

Original Paper

Collaborative Exploration of Plant Genetic Resources in Eastern Cambodia, 2017

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Summary

This report describes the exploration of plant genetic resources in eastern Cambodia jointly conducted by Shinshu University, Japan and Cambodian Agricultural Research and Development Institute (CARDI), Cambodia. We conducted a field survey in eastern Cambodia from the 1st to the 12th of October 2017. We collected a total of 104 samples of *Capsicum* pepper (55), the genus *Solanum* (17), *Cucurbita* sp. (9) that probably belong to the *Cucurbita moschata* species, *Cucumis melo* (6) and so on. The collected accessions will be evaluated and their seed samples stored as genetic resources at CARDI with subsets transferred to the Genetic Resources Center, NARO in accordance with the standard material transfer agreement (SMTA). These are expected to be used as parental breeding lines and agricultural research materials.

KEY WORDS: Cambodia, chili pepper, genetic resources, eggplant, squash

Introduction

The Plant Genetic Resources in Asia (PGRAsia) project was funded by the Ministry of Agriculture, Forestry and Fisheries, Japan, since 2014, to explore, collect and evaluate the plant genetic resources of Asian countries. According to former collaborative explorations with the Cambodian Agricultural Research and Development Institute (CARDI) and Japan conducted through the PGRAsia project, plant genetic

resources of Solanaceae and Cucurbitaceae vegetables (Matsunaga *et al.* 2015) and Leguminous crops and their wild relatives (Takahashi *et al.* 2015) were collected in Western Cambodia in 2014 and in 2015, Poaceous millets (Sreynech *et al.* 2016), Cucurbitaceous vegetables (Tanaka K *et al.* 2016) and Solanaceous vegetables (Tanaka Y *et al.* 2016) were collected in Eastern Cambodia. In Northern Cambodia, plant genetic resources of mainly Solanaceous and Cucurbitaceous vegetables were also explored and collected with PGRAsia project (Okuizumi *et al.* 2017; Sugita *et al.* 2017; Tanaka *et al.* 2017).

As a result of these previous joint explorations, it is expected that there will be many genetic resources in Eastern Cambodia as it is a mountainous region with a number of different ethnic minority populations. Altitude differences within an area can increase the range of crops and vegetables grown there, and the existence and maintenance of local varieties can be expected with different ethnic minority populations. The object of this survey was to explore and collect the plant genetic resources, mainly from the Solanaceous and Cucurbitaceous families, in Eastern Cambodia.

Methods

From the 1st to 12th of October in 2017, we explored and collected plant genetic resources, mainly Solanaceous and Cucurbitaceous vegetable genetic resources in Mondulkiri, Ratanakiri, Stung treng and Kratie provinces in Eastern Cambodia (Table 1, Fig. 1). Our collections were restricted to local varieties, except for developed varieties and imported crops. The fruit and seed samples were collected from farmers' fields, back yards and storage areas. We also recorded information on each of the samples, including usage and characteristics from interviews with farmers. We recorded place names, local plant names, tribal name, latitudes, longitudes, altitudes, and characteristics of the collection sites. Latitude, longitude and altitude were determined using Garmin eTrex20J GPS technology (Garmin International Inc., Olathe, KS, USA).

Results and Discussion

In this survey, we collected a total of 104 samples from: 47 of *Capsicum frutescens* (47), *Capsicum annuum* (8), *Solanum* sp. (14), *Cucurbita* sp. (9) that are probably *Cucurbita moschata*, *Cucumis melo* (6) and *Zea mays* (5); the complete list of samples is provided in Tables 2 and 3. The collected seed samples will be stored as seeds at CARDI and subsets will be transferred to the Genetic Resources Center, NARO in accordance with standard material transfer agreement (SMTA).

Table 1. Itinerary of the field survey in Eastern Cambodia, October 2017

Data	Day	Itinerary	Stay
1. Oct.	Sun	Narita 10:50 (NH817) -- 15:10 Phnom Penh	Phnom Penh
2. Oct.	Mon	Visit the Cambodia Agricultural Research and Development Institute (CARDI) and discuss the survey plan. Visit markets in Phnom Penh.	Phnom Penh
3. Oct.	Tue	Phnom Penh -- Sen Monorom	Sen Monorom
4. Oct.	Wed	Sen Monorom -- Pichchenda -- Sen Monorom	Sen Monorom
5. Oct.	Thu	Sen Monorom -- O'Raing -- Sen Monorom -- Ban lung	Ban lung
6. Oct.	Fri	Ban lung -- O'Churm -- Ban lung	Ban lung
7. Oct.	Sat	Ban lung -- O'Churm -- Ban lung	Ban lung
8. Oct.	Sun	Ban lung -- O'Churm -- Bor Kao -- Stoueng Treang	Stoueng Treang
9. Oct.	Mon	Stoueng Treang -- Thalaborivat -- Seam Bok -- Chetborey -- Kratie	Kratie
10. Oct.	Tue	Kratie -- Phnom Penh	Phnom Penh
11. Oct.	Wed	Visit the CARDI and arrange the collected seeds Phnom Penh 22:50 (NH818) --	
12. Oct.	Thu	--6:45 Narita	

