Nov. 11	2005L9	*Vigna umbellata*	cultivated	Nam Mo, Xaisomboune Province	6	N18-52-13.7 E102-54-45	500m
10	Nov. 11	2005L10	*Vigna unguiculata*	cultivated	Nam Mo, Xaisomboune Province	6	N18-52-13.7 E102-54-45	500m
11	Nov. 11	2005L11	*Psophocarpus tetragonolobus*	cultivated	Xaisomboune, Xaisomboune Province	7	N18-54-25.3 E102-41-31.3	434m
12	Nov. 11	2005L12	*Vigna unguiculata*	cultivated	Xaisomboune, Xaisomboune Province	7	N18-54-25.3 E102-41-31.3	434m
13	Nov. 11	2005L13	*Vigna umbellata*	cultivated	Xaisomboune, Xaisomboune Province	7	N18-54-25.3 E102-41-31.3	434m
14	Nov. 12	2005L14	*Vigna umbellata*	wild	North of Vang Vieng, Vientiane	8	N19-7-33 E102-20-46.6	400m
15	Nov. 12	2005L15	*Vigna umbellata*	wild	North of Vang Vieng, Vientiane	9	N19-7-59.2 E102-19-45.6	568m
16	Nov. 12	2005L16	*Vigna umbellata*	wild	North of Vang Vieng, Vientiane	10	N19-19-1.2 E102-20-44.8	713m
17	Nov. 12	2005L17	*Vigna umbellata*	wild	North of Kasi, Vientiane	11	N19-20-53.7 E102-24-40.6	840m
18	Nov. 12	2005L18	*Vigna hirtella*	wild	East of Phou Khoun, Xieng Khouang Province	12	N19-28-34.8 E102-38-51.3	1385m
19	Nov. 13	2005L19	*Vigna tenuicaulis*	wild	East of Phonsavan, Xieng Khouang Province	13	N19-27-28.8 E103-14-5.7	1122m
20	Nov. 13	2005L20	*Vigna umbellata*	cultivated	East of Phonsavan, Xieng Khouang Province	13	N19-27-28.8 E103-14-5.7	1122m
21	Nov. 13	2005L21	*Vigna umbellata*	wild	West of Nam Kanh, Xieng Khouang Province	14	N19-29-11.5 E104-3-8.4	1300m
22	Nov. 13	2005L21.5	*Zea mays*	cultivated	West of Nam Kanh, Xieng Khouang Province	15		1500m
23	Nov. 13	2005L22	*Glycine max*	cultivated	West of Nam Kanh, Xieng Khouang Province	16	N19-30-6.5 E103-54-52.1	1325m
24	Nov. 13	2005L23	*Vigna umbellata*	cultivated	West of Nam Kanh, Xieng Khouang Province	17	N19-36-1.4 E103-48-46.5	1226m

