

Collection and Conservation of Leguminous Crops and Their Wild Relatives in Cambodia, 2012

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Summary

Based on a Letter of Agreement between the National Institute of Agrobiological Sciences (NIAS), Japan and the Cambodian Agriculture Research and Development Institute (CARDI), Cambodia, a field survey was conducted in Cambodia, from 12th to 24th November, 2012. As a result, 38 accessions of leguminous plants consist of *Lablab purpureus* (1 accession), *Vigna marina* (8), *V. minima* (10), *V. radiata* (3), *V. umbellata* (9), *V. unguiculata* (6) and *V. vexillata* (1) were recorded and seed samples were collected. All the seed materials collected were deposited at CARDI genebank, Cambodia and a subset of the collection were transferred to NIAS genebank, Japan as a safety backup using Standard Material Transfer Agreement (SMTA) of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). These materials will be evaluated in 2013 and the multiplied seed materials will become available for research, breeding and educational purposes from the NIAS genebank (http://www.gene.affrc.go.jp/distribution_en.php?section=plant).

KEY WORDS : Cambodia, Crop Wild Relatives, Legumes, *Lablab*, *Vigna*

Introduction

The NIAS genebank has been conducting domestic and overseas plant germplasm collections. Among them, those for collecting wild *Glycine* and *Vigna* germplasm were summarized in Appendix 1 and 2 of “*Glycine* Genetic Resources” in the proceedings of the 14th NIAS international workshop (Vaughan *et al.*, 2011). http://www.gene.affrc.go.jp/pdf/misc/international-WS_14_1.pdf.

Recent progress in our understandings on the genus *Vigna* was reviewed (Tomooka *et al.*, 2011a, 2011b).

In order to facilitate collaborative research activities on collection, evaluation and sustainable use of Plant Genetic Resources for Food and Agriculture (PGRFA), the National Institute of Agrobiological Sciences (NIAS), Japan and the Cambodian Agriculture Research and

Table 1. Itinerary of the field survey in Cambodia.

日程表 (カンボジア)

Date	Day	Itinerary	Stay
2012/11/12	Mon	Bangkok 13:40 -- (PG933) -- 14:50 Phnom Penh	Phnom Penh (Cambodia)
2012/11/13	Tue	Phnom Penh -- visit CARDI -- (car) -- Sihanoukville	Sihanoukville (Cambodia)
2012/11/14	Wed	Sihanoukville -- (car) -- Koh Kong	Koh Kong (Cambodia)
2012/11/15	Thu	(car) survey around Koh Kong	Koh Kong (Cambodia)
2012/11/16	Fri	(car) survey around Koh Kong	Koh Kong (Cambodia)
2012/11/17	Sat	Koh Kong -- (car) -- Phnom Penh	Phnom Penh (Cambodia)
2012/11/18	Sun	Phnom Penh -- (car) -- Siem Reap	Siem Reap (Cambodia)
2012/11/19	Mon	Siem Reap -- (car) -- Anlong Veng	Anlong Veng (Cambodia)
2012/11/20	Tue	Anlong Veng -- (car) -- Tbaeng Meanchay	Tbaeng Meanchay (Cambodia)
2012/11/21	Wed	Tbaeng Meanchay -- (car) -- Kampong Thom	Kampong Thom (Cambodia)
2012/11/22	Thu	Kampong Thom -- (car) -- Phnom Penh	Phnom Penh (Cambodia)
2012/11/23	Fri	visit CARDI -- Phnom Penh 19:30 -- (PG936) -- 20:40 Bangkok 23:55 -- (NH916) --	on flight
2012/11/24	Sat	-- 07:35 Narita -- NIAS	

Development Institute (CARDI), Cambodia, agreed to establish a Letter of Agreement (LOA) on Joint Research of Plant Genetic Resources in November, 2011. This is a report of the second collaborative field survey on leguminous plants in Cambodia under this collaboration project.

Methods

We had 2 short trips by car from CARDI, Phnom Penh (Table 1). The first trip was from November 13 to 17, covering southwestern regions of Phnom Penh (Sihanoukville and Koh Kong provinces, Fig. 1). The second trip was from November 18 to 22, explored Siem Reap, Oddar Meanchey, Preah Vihear and Kampong Thom provinces which are located on north of Phnom Penh.

Seeds, herbarium specimens and root nodules were collected. Information on collection sites including village name, altitude, latitude, longitude, habitat, cultural practices and other ecological data of the collection sites were recorded as passport data. Latitude and longitude were measured using WGS84 world geodetic system. Identification of wild *Vigna* plants was done based on a key prepared by Tomooka *et al.* (2002, p.26-28).

