

## Collaborative Exploration and Collection of Plant Genetic Resources in Laos, October 2015

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### Summary

During the Plant Genetic Resources in Asia project, the National Institute of Agrobiological Sciences of Japan and National Agriculture and Forestry Research Institute of Laos conducted a collaborative survey for plant genetic resources in Luang Prabang province in Laos under the Joint Research Agreement. Sorghum (*Sorghum bicolor* (L.) Moench) was the main target of the survey; however, some vegetables were also collected. A total of 12 samples collected, including nine sorghum (*Sorghum bicolor*) samples, two bunching onion (*Allium fistulosum* L.) samples, and one chili pepper (*Capsicum chinense* Jacq.) sample.

KEY WORDS: Sorghum, Bunching onion, *Capsicum*

### Introduction

The National Institute of Agrobiological sciences (NIAS) of Japan and the National Agriculture and Forestry Research Institute (NAFRI) of Laos established a Joint Research Agreement (JRA) in 2014 under the Plant Genetic Resources in Asia project (PGRAsia project) in trust of the Ministry of Agriculture, Forestry and Fisheries of Japan. During the project, the NIAS and NAFRI planned a collaborative survey in Laos for plant genetic resources. All obligations and rights of the NIAS under the JRA have been transferred to the National Agriculture and Food Research Organization (NARO), owing to a merger between the NARO and the NIAS in April 2016.

Since 2006, the NIAS and NAFRI have conducted collaborative survey and collection expeditions in Laos for plant genetic resources under the Memorandum of Agreement (MOA) and the Memorandum of Understanding (MOU; Sakata *et al.*, 2008; Saito *et al.*, 2009; Matsunaga *et al.*, 2010; Saito *et al.*, 2015).

Surveys of cereal crop genetic resources also have been conducted in the provinces of Xieng Khouang, Houa Phan, Bolikhamsay, Khammouane, Oudomsay, Luang Namtha, Bokeo, Phongsaly and Luang Prabang, and the country's capital city Vientiane (Kawase *et al.*, 2012; Okuizumi *et al.*, 2011; Okuizumi *et al.*, 2013; Okuizumi *et al.*, 2015a, 2015b; Yamamoto *et al.*, 2015a, 2015b).

In the present survey, we visited Khum villages in Luang Prabang province, where we had not visited in the past, and our survey was mainly targeted at collecting sorghum, which is one of the most important crops in Laos. The survey included both Japanese and NAFRI researchers.

## Methods

The survey was conducted from 22<sup>nd</sup> to 25<sup>th</sup> of October, 2015 (Table 1). We visited 10 sites during the present survey (Fig. 1). A rental car was used for transportation between sites. For the records of the landscapes of the survey sites and sample data (e.g., plant height, panicle length, and local name), we also took photos. The alphabet spelling of locations in this report was referred to the map (World mapping project 2014).

Table 1. Itinerary of the survey in Laos

Date	Day	Itinerary	Collection
Oct 22	Thu	Vientiane - Thin Keo vil. - Luang Prabang city	L1
Oct 23	Fri	Luang Prabang city - Pongpao vil. - Hony Long Theung vil. - Houayleuk vil. - Luang Prabang city	L2 - L5
Oct 24	Sat	Luang Prabang city - Houayleuk vil. - Hua Keng vil. - Napho vil. - Hatxam vil. - Hat Ngam vil. - Nad Kham vil. - Nong Pha Dad vil. - Luang Prabang city	L6 - L11
Oct 25	Sun	Luang Prabang city	L12
Oct 26	Mon	Luang Prabang city - Vientiane	

## Results and Discussions

### 22<sup>nd</sup> October, 2015

The survey was initiated in Vientiane and proceeded to Luang Prabang *via* a westward route from the city of Kasi. At the Khum village of Thin Keo, Ms. Chan Souk provided a sorghum sample (Collection No. 2015-10-L1, hereafter L1). Ms. Souk reported that she also had two other types of sorghums in the field, so we asked her to keep these for a future survey.

Sample L1 was a sorghum (*Sorghum bicolor*; Photo 1) that was locally called 'Oi Fang' or 'Oi Niam'. The plant's stem was sweet, and it was sold in a town market.

