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ミャンマー北部における伝統的作物の調査と収集（2006 年）

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Field Survey and Collection of Traditionally Grown Crops in Northern Areas of Myanmar, 2006

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Summary

Myanmar has been suggested to harbor genetic diversity of wild and cultivated rice and several other cultivated plants. Systematic field survey and collection of plant genetic resources were, however, not so intensively organized there. A limited number of explorations were organized by IRRI in early 1990s, by JICA Seedbank Project during 1997 to 2002, and by NIAS Genebank Project from 1999 to 2005. A field exploration was planned and carried out to investigate and collect genetic variation of upland rice, small millets, pulses, ginger and turmeric in Kachin State in cooperation of scientists of Tsukuba University (Japan), National Institute of Agrobiological Sciences (Japan) and the Ministry of Agriculture and Irrigation (Myanmar) from November 14 to December 1, 2006. This field research was funded by a Grand-in-Aid for Overseas Scientific Research of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. Even though our botanical trip was not so smoothly carried out as planned mainly due to severe road conditions caused by unexpected weather, we successfully surveyed a wide range of areas in Kachin State, and collected 90 samples of plant genetic resources. The collection includes 23 samples of cultivated rice, *Oryza sativa*, 6 samples of finger millet, *Eleusine coracana*, 6 samples of rice bean, *Vigna umbellata*, 6 samples of yard long bean, *Vigna unguiculata* cv.-gr. Sesquipedalis, 7 samples of *Culcuma* spp., 6 samples of *Zingiber* spp. and others.

Introduction

Recent field studies on plant genetic resources for food and agriculture in Myanmar have suggested that genetic diversity of traditionally utilized plants is well preserved there (Uga *et al*., 2005; Uga *et al*., 2006; Saito *et al*., 2006). Myanmar has been suggested to harbor genetic diversity of wild and cultivated rice as well as several other cultivated plants. Systematic field survey and collection of plant genetic resources were, however, not so intensively organized there. A limited number of explorations were organized by IRRI in early 1990s, by JICA Seedbank Project during 1997 to 2002, and by NIAS Genebank Project from 1999 to 2005. Kachin State is located northern extreme of Myanmar. Indigenous ethnic groups: Khandi (Khamti) Shan, Rawan, Lisu, Maru, Lashi, etc. are dwelling there, although the major ethnic group in Myanmar is Bama.

A field exploration was planned and carried out to investigate and collect genetic variation and geographical distribution of upland rice, small millets, pulses, ginger and turmeric in Kachin State in cooperation of scientists of Tsukuba University (Japan), National Institute of Agrobiological Sciences (Japan) and the Ministry of Agriculture and Irrigation (Myanmar) from November 14 to December 1, 2006. This field research was funded by a Grand-in-Aid for Overseas Scientific Research of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. Even though our botanical trip was not so smoothly carried out as planned mainly due to severe road conditions, we successfully surveyed a wide range of areas in Kachin State, and collected 90 samples of genetic resources. We collected 23 samples of cultivated rice, *Oryza sativa*, 6 of finger millet, *Eleusine coracana*, 6 of rice bean, *Vigna umbellata*, 6 of yard long bean, *Vigna unguiculata* cv.-gr. Sesquipedalis, 7 of *Culcuma* spp., 6 of *Zingiber* spp. and others.

Exploration Methods

Japanese members of us, Watanabe and Kawase, were dispatched from November 14th to December 1st, 2006. A Myanmar member, Ye Tint Tun joined the mission at Yangon, and then, we made a field survey in Kachin State of Myanmar from November 17th to November 26th. The surveyed route and collection sites are shown in Fig.1. We flew directly from Yangon to Putao, and surveyed the surrounding areas of Putao until November 21st. We tried to find indigenous landraces traditionally grown there of rice, millets, pulses, and vegetables. Since the air flight prearranged for Putao to Mitkyina on November 21st was cancelled by unfavorable whether, we challenged to travel from Putao to Sumprabun by a local 4x4 vehicle, which was bogged with narrow, muddy and hilly roads several times and finally stuck on November 22nd, and therefore, we surveyed on foot to Sumprabun. The area from Sumprabun to Myitkyina was explored by another local heavy duty vehicle, again.