Results and Discussion

A total of 38 legume plants was collected (Table 2). Collected samples consist of 7 species, i.e., *Lablab purpureus*, *Vigna marina*, *Vigna minima*, *Vigna radiata*, *Vigna umbellata*, *Vigna unguiculata* and *Vigna vexillata*. Their detailed passport information was recorded (Table 3). Collected seed samples were divided into 2 subsets and the first subset was conserved at CARDI genebank (Cambodia) and the second subset was transferred to NIAS with Standard Material Transfer Agreement (SMTA) of International Treaty on Plant Genetic Resources for Food and

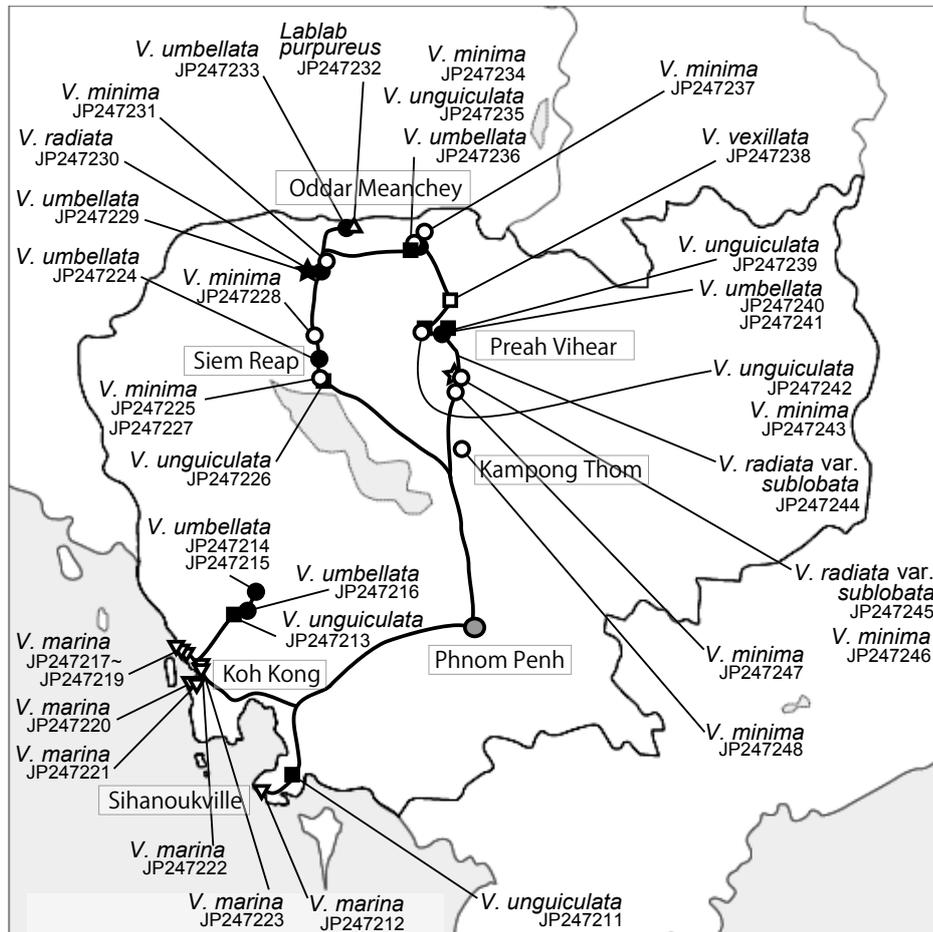


Fig.1. A map of collected materials in Cambodia, 2012

Agriculture (ITPGRFA), and was conserved at NIAS genebank (Japan) as a safety backup.

***Lablab purpureus* (Hyacinth bean)**

An accession (JP247232) of brown seeded *Lablab purpureus* was found cultivated in front of a farmer's house located at a village near the northern border to Thailand, Oddar Meanchey province (Photo 1). A farmer who cultivated this white flowered *Lablab purpureus* said the local name was "Sandek Baraing (French bean)" (Photo 2). Young seeds and young pods were boiled and eaten. Mature seeds are cooked with glutinous rice with sugar.

Vigna marina

Eight accessions of *Vigna marina* were collected. One accession (JP247212) was found on Sokha beach, Sihanoukville (Campong Som) province (Photos 3 & 4). This population was growing on a beautiful white sandy beach about 30 m apart from the sea water's edge. The plants showed very good pod set with slightly purplish stems. This is the first experience for the first author (NT) to find *V. marina* population with purplish stems. Other 7 accessions were found in Koh Kong province and had green stem. A large population was found growing on a stone wall on the sea located at the border to Thailand (Photos 5, 6 & 7). The shoots were sometimes submerged under sea water (Photo 5). Beach morning glory (*Ipomoea pes-caprae*) was also growing on this stone wall (Photo 6, plants with purple flower). Three accessions were collected at this site at about 200 m distance (JP247217, JP247218, JP247219). Plants

growing at this site seemed to have higher levels of pod shattering (Photo 7). A border keeping army man told us that he used to eat young shoots with fish. He also told that he did not have experience to eat seeds.

