

# **THE ACCEPTANCE OF SOYBEAN AND GROUNDNUT INTO SOUTHEAST ASIA -FROM “10,000 YEARS HISTORY OF LEGUMES AND MAN”-**

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## ABSTRACT

In the *Leguminosae*, out of about 20,000 species of three sub-families, only some 30 annual and mainly herbaceous species, belonging to the most evolved the Sub-family *Papilionoideae*, grow as food crops throughout the world, and symbiotic nitrogen fixation with root nodule bacteria had been evolved in this Sub-family.

There is "one more" history in the relationship between the legumes and man. That is, gathering peoples know a lot about plants, so, the real "professional botanist" was equipped with all the knowledge necessary to practice agriculture, but did not do so (Harlan 1975). According to Issacs (1987), the native Australian aborigine uses 27 species of 10 genera of the leguminous plants, which account for 10% of all food plants, and of those various parts are eaten, i.e. flower, fruits, seeds, young buds and pith, resins and nectar, and root tubers, etc., in each season. So-called the "founder crops", which were excavated in package at the archaeological sites in the Fertile Crescent in the Near East, contain the cereals, flax and legumes, but roots and tubers are none in the archaeobotanical record due to their perishability, although they had been harvested as the important food crop with cereals and legumes, since the time of incipient agriculture. "Agricultural-Complex", as parallel development of major legume crops with the cereals and root tubers in the ten regions of origins of domestication and secondary-dispersals in the world (Maeda 2015) is shown in Table 1.

In the about 10,000 years' history of farming, many legume crops were adopted in the traditional cropping systems, and had been played an important role to maintain the soil fertility. And, legumes are highly nutritive, so, soybean was called a "meat from the soil" and "cow of the field" in China, and mature dried seeds are storable with long viability. They are consumed as dried seeds, green vegetable pods, bean sprouts, and also fermented products. Indigestible fibrous skin and various deleterious substances in some legumes, which are eliminated or reduced by appropriate preparation in cooking and processing, limit consumption. Some toxic substances gave rise the taboo and disease such as the favism and lathyrism. However, the importance of legumes as food and crop had been closely linked with mental belief and ethnic observance in agricultural peoples.

The Silk Road an important trading route from China to Rome, until about the 7-8th Century A.D. There was soybean in its start point, North China, and were chickpea, lentil, peas, and faba bean, domesticated in its west, the Fertile Crescent, respectively. The soybean is said the first legume, of which a written record was made in China, and its technology of cultivation and utilization as food had been completed in about the 15th Century A.D. It is said that a black skin soybean in India and a flat grain soybean in Java, Indonesia, had been introduced from Yunnan, south China, via Laos and Thailand by the road runs at south Himalayan foothill. However, there is no record to refer to the fact on "the Silk-Road was the soybean road", and also, the early history of the acceptance of soybean and other legumes to the Southeast Asia is not clear, before about the 17-18<sup>th</sup> Century A.D.

As a result of survey and enumeration, the vernacular generic names of the legumes in the Indo-China Peninsula and islands area in Southeast Asia, were classified into three main groups, i.e. "kacang-", "dau-" and "kedele-", except many tribal names in islands and "sandaek" in Cambodia, and "pe" in Myanmar, as shown in Table 2 and Fig. 1 (Maeda 2015).

The first, "kancang"- group names, "kancang" means "seed" or "legumes", are distributed widely in Malaysia, Indonesia, and Thailand (Table 2A). And the second, "dau"- group names, "thua, tua, thwax, etc.", which are relatives originated from phonetically reading of Chinese character of soybean and legumes, "豆 *dau, dou*", are used restrictedly in Vietnam, Thailand, and Laos (Table 2B). These are common to "tou, zu" in Japanese, and "dou" in Korea. However, it is noted that the bean sprouts is called "taoge, toge taugih" and soybean curd is called "tauhu", in Malaysia, Indonesia and the Philippines. These are also similar to in Japanese reading, "豆芽 *touga*" and "豆腐 *toufu*". This suggests that the route and time of acceptance of the Chinese soybean into

Southeast Asia had differed as seeds and the food culture. And the third, “*kedele*”- group names are used remarkably for the soybean in Malay Peninsula and islands area of Indonesia, but not for the groundnut (Table 2C).