Visiting several villages, we interviewed villagers to perceive what kinds of crops they grow, their cultivation practices and utilization. We mainly focused on cereals like rice landraces (mainly upland rice varieties), sorghum, foxtail millet and finger millet, leguminous crops containing *Vigna* species, indigenous vegetables such as turmeric and ginger. When we collected plant materials, we also noted the geographical location of the collection sites based on GPS and the ecological information of the circumferences together with local people's

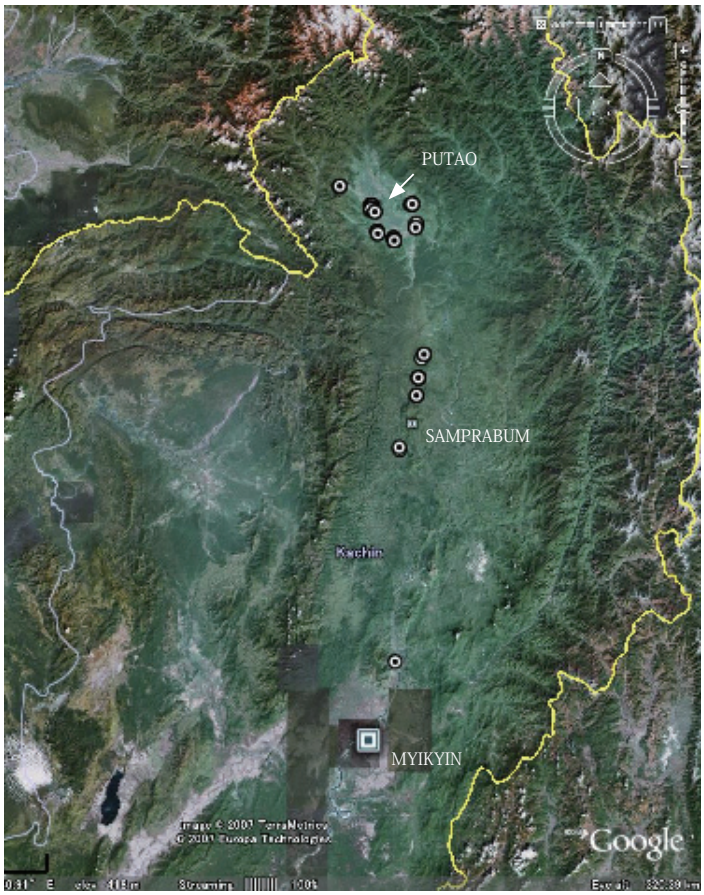

Fig.1. Geographic locations of survey and collection sites in Kachin State, Myanmar in 2006. The map image was obtained from Google Earth™.

Table 1. The itinerary of the survey and collection of traditionally grown crops in northern areas of Myanmar, 2006.

No.	month/ date	day	leave-arrive	stay	
1	Nov./14	Tue	TG641 Narita 1100-Bangkok 1530, TG304 Bangkok 1800-Yangon 1900	Yangon	Myanmar National Day
2	Nov./15	Wed		Yangon	Courtesy call: MAS
3	Nov./16	Thu		Yangon	Preparation for trip
4	Nov./17	Fri	W9-171 Yangon 0645-Putao 1035	Putao	Courtesy call: Putao MAS Office Observation around Putao
5	Nov./18	Sat	Putao-Machambaw-Putao (car)	Putao	Survey on millets & horticulture
6	Nov./19	Sun	Putao-Mkular Shi Di-Ah Te De- Lon Ga Yan-Ye Kya Ti-Putao(car)	Putao	Survey on millets & horticulture
7	Nov./20	Mon	Putao-Ah Htat San Gaung-Putao	Putao	Survey on millets & horticulture
8	Nov./21	Tue	Putao-Sumphiang-Yinshaya (car)	Yinshaya	Survey on millets & horticulture
9	Nov./22	Wed	Yinshaya-Phon Kyan (car, on foot)	Phon Kyan	Survey on millets & horticulture
10	Nov./23	Thu	Phon Kyan	Phon Kyan	Stuck by bad weather
11	Nov./24	Fri	Pon Kyan-Sumprabum (on foot)	Sumprabum	Survey on millets & horticulture
12	Nov./25	Sat	Sumprabum- (car)	(in the car)	Survey on millets & horticulture
13	Nov./26	Sun	-Myitkyina (car)	Yezin	Survey on millets & horticulture
14	Nov./27	Mon	KW: HK834 Myitkyina1330-Mandalay-Yangon1630	Yangon	
			MK:HK834 Myitkyina1330-Mandalay1430, Mandalay-Yezin (car)	Yezin	Courtesy call & Discussion: DAR
15	Nov./28	Tue	KW: around Yangon (car)	Yangon	Discussion: MAS
			MK: Nay Pyi Taw & Yezin	Yezin	Courtesy call & Discussion: DAP, MAS
16	Nov./29	Wed	KW: around Yangon	Yangon	Discussion: VFRDC
			MK: Yezin-Yangon (car)	Yangon	Discussions: MAS
17	Nov./30	Thu	TG304 Yangon 0955-Bangkok 1140	Bangkok	
18	Dec./1	Fri.	TG676 Bangkok 0730 Naria 1540		

KW: Kazuo WATANABE, MK: Makoto KAWASE

information on the cultivation practices and utilization of the plants.

The collected materials were divided into two subsets: one for Myanmar and another for Japan. The former subset for Myanmar is preserved at the Seed Bank of DAR and collected rice samples are also conserved by MAS. The latter one was introduced into Japan in accordance with quarantine rules of the both countries. Collected rice grains were dehusked before introduction to Japan. The ginger and turmeric samples are stored at Tsukuba University, while others are conserved at NIAS Genebank.

