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Original Paper

A Field Study Collecting Cultivated Crops and Useful Plants in Sagaing Region of Myanmar in 2014

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Summary

This is a report of a cooperative field study team that explored plant genetic resources in northern Sagaing Region of Myanmar in November 2014. Naga villages in rather isolated areas that might have harbored crop diversity were targeted based on recent field studies and observation on plant genetic resources of mountainous villages in Southeast Asia. The team visited scattered Naga villages in Hkamti and Lahe Townships to collect plant genetic resources together with the GPS data and information about their vernacular names, agricultural practices, and food preparation or other uses. Slash-and-burn cultivation was commonly practiced on mountain slopes, where sorghum, Job's tears, maize, finger millet, lablab bean, rice bean, soybean, cassava, yams, shallot, tomato, perilla, chili pepper, roselle, bitter gourd, cowpea, sponge gourd, pumpkin, taro, yam, a tall chenopod, holy basil, *Elsholtzia blanda*, mustard, banana, ginger, *etc*. were grown in addition to the staple food crop, rice. The field study team collected 102 samples of plant genetic resources for food and agriculture, which included rice (29 samples), maize (6), cowpea (5), chili pepper (5), *Zanthoxylum* spp. (4), kidney bean (4), Job's tear (3), foxtail millet (3), rice bean (3), soybean (3), *Chenopodium* sp. (3), perilla (3) and others together with available information, which were to be conserved at gene banks in Myanmar and Japan. The vernacular names collected for chosen crops were highly various particularly in Lahe Township. Commonality of crops grown on the mountainous slash-and-burn cultivation fields in Sagaing Region to those of Kachin State of Myanmar, those of Lao PDR and

those of Nagaland of India suggests that the people of those areas share “Southeast Asia Agriculture Basic Complex”. There still remain diverse crop landraces in mountainous Sagaing Region, but the agricultural biodiversity will disappear rather quickly due to drastic socio-economical changes taking place there. We concluded that indigenous crop varieties on those areas need to be collected and studied as soon as possible.

Introduction

Previous studies and observation suggested that the mountainous areas of Myanmar harbor a large genetic agro-biodiversity in cultivated crops and useful plants. Those areas showed considerable similarity to adjacent areas such as Northeast India, particularly Nagaland, Sagaing Region and Kachin State of Myanmar and Lao PDR (Domon *et al*. 2015), from which we hypothesized that they might have shared a common agriculture basic complex. It was recommended that scattered Naga villages in northern Sagaing Region should be explored as early as possible among those areas. They are more isolated than other areas due to poor transportation and information networks, and might retains some unique and diverse plant genetic resources judging from the previous field studies and observation. Local farmers in the area have not only maintained and used traditional crops and useful plants but also introduced cultivated plants from the Mediterranean region, from Middle East, e.g., common pea, cabbage, radish and carrot, from New World, e.g., maize, common bean, tomato, potato, and chayote, and from Africa, e.g., sorghum, finger millet and bottle gourd. It is important to study indigenous or traditional crops of Asian origin cultivated there, because they are expected to have a wide genetic diversity or possess unique traits obtained through their crop evolution in the area, since they are elements of the indigenous material culture or the agriculture basic complex of the area. A field study was planned and implemented in scattered Naga villages in northern Sagaing Region in November 2014 to collect local plant genetic resources together with obtaining geographic data and information about their vernacular names, agricultural practices, and food preparation or other uses.

The field study was done based on the Memorandum of Understanding for Collaborative Research Project on Genetic Resources for Food and Agriculture between Department of Agricultural Research, Ministry of Agriculture and Irrigation, Myanmar and National Institute of Agrobiological Sciences, Japan, which was signed by both parties in April, 2014.

Methods

In November 2014, the field study team flew to Homalin of the Sagaing Region, and then, moved on the Chindwin river upstream to Hkamti (also written as Khamti or Kantee) by boat. The team explored Hkamti town and vicinity, went westward stretching the border between Hkamti Township and Lahe Township using two hired 4 x 4 vehicles and stayed at Pay U (also spelled as Pa Yu or Pa Yo) village, and then, went back halfway and turned northward to visit Lahe town and vicinity in Lahe Township (Table 1, Fig. 1). Several Naga villages scattered in mountainous areas near the Indian border were visited. The members of the team were genetic resources specialists (Domon, Kawase and Min San Thein), an ethnobotanist (Takei) and a linguist (Osada) to study from the viewpoint of agro-biodiversity and that of ethno-diversity.

The team interviewed local farmers and shop keepers at marketplaces along the exploration route about crops produced and consumed there such as rice, millets, pulses, and vegetables during the trip.

Table 1. Itinerary of the field study in Sagaing in November 2014

No.	Date	Day	Route and place	Stay
1	2014/11/06	THU	Japanese members arrive at Yangon	Yangon
2	2014/11/07	FRI	preparation at Yangon	Yangon
3	2014/11/08	SAT	Yangon - Homalin	Homalin
4	2014/11/09	SUN	Homalin - Hkamti	Hkamti
5	2014/11/10	MON	around Hkamti	Hkamti
6	2014/11/11	TUE	Hkamti – Pa San – Pay U	Pay U
7	2014/11/12	WED	Pay U – Pa Thong - Pay U	Pay U
8	2014/11/13	THU	Pay U - Pa San - Law Ngaw - Lahe	Lahe
9	2014/11/14	FRI	around Lahe	Lahe
10	2014/11/15	SAT	Lahe – San Ton – Ma Kyan - Lahe	Lahe
11	2014/11/16	SUN	around Lahe	Lahe
12	2014/11/17	MON	Lahe - Law Ngaw - Hkamti	Hkamti
13	2014/11/18	TUE	Hkamti - Mandalay - Yezin	Yezin
			(TO & ET flew directly to Yangon and then to Japan)	
14	2014/11/19	WED	courtesy visit to DAR DG	Yezin
15	2014/11/20	THU	investigating collection	Yezin
16	2014/11/21	FRI	investigating collection courtesy visit to DAP DyDG, DOA DyDG	Yezin
17	2014/11/22	SAT	report making	Yezin
18	2014/11/23	SUN	Yezin - Yangon	Yangon
19	2014/11/24	MON	Plant Quarantine Office (DOA)	Yangon
20	2014/11/25	TUE	courtesy visit to Embassy of Japan & JICA Yangon Office, Yangon -	on board
21	2014/11/26	WED	- JAPAN	

DAR: Department of Agricultural Research; DOA: Department of Agriculture;
DAP: Department of Agricultural Planning

The photographs of 41 crops used in the previous trips and computer-stored images of 32 plants newly added were shown to local people to collect vernacular names at each site.

The team visited several slash-and-burn cultivation fields just in harvest time collecting crops grown on the fields and/or just after harvest and interviewed about their cultivation practices and utilization. Crops of Asian origin, for example, rice (mostly upland rice landraces), foxtail millet, Job's tear, legumes including *Vigna* species, indigenous vegetables such as *Allium* species and spices were focused on, since they should have been cultivated there for a long time and therefore they were expected to have a good deal of diversity.

Collected materials were transferred to Seed Bank of the Biotechnology, Plant Genetic Resources and Plant Protection Division, Department of Agricultural Research, Ministry of Agriculture and Irrigation at Yezin, Nay Pyi Taw, Republic of the Union of Myanmar. Each sample was identified, cleaned and divided into two subsets - one for conservation in the Myanmar Seed Bank and another for NIAS Genebank in Japan.