### 23<sup>rd</sup> October, 2015

We started in the city of Luang Prabang and followed the main road to the village of Paknga. At the village of Pongpao, which was home to both Monh and Khum, sorghum was found. However, because the owner of houses where the sorghum was found was absent, no collection was made. Then, we visited the village head for the courtesy call. After the call, a villager, Ms. Mai (Khum tribe) provided a sorghum sample (L2). At the Khum village of Hony Long Theung, which was 3 km east of the village of Paknga, Ms. Somchan provided a sorghum sample (L3), and villagers reported that they had stopped cultivating

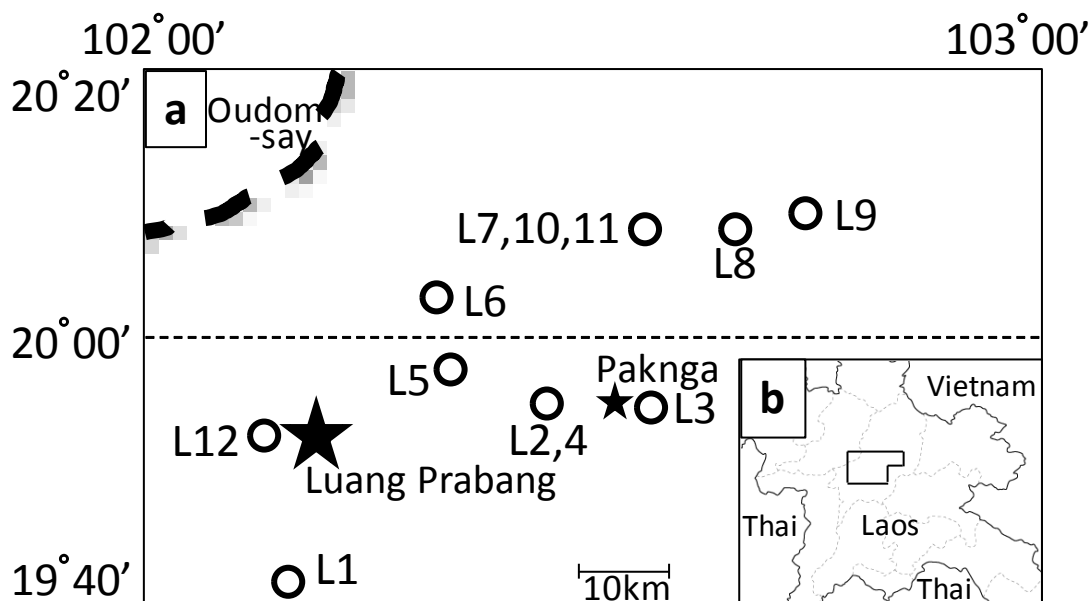


Fig.1. Map of Collection Sites for exploration and collection of plant genetic resources in Laos

a; ○ are collection sites

b; □ in the center is enlarged as Fig. 1-a

foxtail millet 20 years prior. Instead, the villagers grew Chinese cabbage and bunching onion during the dry season; however, because these crops were grown with seeds from the market, landrace seeds were not available. One villager reported that he wanted to grow job's tears (*Coix lacryma-jobi* L.) instead of sorghum. The Chinese and Thai pay thirty thousand kip (4 USD) per kg of job's tears. When travelling back to Luang Prabang, the village head of Pongpao, Mr. Ger, met us and provided a sample of sorghum from his field in the mountains (L4). At the Khum village of Houayleuk, Mr. Kham On provided a sorghum sample (L5).

Samples L2-L5 were sorghums (*Sorghum bicolor*; Photos 2-5). Samples L2, L4, and L5 were locally called 'Kroy', which means "non-sweet sorghum" and L3 was locally called 'Kuoy Yong', which means "sweet juice." Panicle lengths of L2, L3, L4, and L5 were 40, 33, 39, and 43 cm, respectively, the plant heights were 3, 3, 3, and 1.8 - 2.5 m, respectively. All the panicles were bicolor type, with a lax cone shape.

#### 24<sup>th</sup> October, 2015

At the Khum village of Hua Keng, Mr. Joy provided a sorghum sample (L6). According to Mr. Joy, the villagers had stopped cultivating foxtail millet and finger millet 5-6 years prior. We visited the agricultural training center of the local government in Luang Prabang, where local farmers were taught new cultivation methods for the organic farming of broad-leaved mustard (*Brassica juncea* (L.) Czern) and choy sum (*Brassica rapa* L.). Maize (*Zea mays* L.) was found at the village of Napho; however, it was an improved variety called 'LVN10'. At the Khum village of Hatxam, Ms. Ton provided a sorghum sample (L7). According to Ms. Ton, foxtail millet had disappeared 20 years prior. At the Khum village of Hat Ngam, which is east of the village of Pak Xen, where the Nam Xeng and Nam Teu Rivers merge, Ms. Van Dy provided a sorghum sample (L8). We proceeded to the next village in the mountain area. At the Khum village of Nad Kham, which was located at 100 km from Luang Prabang, Ms. Boi On provided a sorghum sample (L9). According to Ms. Boi, foxtail millet had disappeared 20 years prior. On our return journey

Table 2. Termination of millets cultivation

Village	Millet	Termination	Note
Hony Long Theung	Foxtail	20 yrs ago	provided sorghum (L3)
Hua Keng	Foxtail / Finger	5-6 yrs ago	provided sorghum (L6)
Hatxam	Foxtail	20 yrs ago	provided sorghum (L7)
Nad Kham	Foxtail	20 yrs ago	provided sorghum (L9)

to Luang Prabang, we stopped at the Khum village of Nong Pha Dad, where Mr. Soon Tone provided two types of bunching onions (L10 and L11).