An amazing population (JP247220) was found growing at sea water's edge on the Klorng beach, Koh Kong province. They might have a higher level of resistance to salt stress (Photos 8 & 9). Root nodules were formed under the sea water submerged condition (Photo 10). In addition, they showed good pod set (Photo 11). Another population (JP247222) was found along a blackish water river side (Photos 12 & 13). The plants were climbing on a sugar cane stem and showed a very good pod set. A man (Mr. Chanthany) staying near this place told us that he ate fresh young seeds. He said he also ate young shoots and flowers after boiled. Another population (JP247223) was found growing in a blackish water canal in Koh Kong town, just north of Asian Hotel (Photos 14 & 15). The plants showed vigorous growth with good nodules formation (Photo 16).

Vigna minima

In this survey, *Vigna minima* plants were found only during the second trip. *Vigna minima* plants were commonly distributed in the surveyed northern areas in Cambodia (Fig. 1). Two populations (JP247225, JP247227) were found growing at roadside grassland on Kulen mountain, Siem Reap province (Photos 17 & 18). Seeds of these accessions were relatively small among 10 *Vigna minima* seed materials collected in this survey.

In the surveyed area, especially in Siem Reap, Oddar Meanchey and Preah Vihear provinces, savanna type vegetation were seen along the road (Photo 19). In this vegetation, *Vigna minima* plants were growing as a member of forest floor grass community. In this vegetation, leaflet usually became from linear to lanceolate, which might be resulted from competition with narrow leaved grass species for catching sun light and/or resulted from adaptation to drier environmental condition (Photo 20). In this area, there are paddy fields surrounded by this type of vegetation. It seemed that a lot of *Vigna minima* plants grew in and/or around paddy fields. In Tram Chan village of Oddar Meanchey province, seeds of *Vigna minima* (JP247237) were found mixed in the rice grains (Photo 22). A lady cleaning harvested rice said this is a common phenomenon and she usually ate rice grain together with *Vigna minima* seeds (Photo 21).

***Vigna radiata* (cultivated and wild mungbean)**

An accession of cultivated mungbean (*Vigna radiata* var. *radiata*, JP247230) was collected in a local market of Anlong Veng (Oddar Meanchey province). Local name was "Sandek (bean) Bay (rice)". The price was 1\$/kg. Two accessions of wild mungbean (*Vigna radiata* var. *sublobata*) were collected in Preah Vihear province. One accession (JP247244) was found growing on a forest floor beside road (Photos 23 & 24). Many ants gathered to the extra-floral nectar. Another wild mungbean accession (JP247245) was collected about 10 km south from JP247244. The plants were growing beside paddy field.

Table 2. A summary of collected samples in Cambodia
カンボジアにおける収集品の内訳

Species	Cultivated	Not cultivated			Total
		Escaped ¹⁾	Weedy ²⁾	Wild ³⁾	
<i>Lablab purpureus</i>	1				1
<i>Vigna marina</i>				8	8
<i>Vigna minima</i>				10	10
<i>Vigna radiata</i>	1			2	3
<i>Vigna umbellata</i>	6	3			9
<i>Vigna unguiculata</i>	3	3			6
<i>Vigna vexillata</i>				1	1
Total	11	6	0	21	38

1) Escaped: naturally growing population presumably escaped from cultivation

2) Weedy: naturally growing population with intermediate morphology between domesticated and wild form

3) Wild: naturally growing population with typical wild characteristics (small seed, shattering pod, twining stem etc.)

Vigna umbellata

Three accessions of *Vigna umbellata* were collected in the first trip. They were found in a mountainous area in Koh Kong province. Two accessions were collected from Mr. Measchan's house. A yellow seeded cultivar (JP247214) was growing in front of his house climbing to the tree (Photo 25), and another red seeded cultivar (JP247215) was growing in a backyard garden twining to banana tree (Photo 26). Mr. Measchan said both of the cultivars grew naturally. The third accession collected in Koh Kong province seemed to be an escaped population (JP247216).

In the second trip, 6 accessions were collected. A black seeded accession (JP247224) was growing beside road on Kulen mountain, Siem Reap province (Photo 27). This is considered to be an escaped population from domesticated form. Many ants gathered to the *Vigna umbellata* plants (Photo 28). A slender yellow seeded cultivar was grown in backyard garden of Mrs. Keo Peak (Anlong Veng, Oddar Meanchey province, JP247229, Photo 29). According to her interview, local name of this cultivar was "Reach (=King) Meas (=Golden)". Mature seeds were eaten with glutinous rice as a sweet. Young pods were boiled and only immature seeds were eaten. Young leaves were eaten with rice with "nam prick" (a kind of seasoning). Farmers in this village grew rice bean around rice field with stick. In this village, only yellow seeded cultivars were grown. Yellow seeded JP247233 was thought to be an escaped population growing beside road. Yellow seeded JP247236 was large seeded cultivar grown beside farmer's house in Oddar Meanchey province. Red seeded cultivar (JP247240) and black seeded cultivar (JP247241) were grown at backyard garden of Mrs. Senkim Sean, Preah Vihear province. She said she bought 2 colored rice bean cultivars from a farmer in the same village 3 years ago. After the first cultivation, these 2 cultivars grew naturally every year.