Results and Discussion

The observation around Hkamti town

The field study team successfully explored some places in Hkamti and Lahe Townships along the route shown in Fig. 1. Several ethnic groups dwell together inside Hkamti town and vicinity, e.g., Naga

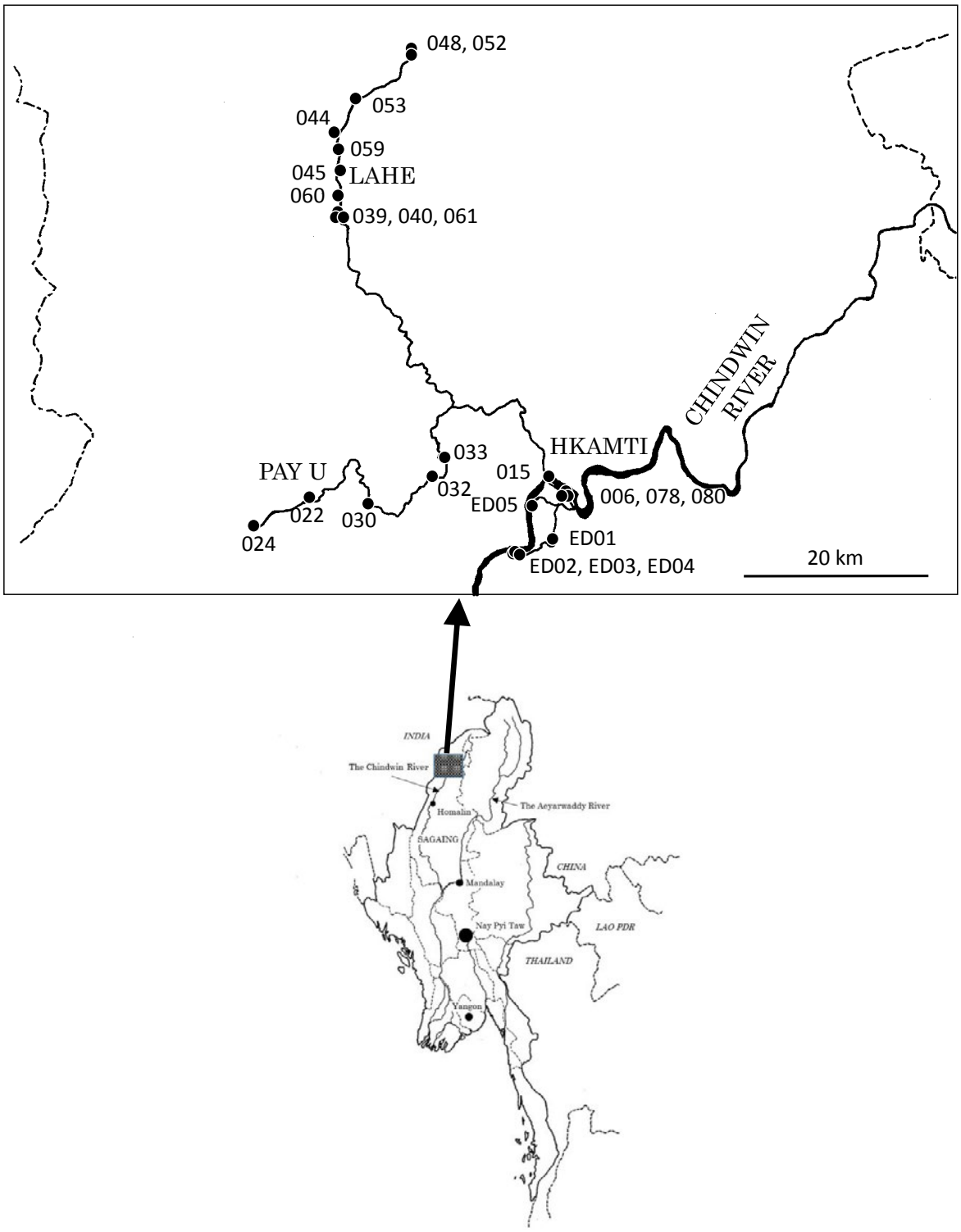

Fig.1. The field study route and sites of the field study in Sagaing Region of Myanmar in November, 2014. Each number in Fig.1 (e.g., 022) corresponds with the waypoint in Table 2 (MK022) and map location in Table 3 (2014.11WP022).

people, Shan people, Bamar people and Tayoke (Chinese) people but a change is undergoing in their population: most of the Chinese people who had lived in Shinthey village on the opposite bank of Hkamti town in February 2014 already left there. The ethnic groups still maintain their own cultures, traditions and languages, although they use Burmese (Myanmar language) as lingua franca.

The team visited two villages in Thar Yar Gone and Phar Moung near the Hkamti town, where Naga people were engaged in agriculture.

The observation at Pay U village and vicinity in Hkamti Township

Pa Sang (also written as Pa Saung), Pay U and Pa Thon (Pa Ton) villages were rather isolated from Hkamti town and from Lahe town due to rough road conditions. Most of the people living at mountainous villages in the west of Hkamti Township are Naga people who are mostly Christians. School teachers and Buddhist monks were dispatched from other places of Myanmar.

Slash-and-burn cultivation was practiced on a large plot near Pa Sang village (a waypoint MK020 = MK032, photo 1), where sorghum, Job's tears, perilla, finger millet, pumpkin, lablab bean, rice bean, soybean, a tall chenopod (probably a variety of *Chenopodium giganteum*), cassava, maize, yam (*Colocasia esculenta* and *Xanthosoma* sp.), tomato, chili pepper, roselle, bitter gourd, cowpea, sponge gourd, taro, holy basil (photo 2), *Elsholtzia blanda* (photo 3), mustard, banana and ginger were found in addition to the staple crop, rice. Also, a slash-and-burn cultivation field of Pa Thon village contained a large number of rice plants admixed with the tall chenopod having a large inflorescence (photo 4 left), kidney bean, rice bean, maize, Job's tears, soybean, cassava, chili pepper, perilla, yam (*Dioscorea bulvifera*), taro, sorghum, ginger, *etc*. They were harvesting, drying and threshing rice grains (photo 5). Harvested grains were stored in granaries (photo 6).

It is interesting to note that the tall chenopod and Job's tears were commonly observed at Pa Sang and Pa Thon, which had not been seen in other states or regions of Myanmar. It was also found in a field near Lahe town (photo 4 right). It was tentatively identified as *C. giganteum* but it was morphologically different from *C. giganteum* grown in India and Taiwan. The chenopod was used as leafy vegetables, medicines, and for brewery there according to farmers' information. Grains of Job's tears were used for drinks like tea, as cooked like rice, or for brewery. The cultivation of this cereal was observed at some places in Kachin State of Myanmar, northern Lao PDR and Nagaland of India. Fruits of *Zanthoxilum* spp. were often used as hot spices for their local cuisines in the areas, which were also used for those in Kachin State of Myanmar and Nagaland State of India. Local people told us that there were a cultivated type and a wild type. The former looked like *Z. armatum*.

The observation in Lahe town and vicinity in Lahe Township

Slash-and-burn cultivation of various crops was practiced in Lahe and the surrounding areas, San Ton village (photo 7) and Makyan village, like that in Hkamti Township. Rice was the major crop on the slash-and-burn fields, where there were the tall chenopod, perilla, cassava, sorghum, yam, pumpkin, soybean, chili pepper, sesame, roselle and eggplant grown admixed. Holy basil, *Elsholtzia blanda* and *Zanthoxilum* spp. were important for their cooking, too. In some places where terrace cultivation was possible, rice was grown on paddy fields in a limited scale.