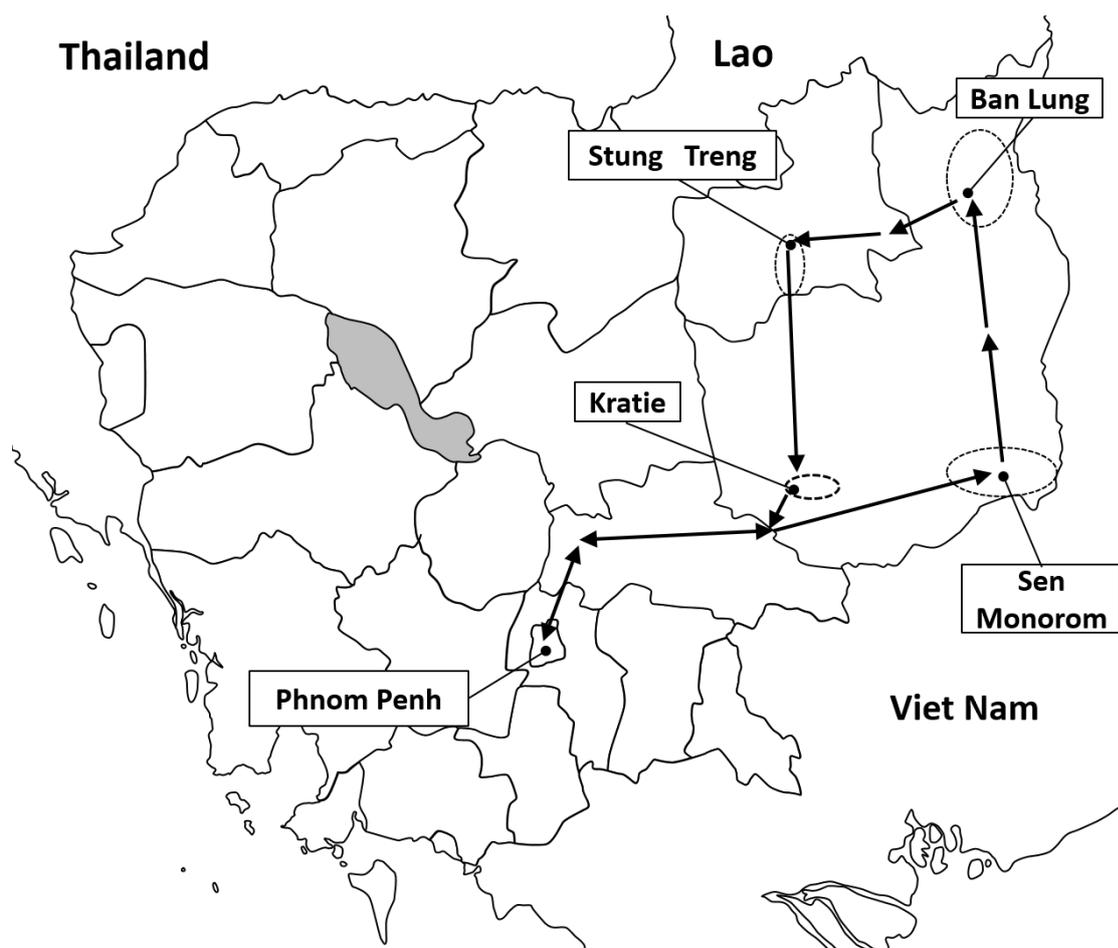


Fig. 1. Map of exploration area in Eastern Cambodia, October 2017.

Table 2. Samples collected during the 2017 survey in Eastern Cambodia

Family	Genus	Species	Province				Total
			Mondulkiri	Ratanakiri	Stung treng	Kartie	
<i>Amaranthaceae</i>	<i>Amaranthus</i>	<i>blitum</i>	0	0	0	1	1
<i>Cucurbitaceae</i>	<i>Benincasa</i>	<i>hispidia</i>	1	0	0	0	1
		<i>Cucumis</i>	<i>melo</i>	4	1	1	0
		<i>sativus</i>	2	0	0	0	2
	<i>Cucurbita</i>	<i>moschata</i>	4	3	2	0	9
	<i>Lagenaria</i>	<i>siceraria</i>	2	1	0	0	3
	<i>Luffa</i>	<i>cylindrica</i>	0	2	0	1	3
<i>Fabaceae</i>	<i>Psophocarpus</i>	<i>tetragonolobus</i>	0	0	0	1	1
	<i>Vigna</i>	<i>unquiculata</i>	1	0	0	0	1
<i>Poaceae</i>	<i>Zea</i>	<i>mays</i>	4	1	0	0	5
<i>Solanaceae</i>	<i>Capsicum</i>	<i>annuum</i>	5	2	0	1	8
		<i>frutescens</i>	13	28	2	4	47
	<i>Solanum</i>	<i>lycopersicum</i>	1	0	0	0	1
		sp.	6	8	0	0	14
	<i>torvum</i>	2	0	0	0	2	
total			45	46	5	8	104

1. Exploration site

1) Mondulkiri province (3rd-5th October)

On the 3rd of October, we moved to Sen Monorom in Mondulkiri province from Phnom Penh, the capital city, by car. We visited Pu Raing, Pu Tout and Pu Louk villages in the Pichchenda district, Pu Chhorb village in the O' Raing district and Pu Taing village in the Senmonorom district and collected a total of 45 samples: 18 *Capsicum* pepper, 6 fruits vegetables from *Solanum* sp., 4 melons and 4 maize from farmers, the complete list is available in Table 2. In this area, there are large scale plantations of rubber trees (Photo 1), and a large amount of black pepper cultivation. The collection sites were in hilly and mountainous areas and the altitudes ranged from 534 to 867 m above sea level (a.s.l.). Several ethnic groups were living in the area, but specifically, the Phnong tribe lived in all of the villages we visited (Photo 2).