Vigna unguiculata

In total, 3 cultivated and 3 escaped accessions were collected.

In the first trip, 2 cultivated accessions were collected. JP247211 collected in Kong province was a black seeded yardlong bean cultivar (*V. unguiculata* cultivar group *Sesquipedalis*). This cultivar was grown on sandy soil area with low pH not far from the sea (pH5.5, Photo 30). A farmer cultivating yardlong bean said she started cultivation at this land 2 year ago. Before that, this place was a forest. White seeded cowpea (*V. unguiculata* cultivar group *Unguiculata*, JP247213) was collected also in Koh Kong province. Collection site was a newly opened farm from flat forest land in mountainous area. This cowpea cultivar was planted between young rubber trees. The rubber plantation started in June, 2012. Before rubber trees were planted, taro and corn plants were grown in this place.

In the second trip, 1 cultivated, 3 escaped accessions were collected. JP247226 was found growing in grassland beside Kulen mountain road. Based on the large black seed size, this accession is considered to be a recently escaped population from cultivation. JP247235 is a small black seeded cultivar which was climbing on a tree near the farmer's house (Mrs. Morn Den) in Oddar Meanchey province. She also grew yellow seeded rice bean (*Vigna umbellata*, JP247236). JP247239 is a black seeded cowpea naturally growing around a palm tree on a ridge in paddy field area of Preah Vihear province. JP 247242 is a black seeded cowpea naturally growing in grassland along a farmland path in Preah Vihear province. Farmers said they just eat young leaves and young pods, but do not eat mature seeds. The plants have a linear leaflet. It was considered that naturally growing cowpea presumably escaped from cultivation was common in northern areas in Cambodia.

Vigna vexillata

V. vexillata is a pan-tropical species found throughout the world with considerable morphological variations. Recently, a domesticated form was found cultivated mainly for its tuberous roots in Bali and Timor, Indonesia (Karuniawan *et al.* 2006). Wild germplasm can therefore be used as gene sources for the crop improvement. In the second trip, one accession (JP247238) of *V. vexillata* were found growing together with *V. minima* (Photos 31 &32).

Germplasm collected

These materials will be conserved both in Cambodia and in Japan. They will be evaluated in 2013 at NIAS in Japan. The multiplied seed materials will become available for research, breeding and educational purposes from the NIAS genebank using SMTA.

(http://www.gene.affrc.go.jp/distribution_en.php?section=plant)

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カンボジアにおけるマメ科植物遺伝資源多様性の保全, 2012年

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和文摘要

本報告は、独立行政法人農業生物資源研究所ジーンバンクとカンボジア農業研究開発機構の間で2011年11月に締結した協同研究協定（LOA）に基づいて行ったカンボジアにおける第二回目のマメ科植物遺伝資源の調査報告である。調査は、2012年11月12日～24日にかけて行った。調査の結果、フジマメ (*Lablab purpureus*)、ハマササゲ (*Vigna marina*)、ホヅバツルアズキ (*Vigna minima*)、栽培リョクトウ (*Vigna radiata* var. *radiata*) 野生リョクトウ (*Vigna radiata* var. *sublobata*)、ツルアズキ (*Vigna umbellata*)、ササゲ (*Vigna unguiculata*)、アカササゲ (*Vigna vexillata*) 等計38系統を記載し、遺伝資源として収集した。収集した遺伝資源は、カンボジア農業研究開発機構ジーンバンクにおいて保存するとともに、SMTA (FAOが提唱する標準材料移転契約) を用いて農業生物資源研究所ジーンバンクに材料を移転し、セーフティバックアップとして保存した。これらの材料は、2013年度に種子増殖、特性評価を実施した後、研究、育種、教育目的での配布を開始する計画である。