Plant genetic resources collected

The team visited Sagaing Region just at the harvest season and could collect plant genetic resources grown on the cultivation fields, dried after harvest and stored in the hut or farmers' houses together with information on cultivation practices and usages. The field study team collected 102 samples of plant genetic resources for food and agriculture, which included 29 sample of rice (*Oryza sativa*), 6 maize (*Zea mays*), 5

cowpea (*Vigna unguiculata*), 5 chili pepper (*Capsicum* spp.), 4 *Zanthoxylum* spp., 4 kidney bean (*Phaseolus vulgaris*), 3 Job's tear (*Coix lacryma-jobi* var. *ma-uen*), 3 foxtail millet (*Setaria italica*), 3 rice bean (*Vigna umbellate*), 3 soybean (*Glycine max*), 3 *Chenopodium* sp., 3 perilla (*Perilla frutescens* var. *frutescens*) and others together with various information. Local farmers paid special attention to rice varieties. Every farmer possess several landraces of different grain shapes, colors, non-waxy or waxy starch types and other traits, and distinguished them with variety names (photo 8, for example). It suggests the importance of rice for their diet compared with other crops. Those local landraces of rice were sown to different parts of even a slash-and-burn field patch and stored separately in a granary. We also collected a wild ancestral form of Azuki bean, *Vigna angularis* var. *nipponensis* (photo 9) near Lahe town. This was the first discovery in Sagaing Region, although it had been already reported in Chin State (Tomooka *et al.*, 2003) and Kachin State (Watanabe *et al*., 2007).

The collected materials were divided into two subsets; one was to be conserved in the Seed Bank of the Plant Biotechnology, Plant Genetic Resources and Plant Protection Department (PBPGRPPD), DAR, MOAI, located at Yezin, Nay Pyi Taw, Myanmar for further research and crop improvement, and another one was transferred with Standard Material Transfer Agreement (SMTA) for the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) of the United Nations (UN) Food and Agriculture Organization (FAO) and a phytosanitary certificate issued by the Plant Quarantine Office of DOA, Yangon, Myanmar to Japan to be conserved in the Genetic Resources Center, National Institute of Agrobiological Sciences (NIAS) located at Tsukuba, Japan.

Vernacular names of crops in Hkamti and Lahe Townships

Printed photographs of 41 crops that had been used in the previous trips and computer-stored images of 32 plant species newly added were shown to local people in order to make sure which crop was grown, and to collect vernacular names at the site (Table 3).

Crop names used in Naga villages in the mountains were often unique and were largely variable from village to village. In Hkamti Township, we collected crop names only at Pay U village (a waypoint MK022). The names collected at Pay U village showed certain similarity to those collected at Pasang Ywa (2014WP021) in Februay 2014 (Domon *et al*. 2015), which is the same village recorded as Pa Sang (2014.11WPMK033) in this filed study. For example, rice was called *che* (*tzi*) and *chun-nya*, maize was called *chong ngam* and *zong nam*, finger millet was called *om ke chi nyak* and *unge chi nyap*, foxtail millet was called che *nyak* and *jin-nyap*, soybean was called *che the* and *chiu te*, lablab bean was called *lapong* and *la bon*, sesame was called *nyam hong* and *nyam hon*, banana was called *lu sep* and *lu shiep*, and perilla was called *nyam* and *niam* in Pay U and in Pa Sang, respectively. Similar pronunciations with different spellings were partly due to the fact that transliteration of local languages were not standardized in Myanmar. Comparatively reliable information was obtained this time, since a linguist (Osada) was in the team. Vernacular names of crops at others villages in the mountainous Hkamti Townships need to be studied.

On the contrary, villages in the Lahe Township did not show high similarity in vernacular names of crops even although the villages are located sometimes in short distances. There observed a tendency that crops that had not been traditionally grown and recently introduced were called with Burmese names or their derivatives, for example in bitter gourd, roselle, and mint (Table 3). It is readily understandable that since Burmese is lingua franca, Burmese names were widely used at a marketplace in Hkamti town and

most of new crops should have been introduced from other places of Myanmar.

Potential genetic diversity in traditional agriculture in Sagaing Region

They practice traditional slash-and-burn agriculture on slopes and hunt animals in the forests nearby in mountainous areas in Sagain Region. They grow rice (both of non-waxy and waxy starch types), Job's teas, sorghum, foxtail millet and other millets, rice bean, soybean, sesame, shallot and some *Allium* spp., taro, yam, and some leaf and fruit vegetables. It is thought that genetic diversity in rice and rice bean are important among them because they have not been collected systematically from the areas. Tian *et al*. (2013) studied DNA polymorphism in rice bean and revealed a large genetic diversity in Vietnam, Myanmar, Nepal and India. Several spices are also grown on the slash-and-burn cultivation fields and kitchen gardens near the houses: coriander, *Elsholtzia blanda*, holy basil, *Zanthoxylum* spp. and others, which are important seasonings for cooking animal meat hunted in the forests. In addition to the crops of the Old World origin, they have introduced those of the New World origin - maize, potato, cassava, *Eryngium foetidum*, and others. Diverse crop landraces of mountainous Sagaing Region are waiting for collection and genetic diversity studies.

Drastic socio-economical change taking place in the areas will alter their agriculture and indigenous landraces will disappear rather quickly. We observed that new road construction was going on, and improved transportation and telecommunication may change social and economic life of the villagers drastically in the near future. We concluded that indigenous crop varieties on those areas need to be collected and studied as soon as possible. Particularly, it is highly recommended to explore scattered Naga villages in Sagaing Region of Myanmar.

The Southeast Asia Basic Agriculture Basic Complex

Nakao (1966) proposed Roots and Tubers Agriculture Basic Complex, Savanna Agriculture Basic Complex, Mediterranean Agriculture Basic Complex and New World Agriculture Basic Complex, and suggested a secondary complex designated as Laurel Forest Culture Complex ("*Shoyo-Jurin Bunka*" in Japanese) widely distributed in Southeast Asia, South China and Far East. The present field study aimed not only to collect crop genetic resources but also to verify a hypothesis that mountainous villages in Southeast Asia have shared a specific agriculture complex rather than have been a part of wide Laurel Forest Culture Complex. As mentioned above, the mountainous villagers in Sagaing Region have common sets of cultivated crops similar to the mountainous areas of Nagaland State of India, Kachin State of Myanmar and Lao PDR. Those areas shares an agriculture basic complex in the sense of Nakao (1966), which can be designated as "Southeast Asia Agriculture Basic Complex". Since mountainous villagers in Sagaing Region are far away from big cities and towns and have been left out of economic development until recently, they well remain a variety of crops essential to Southeast Asia Agriculture Basic Complex, which might be able to serve as a valuable gene pool.