Ochse et al. (1931), had not shown the etymology of this “*kedele*” in his list of abundant vernacular vocabulary on farming and foods in Malay-Indonesian languages, including about 100 samples of “*kacang*”-group names. However, as shown in Table 2D-1, it was recognized that chickpea have been called “*kadale, kadala, dalai*” etc., and soybean and groundnut are called, in “*kedele*”- group names, too, by only Dravidian language peoples in South India, with many other tribal names, and “*konkadala*” by Tamil language peoples in Sri Lanka. For reference, Hindi and other names of major legumes in India are shown in Table 2D-2.

According to Nene (2006), the etymology of “*kedere*” is considered that “*kalaya*”, which means peas or roasted chickpea in ancient India, or “*khalva*” (grain) in the documentation of the Vedas (*Rig Veda, Yajur Veda*, etc., ca. 5,500 B.C.). It was considered that the above-mentioned geographic distribution of “*kedele*”- group names suggests not only the contribution of Dravidian language peoples to the acceptance of soybean and groundnut, but also shows a profile of “indianization” and “sinicization” had occurred in the history of Southeast Asian countries, who had not domesticated their own legumes.

## KEYWORDS

*dua*, groundnut, *kacang*, *kedele*, Southeast Asia, soybean, vernacular name of legumes

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Table 1

表 1：世界の農耕文化複合における、主なマメ類の穀類およびイモ類との共存的発達（前田 2015 より作成）

Table 1. Agricultural-Complex in the World, viewed from the Parallel Development of Legumes, Cereals and Root Tubers (Maeda, 2015)

地 域 Regions: Origins and Secondary Dispersals	マメ類 Legumes	穀 類 Cereals	イモ類 Roots and tubers
東北アジア Northeast Asia	ダイズ、アズキ Soybean, Adzuki bean	キビ、アワ、モロコシ Common millet, Foxtail millet, Sorghum	
華南・東南アジア South China - Southeast Asia	アズキ（シカクマメ、ナタマメ、ハッショウマメ） Adzuki bean (Winged bean, Sword bean, Velvet bean)	イネ Rice	タロイモ、ヤムイモ Taro, Yam
インド亜大陸 Indian Subcontinent	リョクトウ、ケツルアズキ、タケアズキ、ガラスマメ、 キマメ、ホースグラム、グアル、モスビーン、ガラス マメ Mung bean, Black gram, Rice bean, Pigeon pea, Horse gram, Guar, Moth bean, Grass pea	イネ、シコクビエ、モ ロコシ Rice, Finger millet, Sorghum,	
地中海・西南アジア Mediterranean & Southwest Asia	ヒヨコマメ、エンドウ、ソラマメ、ヒラマメ、ベッチ、 ルーピン Chick pea, Pea, Faba bean, Lentil, Vetches, Lupin	コムギ、オオムギ、エ ンバク、ライムギ Wheat, Barley, Oat, Rye	
東アフリカ・スーダン-サヘル・セネガンビア・ギニア East Africa, Sudan-Sahel, Sene-Gambia, Guinea	ササゲ、フタゴマメ、ゼオカルパマメ、フジマメ Cowpea, Bambara groundnut, Geocarpa bean, Lablab bean	テフ、トウジンビエ、 フォニオ、グラベリマ イネ、モロコシ Teff, Pearl millet, Fonio, African rice, Sorghum	ヤムイモ、アフリカヤムビー ン Yam, African Yam bean
メソアメリカ・アンデス Meso-America & Andes	インゲンマメ、ペニバナインゲン、テパリービーン、 リママメ、タチナタマメ、ラッカセイ、タルーイ Common bean, Runner bean, Tepary bean, Lima bean, Jack bean, Groundnut, Tarui (Andean lupin)	キノア、トウモロコシ Quinoa, Corn	サツマイモ、ジャガイモ、 キャッサバ、メキシコヤム ビーン Sweet potato, Potato, Cassava, Mexican Yam bean

表 2 : 東南アジアとインド諸語におけるマメの呼称例

**Tab. 2. Vernacular names of legumes in South-East Asia and India**

(Source: Ochse et al. 1931/1980, Burkill 1966, van del Maesen et al. 1989, Korisetter et al. 2001, Fuller 2002, 2005, Nene 2006, Krishna 2010 ; 永田 1956, 岩佐 1980, 前田 1986, 2015)