Results and Discussion

Species diversity in fields

There are some 29,000 acres (11,700 ha) of cultivated fields in which about 16,000 acres (about 6,500 ha) are used for paddy fields and remaining about 13,000 acres (about 5,300 ha) are used mainly for slash-and-burn or shifting cultivation in Putao Township. A large number of crops are grown in slash-and-burn cultivation fields called *taung-ya* that means "mountain cultivation field". For example, there were taro, rice, finger millet, sesame, chilli pepper (*Capsicum annuum* and *C. frutescens*), *Alocasia* sp., sweet potato, edible cannna, ginger, turmeric, manihot, pigeon pea, *Brassica* sp., and rice bean were observed in a burned field near A Te San Gaon Village, west of Putao. Sloping rice fields were located nearby, which had been harvested already.

There are several modern varieties of rice grown in paddy fields near Putao; China 202, Sin Ekri Toe, Shwe Yin Aye (SR4506), C4-63, IR8, although there are many traditional local landraces recognized by people as "*khauk my*" (early varieties), "*khauk lone*" (late varieties), "*khauk gyi* " (large grain), and "*khauk hnyin*" (glutinous varieties) of different grain colors; red, black and white. *Khauk hnyin* is used to make steamed sticky rice and pounded rice cake. Other types are usually boiled. They are also used to brew a rice wine, which is sometimes distilled into liquor. Some people prefer special rice liquor in which hunted monkeys' brains are soaked.

Other crops other than paddy rice are often planted mixed in backyard gardens, sloping or undulating fields near houses, and steep hilly fields (*taung-ya*) by slash-and-burn cultivation. Minor millets such as foxtail millet and finger millet are sporadically grown in backyard gardens and burned fields there. Foxtail millet, whose vernacular names are "*yakhi*", "*shi ghi*", and "*ah-sa*", are cooked like boiled rice solely or mixed with rice. According to local farmers, they grow both non-glutinous and glutinous foxtail millet. Glutinous foxtail millet is also boiled like rice, which is sometimes used to make something like a rice ball. This cereal is sometimes used solely or with rice, particularly glutinous rice, to brew a wine. Finger millet that is called "*ayer*", "*ah yar*", "*luu*", "*ya-gi*", or "*yakhi*", is used to make cakes or to brew a wine. They pound finger millet grains to make flour, mix the flour with (hot) water to make dough or paste in a certain shape. They roast, boil or steam the dough. Sorghum, which is called "*phan-si-kot*" ("*pham-si-cok*"), or "*le-sel*", is also an important cereal to brew a wine.

Concerning pulses, *Vigna umbellata*, *V. unguiculata* cv.-gr. Sesquipedalis, and *Glycine max* are widely cultivated. It is interesting to note that *V. umbellate* is planted near a tree, an erect wooden post or palings to twine up. It is boiled with other vegetables and mixed in steamed

glutinous rice.

Various kinds of locally produced vegetables, fruits and tubers are sold in the marketplace of Putao (Putao zee); brassicas (probably *B. juncea* and *B. napus*), radish, potato, sweet potato, eggplant, chayote (*Sechium edule*), coriander, common bean (*Phaseolus vulgaris*), Chili pepper, *Citrus* x *paradise*, *C. limon*, *Castanea indica*, banana fruits and flowers, yam, taro, ash gourd, mango, *Diospyros kaki*, pumpkins, *Cucumis sativus*, roselle (*Hibiscus sabdariffa* var. *altissima*), unidentified Labiatae species (*Mentha* sp.?), bean sprouts. Different *Curcuma* species are cultivated often in their backyard gardens under a common name, "*san*(*w*)*um*" or "*mint thrar*". Gingers (*Zingiber officinalis* and *Z. barbatum*) were collected there. *Perilla frutescens* var. *crispa* is commonly grown as an oil crop. A wild form of *P. frutescens* was collected near the bank of Mali-hka River. *Arenga pinnata* is grown to extract starch from the bulk.

Several kinds of edible and useful trees are planted in farmlands there. Banana is very common. *Zanthoxylum armatum* is commonly planted near farmers' houses and its fruits are sold in marketplaces. It is one of the important spices for Kachin cuisine. Persimmon tree, *Diospyros kaki*, is popularly planted in farmlands. We observe its fruits were peeled and dried in the sun.

Wild buckwheat (*Fagopyrum cymosum*) populations occur at wet places near a paddy fields and by a small stream near a farmers' house.

Local restaurants serve dishes of which some are similar but others are different from standard Myanma ones. Compared with standard Myanma preparations, some of them are spicier and less oily, and may be cooked with a stronger fire showing similarity to some Chinese cuisine. They are served with boiled rice and soup.