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和文摘要

本報は 2014 年 11 月にャンマーのザガイン地方域，とくにナガ族居住山地を対象に実施した植物遺伝資源に関する共同現地調査隊の報告である．今までに行なってきた東南アジアの山村での現地調査や観察の結果，他地域との交流が活発ではなく多様な在来作物・有用植物遺伝資源の収集が期待されるナガ族居住地域を対象に選んだ．本調査隊はカムティ郡区およびラへー郡区のナガ族山村を訪問し，GPS 情報，方名，農作業法，調理法等の利用法とともに植物遺伝資源を収集した．山地の傾斜地では焼畑が共通して営まれ，主要食用作物であるイネとともに，モロコシ，ハトムギ，トウモロコシ，シコクビエ，フジマメ，タケアズキ，ダイズ，キャッサバ，シャロット，トマト，エゴマ，トウガラシ，ローゼル，ニガウリ，ササゲ，ヘチマ，カボチャ，サトイモ類，ヤマイモ類，背の高いアカザ類，カミメボウキ，ナギナタコウジュ類，カラシナ，バナナ，ショウガ等が栽培されていた．現地調査隊はイネ 29 点，トウモロコシ 6 点，ササゲ 5 点，トウガラシ類 5 点，サンショウ類 4 点，インゲンマメ 4 点，ハトムギ 3 点，アワ 3 点，タケアズキ 3 点，ダイズ 3 点，アカザ類 3 点，エゴマ 3 点他，計 102 点を収集し，これらはミャンマーと日本の両国のジーンバンクで保存されることとなった．調査した作物の方名は多様で，特にラへー郡区で顕著であった．また，ザガイン地方域の山地の焼畑で栽培される作物の種類はカチン州，ラオス中北部，インド・ナガランド州の山地の焼畑で栽培されるものとの共通性が高く，これらの地域の人々が「東南アジア農耕文化基本複合」を共有していることが示唆された．ザガイン地方域の山地には多様な作物の地方品種が残存している一方，現在急速に進んでいる社会経済的な変革によって農業生物多様性が滅失すると考えられる．この地域の作物遺伝資源を可及的速やかに収集し研究すべきであると結論した．

Table 2. A list of plant materials collected in Sagaing Region of Myanmar in 2014

Sr. No.*	JP No.	Local plant name "local variety name"	English name	*Scientific name*	Date MM/dd	Locality, Village name and/or nearest town/village	Latitude				Longitude			
							o	′	″		o	′	″	
1	252259	no information	wild legume	*Vigna* sp.?	11/10	Hkamti, Hkamti Township	25	57	33.4	N	95	40	30.1	E
2	252260	hsin kha yar	egg plant	*Solanum melongena*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
3	252261	pe lum	cow pea	*Vigna unguiculata*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
4	252262	yone pa di	okra	*Abelmoschus esculenta*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
5	252263	pe ln mwe	snake gourd	*Trichosanthes cucumeroides*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
6	252264	kha we	ridged sponge gourd	*Luffa acutangula*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
7	252265	kyet hin kha	bitter gourd	*Momordica charantia*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
8	252266	ka zaw kha	tree tomato	*Solanum betaceum*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
9	252267	kha yan nyo	egg plant	*Solanum melongena*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
10	252268	bu thee	bottle gourd	*Lagenaria siceraria* var. *gouda*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
11	252269	chin paung	roselle	*Hibiscus sabdariffa*	11/10	Thar Yar Gone, Hkamti Township	25	56	49.9	N	95	38	8.1	E
12	254742	"mya taung"	rice	*Oryza sativa*	11/10	Thar Yar Gone, Hkamti Township	25	56	49	N	95	38	3.3	E
13	252270	khauk hnyin	rice (waxy)	*Oryza sativa*	11/10	Thar Yar Gone, Hkamti Township	25	56	49	N	95	38	3.3	E
14	252271	tha bo thee	sponge gourd	*Luffa cylindrica*	11/10	Thar Yar Gone, Hkamti Township	25	56	48.6	N	95	38	1.5	E
15	252272	pe taing htaung	yard long bean	*Vigna unguiculata Sesquipedalis* Group	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
16	252273	shwe pe thee	common pea	*Pisum sativum*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
17	252274	kai lan	Chinese kale	*Brassicaoleracea* Alboglabra Group	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
18	252275	bu thee	bottle gourd	*Lagenaria siceraria* var. *gouda*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
19	252276	bo sar pe	kidney bean	*Phaseolus vulgaris*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
20	252277	nan nan	criandar	*Coriandrum sativum*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
21	252278	sa mate	dill	*Anethum graveolens*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
22	252279	sa lat	lettuce	*Lactuca sativa*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
23	252280	sa taw pe	common pea	*Pisum sativum*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
24	252281	myway htank pe	kidney bean	*Phaseolus vulgaris*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
25	252282	myway htank pe	kidney bean	*Phaseolus vulgaris*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
26	252283	bo sar pe kyar	kidney bean	*Phaseolus vulgaris*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
27	252284	kyeik	wild Job's tears	*Coix lacryma-jobi* var. *lacryma-jobi*	11/10	Phar Moung, Hkamti Township	25	59	43.09	N	95	39	0.58	E
28	252285	tso thew	rice	*Oryza sativa*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
29	252286	jou, kan sin	Zanthoxylum	*Zanthoxylum* sp.	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
30	252287	cheu the	soybean	*Glycine max*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
31	252288	chong ngam	maize	*Zea mays*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
32	252289	chong ngam	maize	*Zea mays*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
33	252290	nga yoke thee	chili pepper	*Capsicum annuum*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
34	252291	shwe lam bo	chili pepper	*Capsicum annuum*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
35	252292	nenyak	Job's tears	*Coix lacryma-jobi var. ma-yuen*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
36	254743	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
37	254744	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
38	254745	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
39	254746	meshiu	rice (waxy)	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
40	254747	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
41	254748	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
42	254749	che	rice	*Oryza sativa*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
43	252293	o pan	chenopod	*Chenopodium* sp.	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
44	252294	ne nyak	Job's tears	*Coix lacryma-jobi* var. *ma-yuen*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
45	252295	nyam	perilla	*Perilla frutescens* var. *frutescens*	11/12	Pa Thon, Hkamti Township	25	58	52.71	N	95	21	20.84	E
46	252296	che nyak	foxtail millet	*Setaria italica*	11/12	Pay U, Hkamti Township	26	0	6.57	N	95	24	17.4	E
47	254750	"jone nake"	rice	*Oryza sativa*	11/13	Kyauk Ywet, Hkamti Township	26	0	6.9	N	95	28	12.59	E
48	254751	no information	rice	*Oryza sativa*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
49	254752	no information	rice	*Oryza sativa*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E

Sr. No.*	Altitude m	Source	Status	Status of plant sampled	Cultural practices	Topography	Site	Stoniness	Soil texture	Drain-age	Other observations or notes	Waypoint
1		wild	wild	pods		hilly	slope	medium	sandy loam	good		ED01
2		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
3		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
4		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
5		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
6		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
7		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
8		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
9		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
10		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
11		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED02
12		farmland	landrace	seeds		hilly	slope	medium	sandy loam	good		ED03
13		farmland	landrace	seeds		hilly	slope	medium	sandy loam	good		ED03
14		farmstore		seeds		hilly	slope	medium	sandy loam	good		ED04
15	142	farmstore		seeds		hilly	level					ED05
16	142	farmstore		seeds		hilly	level					ED05
17	142	farmstore		seeds		hilly	level					ED05
18	142	farmstore		seeds		hilly	level					ED05
19	142	farmstore		seeds		hilly	level					ED05
20	142	farmstore		seeds		hilly	level					ED05
21	142	farmstore		seeds		hilly	level					ED05
22	142	farmstore		seeds		hilly	level					ED05
23	142	farmstore		seeds		hilly	level					ED05
24	142	farmstore		seeds		hilly	level					ED05
25	142	farmstore		seeds		hilly	level				white	ED05
26	142	farmstore		seeds		hilly	level					ED05
27	142	backyard	wild?	seeds		hilly	level					ED05
28	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
29	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
30	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
31	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
32	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
33	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
34	1250	farmstore	landrace	seeds	shifting	mountainous	slope	medium	loam	good		MK022
35	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	March-December. Tea, alcohol, cook like rice	MK024
36	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
37	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
38	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
39	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
40	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
41	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
42	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
43	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November	MK024
44	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	March-November	MK024
45	1098	farmland	landrace	seeds	shifting	mountainous	slope	medium	loam	good	June-November. Oil extrction, pig feed, cake making, cook withchicken meat	MK024
46	1250	farmstore	landrace	2 panicles	shifting	mountainous	slope				June-	MK022
47	976	farmstore	landrace?	seeds	shifting	mountainous	slope		loam		June-November	MK030
48	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
49	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032

Table 2 (Continued).