2) Ratanakiri province (6th-8th October)

We moved to Ban lung in Ratanakiri province, and visited Kalai, Chhurng and Pachurn Thom villages in the O'Churm district, and Long Khong village in the Bor Kao district. The exploration areas of the Ratanakiri province were at relatively lower altitudes (103-382 m a.s.l.) than those of the Mondulkiri province. A total of 46 samples were collected: 30 *Capsicum* pepper and 8 fruits and vegetables from *Solanum* sp. from farmers, the complete list of samples can be found in Table 2. Rubber tree plantations, and coffee estates were also in operation in this area. In Ratanakiri province there are several different ethnic group populations, of which, we visited villages of the Kreung tribe and the Prov tribe.

3) Stung Treng province (9th October)

We travelled to Stung Treng province, and on the way to go back to Phnom Penh, we visited Svang village in the Thalaborivat district and Srey Krosang village in the Seam Bok district where the Lao tribe live. Stung Treng province is located in the lowland plain of the basin of the region where the Sekon River and the Mekong River join. Two *Capsicum* peppers and 1 squash were collected from farmers here, and 1 melon and 1 squash were collected in the Stung Treng market (Table 2, Photo 3).

4) Kratie province (9th October)

On the way back to go Phnom Penh, we also explored the Seray Pheab village and Kantout village in the Chetborey district of Kratie province. Five *Capsicum* peppers, a weedy amaranthus leaf vegetable, a winged bean and sponge gourd were collected from farmers here (Table 2, Photo 4).

2. Collected plant genetic resources.

1) Chili pepper

In the present exploration, a total of 55 chili pepper samples were collected. Of these, only 8 were identified as *C. annum* L. and 47 were identified as *C. frutescens* L.. In previous explorations for genetic resources of chili pepper in other Asian countries, most of samples are found to be *C. annum*, however we have found that in Eastern Cambodia, *C. frutescens* was the most popular chili pepper sampled. The reason why more *C. frutescens* is grown here than *C. annum* has not been identified; however, one local farmer from Kratie province reported that the demand for *C. annum* is low as they are less pungent than *C. frutescens*.

In Cambodia, chili peppers are generally called 'Mates' in the Khmer language and by the people

of Lao and Phnom tribes. The Phnong, Kreung, Prov and Tom Pum tribes call them ‘Mareeh’ in their language. It seems to be that ‘Mareeh’ is the common term for chili pepper among ethnic groups in Eastern Cambodia (Table 4). According to Yamamoto *et al.* (2010), the people of Lao refer to chili peppers as “maak phuk”; however, we did not record the use of this name in the Lao tribe village in Stung Treng province. Local chili peppers belonging to the *C. frutescens* species were only called ‘Mareeh’ or ‘Mareeh’ combined with the designation of the fruit shape or color; for example, ‘Mareeh Ngang’ in Prov and ‘Mareeh Khlet’ in Kreung means “small chili pepper”; ‘Mareeh Bork’ in Kreung and ‘Mareeh Krok’ or ‘Mareeh Pok’ in Tom Pun means “white chili pepper”, which is the same as ‘Mate Sor’ in Khmer, which has yellowish white immature fruit. ‘Mareeh Chey’ and ‘Mareeh Releav’ both mean “bird droppings chili pepper” in the Phnom language, even though they are different words. These local varieties belong to the *C. frutescens* species and their seeds are thought to be spread by birds’ feces.

Most of the chili peppers from both *C. annuum* and *C. frutescens*, had relatively small fruits and their lengths varied. Among them, sample No. 066 had the longest fruits but was slender. On the other hand, samples No. 074 and No. 077 showed unique fruits with fruits wider than their calyxes, and sample No. 074 had fine protrusions on its fruit surfaces. Normally, *C. frutescens* had greenish white corolla and *C. annuum* had white corolla, while sample No. 066 showed white corolla with a yellowish color on the base and was identified as *C. frutescens* by other traits, but the occurrence of an interspecific genetic introgression was inferred.