Unexpected walking on mountainous road toward Sumprabun enabled us to perceive villagers' life intimately. As arable land is limited there, they mostly depend on slash-and-burn cultivation for agricultural products. They are also active hunters and fishers. Different types of upland rice and maize local varieties are grown there. Foxtail millet and finger millet are sporadically found in farmers' stores. A limited variety of vegetables such as *Z. officinalis* , *C. amada* and *V. unguiculata* are grown there. We could not see many vegetables during our trekking partly because it was the beginning of winter season in hilly Kachin State that is located in the Temperate Zone. Based on the information obtained from local people, they do not grow many vegetables even in summer.

Wild buckwheat, *Fagopyrum cymosum*, is distributed by damp roadside at an altitude of around 1,100 m near Sumprabun. We found wild aduki bean, *Vigna angularis* var. *nipponensis* (tentatively identified) is distributed in some wet or moist places between Sumprabun and Myitkyina. It is the first report of *V. angularis* var. *nipponensis* from northern Myanmar.

Indigenous ethnic groups have their own languages and they speak Jingpaw as lingua franca in Kachin State and their official language is Burmese. They live together even in a village and are multilingual. A wide range of vernacular names for each crop does not always mean to represent genetically diversified cultivars but linguistic differences among different ethnic groups dwelling there. We should carefully compare the genetic diversity of the collection and variation in vernacular names.

Future subject

Climatic conditions in Putao, Sumprabun and Myit-san areas in Kachin State are wet and temperate being different from the central and southern parts of Myanmar. We will find a larger variety of local landraces of millets, legumes and vegetables grown in the slash-and-burn cultivation in hilly areas, even though there are scarce populations in the areas if we can access different villages. Wild crop relatives such as *Perilla frutescens*, *Vigna angularis*, and *Fagopyrum cymosum* collected will provide new information about domestication and crop evolution of cultivated crops. Places along with main roads on which vehicles can run were surveyed several times, while those distant from the main roads are not explored yet. Rainfalls in December and November make it difficult for field researchers to visit farmers' fields in harvest time, even though the fields are located near main roads. Based on our experiences, a walking tour that superficially looks a waste of time should be considered valuable to access of remote slash-and-burn fields to obtain a wider diversity.

Acknowledges

Many people in both the Union of Myanmar and Japan supported this exploration and their help is very much appreciated. In particular, U Tin Htut Oo, Director General, Department of Agricultural Planning (DAP), Ministry of Agriculture and Irrigation (MOAI), Dr. Toe Aung, Director General, Department of Agricultural Research (DAR), MOAI, and U Ohn Than, Managing Director, Myanma Agriculture Service (MAS), MOAI facilitated our field study greatly from planning to implementation.

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和文摘要

ミャンマーは栽培稲や野生稲，そして多くの栽培植物の遺伝的多様性を有していると云われている．しかし，組織的な植物遺伝資源のフィールド調査や収集は十分とはいえない．1990 年代初頭には IRRI によって, 1997 年から 2002 年にかけては JICA シードバンク計画によって, また, 1999 年から 2005 年にかけては農業生物ジーンバンク事業によって，十分とはいえないながらも探索収集が行われた．今回，筑波大学，農業生物資源研究所およびミャンマー農業灌漑省との協力のもと 2006 年 11 月 14 日から 12 月 1 日までカチン州において雑穀，マメ類，ショウガ，ウコン遺伝資源の調査と収集を行った．本現地調査研究は文部科学省科学研究費助成　基盤研究（B(2)H16-H18、課題番号 16405019 代表者　渡邉和男）によるものである．主に季節外れの

天候不良による悪路のため計画通りには探索できなかったが，カチン州の広い地域を調査し遺伝資源 90 点を収集することができた．収集品には栽培稲 23 点, シコクビエ 6 点, タケアズキ 6 点, ジュウロクササゲ 6 点，ウコン類 7 点，ショウガ類 6 点などが含まれる．