Sr. No.*	JP No.	Local plant name "local variety name"	English name	*Scientific name*	Date MM/dd	Locality, Village name and/or nearest town/village	Latitude				Longitude			
							o	′	″		o	′	"	
50	254753	no information	rice	*Oryza sativa*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
51	252297	no information	cow pea	*Vigna unguicullata*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
52	254754	no information	rice	*Oryza sativa*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
53	252298	no information	maize	*Zea mays*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
54	252299	no information	Job's tears	*Coix lacryma-jobi* var. *ma-yuen*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
55	252300	no information	Job's tears	*Coix lacryma-jobi* var. *ma-yuen*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
56	252301	no information	chenopod	*Chenopodium* sp.	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
57	252302	no information	tomato	*Solanum lycopersicum*	11/13	near Pa Sang (Jinkiu), Hkamti Township	26	1	34.36	N	95	32	23.29	E
58	252303	no information	maize	*Zea mays*	11/13	Pa Sang (Jinkiu), Hkamti Township	26	2	31.34	N	95	33	36.98	E
59	252304	moicham	holy basil	*Occimum tenuiflorum*	11/13	Pa Sang (Jinkiu), Hkamti Township	26	2	31.34	N	95	33	36.98	E
60	252305	no information	rice bean	*Vigna umbellata*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
61	252306	no information	soybean	*Glycine max*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
62	252307	no information	cowpea	*Vigna unguicullata*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
63	252308	no information	chenopod	*Chenopodium* sp.	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
64	252309	no information	chili pepper	*Capsicum annuum*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
65	252310	no information	sorghum	*Sorghum bicolor*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
66	252311	no information	sorghum	*Sorghum bicolor*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
67	252312	no information	maize	*Zea mays*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
68	254755	no information	rice	*Oryza sativa*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
69	252313	no information	rice	*Oryza sativa*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
70	254756	no information	rice	*Oryza sativa*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
71	252314	no information	rice	*Oryza sativa*	11/14	near Lahe, Lahe Township	26	17	55.73	N	95	26	29.32	E
72	254757	"ra lein nyat"	rice (waxy)	*Oryza sativa*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
73	254758	"ba htang"	rice	*Oryza sativa*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
74	252315	"nar thein"	rice	*Oryza sativa*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
75	254759	"ra tain paint"	rice	*Oryza sativa*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
76	252316	"kalar thar hein"	chili pepper	*Capsicum annuum*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
77	252317	"thar khein thil"	chili pepper	*Capsicum annuum*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
78	252318	ngwat	foxtail millet	*Setaria italica*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
79	252319	khom	pumpkin	*Cucurbta maxima*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
80	252320	ka mam	maize	*Zea mays*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
81	252321	hnan kyaw thay	cowpea	*Vigna unguicullata*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
82	254760	"htwin ra"	rice	*Oryza sativa*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
83	252322	hay thay	rice bean	*Vigna umbellata*	11/15	San Ton (Nou Him), Lahe Township	26	26	5.99	N	95	31	27.07	E
84	252323	"ba htaung tzar"	rice	*Oryza sativa*	11/15	Ma Kyan (Ngaung Ke), Lahe Township	26	23	49.23	N	95	27	54.72	E
85	252324	"tzar pike"	rice	*Oryza sativa*	11/15	Ma Kyan (Ngaung Ke), Lahe Township	26	23	49.23	N	95	27	54.72	E

Sr. No.*	Altitude m	Source	Status	Status of plant sampled	Cultural practices	Topography	Site	Stoniness	Soil texture	Drain-age	Other observations or notes	Waypoint
50	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
51	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
52	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
53	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
54	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
55	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
56	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
57	1086	farmland	landrace?	seeds	shifting	mountainous	slope	low	loam	good		MK032
58	1049	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK033
59	1049	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	June-November	MK033
60	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	June-November, December	MK045
61	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	June-November, December	MK045
62	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	June-November, December	MK045
63	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	May-December. Eat leaf, put into brewing alcohol	MK045
64	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	May-October	MK045
65	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	May-November, December	MK045
66	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	June-November, December	MK045
67	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	April-October	MK045
68	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK045
69	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK045
70	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK045
71	815	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK045
72	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October	MK048
73	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October	MK048
74	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October	MK048
75	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October	MK048
76	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	very hot, May, June-October	MK048
77	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October	MK048
78	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	February-May	MK048
79	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June- September	MK048
80	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	March, April-October	MK048
81	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-September, October	MK048
82	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	April, May-October	MK048
83	1275	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-November, December	MK048
84	1578	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good	May, June-October, November	MK053
85	1578	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK053

Table 2 (Continued).

Sr. No.*	JP No.	Local plant name "local variety name"	English name	*Scientific name*	Date MM/dd	Locality, Village name and/or nearest town/village	Latitude				Longitude			
							º	′	″		º	′	"	
86	254761	"pa lat tzar"	rice	*Oryza sativa*	11/15	Ma Kyan (Ngaung Ke), Lahe Township	26	23	49.23	N	95	27	54.72	E
87	252325	no information	wild legume	*Vigna angularis* var. *niponensis*	11/16	near Lahe, Lahe Township	26	18	32.29	N	95	26	40.48	E
88	252326	tok ti	soybean	*Glycine max*	11/16	Gahom, Lahe Township	26	16	35.64	N	95	26	28.77	E
89	252327	nim hon	sesame	*Sesamum indicum*	11/16	Gahom, Lahe Township	26	16	35.64	N	95	26	28.77	E
90	252328	tju von	Zanthoxylum	*Zanthoxylum* sp.	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
91	252329	tju	Zanthoxylum	*Zanthoxylum* sp.	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
92	252330	nium	perilla	*Perilla frutescens* var. *frutescens*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
93	252331	nim hoan	sesame	*Sesamum indicum*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
94	252332	zhain	foxtail millet	*Setaria italica*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
95	254762	"chum chaup thui"	rice (waxy)	*Oryza sativa*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
96	252333	"htan kyauk"	rice	*Oryza sativa*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
97	252334	ma shan ko daini	elsholtzia basil	*Elsholtzia blanda*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
98	252335	ngam ma.shan	holy basil	*Occimum tenuiflorum*	11/16	Lahe San Pyar, Lahe Township	26	15	58.93	N	95	26	54.21	E
99	252336	kashieu	rice bean	*Vigna umbellata*	11/17	Solo Not In, Lahe Township	26	12	45.09	N	95	28	3.28	E
100	252337	niem	sesame	*Sesamum indicum*	11/17	Solo Not In, Lahe Township	26	12	45.09	N	95	28	3.28	E
101	252338	kansein	Zanthoxylum	*Zanthoxylum* sp.	11/18	Hkamti, Hkamti Township	26	0	5.97	N	95	41	30.44	E
102	252339	hnan lone	perilla	*Perilla frutescens* var. *frutescens*	11/18	Hkamti, Hkamti Township	26	0	5.97	N	95	41	30.44	E