Habitat	Shading	Distur-bance	Popula-tion size	Growth stage	Soil	Seed	Sample	Herba-rium	Rhizo-bium	Remarks
market						yes	bulk	no	no	local name: tua dam, Phonsavan Market, use only seed for sweet
wet grassland	light	high	several plants	flowering → mature	clay	yes	indivi-dual	yes	no	slope 30° , few mature seeds, powdery mildew, bracteole not so long
grassland	light	high	several plants	flowering → mature	silt	yes	bulk	yes	yes	beside road
grassland	light	high	several plants	flowering → mature	sandy	yes	bulk	yes	yes	beside road, very similar to *V. umbellata*, flower color clear yellow, long peduncle, many pods
from farmer						yes	bulk	no	no	grown on mountain field, make soy milk, yellow seed
farmer's field	light	low	10 x 10 m	mature	silt	yes	bulk	no	no	black seed, climbing up bananas, many types (L6 ～ L9) cultivated in a field
farmer's field	light	low	10 x 10 m	mature	silt	yes	bulk	no	no	yellow seed, black pod, climbing up bananas , many types (L6 ～ L9) cultivated in a field
farmer's field	light	low	10 x 10 m	mature	silt	yes	bulk	no	no	black mottled seed, climbing up bananas, many types (L6 ～ L9) cultivated in a field
farmer's field	light	low	10 x 10 m	mature	silt	yes	bulk	no	no	yellow seed, yellow pod, climbing up bananas, many types (L6 ～ L9) cultivated in a field
farmer's field	light	low	10 x 10 m	mature	silt	yes	bulk	no	no	same field as L6 ～ L9, black seed
farmer's field	open	medium	several plants	mature	sandy	yes	bulk	no	no	beside paddy, upland field, pale brown seed
farmer's field	open	medium	several plants	mature	sandy	yes	bulk	no	no	beside paddy, upland field, yard long bean, brown seed
farmer's field	open	medium	5 x 10 m	flowering	sandy	no	no	no	yes	beside paddy, upland field, late planting rice bean, only nodules collected
grassland	open	medium	10 x 10 m	flowering → mature	sandy	yes	bulk	yes	yes	beside road, many nematode attacked
grassland	open	medium	5 x 10 m	flowering → mature	sandy	yes	bulk	yes	no	beside road, yellow seed, black pod, no nodules found
grassland	open	medium	5 x 10 m	flowering → mature	sandy	no	no	no	yes	only nodules collected
slope beside road	light	high	several plants	mature ← → past maturity	gravel	yes	bulk	yes	yes	short pod, early maturity, beside road (sharp curve gully), many new seedlings emerging on gravel
grassland	light	high	several plants	vegetative	gravel	no	no	yes	yes	beside road, can flower from stem, very hairy shoot, no mature pods, only nodules and herbarium collected
beside paddy	light	high	a few plants	mature	clay	yes	bulk	yes	yes	beside paddy, flower color bright yellow, very short bracteole like *V. minima*
farmer's field	light	high	a few plants	mature	clay	yes	bulk	no	no	local name: tua am, yellow seed, beside paddy, many stink bug
grassland	light	high	several plants	flowering → mature	gravel	yes	bulk	yes	yes	beside road, flower color yellow, heavily cut location, small leaf, short pod, less hairy, small stipule
from farmer				harvested		yes	indivi-dual	no	no	glutinous variety, purple kernel
farmer's field	open	low	5 x 10 m	maturing	silt	yes	bulk	no	yes	short statue, not mature but collected 2 plants, yellow small seed
from farmer				harvested		yes	bulk	no	no	local name:tua am, yellow seed

Table 3. (continued).