Table 3. A passport data of collected materials

収集品のパスポートデータ

JP No.	Coll. No.	Coll. Date	Species name	Status	Coll. Site	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks
247211	2012C-1	12 Nov., 2012	<i>Vigna unguiculata</i>	cultivated	Andong Tamor, Veal Renh, Koh Kong Province, Cambodia	N 10-39-57.9	E103-46-59.1	26	sand	bulk	no	yes	yard long bean, local name: Sandaik Kour, sandy soil, pH5.5, a farmer said that the cultivation started 2 years ago, before that, this place was forest
247212	2012C-2	13 Nov., 2012	<i>Vigna marina</i>	wild	Sokha Beach, Shihanuke Vill., Kampong Som Province, Cambodia	N10-36-24.7	E103-30-59.1	1	fine sandy	bulk	yes	yes	sandy beach, slope 0°, flower color: yellow, stem somewhat purple, very good pod set, very good nodulation, some nodules are very large
247213	2012C-3	15 Nov., 2012	<i>Vigna unguiculata</i>	cultivated	Korki Chhrum village, Rusey Chhrum Commune, Thmor Baing District, Koh Kong Province, Cambodia	N11-40-50.9	E103-25-22.7	395	sand y	bulk	no	no	cowpea, rubber plantation (cowpea between young rubber tree). The rubber plantation started June, 2012, before that, taro and corn were planted. Farmer bought cowpea seeds from another farmer of Kandal area.
247214	2012C-4-1	15 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mr. Measchan, Chief commune, Kandal, Tateileu, Koh Kong Province, Cambodia	N11-47-34.4	E103-29-42.0	443	silt	bulk	no	no	seeds from Mr. Maeschan's home garden, He was born here, yellow seeded cultivar
247215	2012C-4-2	15 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mr. Measchan, Chief commune, Kandal, Tateileu, Koh Kong Province, Cambodia	N11-47-34.4	E103-29-42.0	443	silt	bulk	no	no	seeds collected from back yard garden of Mr. Maeschan, many leeches attacked during collection, red seeded cultivar
247216	2012C-5	15 Nov., 2012	<i>Vigna umbellata</i>	escaped	Mr. Bochorm, Korkichhrum, Koh Kong Province, Cambodia	N11-41-08.3	E103-26-34.3	435	silt	bulk	no	no	beside house, not cultivated but grow naturally, farmers said they have never eaten it, pod color mixed (brown, tan)
247217	2012C-6-1	16 Nov., 2012	<i>Vigna marina</i>	wild	Border to Thailand, Koh Kong Province, Cambodia	N11-38-54.4	E102-54-34.1	1	sand	bulk	no	no	sea side, beside the stone walls on the sea, stem color green, pod shattering seems to be more. Very good pod setting on stone wall. Border keeping army men said young shoots were eaten with fish, tasty, but seeds were not eaten.
247218	2012C-6-2	16 Nov., 2012	<i>Vigna marina</i>	wild	Border to Thailand, Koh Kong Province, Cambodia	N11-38-50.3	E102-54-29.8	1	sand	bulk	no	no	seeds collected at 200 m distant from C-6-1
247219	2012C-6-3	16 Nov., 2012	<i>Vigna marina</i>	wild	Border to Thailand, Koh Kong Province, Cambodia	N11-38-46.1	E102-54-23.8	1	sand	bulk	no	no	seeds collected at 200 m distant from C-6-2
247220	2012C-7	16 Nov., 2012	<i>Vigna marina</i>	wild	near Yo island, Bach Klorng, Koh Kong Province, Cambodia	N11-34-43.4	E 102-56-41.1	0	fine gray sand	bulk	no	yes	sandy beach, stem color: green, growing very near to the sea, good nodulation, stem wet by sea water directly, sometimes sea water come over the population, so the tip of shoots wet by sea water. Stems under sea water, still roots emerged and nodules formed
247221	2012C-8	16 Nov., 2012	<i>Vigna marina</i>	wild	Wild Loving, Koh Kong Province, Cambodia	N11-34-56.7	E102-58-22.7	1	fine sand	bulk	no	no	sandy brackish water river side, only a few <i>Vigna marina</i> plants here
247222	2012C-9	16 Nov., 2012	<i>Vigna marina</i>	wild	ca. 1 km N. of Asian Hotel, Koh Kong Province, Cambodia	N11-37-17.8	E102-58-44.7	2	sand	bulk	no	no	river side near the sea, good pod set from climbing stem to sugarcane. Mr. Chanthany said he eat youg seeds fresh. Youg shoot and flowers also boiled and eaten.
247223	2012C-10	16 Nov., 2012	<i>Vigna marina</i>	wild	beside (N. of) Asian Hotel, Koh Kong Province, Cambodia	N11-36-50.2	E102-58-45.2	3	sand	bulk	no	yes	brackish water canal, very good pod setting, climbing on a tree, many big nodules formed

Table 3 (Continued).