Sr. No.*	Altitude m	Source	Status	Status of plant sampled	Cultural practices	Topography	Site	Stoniness	Soil texture	Drain-age	Other observations or notes	Waypoint
86	1578	farmstore	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK053
87	812	wetland	wild	seeds		mountainous	slope	low	clay loam	good		MK059
88	710	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good	July, August-November, December	MK060
89	710	farmland	landrace	seeds	shifting	mountainous	slope	low	loam	good		MK060
90	716	farmstore	landrace	seeds		mountainous					small, cultivated	MK061
91	716	farmstore	wild?	seeds		mountainous					naturally grown	MK061
92	716	farmstore	landrace	seeds	shifting	mountainous					May-November	MK061
93	716	farmstore	landrace	seeds	shifting	mountainous					May-November	MK061
94	716	farmstore	landrace	seeds	shifting	mountainous					February-July	MK061
95	716	farmstore	landrace	seeds	shifting	mountainous					May, June-November	MK061
96	716	farmstore	landrace	seeds	shifting	mountainous					May, June-November	MK061
97	716	farmstore	landrace	seeds	shifting	mountainous					May, June-Novemver	MK061
98	716	farmstore	landrace	seeds	shifting	mountainous					May, June-Novemver	MK061
99	877	backyard	landrace	seeds		mountainous					June-November	MK068
100	877	backyard	landrace	seeds		mountainous					May-November	MK068
101	137	village market		seeds		hilly					marketstore	MK080
102	137	village market		seeds		hilly					marketstore	MK080

Table 3. A summary of interviews on traditional crops in the Northeast India and Sagaing State of Myanmar

			dd/mm/yyyy	12/11/2014	14/11/2014	←	15/11/2014	←	16/11/2014	←
			Village	Pay U	Lahe	←	Nou Hin (San Tou)	Ngaung Ke (Ma Kyan)	Gahom	Sanpyar
			Township, Region	Hkamti, Sagaing	Lahe, Sagaing	←	←	←	←	←
			map location (waypoint)	2014.11WPMK022	near 2014.11WPMK044	←	2014.11WPMK048	2014.11WPMK053	2014.11WPMK060	2014.11WPMK061
			latitude (N)	26º0'6.57"	26º19'31.20"	←	26º26'5.99"	26º23'49.2"	26º16'35.6"	26º15'58.9"
			longitude (E)	95º24'17.4"	95º26'34.62"	←	95º31'27.1"	95º27'54.7"	95º26'28.8"	95º26'54.2"
			altitutde (m)	1,250	990	←	1,275	1,578	710	716
No.	crop name in Myanmar	crop name in English	Latin name							
1	*saba* dehusked: *san* cooked: *htamin*	rice	*Oryza sativa* L.	*che* (*tzi*) (non-waxy) cultivar names: *incha* (*inja*) *tsodong* *tso nee* *tso thew* *meshiu* (waxy)	*yar* (*jar*)(non-waxy) dehusked: *kyuan* cooked: *shinner* *pain yar* (waxy)	no information	*ra* (non-waxy) cultivar names: *ba thon* *htun* *tain kay* htwin kyinn *ra lein* (waxy) *ra lein payint* (white)	*za* (non-waxy) *phain za* (waxy)	*chūʔ* (non-waxy) *chim chūʔ* (waxy)	*chaup* [tʃʰaup] cultivar name: *cham chaup thui* [tʃʰam. tʃʰaup tʰui]
2	*pyoung bu*	maize	*Zea mays* L.	*chong ngam*	*kha mang*	no information	*kha man*	*kha man*	*ma lon*	*malon*
3	*gjoun*	common wheat	*Triticum aestivum* (L.) THELL. ssp. *vulgare* (VILL.) MACKEY	-	-	no information	-	-	-	-
4	*gjoun*	durum wheat	*Triticum turgidum* (L.) THELL. ssp. *turgidum* conv. *durum* (DESF.) MACKEY	-	-	no information	-	-	-	-
5	*mu yaw saba*	barley	*Hordeum vulgare* L.	-	-	no information	-	-	-	-
6	*hnan sa pyoung*	sorghum	*Sorghum bicolor* (L.) MOENCH	*me liam*	*khamee khaman*	no information	*khala kwet*, *khala gwet*	*khamie khaman*	*lay lain*	*lan lyan*
7	*kala sat*	peral millet	*Pennisetum americanum* (L.) LEEKE	*khe la che nyak*	-	no information	-	-	*lyan*	-
8	*sat ni*	finger millet	*Eleucine coracana* (L.) GAERTN.	*om ke chi nyak*	*hsaung gyi*	no information	-	-	-	-
9	*sat*	foxtail millet	*Setaria italica* (L.) P.BEAUV.	*che nyak*	*gwat*	*zee*, *zyi*	*gwet lin*	*ngwat*, *ngowat*	*chon lam*	*zhain* [zʰain]
10		barnyard millet	*Echinochloa* sp.	-	-	-	-	-	-	-
11		kodo millet	*Paspalum scrobiculatum* L.	-	-	-	-	-	-	-
12		yellow foxtail millet	*Setaria pumila* (Poir.) Roem. & Schult.	-	-	-	-	-	-	-
13	*lu*	common millet	*Panicum miliaceum* L.	-	-	*law*	*le:*	-	*ka lya*	*niegop*
14	*kala lu*	little millet	*Panicum sumatrense* ROTH ex ROEM. et SCHULT.	-	-	-	-	-	-	-
15		korne	*Brachiaria ramosa* (L.) STAPF.	-	-	-	-	-	-	-
16	*pe bouk*	soybean	*Glycine max* (L.) MERRILL	*che the*	*hattie*	*kashiew dai*	*thel*	*ha tje*, *ha tye*	*toʔ. ti*	*kha. shieu* [kʰa. ʃieu]
17	*bo sa pe*	common bean	*Phaseolus vulgaris* L.	*yanglii* *cheu kiang*	*kashiew dai*	*kashiew dai*	*pe ngapi*, *the shu*	-	*ka chiew*	-
18	*pe di sein*	mung bean	*Vigna radiata* (L.) WILCZEK	-	no name	no name	-	-	-	-
19	*mat pe*	black gram	*Vigna mungo* (L.) HEPPER	*chom*	-	-	-	-	-	-

Table 3 (Continued).