Samples L6-L9 were sorghums (*Sorghum bicolor*; Photos 6-9) and were locally called ‘Kouy Yong’. Sample L6 was 2.5-3.0 m in height, and the panicle length, shape, and grain density were 45 cm, lax cone, and dense, respectively. Sample L7 was 3 m in height, and the panicle length was 45 cm. Sample L8 was 2.5-3.0 m in height, and the panicle length was 26 cm. Sample L9 was 3 m in height, and the panicle length was 36 cm.

Samples L10 and L11 were bunching onions (*Allium fistulosum*; Photos 10 and 11) and were collected as vegetative samples. Sample L10 was locally called ‘Sang Eun Nam’, which means “big bunching onion.” The plant’s height was 42 cm, and the leaf sheath length was 13 cm. Sample L11 was locally called ‘Sang Eun Yao’, which means “small bunching onion.” The plant’s height was 31 cm, and leaf sheath length was 9 cm. The Lao people use bunching onion as a garnish.

### 25<sup>th</sup> October, 2015

In the city of Luang Prabang, we explored the Phosy market, where vegetables, fruits, fish, animals, and insects were sold. There were 200 indoor stores of which 20 sold agricultural products, and there were 120 outdoor stalls at the side of the market building of which 100 sold agricultural products. We obtained a chili pepper sample (L12) at this market.

Sample L12 was a chili pepper (*Capsicum chinense*, Photo 12) that was locally called Pick. The mature fruit of the sample was red and pungent.

### Conclusions

During the present survey, we visited 10 Khum villages and a market in Luang Prabang and collected a total of 12 plant genetic resources, including nine sorghum samples of sorghum, two bunching onion samples, and one chili pepper sample. The sorghums were locally known as ‘Kroy’ or ‘Kouy Yong’ (meaning “sweet sorghum” or “non-sweet sorghum,” respectively), except for the sorghum from Thin Keo, which was locally called ‘Oi Nium’ or ‘Oi Fang’. All of the collected sorghums were bicolor-type with red glume and lax cone-type panicles. In the present survey, we failed to collect any minor millets, such as foxtail millet; however, the farmers provided information about the millets that they had cultivated in the past. In four villages, the farmers reported that they had cultivated foxtail millets 5-6 years prior, at the latest, or 20 years prior, and finger millet had also been cultivated 5-6 years prior (Table 2). This suggests that the farmers these had changed their lifestyles within the last 5-6 or 20 years. The characteristics of the plant genetic resources obtained in the present survey will be studied in Laos and Japan.

## Acknowledgment

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# ラオスにおける植物遺伝資源の探索・収集，2015年10月

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## 和文摘要

本研究報告は，農林水産省委託事業「海外植物遺伝資源の収集・提供強化」(PGRAsia プロジェクト)の研究の一環として，2015年10月22日から10月26日にかけて行われたラオスにおける海外植物遺伝資源の探索・収集に関するものである。本探索では，ラオスのルアンプラバン市周辺の少数民族の村を対象に，ソルガムを主目的とする探索を行った。その結果，ソルガム9点，ネギ2点，トウガラシ1点，合計12点の植物遺伝資源を収集した。