Table 4. Local name of *Capsicum frutescens* in Eastern Cambodia

Ethnic group	Local name	Meanig	
Phnong	Mareeh Chey	Chey = bird droppings	
	Mareeh Releav	Releav = bird droppings	
	Mareeh Nkang		
	Mates Chey	Chey = bird droppings	
	Mates Chuma	Chuma = small	
	Mates Kong	Kong = big	
	Mates Ach sath	Ach sath = bird droppings	(Khmer name)
	Mates Dai Neang	Dai Neang = ring finger	(Khmer name)
	Mates Sor	Sor = white	(Khmer name)
Kreung	Mareeh		
	Mareeh Bork	Bork = white	
	Mareeh Chanav	Chanav = Eal	
	Mareeh Ghost	Ghost = long	
	Mareeh Khlet	Khlet = small	
	Mareeh Tis	Tis = big	
	Mareeh Trotes	Trotes = big	
Prov	Mareeh Meeh		
	Mareeh Charong	Charong= medium	
	Mareeh Drain	Drain= grub in tree	
	Mareeh Mart	Mareeh Mart= Just a chili pepper	
Tom Pun	Mareeh Ngang	Ngang = small	
	Mareeh		
	Mareeh Kork	Kork= white	
Lao	Mareeh Pok	Pok= white	
	Mates		

Most of farmers in our exploration area only had 1 to 5 chili peppers growing in their farmhouse or garden. In addition, these chili pepper plants were often infected with viruses (Photo 6). Although the surrounding individuals were severely infected, No. 080, 097, 098, 101 and 102 did not show disease symptoms. These are expected to be disease resistant strains.

2) Eggplant

We collected 17 sample of the genus *Solanum*. Of these, 1 accession was tomato, 2 were *S. torvum* and although 14 accessions were speculated to be *S. melongena*, their identifications should be verified. Most eggplant fruits sampled were spherical, but the accessions No. 009 and 085 showed long oval spherical fruits. The mature fruits were yellow, but their immature fruits were diverse in color; mottled patterned green (No. 009, 084 and 089), white (No. 062), purple (No. 085) and pink (No. 065).

3) Cucurbitaceae accessions

We collected 8 accessions of genus *Cucumis*. Of these, 6 accessions were melon and only 2 accessions were cucumber. Depending on the variety, the fruits of mature cucumbers and melons are very similar. In Eastern Cambodia, even farmers showed confusion when identifying melons and cucumbers. The local name of melon is 'Rapong' in the Phnom tribe, 'Paya Pung' in the Tom Pun tribe and the local name of cucumber is 'Pleay rapong' in the Phnong tribe.

We collected 9 samples of squash also and it is thought that they are all *Cucurbita moschata*. The local name for squash is 'Raporl' in the Phnong tribe and 'Blouy' or 'Bro Pao' in the Krueng tribe.

In addition, we collected one accession of wax gourd, 3 accessions of bottle gourd and 3 accessions of sponge gourd.

Apart from plants of the family Cucurbitaceae and Solanaceae, we collected accessions of one winged bean and one cowpea from the Leguminosae family, 5 accessions of maize from the Gramineae family, and one accession of purple amaranth from the Amaranthaceae family, as genetic resources. The purple amaranth was native to the farmhouse garden in Kratie province and its leaves were used as a vegetable.

Compared with the results of previous explorations in the western regions where the land is occupied mostly by the Khmer people, the eastern region had considerably more genetic diversity of vegetables. This was thought to be due to the residence of several ethnic groups and the geographic variability. It will become clearer after we get a result of future evaluation of these genetic resources we collected .

The seed samples of the collected accessions were propagated and stored as genetic resources at CARDI and subsets were transferred to the Genetic Resources Center, NARO in accordance with standard material transfer agreement (SMTA). These plant genetic resources will be used as parental breeding lines and agricultural research materials.

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東カンボジアにおける植物遺伝資源の 共同探索，2017年

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和文摘要

本報告は農林水産省委託プロジェクト研究「海外植物遺伝資源の収集・提供強化」の予算により実施され、国立研究開発法人農業・食品産業技術総合研究機構 遺伝資源センターとカンボジア農業研究開発研究所 (Cambodian Agricultural Research and Development Institute; CARDI) との間で締結した共同研究協定に基づいて行われた東カンボジアにおける植物遺伝資源の探索・収集に関わる調査報告書である。調査は2017年10月1日～12日にかけて行った。カンボジア東部のモンドルキリ県、ラタナキリ県、スタントレン県、クラチエ県において探索・調査を行った。その結果、トウガラシ属55点、ナス属17点、ニホンカボチャと推定されるカボチャ9点、メロン6点等の全合計104点の植物遺伝資源を収集した。収集された遺伝資源は、CARDIで評価された後、保存するとともに、我が国の遺伝資源センターに標準材料移転契約 (SMTA) に基づいて移転され、農業研究や育種目的に利用可能な遺伝資源として保存される。