Table 2. Collection list

Sr. No.*	JP No.	Local Variety Name & Common Name		Scientific Name	Date MM/dd	Country	State	town-ship	nearest town/village	Latitude			Longitude			Alti-tude	Source	Status	Number of plant sampled	Cultural practices	Sowing Month	Harvest Month	Topography	Site	Stoni-ness	Soil Texture	Drainage	Other Observations
		Myanmar	common English							°	′	″	°	′	″	m												
1	232278	KHAO LONE	rice	*Oryza sativa* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	21	32.1	97	24	4.8	405	farmstore	landrace	bulk	transplant	6, 7T	11	(plain level)	(level)	(low)	highly organic	moderate	seed being dried on garden, 2 types mixed, round and long. Shan people.
2	232279	KHAO AWM	rice	*Oryza sativa* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	21	32.1	97	24	4.8	405	farmstore	landrace	bulk	transplant	6, 7T	11	(plain level)	(level)	(low)	highly organic	moderate	seed being dried on garden, blackih lemma. Shan people.
3	232280	PAZISOE	leguminous plant	*Cassia occidentalis* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	21	32.1	97	24	4.8	405	farm garden	wild	bulk				(plain level)	(level)	(low)	highly organic	moderate	
4	232281	PO MASHEL	rice	*Oryza sativa* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	21	26.9	97	24	19.4	398	farm land	landrace	bulk	transplant	6, 7T	11	plain level	level	low	highly organic	moderate	
5	232282	KHAO LONE	rice	*Oryza sativa* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	21	21.3	97	24	24.0	397	farm land	landrace	bulk	transplant	6, 7T	11	plain level	level	low	highly organic	good	
6	232283	LONZUN	zinger	*Zingiber* sp.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	19	55.2	97	25	1.7	414	farm land	landrace	1plant				plain level	level	low	highly organic	good	
7	232284	PO MASHEL	rice	*Oryza sativa* L.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	19	55.2	97	25	1.7	414	farm land	landrace	bulk	transplant	6, 7T	11	plain level	level	low	highly organic	good	
8	232285	AYER	finger millet	*Eleucine coracana* (L.) GAERTN.	11/17	Myanmar	Kachin	Panhlaing	Putao	27	19	55.2	97	25	1.7	414	farm land	landrace	bulk	transplant	6, 7T	11	plain level	level	low	highly organic	good	
9	232286	HNAN GYI	sesame	*Sesamum indicum* L.	11/18	Myanmar	Kachin	Putao	Putao	27	20	32.2	97	24	3.2	430	local market	landrace	bulk									
10	232287	SHI RAM	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/18	Myanmar	Kachin	Putao	Naung Khaing	27	16	12.6	97	35	3.7	391	farmland	landrace	seed and pods		4/5	11/12	undulating	level	none	loam	moderate	
11	232288	YAKHI	foxtail millet	*Setaria italica* (L.) BEAUV. ssp. *italica*	11/18	Myanmar	Kachin	Macham-baw	Macham-baw	27	16	16.7	97	35	4.3	403	farmstore	landrace	seed(1 panicle)	shifting	5/6	9/10	hilly	(slope)				
12	232289	SA NWUM	turmeric	*Curcuma longa* L.	11/18	Myanmar	Kachin	Macham-baw	Macham-baw	27	16	16.7	97	35	4.3	403	backyard garden	landrace	rhizome		4/5	11/12	hilly	level	low	clay	moderate	
13	232290	PHAM SI COK	sorghum	*Sorghum bicolor* (L.) MOENCH	11/18	Myanmar	Kachin	Macham-baw	Macham-baw	27	17	11.7	97	35	15.6	387	backyard garden	landrace			4	12	undulating	level	low	loam	good	
14	232291	SA NWUM	turmeric	*Curcuma longa* L.	11/18	Myanmar	Kachin	Macham-baw	Maham-baw	27	17	12.7	97	35	15.3	392	backyard garden	landrace	rhizome		4/5	12	undulating	level	low	loam	good	
15	232292	WAR	cotton	*Gossypium arboreum* L.	11/18	Myanmar	Kachin	Macham-baw	Macham-baw	27	17	12.7	97	35	15.3	392	backyard garden	landrace	seed (3 plants)		3/4	10/11 /12	undulating	level	low	loam	good	
16	232293	AH BU MA SHEL	rice	*Oryza sativa* L.	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	seed	upland rice	5	9	(plain level)	(level)	(none)	(sand)	(good)	
17	232294	REI TIN	rice	*Oryza sativa* L.	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	seed	shifting	5/6	9	(hilly)	(slope)	(none)			
18	232295	LUU	finger millet	*Eleucine coracana* (L.) GAERTN.	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	seed	shifting	4/5	9/10	(hilly)	(slope)	(none)	(loam)		
19	232296	LE SEL	sorghum	*Sorghum bicolor* (L.) MOENCH	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	seed		4/5	9/10	(hilly)	(slope)	(none)	(clay)	(moderate)	

Table 2 (continued).