<b>A. 「カチャン <i>Kacang</i>」 (<i>katjang, cachang</i>)系 : マレー・インドネシア</b>	
<i>Kacang</i> as vernacular-names of legumes in Malay-Indonesia	
1. ダイズ <b>Soybean</b>	Malay-Peninsula: <i>kacang soya, k. bulu riman, k. depoon</i> , etc. Indonesia, Java, Bali, Sunda Is., Thailand: <i>k. kadele, k. kedelai, k. djepoon, k. bulu</i> . etc.
2. ラッカセイ <b>Groundnut</b>	Malaysia: <i>kacang tanah, k. china, k. goreng, k. jawa, k. maneela</i> , etc. Indonesia: Java, Bali Is. : <i>k. tanah, k. tjeena, k. broodool, k. goreng</i> , etc. Borneo: <i>k. tjeena</i> , etc., Sumatra: <i>anee kacang, retak katjang</i> , etc. Celebes: <i>kasang, kasan goreng, katjang djawa</i> , etc.
3. その他のマメ <b>Other legumes</b>	
アズキ <b>Adzuki bean</b> : <i>kacang merah</i> ;	ヒヨコマメ <b>Chickpea</b> : <i>k. Arab, k. kuda</i>
インゲンマメ <b>Common bean</b> : <i>k. buncis, k. pandak</i> ;	ササゲ <b>Cowpea</b> : <i>panjang</i>
ソラマメ <b>Fababean</b> : <i>k. babi</i> ;	フジマメ <b>Lablab bean</b> : <i>k. kara, k. peda</i> , etc.
リョクトウ <b>Mungbean</b> : <i>k. hijau</i> ;	エンドウ <b>Pea</b> : <i>k. polong</i>
キマメ <b>Pigeonpea</b> : <i>k. kayu</i> ;	シカクマメ <b>Winged bean</b> : <i>k. belimbing, k. botor</i>
<b>B. 中国語の「豆」系 (In Chinese character, 豆 <i>dau</i>)</b>	
(cf. Japanese: トウ <i>tou</i> 、ズ <i>zu</i> ; Korean: <i>dou</i> )	
<b>Chickpea</b>	Thailand: <i>thua hua chang</i>
<b>Common bean</b>	Laos: <i>thwax falangx</i> ; Thailand: <i>thua khaek, thua phum</i> ; Vietnam: <i>dau ve</i>
<b>Cowpea</b>	
a. var. <i>Unguiculata</i> (ササゲ)	Laos: <i>thwax do</i> ; Thailand: <i>tua dam, tua na</i> Vietnam: <i>dou den, dou trang, dou tua</i>
b. var. <i>Sesquipedalis</i> (ナガササゲ)	Thailand: <i>thua fak yaw, tua phnom</i> Vietnam: <i>dau dua, dau giai ao</i>
<b>Faba bean</b>	Thailand: <i>thua yang</i>
<b>Groundnut</b>	Thailand: <i>tua lisong</i> ; Vietnam: <i>dau phong</i> ;
<b>Lablab bean</b>	Thailand: <i>tua nang, tua paep</i> ; Vietnam: <i>dau van</i>
<b>Lentil</b>	Thailand: <i>thua daeng</i>
<b>Mung bean</b>	Laos: <i>thwax khiew, thuwx ngo</i> ; Thailand: <i>thua khieo, thua thong</i> Vietnam: <i>dau xanh, dau che</i>
<b>Pea</b>	Vietnam: <i>dau hoa lan</i>
<b>Pigeon pea</b>	Thailand: <i>tua re</i> ; Vietnam: <i>dau sang, cay dau chiu, dau maetaai</i> Laos: <i>thwax h'e</i>
<b>Soybean</b>	Thailand: <i>thua lueang, thua phla lueang, tua rae</i> Vietnam: <i>dau tuong, dau nahn, dau xa</i>
<b>Sword bean</b>	Thailand: <i>tua pra</i>
<b>Winged bean</b>	Thailand: <i>tua pu</i>
cf. Malay—Indonesia, Philippines: 「豆芽」 Bean sprouts: <i>taoge, toge, taugih</i> ; 「豆腐」 Soybean curd: <i>toufu</i>	

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**C. 「ケデレ *kedele*」系：マレー-インドネシア**

(*kedele* etc. as vernacular-names of Soybean in Malay-Indonesia; Sumatra, Borneo, Java, Sunda Is., Celebes, Timor-Moluccas)

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ダイズ **Soybean** *kedele, kudele, kadoele, dele, dekeman, dekenan, gadele*, etc.