Table 3. Collected genetic resources in Eastern Cambodia, 2017

JP No.	Site No.	Individual No.	Date	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Species name	Local name	Source	Tribe
260592	1	1	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-32-28.0	E107-25-51.4	534	<i>Capsicum frutescens</i> L.	Mates sor / Mareeh Nkang	The plant grown in front of vegetable shop	Phnong
260593	1	2	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-25.3	E107-26-05.3	544	<i>Capsicum frutescens</i> L.	Mates chuma / Mareeh chay	Famer's Backyard	Phnong
260594	1	3	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-29.0	E107-26-22.2	538	<i>Lagenaria siceraria</i> (Molina) Standl. var. <i>siceraria</i>	Pleay Nong	Farming field	Phnong
260595	1	4	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-29.0	E107-26-22.2	538	<i>Capsicum frutescens</i> L.	Mates chuma / Mareeh chay	Farming field	Phnong
260596	1	5	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-29.0	E107-26-22.2	538	<i>Capsicum frutescens</i> L.	Mates Ach sath / Mareeh Raleav	Farming field	Phnong
260597	1	6	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-30.3	E107-26-11.4	544	<i>Zea mays</i> L.	Port / Omber	Famer's Backyard	Phnong
260598	1	7	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-30.3	E107-26-11.4	544	<i>Solanum</i> sp.	Plaey plorn	Famer's Backyard	Phnong
260599	1	8	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-30.3	E107-26-11.4	544	<i>Cucurbita moschata</i> Duch.	Plaey raporl	Famer's Backyard	Phnong
260600	1	9	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-30.3	E107-26-11.4	544	<i>Solanum</i> sp.	Pleay plorn	Famer's Backyard	Phnong
260601	1	10	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Raing	N12-31-30.3	E107-26-11.4	544	<i>Cucumis sativus</i> L.	Pleay rapong	Famer's Backyard	Phnong
260602	2	11	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Tout	N12-32-40.5	E107-26-55.6	560	<i>Capsicum frutescens</i> L.	Mates sor	Famer's house	Phnong
260603	2	12	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Tout	N12-32-40.5	E107-26-55.6	560	<i>Capsicum frutescens</i> L.	Mates Ach sath	Famer's house	Phnong
260604	2	13	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Tout	N12-32-40.5	E107-26-55.6	560	<i>Capsicum frutescens</i> L.	Mates Dai Neang	Famer's house	Phnong
260605	2	14	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-30.1	E107-28-45.4	640	<i>Solanum</i> sp.	Plin Tang	Farming field	Phnong
260606	2	15	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-30.1	E107-28-45.4	640	<i>Solanum</i> sp.		Farming field	Phnong
260607	2	16	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-29.8	E107-28-44.7	633	<i>Cucurbita moschata</i> Duch.	Raporl	The plant grown in front of vegetable shop	Phnong
260608	2	17	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-29.8	E107-28-44.7	633	<i>Cucurbita moschata</i> Duch.	Raporl Tom	Farming field	Phnong
260609	2	18	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-29.8	E107-28-44.7	633	<i>Cucumis melo</i> L.	Rapong khov	Farming field	Phnong
260610	2	19	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-29.8	E107-28-44.7	633	<i>Zea mays</i> L.	Omber	Famer's house	Phnong
260611	2	20	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-07.0	E107-28-46.6	638	<i>Zea mays</i> L.	Omber	Famer's house	Phnong
260612	2	21	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-29-07.0	E107-28-46.6	638	<i>Capsicum frutescens</i> L.	Mates chey	Farming field	Phnong
260613	2	22	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Vigna unguiculata</i> (L.) Walp.		Farming field	Phnong
260614	2	23	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Cucumis melo</i> L.	Rapong Tok	Farming field	Phnong
260615	2	24	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Lycopersicon esculentum</i> Mill. var. <i>cerasiforme</i> Alef.		Farming field	Phnong
260616	2	25	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Capsicum frutescens</i> L.	Mates Ach sath	Farming field	Phnong
260617	2	26	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Solanum torvum</i> Swartz.	Pleay pren	Farming field	Phnong
260618	2	27	4-Oct	Mondulkiri	Pichchenda	Busra	Pu Louk	N12-28-56.7	E107-28-41.6	643	<i>Zea mays</i> L.		Farming field	Phnong
260619	3	28	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-18.9	E107-17-52.8	867	<i>Cucurbita moschata</i> Duch.	Raporl	Famer's Backyard	Phnong
260620	3	29	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-18.9	E107-17-52.8	867	<i>Cucumis melo</i> L.	Rapong	Famer's Backyard	Phnong
260621	3	30	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-18.9	E107-17-52.8	867	<i>Benincasa hispida</i> Cogn.	Raporl prah	Famer's Backyard	Phnong
260622	3	31	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-18.9	E107-17-52.8	867	<i>Solanum torvum</i> Swartz.	Plea pran	Farming field	Phnong
260623	3	32	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-18.9	E107-17-52.8	867	<i>Lagenaria siceraria</i> (Molina) Standl. var. <i>siceraria</i>	Pray Norng	Famer's Backyard	Phnong
260624	3	33	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-07.3	E107-18-48.7	836	<i>Capsicum frutescens</i> L.	Mates Ach sath / Mareeh chey	Famer's house	Phnong
260625	3	34	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-07.3	E107-18-48.7	836	<i>Cucumis sativus</i> L.		Famer's Backyard	Phnong
260626	3	35	5-Oct	Mondulkiri	O' Raing	Dak Dam	Pu Chhorb	N12-25-01.3	E107-18-27.2	847	<i>Capsicum frutescens</i> L.	Mates Ach sath / Mareeh chey	Farming field	Phnong
260627	4	36	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-24-52.9	E107-09-38.1	724	<i>Cucumis melo</i> L.	Rapong	Famer's Backyard	Phnong
260628	4	37	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-24-52.9	E107-09-38.1	724	<i>Solanum</i> sp.		Famer's Backyard	Phnong
260629	4	38	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-24-52.9	E107-09-38.1	724	<i>Capsicum frutescens</i> L.	Mates Kong	Famer's house	Phnong
260630	4	39	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-24-52.9	E107-09-38.1	724	<i>Capsicum frutescens</i> L.	Mates Ach sath / Mareeh chey	Famer's house	Phnong

Table 3. (Continued).