20	232297	AH SA (SAT)	foxtail millet	*Setaria italica* (L.) BEAUV. ssp. *italica*	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	seed (1 panicle)		4/5	9/10	(hilly)	(slope)	(none)	(clay)	(moderate)	
21	232298	LA KON	maize	*Zea mays* L.	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	33.7	97	34	20.8	391	farmstore	landrace	2 ears		4/5	9/10	(hilly)	(slope)	(none)	(clay)	(moderate)	glutinous
22	232299	SA NAM	perilla	*Perilla frutescens* BRITT.	11/18	Myanmar	Kachin	Macham-baw	Nam Kham	27	21	30.4	97	33	50.5	379	wild	wild	seed (3 plants)				undulating	slope	low	silt	good	near the bank of the Malikha river
23	232300	SA NAM	perilla	*Perilla frutescens* BRITT. var. *crispa* (THUNB) DECNE.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	seed		3/4	11/12	undulating	slope	med-ium	clay	moderate	
24	232301	LONE TSIN	zinger	*Zingiber officinale* ROSC.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	1 plant		3/4	11/12	undulating	slope	med-ium	clay	moderate	used after being kept in soil.
25	232302	SA LUM	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	2 plants mixed		4/5	12	undulating	slope	med-ium	clay	moderate	
26	232303	AH YAR	finger millet	*Eleucine coracana* (L.) GAERTN.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	2 plants mixed		4/5	10/11	undulating	slope	med-ium	clay	moderate	
27	232304	PHAN SI COK	sorghum	*Sorghum bicolor* (L.) MOENCH	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	1 plant		3/4	11/12	undulating	slope	med-ium	clay	moderate	
28	232305	MAT TSAP	chilli pepper	*Capsicum frutescens* L.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	41.1	97	24	8.9	410	backyard garden	landrace	1 plant				undulating	slope	med-ium	clay	moderate	
29	232306	MINT THRAR	turmeric	*Curcuma aromatica* SALISB.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	39.6	97	24	11.6	397	backyard garden	landrace			4/5	11/12	undulating	slope	med-ium	clay	moderate	medicine for stomachache and gasseous problem.
30	232307	MINT THRAR	turmeric	*Curcuma amada* ROXB.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	39.6	97	24	11.6	397	backyard garden	landrace			4/5	11/12	undulating	slope	med-ium	clay	moderate	
31	232308	MINT THRAR	turmeric	*Curcuma amada* ROXB.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	39.6	97	24	11.6	397	backyard garden	landrace			4/5	11/12	undulating	slope	med-ium	clay	moderate	Gajutu type
32	232309	KHAO LONE	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	39.6	97	24	11.6	397	backyard garden	landrace			6	12	undulating	level	low	clay	moderate	offtype selected by a farmer
33	232310	NGWAY PANN	zinger	*Zingiber officinale* ROSC.	11/19	Myanmar	Kachin	Putao	Mular Shi Di	27	15	34.0	97	25	30.1	462	backyard garden	landrace					undulating	level	med-ium	clay	moderate	
34	232311	YA GI	finger millet	*Eleucine coracana* (L.) GAERTN.	11/19	Myanmar	Kachin	Putao	Mular Shi Di	27	15	31.9	97	25	34.1	462	farmstore	landrace	1 panicle		6	10	(hilly)	(slope)				harvested at a burned field 3 miles away
35	232312	SA RAM	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/19	Myanmar	Kachin	Putao	Mular Shi Di	27	15	31.9	97	25	34.1	462	backyard garden	landrace	1 plant		4/5	11	undulating	level	med-ium	clay	moderate	

Table 2 (continued).

36	232313	(YA GI)	finger millet	*Eleucine coracana* (L.) GAERTN.	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	2 plants				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
37	232314	(SA RAM)	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace					hilly	slope	med-ium	loam	moderate	sown after the field was burned.
38	232315	PI KHAM MAN	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace					hilly	slope	med-ium	loam	moderate	sown after the field was burned.
39	232316	A NO (NO QYU)	yard long bean	*Vigna unguiculata* (L.) WALP. cv.gr. Sesquipedalis E.WESTPHAL	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	1 plant				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
40	232317	NAM PAN QI	canna	*Canna edulis* KER-GAWL.	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	1 plant				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
41	232318	(PHAM SI COK)	sorghum	*Sorghum bicolor* (L.) MOENCH	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	1 plant				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
42	232319	(PE POKE)	soybean	*Glycine max* L.	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	1 plant				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
43	232320	SA LON	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/19	Myanmar	Kachin	Putao	Ah Te De	27	13	57.1	97	29	33.2	433	farmland	landrace	1 plant				hilly	slope	med-ium	loam	moderate	sown after the field was burned.
44	232321	(SA RAM)	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace					(hilly)	(slope)	(med-ium)	(loam)	(moderate)	
45	232322	SA LON PAR	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace			5	8/9	(hilly)	(slope)				
46	232323	SAR NYO	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace			5	9	(hilly)	(slope)				khauk hnyin (glutinous) for snack
47	232324	OK PHA	sesame	*Sesamum indicum* L.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace			5	10	(hilly)	(slope)		loam	moderate	sown in sesame fields after sowing rice.
48	232325	CHU PHI	zinger	*Zingiber officinale* ROSC.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	backyard garden	landrace			4/5	11/12	undulating	level	low	loam	moderate	
49	232326	A NU PI U (PE POKE)	soyabean	*Glycine max* L.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace			6	11	(hilly)	(slope)	(med-ium)	(loam)	(moderate)	
50	232327	KA ME WO	wild buckwheat	*Fagopyrum* sp.	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	26.4	97	29	46.3	448	wild	wild	bulk				undulating	level	low	loam	moderate	near a paddy filed. Leaves are used to make a soup
51	232328	AR ZU	wild Job's tear	*Coix lacryma-jobi* L. var. *lacryma-jobi*	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	26.6	97	29	46.9	448	wild	wild	bulk				undulating	level	low	loam	moderate	used to make a necklace.
52	232329	ZA PYAN	rice bean	*Vigna umbellata* (THUNB.) OHWI et OHASHI	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	24.7	97	29	46.9	452	farmstore	landrace	bulk		5	11	(hilly)	(slope)	(med-ium)			
53	232330	(PE YAIN)	wild legume	*Phaseolus* sp.?	11/19	Myanmar	Kachin	Putao	Lon Gar Yan	27	13	26.6	97	29	46.9	448	wild	wild	bulk				undulating	level	low	loam	moderate	