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**D-1. インド-ドラビダ語系のマメの呼称**

(Names of legumes in Dravidian languages, India)

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<b>Chickpea</b>	Kannada (Karnataka): <i>kadale</i> ; Tamil: <i>kad(t)alai</i> Telegu (Andhra): <i>sannagalu, harimandhakam</i> ; Malayalam (Kerala): <i>kadala</i>
<b>Grass pea</b>	Gujarati: <i>lang</i> ; Malayalam: <i>lakh</i> ;
<b>Groundnut</b>	Bengali: <i>mat kalai</i> ; Kannada: <i>nila kadale, kadalaie kayi</i> ; Malayalam: <i>nela kadala</i> ; Tamil: <i>ver kadalai, nila kadalai, kadalai kai</i>
<b>Horse gram</b>	South Dravidian: <i>kol</i> ; Sri Lanka (Sinhala): <i>kondakadala</i>
<b>Lentil</b>	Kannada: <i>massur, channang</i> ; Tamil: <i>misurpurpu</i>
<b>Mung bean</b>	Kannada: <i>udu, uddu</i> ; Tamil: <i>uruntu</i>
<b>Peas</b>	Kannada: <i>batgadale</i> ; Tamil: <i>patanie</i> ; Telegu: <i>patanlu</i>
<b>Pigeon pea</b>	Tamil: <i>kanti</i> ; Telegu: <i>kandalu</i>
<b>Soybean</b>	Bengali: <i>garikalai</i> ; Kannada: <i>kadale</i> ; Malayalam: <i>kadala</i> ; Tamil: <i>kadalai</i>

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**D-2. インド-ヒンディ語ほかのマメの呼称**

(Hindi and other names of Indian legumes)

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ケツルアズキ <b>Blackgram</b>	<i>urd</i>
<b>Chick pea</b>	<i>chana, gram</i>
<b>Cowpea</b>	<i>lobia</i>
<b>Faba bean</b>	<i>baqla</i>
ガラスマメ <b>Grasspea</b>	<i>khesari</i>
<b>Mungbean</b>	<i>mung</i>
<b>Groundnut</b>	Hindi, Panjabi, Gujarati: <i>mungphalii, vilayatimung</i> Marathi (Maharashtra): <i>phuumung</i> ; Telegu: <i>nila senagalu, vershenagalu</i>
ホースグラム <b>Horsegram</b>	<i>kulthi</i>
<b>Lentil</b>	<i>masur</i>
<b>Pea</b>	<i>matar</i>
<b>Pigeon pea</b>	<i>tur</i>
<b>Soybean</b>	<i>bhat, bhatmas, ramkurthi, soyabeen</i> Gujarati: <i>soyabin</i> ; Telegu: <i>soyachikkudu</i> ; Punjabi: <i>soyabeen</i>

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\* 呼称言語の表音記号は略.

## 基調講演 Keynote speech

1

東南アジアにおけるダイズとラッカセイの受容  
—「マメと人間、1万年の歴史から」—

前田和美  
(高知大学 名誉教授)

The Acceptance of Soybean and Groundnut  
into Southeast Asia  
From "10,000 Years History of Legumes and Man"

Kazumi MAEDA  
(Prof. Emeritus, Kochi University, Japan)

1

## マメの子実の変異

2

## Variation of Legume Seeds in Size, Shape, Color and Pattern



インゲンマメ  
Common bean (Japan)

Magnification is not equal in species and cvs.