Appendix. A passport data of collected materials

No.	Coll. No.	JP No.	Coll. Date	Species name	Status <sup>*1)</sup>	Local name	Sample	Locality (Province, Village)	Collection <sup>*2)</sup>	Latitude	Longitude	Altitude (m)	Condition <sup>*3)</sup>	Remarks	Photo No./ image
1	2015-10-L1	256196	Oct 22	<i>Sorghum bicolor</i>	In	Oi Fang, Oi Niam	Landrace	Ban Thin Keo, Xiang Ngeun, Luang Prabang	4	N19-40-59.1	E102-07-04.8	382	6-2-3-3-3	Ms. Chan Souk, Khum tribe	1 / 0697
2	2015-10-L2	256197	Oct 23	<i>Sorghum bicolor</i>	In	Kroy	Landrace	Ban Pougpaio, Phone Xay, Luang Prabang	4	N19-57-27.6	E102-29-07.3	378	6-2-2-3-3	Ms. Mai, Khum tribe Plant height : 3 m, Panicle length : 40 cm	2 / 0706
3	2015-10-L3	256198	Oct 23	<i>Sorghum bicolor</i>	In	Kuoy Yong	Landrace	Ban Houy Long Theung, Phone Xay, Luang Prabang	4	N19-57-09.1	E102-34-03.5	450	6-2-2-2-3	Ms. Somchan, Khum tribe Plant height : 3 m, Panicle length : 33 cm	3 / 0715
4	2015-10-L4	256199	Oct 23	<i>Sorghum bicolor</i>	In	Kroy	Landrace	Ban Poug Pao, Phone Xay, Luang Prabang	2	N19-57-27.6	E102-29-07.3	378	6-2-3-3-3	Mr. Ger, Khum tribe Plant height : 3 m, Panicle length : 39 cm	4 / 0727
5	2015-10-L5	256200	Oct 23	<i>Sorghum bicolor</i>	In	Kroy	Landrace	Ban Houayleuk, Phone Xay, Luang Prabang	4	N19-59-08.4	E102-21-42.0	373	6-2-3-3-3	Mr. Kham On, Khum tribe Plant height : 1.8 to 2.5 m, Panicle length : 43 cm	5 / 0731
6	2015-10-L6	256201	Oct 24	<i>Sorghum bicolor</i>	In	Kuoy Yong	Landrace	Ban Hua Keng, Pak Xeng, Luang Prabang	4	N20-03-03.3	E102-20-56.7	311	6-2-3-2-3	Mr. Joy, Khum tribe Plant height : 2.5 to 3.0 m, Panicle length : 45 cm	6 / 0741
7	2015-10-L7	256202	Oct 24	<i>Sorghum bicolor</i>	In	Kuoy Yong	Landrace	Ban Hatxam, Pak Xeng, Luang Prabang	4	N20-09-55.5	E102-35-42.6	348	6-2-3-3-3	Ms. Ton, Khum tribe Plant height : 3.0 m, Panicle length : 45 cm	7 / 0753
8	2015-10-L8	256203	Oct 24	<i>Sorghum bicolor</i>	In	Kuoy Yong	Landrace	Ban Hat Ngam, Pak Xeng, Luang Prabang	4	N20-09-39.0	E102-41-02.5	377	6-2-2-3-3	Ms. Van Dy, Khum tribe Plant height : 2.5 to 3.0 m, Panicle length : 26 cm	8 / 0765
9	2015-10-L9	256204	Oct 24	<i>Sorghum bicolor</i>	In	Kuoy Yong	Landrace	Ban Nad Kham, Pak Xeng, Luang Prabang	4	N20-10-07.8	E102-45-29.9	946	6-2-3-3-3	Ms. Boi On, Khum tribe Plant height : 3 m, Panicle length : 36 cm	9 / 0768
10	2015-10-L10	256205	Oct 24	<i>Allium fistulosum</i> L.	In	Sang Eun Nam	Landrace	Ban Nong Pha Dad, Pak Xeng, Luang Prabang	2	N20-09-14.0	E102-34-56.5	339	6-1-1-2-4	Mr. Soon Tone, Khum tribe Plant height : 42 cm, Leaf sheath length : 13 cm	10 / 0775
11	2015-10-L11	256206	Oct 24	<i>Allium fistulosum</i> L.	In	Sang Eun Yae	Landrace	Ban Nong Pha Dad, Pak Xeng, Luang Prabang	2	N20-09-14.0	E102-34-56.5	339	6-1-1-2-4	Mr. Soon Tone, Khum tribe Plant height : 31 cm, Leaf sheath length : 9 cm	11 / 0776
12	2015-10-L12	256207	Oct 25	<i>Capsicum chinense</i>		Pick	Landrace	Ban Phosy (Phosy Market), Luang Prabang	5	N19-52-38.7	E102-07-23.0	294			12 / 0870

\*1) In; Individual, P; Population (seeds)

\*2) 1; wild, 2; farmland, 3; farmstore, 4; backyard, 5; village market, 6; commercial market, 7; institute, 8; others

\*3) Topography-Site-Stoniness-Soil texture-Drainage

Topography 1; swamp, 2; flood plain, 3; plain level, 4; undulation, 5; hilly, 6; mountainous, 7; other (specify)

Site 1; level, 2; slope, 3; summit, 4; depression

Stoniness 1; none, 2; low, 3; medium, 4; rocky

Soil texture 1; sand, 2; loam, 3; clay, 4; silt, 5; highly organic

Drainage 1; poor, 2; moderate, 3; good, 4; excessive





Photo 1. *Sorghum bicolor* (L1)



Photo 2. *Sorghum bicolor* (L2)



Photo 3. *Sorghum bicolor* (L3)



Photo 4. *Sorghum bicolor* (L4)



Photo 5. *Sorghum bicolor* (L5)



Photo 6. *Sorghum bicolor* (L6)



Photo 7. *Sorghum bicolor* (L7)



Photo 8. *Sorghum bicolor* (L8)





Photo 9. *Sorghum bicolor* (L9)



Photo 10. *Allium fistulosum* (L10)



Photo 8. *Allium fistulosum* (L11)



Photo 12. *Capsicum chinense* (L12)