			dd/mm/yyyy	12/11/2014	14/11/2014	←	15/11/2014	←	16/11/2014	←
			Village	Pay U	Lahe	←	Nou Hin (San Tou)	Ngaung Ke (Ma Kyan)	Gahom	Sanpyar
			Township, Region	Hkamti, Sagaing	Lahe, Sagaing	←	←	←	←	←
			map location (waypoint)	2014.11WPMK022	near 2014.11WPMK044	←	2014.11WPMK048	2014.11WPMK053	2014.11WPMK060	2014.11WPMK061
			latitude (N)	26º0'6.57"	26º19'31.20"	←	26º26'5.99"	26º23'49.2"	26º16'35.6"	26º15'58.9"
			longitude (E)	95º24'17.4"	95º26'34.62"	←	95º31'27.1"	95º27'54.7"	95º26'28.8"	95º26'54.2"
			altitutde (m)	1,250	990	←	1,275	1,578	710	716
No.	crop name in Myanmar	crop name in English	Latin name							
20	*chin pe*, *taung ya pe*	rice bean	*Vigna umbellata* (Thunb.) OHWI et OHASHI	*chom*	*kashiew lai*	*kashiew lai*	*hwui thel*	*hwū tie*	*ka chiew kyan*	*kha. shieu lai* [k^{h}a. ʃieu lei]
21	*pe zaung ya*	winged bean	*Psophocarpus tetragonolobus* (L.) DC.	*lapon*	no name	no name	-	-	*ka chiew ko kyu*	*kha. shieu gūn*
22	*pe lun*	cowpea/yard-long bean	*Vigna unguiculata* (L.) WALPERS	*cheu kiang*	*num cho te*	*kashiew kyan*	-	-	*ka chiew lon nyu*	*kha. shieu kyan* [k^{h}a. ʃieu tʃən]
23	*kala pe*	chickpea	*Cicer arietinum* L.	-	-	-	-	-	-	-
24	*pe zin ngoun*	pigeon pea	*Cajanus cajan* (L.) MILLSP.	-	-	-	-	-	-	-
25	*pegyi*	lablab bean	*Lablab purpureus* (L.) SWEET	*lapong*	*appan*	*kashiew bin yu*	*a pan thel*	-	*lā puon*	*lā puon*
26		moth bean	*Vigna aconitifolia* (Jacq.) MARECHAL	-	-	-	-	-	-	-
27	*pe dalet*	sword bean	*Canavalia gladiata* (Jacq.) DC.	*khao lapong*	-	-	-	-	-	-
28	*pan gjoun*	buckwheat	*Fagopyrum esculentum* MOENCH.	-	-	-	-	-	-	-
29	*pe wali*	guar	*Cyamopsis tetragonoloba* (L) TAUB	-	-	-	-	-	-	-
30	*hin nu nwe*	amaranth	*Amaranthus cruentas* L.	-	-	-	-	-	-	-
31	*hin nu nwe*	amaranth	*Amaranthus caudatus* L.	-	-	-	-	-	-	-
32	*hin nu nwe*	amaranth	*Amaranthus hypochondriacus* L.	-	-	-	*thuin thwe*	-	-	-
33	*hnan*	sesame	*Sesamum indicum* L.	*nyam hong*	*thun thu*	*niem hwo*	*tham thwe*	*tham thjiu*	*nim hon*	*nim hoan* [nim øwan]
34	*chin banung*	kenaf	*Hibiscus cannabinus* L.	*ahejet*	-	-	*chin bon ka phei*	-	-	*chin baun athuin*
35	*chin baung ni*	rosselle	*Hibiscus sabdariffa* L.	*ahejet*	*hoan tin*	*chin baon* (Burmese name)	*chin bon katein*	*hwan tin ba*	(*chin baung*)(Burmese name)	*chin baun azun*
36	*kyet hin khar*	bitter gourd	*Momordica charantia* L.	*chet hen kati* (Burmese name)	*hoan kha tie*	*payi ku sa*	*kyet hin khar* (Burmese name)	*hwan kha*	(*kyet hin khar*)(Burmese name)	*khut ser*
37	*pelin mwe*	snake gourd	*Trichosanthes anguina* L.	-	*ma lue*	*bon lone dhi* (Burmese name)	*khala hwon*	grown	*ka chu po* [kətʃupɔː]	grown but no name
38	*wa u*	elephant foot yam	*Amorphophallus* sp.	*kong jan kheo*	*veik kuon tawn*	*byo don*	-	-	*chiu* [tʃhiu]	-
39	*hnget pyaw*	banana	*Musa* spp.	*lu sep*	*kala tie*	*la khan*	*khala de* cultivars: *khala phi thi* (cultivated) *khala thi* (wild) *khala dan* (wild)	*khala phi tie*	*lowe long* (cultivated) *lu lowe long* (wild)	*rakhan zom rakhan* (cultivated) *lo rakhan* (wild)

Table 3 (Continued).

			dd/mm/yyyy	12/11/2014	14/11/2014	←	15/11/2014	←	16/11/2014	←
			Village	Pay U	Lahe	←	Nou Hin (San Tou)	Ngaung Ke (Ma Kyan)	Gahom	Sanpyar
			Township, Region	Hkamti, Sagaing	Lahe, Sagaing	←	←	←	←	←
			map location (waypoint)	2014.11WPMK022	near 2014.11WPMK044	←	2014.11WPMK048	2014.11WPMK053	2014.11WPMK060	2014.11WPMK061
			latitude (N)	26º0'6.57"	26º19'31.20"	←	26º26'5.99"	26º23'49.2"	26º16'35.6"	26º15'58.9"
			longitude (E)	95º24'17.4"	95º26'34.62"	←	95º31'27.1"	95º27'54.7"	95º26'28.8"	95º26'54.2"
			altitutde (m)	1,250	990	←	1,275	1,578	710	716
No.	crop name in Myanmar	crop name in English	Latin name							
40	*shan hnan*	perilla	*Perilla frutescens* BRITT.	*nyam*	*thu*	*niem*	*thuin thwe*	-	*nium* [njum]	*nium*
41	*pan hnan*	niger seed	*Guizotia abyssinica* (L. f.) CASS.	-	-	-	-	-	-	-
42	*pyi nyaung*	banyan tree shoot	*Ficus benghalensis* L.	*kenpeshiu*	*mun goi*	*gen kha*	-	*ji ga* *nian ji* (Burmese name)	*gen pom joue*, *gen pom jo*	*gin khan*
43	*myin khwa*	Asiatic pennywort	*Centella asiatica* (L.) URBAN	*sang kom komtso*	*myin khwa* (Burmese name)	*ko to mushi*	*hwa*	*jo pa palap*	(*myin khwa*)(Burmese name)	-
44	*kyet thun meik*	Chinese chive	*Allium tuberosum* BOTTL. ex SPRENG.	*hao the* (*asha*)	*kala hate*	*kala hate*	*ha thwe*	-	*kha thu shom jo* [kʰatʰu.sʰomjo:], *kha thu shomyo*	*hauthiji* [hau.tʰi.ji]
45	*gyu myit*	Hooker chives	*Allium hookeri* THWAITES	*hao the kheo*	*hate*	*hate*	*ha thwe*	*hatte zain*	*kha thu* [kʰatʰu.]	*hau thi kho* [hau.tʰi.kʰo]
46	*kyet thun ni*	shallot	*Allium cepa* L. Aggregatum Group	*hao the* (*akeu*)	*kala hate*	-	*khala ha thwe*	-	*kha thu shom jo* [kʰatʰu.sʰomjo:]	*hau thi kho* [hau.tʰi.kʰo]
47	*kyet thun ni*	Chinese onion	*Allium chinense* G. DON.	*hao the tso*	no name	*guan hati*	-	*hathep*	*khala lha thu*	*hau thi thui* [hau.tʰi.tʰui]
48	*kyet thun phyu*	garlic	*Allium sativum* L.	*hao the athou*	*hate phai*	*hate ku tue*	*ha thwe phei*	-	*kha thu tho jo*	not grown
49	*nan nan*	Coriander	*Coriandrum sativum* L.	nan nan (Burmese name)	*gyi hom*	*gyi hom*	*gii hom*	*ghii nom*	*mak khii* [maʔkʰi:]	*khei hem* [kʰei.hem]
50	*shan nan nan*	Chinese celery	*Oenanthe javanica* (Blume) DC.	-	not cultivate	not cultivate	-	-	-	-
51	*kala nan nan*	Mexican coriander	*Eryngium foetidum* L.	*khe la kom*	*den ba pya pi*	*pajjei*	*pan ti*	*themba pyat bi*	*khom si dap*	*pat tj*
56	*pusi nan*	mint (probably corn mint)	*Mentha* spp. (probably *M. arvensis*)	*lao sang*	*pusi nan* (Burmese name)	*pusi nan* (Burmese name)	*niang ke tong*	*pusi nan* (Burmese name)	*khala lou tian*	*pu si nan* (Burmese name)
57	*sit pok*	water mimosa	*Neptunia oleracea* LOUR.	*tsoao sung*	*sit pok* (Burmese name)	*sit pok* (Burmese name)	-	no (*sit pok*)(Burmese name)	-	-
58	*pin zein*	lomba	*Elsholtzia blanda* BENTH.	*lao sang*	*hi mye katian*	*mai shan*	*he shon ka thein*	*khat thian phai*	*lou tian dom jo*	*ma shan ko daini*
59	*lum* *kala pinzein*	holy basil	*Ocimum tenuiflorum* L.	*lao sang*	*katian pai*	*ga mai shan*	*ka thein ko tong*	*khat thian nom*	*lou tian man yu*	*ngam ma. shan*
60	*khayan khazaw*	Indian nightshade	*Solanum violaceum* ORTEGA	*se kheo ko*	*kanga tu*	*kashiem ku*	*katu kati* (cultivated)	*khat tzu kha*	*pa tei kut nju* [pateikuʔnju]	*kashiu ku sha*
61	*khayan gyin*	cultivated nightshade	*Solanum torvum* SWARTZ.	*pong go*	*po poke pi tie*	*riam kashiem*	spontaneously grown	*tha kain khat tsu*	*kohon patei* [kɔhon patei]	khashiu kun
62	*taung paw* *kan sin*	Zanthoxylum pepper	*Zanthoxylum* spp.	*jou*（two types）	*niam* (dried) *makka* (raw)	*zho ti niu*	*niang thea*	*nian ga* (hot) *nian ti* (sweat)	*tzu thain nju*	*tju* (spontaneous) *tju von* (cultivated, small)