2

## マメ科のイモ形成種 —ホドイモとヤムビーン—

3

## Tuber crops in Legume spp. — Apios and Yambean—



アメリカホドイモ  
(日本栽培種)  
Apios grown at Kochi, Japan



クズイモ(ヤムビーン)  
ミャンマー, パガン  
Yam bean grown at Pagan,  
Myanmar

3

地下結実のマメ; ラッカセイ(南アメリカ)、  
バンバラマメとゼオカルパマメ(西アフリカ)

4

Geocarpic legumes; Groundnut (S. America),  
Bambara groundnut & Geocarpa bean (W. Africa)

バンバラマメ  
Bambara groundnut



ゼオカルパマメ  
Geocarpa bean

ラッカセイと近縁野生種  
Groundnut & wild relative, *Arachis monticola*

4

## 食べる木本種のマメ

5

## Leguminous woody plants for Food



フサマメノキ  
*Parkia* sp.



モダマの子実と  
その芽出し  
*Entada* sp.



タマリンド (タイ, バンコク)  
Tamarind (Bangkok, Thailand)

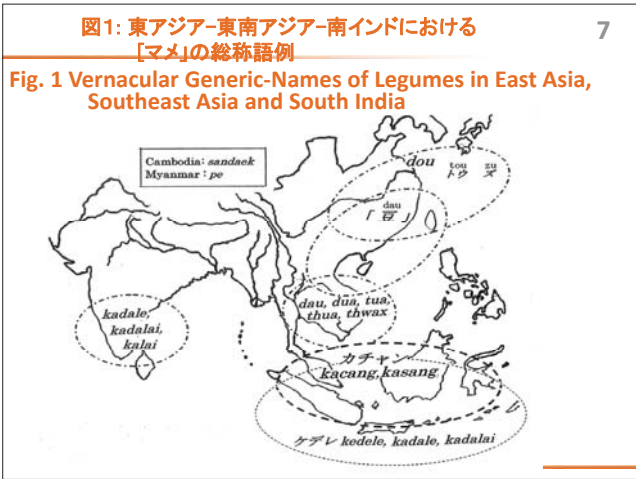
5

世界の農耕文化を創ったマメ  
Legumes as "Founder Crop" in the World

6

ヒヨコマメ Chick pea	ヒラマメ Lentil	Southwest Asia	Chick pea, Lentil Faba bean, Peas
ソラマメ Faba bean	エンドウ Peas	Northeast Asia	Soybean, cv. <i>Tanbaguro</i> (Japan) Adzuki bean, cv. <i>Tanba Dainagon</i> (Japan)
インゲンマメ Common bean	タケアズキ Rice bean	India & Africa	Black gram, Rice bean Cowpea
アズキ Adzuki bean	ササゲ Cowpea	Meso-South America	Common bean Scarlet runner bean
インゲンマメ Common bean	ベニバナインゲン Scarlet runner bean		

6



### Chair Doi

May I now introduce our next speaker, Dr. Kazumi Maeda. Dr. Maeda is a Professor Emeritus at Kochi University. His expertise is on legumes crop physiology and farming systems in tropical countries. He has an experience working as a visiting scientist at ICRISAT. He wrote a book which describes the relationship between the cultural history of beans and human beings. He is considered as one of the top legume scientists in Japan until now.

The title of his presentation is “The acceptance of soybean and groundnut into Southeast Asia – From 10,000 years’ history of legumes and man.” This is included in his recently published book. Dr. Maeda, floor is yours.

### Dr. Kazumi Maeda

Thank you very much for your kind introduction. Ladies and gentlemen, it is my great pleasure to be able to make this keynote speech, and I am very much honored for the opportunity.

Originally, I was requested to give a talk on the domestication, history, and culture of legumes. However, it is too broad for the limited time. Therefore, I would like to focus my keynote speech today on “the acceptance of soybean and groundnut into Southeast Asia -from 10,000 years’ history of legumes and man-”.

What I would like to do first is to show you examples of wide variation in the seeds of leguminous crops. A total of 24 species of widely utilized leguminous crops are shown in Slide 2. As you can see here, “Common bean”, domesticated in the New World, shows a wide variation in seed patterns and colors. It is commonly said that the diverse patterns and colors of seeds are the results of adaptation to obtain camouflage effects to escape from natural enemies. On the other hand, it is also said that these beautiful seeds are the products of a sense of beauty of the Latin American people who domesticated this crop. I myself prefer supporting the latter theory for the beautiful diversity.