JP No.	Site No.	Individual No.	Date	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Species name	Local name	Source	Tribe
260631	4	40	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-24-52.9	E107-09-38.1	724	<i>Solanum</i> sp.		Famer's Backyard	Phnong
260632	4	41	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-25-15.4	E107-09-38.3	719	<i>Capsicum annuum</i> L.	Mates Dai Neang	Famer's Backyard	
260633	4	42	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-25-15.4	E107-09-38.3	719	<i>Capsicum annuum</i> L.	Mates Dai Neang	Famer's Backyard	
260634	4	43	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-25-15.4	E107-09-38.3	719	<i>Capsicum annuum</i> L.	Mates Dai Neang	Farming field	
260635	4	44	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-25-15.4	E107-09-38.3	719	<i>Capsicum annuum</i> L.	Mates Dai Neang	Farming field	
260636	4	45	5-Oct	Mondulkiri	Senmonorom	Romoner	Pu Taing	N12-25-15.4	E107-09-38.3	719	<i>Capsicum annuum</i> L.	Mates Dai Neang	Farming field	
260637	5	46	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh khlet	Farming field	kreung
260638	5	47	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh khlet	Farming field	kreung
260639	5	48	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh khlet	Farming field	kreung
260640	5	49	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh khlet	Farming field	kreung
260641	5	50	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh Bork	Farming field	kreung
260642	5	51	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh ghost	Farming field	kreung
260643	5	52	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Capsicum frutescens</i> L.	Mareeh khlet	Farming field	kreung
260644	5	53	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Solanum</i> sp.	Trorb	Farming field	kreung
260645	5	54	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-49-59.0	E106-56-24.8	227	<i>Luffa cylindrica</i> M. Roem	Danorng	Famer's Backyard	kreung
260646	5	55	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Capsicum frutescens</i> L.	Mareeh ghost	Famer's Backyard	kreung
260647	5	56	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Capsicum frutescens</i> L.	Mareeh Bork	Famer's Backyard	kreung
260648	5	57	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Cucurbita moschata</i> Duch.	Blouy / Bro Pao	Famer's Backyard	kreung
260649	5	58	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Luffa cylindrica</i> M. Roem	Blouy	Famer's Backyard	kreung
260650	5	59	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Cucurbita moschata</i> Duch.		Famer's Backyard	kreung
260651	5	60	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-18.4	E106-57-31.5	249	<i>Cucurbita moschata</i> Duch.		Famer's Backyard	kreung
260652	5	61	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-31.8	E106-57-29.7	158	<i>Capsicum frutescens</i> L.	Mareeh Trotes	Famer's Backyard	kreung
260653	5	62	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-31.8	E106-57-29.7	158	<i>Solanum</i> sp.	Trorb bork	Famer's Backyard	kreung
260654	5	63	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Capsicum frutescens</i> L.	Mareeh khlet	Road side	kreung
260655	5	64	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Solanum</i> sp.		Famer's house	kreung
260656	5	65	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Solanum</i> sp.		Famer's house	kreung
260657	5	66	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Capsicum frutescens</i> L.	Mareeh Chanav	Famer's house	kreung
260658	5	67	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Capsicum frutescens</i> L.	Mareeh tis	Famer's house	kreung
260659	5	68	6-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N13-50-43.7	E106-57-23.8	156	<i>Capsicum frutescens</i> L.	Mareeh khlet	Famer's house	kreung
260660	5	69	7-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N14-04-04.6	E107-05-04.6	103	<i>Solanum</i> sp.	Trorb	Farming field	Prov
260661	5	70	7-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N14-04-04.6	E107-05-04.6	103	<i>Capsicum frutescens</i> L.	Mareeh Ngang	Famer's Backyard	Prov
260662	5	71	7-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N14-04-20.6	E107-04-32.3	108	<i>Capsicum frutescens</i> L.	Mareeh Mart	Farming field	Prov
260663	5	72	7-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N14-04-20.6	E107-04-32.3	108	<i>Capsicum frutescens</i> L.	Mareeh Drain	Famer's house	Prov
260664	5	73	7-Oct	Ratanakiri	O'Churm	Kalai	Kalai	N14-04-20.6	E107-04-32.3	108	<i>Capsicum frutescens</i> L.	Mareeh Charong	Famer's house	Prov
260665	6	74	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-45.2	E107-02-38.8	348	<i>Capsicum frutescens</i> L.	Meeh	Farming field	kreung
260666	6	75	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-45.2	E107-02-38.8	348	<i>Capsicum frutescens</i> L.	Meeh	Farming field	kreung
260667	6	76	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-53.5	E107-02-44.7	382	<i>Capsicum frutescens</i> L.	Meeh	Farming field	kreung
260668	6	77	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-53.5	E107-02-44.7	382	<i>Capsicum frutescens</i> L.	Meeh	Farming field	kreung
260669	6	78	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-53.5	E107-02-44.7	382	<i>Capsicum frutescens</i> L.	Meeh	Farming field	kreung
260670	6	79	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-53.5	E107-02-44.7	382	<i>Capsicum annuum</i> L.		Farming field	kreung
260671	6	80	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-55-53.5	E107-02-44.7	382	<i>Capsicum annuum</i> L.		Farming field	kreung

Table 3. (Continued).