Table 2 (continued).

54	232331	CHINA 203	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Ye Kya Ti	27	15	1.6	97	25	41.5	442	farmstore	improved	bulk	transplant	6	10	plain level	level	none	loam		
55	232332	(ZA BAR)	rice	*Oryza sativa* L.	11/19	Myanmar	Kachin	Putao	Ye Kya Ti	27	15	1.6	97	25	41.5	442	farmstore	improved	bulk		mid-6	10 end	plain level	level	none	clay	moderate	
56	232333	PHAN HU SHII	wild egg plant	*Solanum torvum* SWARTZ.	11/19	Myanmar	Kachin	Putao	Ye Kya Ti	27	15	3.5	97	25	40.7	442	wild	wild	bulk				undulating	level	med-ium	loam	moderate	roadside. medicinal.
57	232334	BO SAR PE	common bean	*Phaseolus vulgalis* L.	11/20	Myanmar	Kachin	Putao	Putao	27	20	32.2	97	24	3.0	430	market	landrace	bulk									obtained at Putao zee
58	232335	BA KI (KAYAN CHIN)	tomato	*Lycopersicon esculentum* MILL.	11/20	Myanmar	Kachin	Putao	Putao	27	20	32.2	97	24	3.0	430	market	landrace	bulk									obtained at Putao zee
59	232336	BA KI (KAYAN CHIN)	tomato	*Lycopersicon esculentum* MILL.	11/20	Myanmar	Kachin	Putao	Putao	27	20	32.2	97	24	3.0	430	market	landrace	bulk									obtained at Putao zee
60	232337	MIN TRA	zinger	*Zingiber barbatum* WALL.	11/20	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	32.7	97	23	56.9	434	backyard garden	landrace	1 plant	perennial			plain level	level	none	loam	moderate	Whole year round but no upperpart on the ground in January & February.
61	232338	SA NUM	turmeric	*Curcuma longa* L.	11/20	Myanmar	Kachin	Putao	Myo Ma Quarter	27	20	45.6	97	23	58.6	423	house garden	landrace	1 plant				plain level	level	med-ium	loam	moderate	MAS T/S manager's house
62	232339	AM-21	rice	*Oryza sativa* L.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	bulk	shifting			hilly	level	rocky	loam	moderate	
63	232340	LONE KYIN	zinger	*Zingiber officinale* ROSC.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	1 plant	shifting			hilly	level	rocky	loam	moderate	
64	232341	GA NUM	sesame	*Sesamum indicum* L.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	5 plant	shifting			hilly	level	rocky	loam	moderate	
65	232342	MA KYAP	chilli pepper	*Capsicum frutescens* L.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	3 plant	shifting			hilly	level	rocky	loam	moderate	
66	232343	SA LO MA KYAP	chilli pepper	*Capsicum annuum* L.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	1 plant	shifting			hilly	level	rocky	loam	moderate	a round tipped fruit. The local name means that even a tiger cries
67	232344	MA KYAP GA LU	chilli pepper	*Capsicum annuum* L.	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	1 plant	shifting			hilly	level	rocky	loam	moderate	The local name means a long pod
68	232345	PAN HU SEE	wild egg plant	*Solanum torvum SWARTZ.*	11/20	Myanmar	Kachin	Putao	Ah Htat San Gaung	27	25	40.0	97	16	16.2	508	farmland	landrace	3 plant	shifting			hilly	level	rocky	loam	moderate	medicine for tooth pain
69	232346	TAI KYI	rice	*Oryza sativa* L.	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	bulk	shifting	6	11						
70	232347	SA LWE	rice	*Oryza sativa* L.	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	bulk	shifting	4	6/7						

Table 2 (continued).