JP No.	Coll. No.	Coll. Date	Species name	Status	Coll. Site	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks
247224	2012C-11	19 Nov., 2012	<i>Vigna umbellata</i>	escaped	Knorng Phnom commune, Phnum Kulen, Siem Reap Province, Cambodia	N13-35-06.5	E104-04-14.4	250	sand	bulk	yes	no	road side grassland on Kulen mountain, red big ants gathered, black seeds
247225	2012C-12-1	19 Nov., 2012	<i>Vigna minima</i>	wild	Phnum Kulen, Siem Reap Province, Cambodia	N13-34-05.1	E104-06-01.6	300	sand	bulk	no	no	beside road on Kulen mountain, grassland, black small ants came to flower
247226	2012C-12-2	19 Nov., 2012	<i>Vigna unguiculata</i>	escaped	Phnum Kulen, Siem Reap Province, Cambodia	N13-34-05.1	E104-06-01.6	300	sand	bulk	no	no	beside road on Kulen mountain, grassland, black seeded escaped cowpea
247227	2012C-12-3	19 Nov., 2012	<i>Vigna minima</i>	wild	Phnum Kulen, Siem Reap Province, Cambodia	N13-34-05.1	E104-06-01.6	300	sand	bulk	no	yes	beside road on Kulen mountain, grassland
247228	2012C-13	19 Nov., 2012	<i>Vigna minima</i>	wild	ca. 5km S of Sra Noy, Siem Reap Province, Cambodia	N13-44-09.1	E104-02-44.0	95	sand	bulk	yes	no	open Dipterocarpus forest with grass floor, not matured yet, very narrow leaflet, immature pods were pressed in a herbarium sheet
247229	2012C-14	20 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mrs. Keo Peak, Kandaleu, Anlong Veng, Oddar Meanchey Province, Cambodia	N 14-13-49.0	E104-06-00.5	60	silt	bulk	no	no	local name: Reach (=King) Meas (=Golden), growing in a back yard home garden. Eat with glutinous rice as a sweet. Young pod boiled and eat only seeds. Young leaves eaten with rice with nam prick (a kind of seasoning). Tasty. Farmers grow around rice field with stick. In this village, only yellow seeded cultivars were grown.
247230	2012C-15	20 Nov., 2012	<i>Vigna radiata</i>	cultivated	Miss Peak Phai, Anlong Veng Market, Oddar Meanchey Province, Cambodia	N14-13-47.5	E104-04-54.3	70	unknown	bulk	no	no	local name: Sandek Bay (Bay=rice), seeds from local market, 1\$/kg
247231	2012C-16	20 Nov., 2012	<i>Vigna minima</i>	wild	Kandal Krom, Anlong Veng, Oddar Meanchey Province, Cambodia	N14-13-55.4	E104-06-09.9	50	fine reddish sand	bulk	yes	no	local name: Kan (=rat) Dao (=bean), Red ants gathered to flower stem. Leaves and stems with very short hairs. <i>V. minima</i> plants were found in a tree plot in paddy field area. This tree plot remains not becoming paddy field, because of the owner not willing to do farming.
247232	2012C-17	20 Nov., 2012	<i>Lablab purpureus</i>	cultivated	Mrs. Yei Lola, Okragnoung, Oddar Meanchey Province, Cambodia	N14-20-51.5	E104-05-50.1	350	clay	bulk	no	no	local name: Sandek (=bean) Baraing (=France). Young seeds boiled and eaten. Young pods and mature seeds are also eaten. Mature seeds cooked with glutinous rice, put sugar and boil.
247233	2012C-18	20 Nov., 2012	<i>Vigna umbellata</i>	escaped	Anlong Veng, Oddar Meanchey Province, Cambodia	N14-20-46.0	E104-05-09.5	340	gray sand	bulk	no	no	road side population, near full maturity, yellow seeds, not shattered
247234	2012C-19-1	20 Nov., 2012	<i>Vigna minima</i>	wild	Mrs. Morn Den, Tram Chan, Phah Pralay, Oddar Meanchey Province, Cambodia	N14-14-56.2	E104-30-53.2	90	gray sand	bulk	no	no	slope 0° , grassland in paddy, rice producing forest
247235	2012C-19-2	20 Nov., 2012	<i>Vigna unguiculata</i>	cultivated	Mrs. Morn Den, Tram Chan, Phah Pralay, Oddar Meanchey Province, Cambodia	N14-14-56.2	E104-30-53.2	90	gray sand	bulk	no	no	slope 0° , back yard home garden, black seeded cultivar, climbing on a tree
247236	2012C-19-3	20 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mrs. Morn Den, Tram Chan, Phah Pralay, Oddar Meanchey Province, Cambodia	N14-14-56.2	E104-30-53.2	90	gray sand	bulk	no	no	back yard home garden, yellow seeded cultivar

Table 3 (Continued).