No.	Coll. Date	Coll. No.	Species	Status	Collection Site	Site No.	Latitude/ Longitude	Altitude (m)
25	Nov. 13	2005L24	*Phaseolus vulgaris*	cultivated	West of Nam Kanh, Xieng Khouang Province	17	N19-36-1.4 E103-48-46.5	1226m
26	Nov. 13	2005L25	*Glycine max*	cultivated	West of Nam Kanh, Xieng Khouang Province	17	N19-36-1.4 E103-48-46.5	1226m
27	Nov. 13	2005L26	*Setaria italica*	cultivated	West of Nam Kanh, Xieng Khouang Province	17	N19-36-1.4 E103-48-46.5	1226m
28	Nov. 13	2005L27	*Vigna umbellata*	wild	near Hot Spring, Muang Kham, Xieng Khouang Province	18	N19-35-11.9 E103-40-49.3	530m
29	Nov. 13	2005L28	*Vigna umbellata*	wild	near Hot Spring, Muang Kham, Xieng Khouang Province	18	N19-35-11.9 E103-40-49.3	530m
30	Nov. 14	2005L29	*Glycine max*	cultivated	Muang Kham Market, Xieng Khouang Province	19		640m
31	Nov. 14	2005L30	*Vigna* sp. cf. *Vigna vexillata*	wild	ca. 10km North of Muang Kham, Xieng Khouang Province	20	N19-43-30.7 E103-36-28	1416m
32	Nov. 14	2005L31	*Vigna trinervia*	wild	North of Muang Kham, Xieng Khouang Province	21	N19-45-52.9 E103-37-24.8	1475m
33	Nov. 14	2005L32	*Vigna hirtella*	wild	80km South of Xam Nua, Houa Phan Province	22	N20-6-24.4 E103-45-21.2	980m
34	Nov. 14	2005L33	*Vigna umbellata*	cultivated	Saleuy, Xam Nua, Houa Phan Province	23	N20-12-57.3 E103-58-0.8	1370m
35	Nov. 14	2005L34	*Vigna angularis* var. *nipponensis*	wild	Saleuy, Xam Nua, Houa Phan Province	23	N20-12-57.3 E103-58-0.8	1370m
36	Nov. 14	2005L35	*Glycine max*	cultivated	Saleuy, Xam Nua, Houa Phan Province	23	N20-12-57.3 E103-58-0.8	1370m
37	Nov. 14	2005L36	*Vigna angularis* var. *nipponensis*	wild	Nam Daen, South of Xam Nua, Houa Phan Province	24	N20-14-51 E104-1-50.7	1160m
38	Nov. 15	2005L37	*Vigna radiata*	cultivated	Xam Neua Market, Houa Phan Province	25		1000m
39	Nov. 15	2005L38	*Vigna hirtella*	wild	Tan Low, Xam Nua, Houa Phan Province	26	N20-27-39.5 E104-10-9.8	830m
40	Nov. 15	2005L39	*Vigna trinervia*	wild	Mun Kan, West of Na Meo, Houa Phan Province	27	N20-19-56.6 E104-22-43.3	650m
41	Nov. 15	2005L40	*Vigna tenuicaulis*	wild	Mun Kan, West of Na Meo, Houa Phan Province	27	N20-19-56.6 E104-22-43.3	650m
42	Nov. 15	2005L41	*Vigna trinervia*	wild	Xam Nua, Houa Phan Province	28	N20-25-28.6 E104-4-30	980m
43	Nov. 16	2005L42	*Vigna umbellata*	weedy	South of Sop Bao, Houa Phan Province	29	N20-36-49.5 E104-25-11	200m
44	Nov. 16	2005L43	*Glycine max*	cultivated	Muang Et, Houa Phan Province	30		
45	Nov. 16	2005L44	*Vigna umbellata*	weedy	near Muang Et (2km), Houa Phan Province	31	N20-49-2.1 E104-1-39.1	234m
46	Nov. 17	2005L45	*Vigna angularis* var. *nipponensis*	wild	Houay Yon, South of Xam Nua, Houa Phan Province	32	N20-16-19.5 E104-2-40.4	1122m
47	Nov. 17	2005L46	*Vigna trinervia*	wild	Houay Yon, South of Xam Nua, Houa Phan Province	32	N20-16-19.5 E104-2-40.4	1122m