JP No.	Site No.	Individual No.	Date	Province	District	Commune	Village name	Latitude	Longitude	Altitude (m)	Species name	Local name	Source	Tribe
260672	6	81	7-Oct	Ratanakiri	O'Churm	Poy	Chhurng	N13-49-03.8	E107-00-05.4	286	<i>Capsicum frutescens</i> L.	Mareeh	Famer's house	kreung
260673	7	82	8-Oct	Ratanakiri	O'Churm	Ek Pheab	Pachurn Thom	N13-44-46.1	E107-03-21.4	350	<i>Cucumis melo</i> L.	Paya Pung	Farmer's shop	Tom Pun
260674	7	83	8-Oct	Ratanakiri	O'Churm	Ek Pheab	Pachurn Thom	N13-44-46.1	E107-03-21.4	350	<i>Capsicum frutescens</i> L.	Mareeh	Farmer's shop	Tom Pun
260675	8	84	8-Oct	Ratanakiri	Bor Kao	Ek Pheab	Long Khong	N13-39-43.4	E107-07-53.0	235	<i>Solanum</i> sp.		Farming field	Tom Pun
260676	8	85	8-Oct	Ratanakiri	Bor Kao	Ek Pheab	Long Khong	N13-39-43.4	E107-07-53.0	235	<i>Solanum</i> sp.		Farming field	Tom Pun
260677	8	86	8-Oct	Ratanakiri	Bor Kao	Ek Pheab	Long Khong	N13-39-43.4	E107-07-53.0	235	<i>Lagenaria siceraria</i> (Molina) Standl. var. <i>siceraria</i>		Farming field	Tom Pun
260678	8	87	8-Oct	Ratanakiri	Bor Kao	Ek Pheab	Long Khong	N13-39-43.4	E107-07-53.0	235	<i>Capsicum frutescens</i> L.		Farming field	Tom Pun
260679	8	88	8-Oct	Ratanakiri	Bor Kao	Long Khong	Long Khong	N13-39-38.9	E107-07-41.4	256	<i>Capsicum frutescens</i> L.	Mareeh kork	Farming field	Tom Pun
260680	8	89	8-Oct	Ratanakiri	Bor Kao	Long Khong	Long Khong	N13-39-38.9	E107-07-41.4	256	<i>Solanum</i> sp.	Provb Sleur	Farming field	Tom Pun
260681	8	90	8-Oct	Ratanakiri	Bor Kao	Long Khong	Long Khong	N13-39-38.9	E107-07-41.4	256	<i>Zea mays</i> L.	Poo	Farming field	Tom Pun
260682	8	91	8-Oct	Ratanakiri	Bor Kao	Long Khong	Long Khong	N13-39-36.1	E107-07-35.4	255	<i>Capsicum frutescens</i> L.	Mareeh pok	Farming field	Tom Pun
260683	9	92	9-Oct	Stung Treng	Thalaborivat	Thalaborivat	Svang	N13-31-47.5	E105-58-21.4	49	<i>Cucumis melo</i> L.		Market (Stoueng Treang)	
260684	9	93	9-Oct	Stung Treng	Thalaborivat	Thalaborivat	Svang	N13-31-47.5	E105-58-21.4	49	<i>Cucurbita moschata</i> Duch.		Market (Stoueng Treang)	
260685	10	94	9-Oct	Stung Treng	Seam Bok	Srey Krosang	Srey Krosang	N13-21-40.3	E105-57-32.4	55	<i>Capsicum frutescens</i> L.	Mates	Farming field	Lao
260686	10	95	9-Oct	Stung Treng	Seam Bok	Srey Krosang	Srey Krosang	N13-21-40.3	E105-57-32.4	55	<i>Capsicum frutescens</i> L.	Mates	Farming field	Lao
260687	10	96	9-Oct	Stung Treng	Seam Bok	Srey Krosang	Srey Krosang	N13-21-40.3	E105-57-32.4	55	<i>Cucurbita moschata</i> Duch.		Famer's Backyard	Lao
260688	11	97	9-Oct	Kratie	Chetborey	Da	Seray Pheab	N12-28-04.3	E106-08-47.2	30	<i>Capsicum frutescens</i> L.	Mates sor	Farming field	
260689	11	98	9-Oct	Kratie	Chetborey	Da	Seray Pheab	N12-27-56.6	E106-08-34.5	26	<i>Capsicum frutescens</i> L.	Mates Noombo Chok	Farming field	
260690	12	99	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-54.4	E106-09-41.6	28	<i>Capsicum frutescens</i> L.	Mates Khmang	Farming field	
260691	12	100	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-54.4	E106-09-41.6	28	<i>Luffa cylindrica</i> M. Roem	Nonong Mate	Farming field	
260692	12	101	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-06.7	E106-10-06.9	31	<i>Capsicum frutescens</i> L.	Mates Ach sath	Farming field	
260693	12	102	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-06.7	E106-10-06.9	31	<i>Capsicum annuum</i> L.	Mates Dai Neang	Farming field	
260694	12	103	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-06.7	E106-10-06.9	31	<i>Psophocarpus tetragonolobus</i> (L.) DC.	Po peay	Farming field	
260695	12	104	9-Oct	Kratie	Chetborey	Da	Kantout	N12-28-06.7	E106-10-06.9	31	<i>Amaranthus blitum</i> L.		Farming field	



Photo 1. Large scale plantations of rubber tree in Mondul Kiri province.