JP No.	Coll. No.	Coll. Date	Species name	Status	Coll. Site	Latitude	Longitude	Altitude (m)	Soil	Seed	Herbarium	Nodule	Remarks
247237	2012C-20	20 Nov., 2012	<i>Vigna minima</i>	wild	Mrs. Morn Den, Tram Chan, Phah Pralay, Oddar Meanchey Province, Cambodia	N14-15-08.5	E104-31-00.9	70	gray sand	bulk	no	no	Growing together with aromatic rice in upland rice field. Shop lady separated <i>V. minima</i> seeds from aromatic rice that she bought last year by our driver's suggestion. Contaminated <i>Vigna minima</i> seeds in glutinous rice. Seed color mixed (black, brown, mottled black).
247238	2012C-21	20 Nov., 2012	<i>Vigna vexillata</i>	wild	Preah Vihear Province, Cambodia	N14-04-33.1	E104-47-54.7	100	fine reddish sand	bulk	no	no	growing on open <i>Dipterocarpus</i> forest floor, many <i>Vigna minima</i> plants growing, but immature, <i>V. vexillata</i> plants may be matured earlier and seeds were collected
247239	2012C-22-1	21 Nov., 2012	<i>Vigna unguiculata</i>	escaped	Mrs. Senkim Sean, Dolkeay Thmei, Kulen, Preah Vihear Province, Cambodia	N13-49-14.4	E104-48-10.2	60	clay	bulk	no	no	this black seeded cowpea naturally growing in a paddy field (place of palm growing)
247240	2012C-22-2	21 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mrs. Senkim Sean, Dolkeay Thmei, Kulen, Preah Vihear Province, Cambodia	N13-49-14.4	E104-48-10.2	60	clay	bulk	no	no	Red seeded cultivar (C-22-2) growing in a home garden. She bought 2 color seeds (red and black) of <i>V. umbellata</i> from another farmer in this village 3 years ago. After that they grow naturally.
247241	2012C-22-3	21 Nov., 2012	<i>Vigna umbellata</i>	cultivated	Mrs. Senkim Sean, Dolkeay Thmei, Kulen, Preah Vihear Province, Cambodia	N13-49-14.4	E104-48-10.2	60	clay	bulk	no	no	Black seeded cultivar (C-22-3) growing in a home garden. She bought 2 color seeds (red and black) of <i>V. umbellata</i> from another farmer in this village 3 years ago. After that they grow naturally.
247242	2012C-23-1	21 Nov., 2012	<i>Vigna unguiculata</i>	escaped	Mrs. Prak San, Domnakatouch, Thmei commune, Preah Vihear Province, Cambodia	N13-49-25.0	E104-45-58.7	67	fine sand	bulk	no	no	Black seeded cowpea growing naturally along a farmland path. Farmers said they just eat young leaves and young pods, but they do not eat mature seeds. linear leaflet
247243	2012C-23-2	21 Nov., 2012	<i>Vigna minima</i>	wild	Mrs. Prak San, Domnakatouch, Thmei commune, Preah Vihear Province, Cambodia	N13-49-25.0	E104-45-58.7	67	fine sand	bulk	yes	no	growing on backyard open forest floor, immature, only two mature pods found
247244	2012C-24	21 Nov., 2012	<i>Vigna radiata</i> var. <i>sublobata</i>	wild	5 km NW of Phumi Khvav, Preah Vihear Province, Cambodia	N13-38-28.4	E105-01-05.2	90	sand	bulk	no	no	growing on open forest floor beside road, no flower seen, ants gathered
247245	2012C-25-1	21 Nov., 2012	<i>Vigna radiata</i> var. <i>sublobata</i>	wild	Mr. Am San, Krang Dong, 5 km S of Phumi Khvav, Preah Vihear Province, Cambodia	N13-34-42.2	E105-01-54.9	72	fine sand	bulk	no	no	growing beside paddy field
247246	2012C-25-2	21 Nov., 2012	<i>Vigna minima</i>	wild	Mr. Am San, Krang Dong, 5 km S of Phumi Khvav, Preah Vihear Province, Cambodia	N13-34-42.2	E105-01-54.9	72	fine sand	bulk	no	no	local name: Sandek Chumar (Chumar=small), growing beside paddy field. Farmer eat young leaves and pods with Nam Prick (a local seasoning), also eat boiled mature seeds.
247247	2012C-26	21 Nov., 2012	<i>Vigna minima</i>	wild	CARDI, Koskea Station, Preah Vihear Province, Cambodia	N 13-28-24.6	E105-01-12.5	55	sand	bulk	yes	no	growing on <i>Dipterocarpus</i> open forest floor, No mature seeds available. Only herbarium. immature pods are pressed in a herbarium, and 3 seeds were obtained from herbarium later
247248	2012C-27	21 Nov., 2012	<i>Vigna minima</i>	wild	Mr. Nom Samai, Sambo Drekup Temple, Sambo commune, Prasat Sambo Dist., Kampong Thom Province, Cambodia	N12-52-29.0	E105-02-54.1	20	sandy clay	bulk	no	no	slope 0° , sandy clay, growing around a mound in rainfed paddy field, short pod