Habitat	Shading	Distur-bance	Popula-tion size	Growth stage	Soil	Seed	Sample	Herba-rium	Rhizo-bium	Remarks
from farmer				harvested		yes	bulk	no	no	local name: tua ma, dark brown seed
from farmer				harvested		yes	bulk	no	no	local name: tua tui, used for fermented paste
from farmer				harvested		yes	bulk	no		local name: khao fan
beside paddy	open	medium	large	flowering → mature	clay	yes	bulk	yes	yes	smaller seed, in paddy around hut & along the road, farmer said they eat flower as salad
beside paddy	open	medium	large	flowering → mature	clay	yes	bulk	yes	yes	larger seed, in paddy around hut & along the road, farmer said they eat flower as salad
market						yes	bulk	no	no	local name: tua tue, black seed, for fermented paste
road side grassland	light	medium	one plant	past maturity	clay	yes	indivi-dual	yes	no	*Vigna* sp. (cf. *V. vexillata*), beside mountain road, no flower seen, high pubscence on the pod
road side grassland	light	medium	2 x 5 m	mature	silt	yes	bulk	yes	yes	beside road, flower color bright yellow, large nodules formed
road side grassland	heavy	medium	several plants	mature	silt	yes	bulk	yes	yes	beside road, flower color pale yellow (outside standard purple), many pods on one peduncle, long pods, bracteole same as calyx, stipule small, large leaf, 17seeds/pod, 7.5cm length (pod)
farmer's field	medium	low	3 x 5 m	past maturity	clay	no	no	no	no	climbing on the fence
wet paddy fallow	medium	low	3 x 5 m	past maturity	clay	yes	bulk	yes	yes	growing in a wet terrace fallow rice field, stem hairy
from farmer				harvested	cay	yes	bulk	no	no	make fermented paste, yellow round seed
wet paddy fallow	mediun	low	several plants	past maturity	clay	yes	bulk	yes	yes	very short bracteole
market						yes	bulk	no	no	*V. radiata* from Vietnam, shiny green seed
beside paddy	heavy	medium	several plants	flowering → mature	clay	yes	bulk	yes	yes	beside paddy field (shady place), flower color pale creamy yellow, bracteole as long as calyx, stipule long, very long pods containing 20 seeds, ants gathered
near stream grassland	light	medium	10 m	mature	clay	yes	bulk	yes	yes	stream side, flower color bright yellow, sympatric with *V. tenuicaulis* (L40)
near stream grassland	light	medium	10 m	past maturity	clay	yes	bulk	yes	yes	stream side, sympatric with *V.trinervia* (L39)
beside wet paddy	light	medium	several plants	mature	clay	yes	bulk	yes	no	slope 10° , beside paddy, flower color bright yellow
beside paddy grassland	light	low	maybe single plant	mature	sandy	yes	bulk	yes	no	between paddy & stream, seed used for healing back pain together with many other herbs, black mottled seed, big stink bug came to pod
from farmer				harvested		yes	bulk	no	no	weeding once, no insecticide used, seed from Vietnam for export to Vietnam
from farmer				maturity		yes	bulk	no	no	seeds boiled with rice, eat young pod and flower
beside harvested paddy	medium	medium	several plants	flowering	clay	no	no	yes	yes	only nodule & harbarium, beside paddy, flower color clear yellow, very small stipule, bracteole as long as calyx.
beside pond in paddy	open	low	several plants	flowering	clay	no	no	yes	yes	only nodule & herbarium, beside paddy

Table 3. (continued).