Photo 2. Farmer's house in Phnong tribe village in Mondul Kiri province.



Photo 3. Melon and squash sold at the farmer's market in Stung Treang province.



Photo 4. Investigation of the farm garden in Kratie province.



Photo 5. Dried chili pepper in Mondul Kiri province.



Photo 6. The chili pepper plant that was infected with a virus in Mondul Kiri province.

Photos of collected genetic resources samples



No. 001 *Capsicum frutescens*



No. 002 *Capsicum frutescens*



No. 003 *Lagenaria siceraria*



No. 004 *Capsicum frutescens*



No. 005 *Capsicum frutescens*



No. 006 *Zea mays*



No. 007 Seeds and placenta of *Solanum* sp.;left, No. 008 Seeds of *Cucurbita moschata*; right



No. 009 *Solanum* sp.



No. 010 *Cucumis sativus*



No. 011 *Capsicum frutescens*



No. 012 *Capsicum frutescens*



No. 013 *Capsicum frutescens*



No. 014 *Solanum* sp.



No. 015 *Solanum* sp.



No. 016 *Cucurbita moschata*



No. 017 *Cucurbita moschata*



No. 018 *Cucumis melo*



No. 019 *Zea mays*



No. 020 *Zea mays*



No. 021 *Capsicum frutescens*



No. 022 *Vigna* sp.



No. 023 *Cucumis melo*



No. 024 *Solanum lycopersicum*



No. 025 *Capsicum frutescens*



No. 026 *Solanum torvum*



No. 027 *Zea mays*



No. 028 Seeds of *Cucurbita moschata*; front, No. 029 Seeds of *Cucumis melo* ;back



No. 030 *Benincasa hispida*



No. 031 *Solanum torvum*



No. 032 *Lagenaria siceraria*



No. 033 *Capsicum frutescens*



No. 035 *Capsicum frutescens*



No. 038, No. 039 *Capsicum frutescens*



No. 041 *Capsicum annuum*



No. 042 *Capsicum annuum*



No. 043 *Capsicum annuum*



No. 044 *Capsicum annuum*



No. 045 *Capsicum annuum*



No. 046 *Capsicum frutescens*



No. 047 *Capsicum frutescens*



No. 048 *Capsicum frutescens*



No. 049 *Capsicum frutescens*



No. 050 *Capsicum frutescens*



No. 051 *Capsicum frutescens*



No. 052 *Capsicum frutescens*



No. 053 *Solanum* sp.



No. 055 *Capsicum frutescens*



No. 056 *Capsicum frutescens*



No. 057 *Cucurbita moschata*



No. 057 Section of *Cucurbita moschata*



No. 058 *Luffa cylindrica*



No. 059 *Cucurbita moschata*



No. 059 Section of *Cucurbita moschata*



No. 060 *Cucurbita moschata*



No. 060 Section of *Cucurbita moschata*



No. 061 *Capsicum frutescens*



No. 062 *Solanum* sp.



No. 063 *Capsicum frutescens*



No. 064 *Solanum* sp.



No. 065 *Solanum* sp.



No. 066 Flower of *Capsicum frutescens*



No. 066 *Capsicum frutescens*



No. 067 *Capsicum frutescens*



No. 068 *Capsicum frutescens*



No. 069 *Solanum* sp.



No. 070 *Capsicum frutescens*



No. 071 *Capsicum frutescens*



No. 072 *Capsicum frutescens*



No. 073 *Capsicum frutescens*



No. 074 *Capsicum frutescens*



No. 075 *Capsicum frutescens*



No. 076 *Capsicum frutescens*



No. 077 *Capsicum frutescens*



No. 078 *Capsicum frutescens*



No. 079 *Capsicum annuum*



No. 080 *Capsicum annuum*



No. 081 *Capsicum frutescens*



No. 082 *Cucumis melo*



No. 083 *Capsicum frutescens*



No. 084 *Solanum* sp.



No. 085 *Solanum* sp.



No. 087 *Capsicum frutescens*



No. 088 *Capsicum frutescens*



No. 089 *Solanum* sp.



No. 090 *Zea mays*



No. 091 *Capsicum frutescens*



No. 092 *Cucumis melo*



No. 093 *Cucurbita moschata*



No. 094 *Capsicum frutescens*



No. 095 *Capsicum frutescens*



No. 097 *Capsicum frutescens*



No. 098 *Capsicum frutescens*



No. 099 *Capsicum frutescens*



No. 100 *Luffa cylindrica*



No. 101 *Capsicum frutescens*



No. 102 *Capsicum annum*



No. 103 *Psophocarpus tetragonolobus*



No. 104 *Amaranthus blitum*



No. 104 *Amaranthus blitum*
inflorescece