Photo 1. *Lablab purpureus*, JP247232, Oddar Neanchey, Cambodia



Photo 2. *Lablab purpureus*, JP247232, Oddar Neanchey, Cambodia



Photo 3. *Vigna marina*, JP247212, Sihanukville, Cambodia



Photo 4. *Vigna marina*, JP247212, Sihanukville, Cambodia

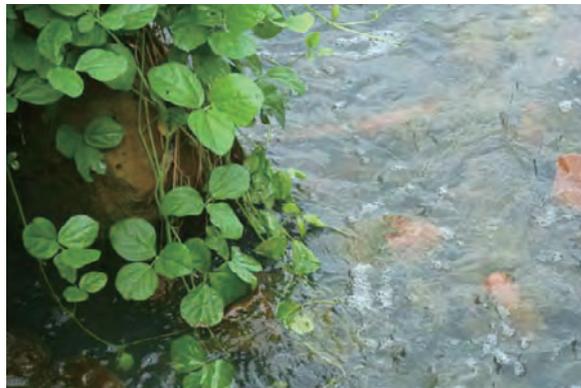


Photo 5. *Vigna marina*, JP247217, Koh Kong, Cambodia



Photo 6. *Vigna marina*, JP247217, Koh Kong, Cambodia



Photo 7. *Vigna marina*, JP247218, Koh Kong, Cambodia



Photo 8. *Vigna marina*, JP247218, Koh Kong, Cambodia



Photo 9. *Vigna marina*, JP247220, Koh Kong, Cambodia



Photo 10. Nodules, *Vigna marina*, JP247220, Koh Kong, Cambodia



Photo 11. *Vigna marina*, JP247220, Koh Kong, Cambodia



Photo 12. *Vigna marina*, JP247222, Koh Kong, Cambodia



Photo 13. *Vigna marina*, JP247222, Koh Kong, Cambodia



Photo 14. *Vigna marina*, JP247223, Koh Kong, Cambodia



Photo 15. *Vigna marina*, JP247223, Koh Kong, Cambodia



Photo 16. Nodules, *Vigna marina*, JP247223, Koh Kong, Cambodia



Photo 17. *Vigna minima*, JP247225, Siam Reap, Cambodia



Photo 18. *Vigna minima*, JP247225, Siam Reap, Cambodia



Photo 19. *Vigna minima*, JP247228, Siam Reap, Cambodia



Photo 20. *Vigna minima*, JP247228, Siam Reap, Cambodia



Photo 21. *Vigna minima*, JP247237, Oddar Meanchey, Cambodia



Photo 22. *Vigna minima*, JP247237, Oddar Meanchey, Cambodia



Photo 23. *Vigna radiata*, JP247244, Preah Vihear, Cambodia



Photo 24. *Vigna radiata*, JP247244, Preah Vihear, Cambodia



Photo 25. *Vigna umbellata*, JP247215, Koh Kong, Cambodia



Photo 26. *Vigna umbellata*, JP247215, Koh Kong, Cambodia



Photo 27. *Vigna umbellata*, JP247224, Siam Reap, Cambodia



Photo 28. *Vigna umbellata*, JP247224, Siam Reap, Cambodia



Photo 29. *Vigna umbellata*, JP247229, Oddar Meanchey, Cambodia



Photo 30. *Vigna unguiculata*, JP247211, Koh Kong, Cambodia



Photo 31. *Vigna vexillata*, JP247238, Preah Vihear, Cambodia



Photo 32. *Vigna vexillata*, JP247238, Preah Vihear, Cambodia



JP247211, *V. unguiculata*, 2012C-01



JP247212, *V. marina*, 2012C-02



JP247213, *V. unguiculata*, 2012C-03



JP247214, *V. umbellata*, 2012C-04-1



JP247215, *V. umbellata*, 2012C-04-2



JP247216, *V. umbellata*, 2012C-05



JP247217, *V. marina*, 2012C-06-1



JP247218, *V. marina*, 2012C-06-2



JP247219, *V. marina*, 2012C-06-3



JP247220, *V. marina*, 2012C-07



JP247221, *V. marina*, 2012C-08



JP247222, *V. marina*, 2012C-09



JP247223, *V. marina*, 2012C-10



JP247224, *V. umbellata*, 2012C-11



JP247225, *V. minima*, 2012C-12-1



JP247226, *V. unguiculata*, 2012C-12-2



JP247227, *V. minima*, 2012C-12-3



JP247228, *V. minima*, 2012C-13



JP247229, *V. umbellata*, 2012C-14



JP247230, *V. radiata*, 2012C-15



JP247231, *V. minima*, 2012C-16



JP247232, *Lablab purpureus*, 2012C-17



JP247233, *V. umbellata*, 2012C-18



JP247234, *V. minima*, 2012C-19-1



JP247235, *V. unguiculata*, 2012C-19-2



JP247236, *V. umbellata*, 2012C-19-3



JP247237, *V. minima*, 2012C-20



JP247238, *V. vexillata*, 2012C-21



JP247239, *V. unguiculata*, 2012C-22-1



JP247240, *V. umbellata*, 2012C-22-2



JP247241, *V. umbellata*, 2012C-22-3



JP247242, *V. unguiculata*, 2012C-23-1



JP247243, *V. minima*, 2012C-23-2



JP247244, *V. radiata*, 2012C-24



JP247245, *V. radiata*, 2012C-25-1



JP247246, *V. minima*, 2012C-25-2



JP247247, *V. minima*, 2012C-26



JP247248, *V. minima*, 2012C-27