No.	Coll. Date	Coll. No.	Species	Status	Collection Site	Site No	Latitude/ Longitude	Altitude (m)
48	Nov. 17	2005L47	*Vigna angularis* var. *nipponensis*	wild	35km to Xan Nua. South of Xam Nua, Houa Phan Province	33	N20-13-50.7 E104-0-23.2	1240m
49	Nov. 17	2005L48	*Vigna minima*	wild	35km to Xan Nua. South of Xam Nua, Houa Phan Province	33	N20-13-50.7 E104-0-23.2	1240m
50	Nov. 17	2005L49	*Vigna minima*	wild	near Nam Van. Xam Nua, Houa Phan Province	34	N20-13-20 E103-59-0.4	1340m
51	Nov. 18	2005L50	*Vigna hirtella*	wild	West of Vieng Thong, Luang Prabang Province	35	N20-6-50.2 E103-18-0.3	1000m
52	Nov. 18	2005L51	*Vigna hirtella*	wild	West of Vieng Thong, Luang Prabang Province	36	N20-7-58.9 E103-17-19.8	1020m
53	Nov. 18	2005L52	*Vigna reflexo pilosa*	wild	Ban Bong, Vieng Kham, Luang Prabang Province	37	N20-34-48.5 E102-35-54.7	330m
54	Nov. 18	2005L53	*Vigna tenuicaulis*	wild	East of Nam Bak, Luang Prabang	38	N20-38-9.3 E102-29-18.4	350m
55	Nov. 19	2005L54	*Vigna umbellata*	wild	South of Xiang Ngeun, Luang Prabang Province	39	N19-39-21.6 E102-5-43.7	370m
56	Nov. 19	2005L55	*Vigna umbellata*	wild	Muang Nan, Luang Prabang Province	40	N19-36-7.9 E102-2-4.4	540m
57	Nov. 19	2005L56	*Vigna umbellata*	wild	North of Nakhoun, Sayabouli, Sayabouli Province	41	N19-22-2.9 E101-46-56.6	345m
58	Nov. 20	2005L57	*Vigna mungo*	cultivated	Sayabouli Market, Sayabouli Province	42	N19-15-38.4 E101-42-41.2	290m
59	Nov. 20	2005L58	*Vigna radiata*	cultivated	Sayabouli Market, Sayabouli Province	42	N19-15-38.4 E101-42-41.2	290m
60	Nov. 20	2005L59	*Vigna hirtella*	wild	ca. 3km North of Phiang (32km), Sayabouli Province	43	N19-8-36.9 E101-34-1.3	385m
61	Nov. 20	2005L60	*Vigna tenuicaulis*	wild	ca. 10km South from 2005L59. South of Phiang, Sayabouli Province	44	N19-4-3.7 E101-31-15.6	355m
62	Nov. 20	2005L61	*Vigna trinervia*	wild	ca. 6km South from 2005L60. NaSing, Sayabouli Province	45	N19-0-56.3 E101-30-31.6	355m
63	Nov. 20	2005L62	*Vigna umbellata*	wild	ca. 2km South from 2005L61. Sayabouli Province	46	N18-59-51.7 E101-30-5.5	350m
64	Nov. 20	2005L63	*Vigna minima*	wild	South of B. Khounphon Village, Sayabouli Province	47	N18-47-40.5 E101-31-47.5	430m
65	Nov. 20	2005L64	*Vigna radiata*	cultivated	Vieng Chaleum Market, Sayabouli Province	48		
66	Nov. 21	2005L65	*Vigna umbellata*	cultivated	Sayabouli Market, Sayabouli Province	42	N19-15-38.4 E101-42-41.2	290m
67	Nov. 21	2005L65.5	*Vigna unguiculata*	cultivated	Sayabouli Market, Sayabouli Province	42	N19-15-38.4 E101-42-41.2	290m
68	Nov. 21	2005L66	*Vigna radiata*	cultivated	Muang Thadua, Luang Prabang Province	49	N19-27-38.9 E101-51-10.3	325m
69	Nov. 21	2005L67	*Vigna umbellata*	wild	6km South of 2005L54. Luang Prabang Province	50	N19-37-14.3 E102-3-16.9	562m
70	Nov. 21	2005L68	*Vigna unguiculata*	weedy	Luang Prabang, Luang Prabang Province	51	N19-51-19.5 E102-5-28.5	310m
71	Nov. 21	2005L69	*Vigna radiata*	cultivated	before Kouangsi Waterfall, Luang Prabang Province	52	N19-49-46.4 E102-1-49.1	310m
72	Nov. 21	2005L70	*Vigna unguiculata*	cultivated	Luang Prabang Market, Luang Prabang Province	53		
73	Nov. 14	2005L71	*Lablab purpureus*	cultivated	Saleuy, Xam Nua, Houa Phan Province	23	N20-12-57.3 E103-58-0.8	1370m