Table 3 (Continued).

			dd/mm/yyyy	12/11/2014	14/11/2014	←	15/11/2014	←	16/11/2014	←
			Village	Pay U	Lahe	←	Nou Hin (San Tou)	Ngaung Ke (Ma Kyan)	Gahom	Sanpyar
			Township, Region	Hkamti, Sagaing	Lahe, Sagaing	←	←	←	←	←
			map location (waypoint)	2014.11WPMK022	near 2014.11WPMK044	←	2014.11WPMK048	2014.11WPMK053	2014.11WPMK060	2014.11WPMK061
			latitude (N)	26º0'6.57"	26º19'31.20"	←	26º26'5.99"	26º23'49.2"	26º16'35.6"	26º15'58.9"
			longitude (E)	95º24'17.4"	95º26'34.62"	←	95º31'27.1"	95º27'54.7"	95º26'28.8"	95º26'54.2"
			altitutde (m)	1,250	990	←	1,275	1,578	710	716
No.	crop name in Myanmar	crop name in English	Latin name							
63	*kyeik*	Job's tears	*Coix lacryma-jobi* L.	*ne nyak*	*lie*	-	*moan* *si luan* (wild)	*si luan*	*len len*	*niegop*. *kalap* (wild)
64		tree Spinach	*Chenopodium giganteum* G.DON		*ka zai*	*sanay*	*kha le ba*	*khe ze va*	*ma san*	*si ni*
65	*pein u*	taro	*Colocasia esculenta* (L.) SCHOTT		*jhi khe*	*dawn*	*ryee*	*dzi khet*	*don*	*don*
66	*myauk u*	yam	*Dioscorea* spp.	*alu*	*ha ke*	*kui*	*ha ru*	*hake*	*khui* [k^{h}ui]	*khui*
67	*palau pinau u pin*	cassava	*Manihot esculenta* CRANTZ	*pai khe*	*hu ha*	*bei khe*	*hwu-ha*	*hwa ha*	*chonkhii*	*phi khui*
68	*ngayok*	chilli pepper	*Capsicum annuum* L.	*pai hieu*	*thein*	*son kyu*	*thin*	*za kin*	*baziup*	*mosophyu*
69	*khayan gyin*	tomato	*Solanum lycopersicon* L.		*hwan thin tie*	*kala pe ji*	*kha pai thel*	*khat htu chyin*	(*khayan cyin*)(Burmese name)	*pezi ywap nju*
70	*khayan*	egg plant	*Solanum melongena* L.		*san pi kathu*	*ga shu ma lon*	*than phi*	*tzhampi ka tzhu*	*chon pat theu*	*khasiu malon*
71	*hpayon*	pumpkin	*Cucurbita maxima* DUCH. ex LAM.		*koum*	*kampuki*	*khūn*	*khōm*	*gom ga*	*khamkhai*
72	*kyauk hpayon*	ash gourd	*Benincasa hispida* (THUNB.) COGN.		*kom pai*	*kampuki tui nyu*	*khūn phei*	*khōm phai*	*ji gom ga*	*khamkhai thuinju*
73	*bu*	bottle gourd	*Lagenaria siceraria* (MOLINA) STANDL.		*bon hwan*	*budi* (Burmese name)	*bon*	*buom pho*	*cham chi, cham tschi*	*su kho*
note				KHIAMNIU NGAN NAGA tribe	MAKYAN NAGA tribe	LAING NOUNG NAGA tribe	LAI NONG NAGA tribe	PHAUNG NYUENG NAGA tribe	GAWONG NAGA tribe	LAIN NAUNG NAGA tribe

Photo 1. Sorghum, Job's teas, and perilla were grown admixed with rice on a slash-and-burn field near Pa Sang village in Hkamti Township (a waypoint MK020 = MK032).

Photo 2. Holy basil grown with rice on a slash-and-burn field near Pa Sang village in Hkamti Township (a waypoint MK024).

Photo 3. *Elsholtzia blanda* grown with rice on a slash-and-burn field near Pa Sang village in Hkamti Township (a waypoint MK020 = MK032).

Photo 4. *Chenopodium* sp. (probably *C. giganteum*) grown on a slash-and-burn field was characterized by a large inflorescence (left)(photo was taken at Pa Thon village) and a tall plant height (right)(photo was taken near Lahe).

Photo 5. Threshed rice grains are cleaned in a working tent shed at Pa Thon village in Hkamti Township (a waypoint MK024).

Photo 6. Granaries at Pa Sang village, Hkamti Township (a waypoint MK033).

Photo 7. San Ton (Naga name: Nou Him) village is located on a hill top in Lahe Township (a waypoint MK048).

Photo 8. Several local varieties of rice were recognized with different names at every farmer in northern Sagaing Region. They are separately sown and conserved. Photographed at San Ton (Naga name: Nou Him) village, Lahe Township (a waypoint MK048).

Photo 9. A wild ancestral form of Azuki bean, *Vigna angularis* var. *nipponensis* was collected near Lahe town (a waypoint MK059).