71	232348	PYONG BU	maize	*Zea mays* L.	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	2 cobs	shifting								
72	232349	SHI GHI	foxtail millet	*Setaria italica* (L.) BEAUV. ssp. *italica*	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	3 panicles	shifting								glutinous, greyish pericarp
73	232350	(PE POKE)	soyabean	*Glycine max* L.	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	2 plants	shifting								
74A	232351	ZA PYAN	yard long bean	*Vigna unguiculata* (L.) WALP. cv.gr. Sesquipedalis E.WESTPHAL	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	bulk	shifting	6	11						
74B	232352	ZA PYAN	cow pea	*Vigna unguiculata* (L.) WALP. cv.gr. Unguiculata E.WESTPHAL	11/22	Myanmar	Kachin	Putao	Khin Thu Ya	26	48	17.3	97	37	12.7	497	farmstore	landrace	bulk	shifting	6	11						
75	232353	(SAT YAIN)	wild foxtail	*Setaria glauca* (L.) BEAUV.	11/22	Myanmar	Kachin	Sumprabun		26	47	20.2	97	36	32.8	568	wild	wild	2 panicles									on a cliff near roadside
76	232354	KHAO SOE	rice	*Oryza sativa* L.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	2	8/9						semi-glutinous, wine, cake, boiled rice
77	232355	(TAUNG YA ZABAR)	rice	*Oryza sativa* L.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	5/6	10/11						
78	232356	A NOU	yard long bean	*Vigna unguiculata* (L.) WALP. cv.gr. Sesquipedalis E.WESTPHAL	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	5/6	10/11						black seed
79	232357	A NOU	yard long bean	*Vigna unguiculata* (L.) WALP. cv.gr. Sesquipedalis E.WESTPHAL	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	5/6	10/11						red seed
80	232358	SA NAM	sesame	*Sesamum indicum* L.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	5/6	10/11						black and white mixed
81	232359	YA KHI	finger millet	*Eleucine coracana* (L.) GAERTN.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	5/6	10/11						
82	232360	TAN BAUN	maize	*Zea mays* L.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	farmstore	landrace	bulk	shifting	2							Good harvest was obtained when sown early in Feb. 12.
83	232361	SA NUM	turmeric	*Curcuma amada* ROXB.	11/22	Myanmar	Kachin	Sumprabun	Phon Kyan	26	43	7.7	97	35	49.0	413	backyard garden	landrace	1 plant									
84	232362	NI KOK MAN	rice	*Oryza sativa* L.	11/24	Myanmar	Kachin	Sumprabun	IN KAW MA	26	39	12.2	97	35	20.7	660	farmstore	landrace	bulk	shifting	4/5	9						hard but tasty. boil with much water to make htamin.
85	232363	NIK RAN MAN	rice	*Oryza sativa* L.	11/24	Myanmar	Kachin	Sumprabun	IN KAW MA	26	39	12.2	97	35	20.7	660	farmstore	landrace	bulk	shifting	4/5	10						

Table 2 (continued).

86	232364	BAW MAN	rice	*Oryza sativa* L.	11/24	Myanmar	Kachin	Sumpra-bun	IN KAW MA	26	39	12.2	97	35	20.7	660	farmstore	landrace	bulk	shifting	4/5	10						glutinous. make different cakes.
87	232365	NA TO SI	yard long bean	*Vigna unguiculata* (L.) WALP. cv.gr. Sesquipedalis E.WESTPHAL	11/24	Myanmar	Kachin	Sumpra-bun	IN KAW MA	26	39	12.2	97	35	20.7	660	farmstore	landrace	bulk	shifting	5/6	11/12						
88	232366	(PE YAIN)	wild legume	*Vigna angularis* (WILLD.) OHWI et OHASHI var. *nipponensis* (OHWI) OHWI et OHASHI ?	11/25	Myanmar	Kachin	Sumpra-bun	SUE REN	26	27	43.1	97	31	3.0	552	wild	wild	bulk				mountain-ous	slope	rocky	loam	poor	on a rocky cliff
89	232367	(PE YAIN)	wild legume	*Vigna angularis* (WILLD.) OHWI et OHASHI var. *nipponensis* (OHWI) OHWI et OHASHI ?	11/25	Myanmar	Kachin	Sumpra-bun	SUE REN	26	27	7.0	97	31	6.5	499	wild	wild	bulk				mountain-ous	slope	rocky	loam	poor	on a rocky cliff
90	232368	(ZA BAR)	rice	*Oryza sativa* L.	11/26	Myanmar	Kachin	Myitky-ina		25	40	7.3	97	30	2.4	175	farmland	landrace	bulk	terraced		11	hilly	level	none	loam	moderate	2,3 types mixed

* Collection No. is designated as COL/MYANMAR/2007/UT-NIAS-MAS/(Sr. No.).

Photo 1. Threshing paddy rice in Putao basin.

Photo 2. A foxtail millet panicle stored in a farmstore at Machambaw.

Photo 3. Maize, foxtail millet, sorghum and finger millet stored in a farmstore at Nam Kham, Machambaw.

Photo 4. Many crops such as rice, sorghum, rice bean, finger millet and others are grown in a slash-and-burn cultivation field.

Photo 5. *Vigna angularis* var. *nipponensis*, a presumed wild ancestor of azuki bean.

Photo 6. *Curcuma aromatica* is also cultivated like *C. longa* and *C. amada*.