Habitat	Shading	Distur-bance	opula-tion size	Growth stage	Soil	Seed	Sample	Herba-rium	Rhizo-bium	Remarks
paddy ridge	medium	medium	a few plants	mature	clay	yes	indivi-dual	yes	yes	beside paddy, only 1 pod collected
beside paddy grassland	light	low	2 x 5 m	mature	clay	yes	bulk	yes	yes	beside paddy, seeds small
beside paddy grassland	light	medium	several seedlings	mature	clay	yes	indivi-dual	yes	yes	beside paddy, seems to emerge relatively recently, 2 pods collected
road side wet slope grassland	medium	medium	several plants	flowering	silt	yes	indivi-dual	yes	yes	only nodule & herbarium, no mature pod, beside road, wet slope
road side grassland	medium	medium	several plants	flowering	silt	yes	bulk	yes	no	beside road, flower color clear yellow (not pale like before), very hairy stem & leaf, pod very long
river side grassland	open	medium	several plants	flowering → mature	sandy	yes	bulk	yes	yes	beside road, flower color clear yellow, beside Nam Bak river
paddy ridge grassland	light	medium	several plants	mature	clay	yes	bulk	yes	yes	in paddy field, flower color clear yellow
road side grassland	open	medium	2 x 5 m	flowering	silt	no	no	yes	yes	beside road, flower color clear yellow, no mature pods, only herbarium specimen
grassland	open	medium	3 x 5 m	flowering → mature	silt	yes	bulk	yes	yes	beside road & paddy, flower color bright yellow
grassland	open	medium	2 x 15 m	mature	clay	yes	bulk	yes	yes	local name: tua nuu, between road and paddy, butterfly visiting flower
market				harvested		yes	bulk	no	no	local name: tua ngo dam, Sayabouli market, seed from Thailand
market				harvested		yes	bulk	no	no	dull green seed, Sayabouli market
road side wet grassland	medium	medium	3 x 4 m	flowering	silt	yes	bulk	yes	yes	beside road, slope 5° , flower color clear yellow, bracteole hairy, longer than calyx, stem hairy, thick rim aril
beside paddy grassland	open	medium	large along paddy	flowering → mature	clay	yes	bulk	yes	yes	beside paddy
beside stream grassland	open	medium	2 x 3 m	mature	sandy	yes	bulk	yes	yes	beside stream, flower color clear yellow, stem reddish, no hair on long peduncle, short hairs on pod
beside paddy grassland	open	medium - low	spreading 10 x 10 m	flowering	clay	yes	bulk	yes	yes	beside paddy & home garden, flower color clear yellow, a few mature pods
road side stream grassland	medium	medium	several plants	mature	clay	yes	bulk	yes	yes	beside roadside stream, flower color pale clear yellow, stem glabrous
market				harvested		yes	bulk	no	no	small dull green seed, Vieng Chaleum Market
market				harvested		yes	bulk	no	no	yellow seed, local name: tua lantek, Sayabouli Market
market				harvested		yes	bulk	no	no	small seed, yellow-brown mottled seed, Sayabouli Market
farmer's field	open	none	15 x 15 m	mature	clay	yes	bulk	yes	yes	mungbean field, large insects came to extra-floral nectars, larger seeds than mungbean sold in the market
road side fence	light	medium	2 x 6 m	mature	clay	yes	bulk	yes	yes	beside road, flower color clear yellow, very early maturity, stink bug
road side grassland	open	medium	several plants	mature	silt	yes	bulk	yes	yes	beside road, very small black seed, very easily shattered pod
from farmer				harvested		yes	bulk	no	no	dull green seed, farmer said she bought and sell seeds from and to Luang Prabang Market
market				harvested		yes	bulk	no	no	Luang Prabang Market, black seed
farmer's field	open	low	several plants	harvested	clay	yes	bulk	no	no	beside rice field, climbing on fence

2005L1
Vigna unguiculata

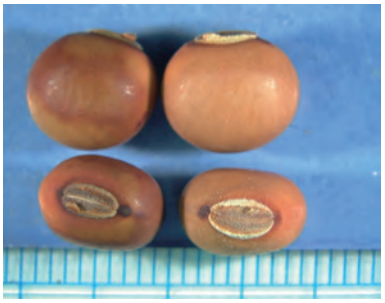
2005L3
Vigna umbellata

2005L4
Vigna hirtella

2005L5
Glycine max

2005L6
Vigna umbellata

2005L7
Vigna umbellata



2005L11
Psophocarpus tetragonolobus

2005L15
Vigna umbellata

2005L29
Glycine max

2005L31
Vigna trinervia

2005L34
Vigna anguralis var. *nipponensis*

2005L37
Vigna radiata

2005L40
Vigna tenuicaulis

2005L49
Vigna minima

2005L52
Vigna reflexo-pilosa