In Slide 3, examples of tuber-bearing crops in legume species are shown. On the left is “Apios” or “American potato bean”, *Amerika hodoimo* in Japanese, from Aomori Prefecture, Japan. It is grown with tubers and survives the winter in the form of a tuber under natural conditions in Kochi Prefecture, Japan.

Two photos on the right show a “Yam bean” field in a village in Pagan, Myanmar and its tubers. Please note that “Yam bean”, which belongs to *Leguminosae*, is totally different from the so-called “Yam”, a tuber crop belonging to the *Dioscorea* sp.. I introduced a variety of yam bean that originated in Mexico via the Philippines. It can be well grown in Kochi, Japan, and some farmers there have been able to grow the crop and even sell the tubers to the markets.

Slide 4 shows examples of geocarpic legume species. “Groundnut” is the most well-known geocarpic legume. A wild relative, *Arachis monticola* with the pod of which isthmus elongated is also shown. According to recent research, this *A. monticola* is the most possible ancestor of groundnut. Bambara groundnut and Geocarpa bean were both domesticated in West Africa. Since these 3 legumes grow seeds underground, there were considerations in favor of treating these leguminous crops as tuber crops. It has been recorded that when groundnut was introduced from Latin America to Western Africa, where hunting was the primary work of men and women did most of the hard farming work, men in the region specifically pointed out that groundnut was very easy to grow. This may be a reason why groundnut became very popular there.

As shown in Slide 5, leguminous woody plants are also used as food. These were seeds of leguminous woody plants sold in Bangkok, Thailand, though I did not have the opportunity to taste them.

Here in Slide 6, I listed the major legume crops that played important roles as “founder crop” of agriculture in different regions of the world. In Southwest Asia, “Chick pea”, “Lentil”, “Faba bean” and “Peas” were domesticated. Please look at the photo of lentil. The smaller-sized grain on the left is a local cultivar from India. The large grain on the right is an old Russian cultivar. I consider this comparison as a good example showing selection effectiveness towards bigger seed size.

Regarding India and Africa, “Black gram” and “Rice bean” were domesticated in India, and “Cowpea” has its origin in Africa. Including “Adzuki bean” from Northeast Asia (the photo shown here is the famous Japanese cultivar “Tanba Dainagon”), these 4 species all belong to the genus *Vigna*.

Northeast Asia was also the origin of “Soybean” cultivation. The photo shown here is of a Japanese black soybean cultivar known as “Tanbaguro”, which has a large grain size. “Common bean” and “Scarlet runner bean” are representatives of leguminous crops domesticated in Meso-South America. These two beans in addition to “Tanba Dainagon” Adzuki bean and “Tanbaguro” Soybean are known in Japan as value-added foodstuff for their excellent quality.

Thus far, I have given you a brief introduction on major leguminous crops for food use. Out of more than 20,000 species that belong to *Leguminosae*, only about 30 species of herbaceous plants are cultivated as crops for food use today. However, leguminous plants generally have a special function or ability to perform nitrogen fixation through symbiosis with nitrogen-fixing bacteria. Because of this function, leguminous crops/plants are being adopted in agricultural systems such as mixed cropping and intercropping. They also play important roles in soil fertility management and in conserving traditional agriculture.

Regarding its nutritional value as food, grain legumes are rich in protein, and they supplement cereals for the balanced uptake of essential amino acids in the diet. Recently, grain legumes have been re-acknowledged and are getting more popular as functional food because it is rich in dietary fiber, polyphenolic compounds etc. Therefore, grain legumes are cooked and processed in various ways including fermentation, and served at peoples’ daily table all around the world.

The grains of some leguminous crops have hard or thick seed coats, and some species contain poisonous compounds. Hence, eating habits involving some grain legumes are considered taboo. Generally, however, appropriate preprocessing before cooking solve the problems. As you may know, Lathyrism, a higher incidence of a neuromuscular disease caused by excessive intake of grass pea, *Lathyrus sativus*, *khesari* in India and Bangladesh. And, Favism, a genetic disorder caused by a hemolytic response to the consumption of faba bean is also well known in Mediterranean area. In ancient Greece and Rome, people believed that evil spirits lived in faba bean, on the other hand the crop was a symbol of procreativity and productivity, and it was also believed that the crop has special powers to expel demons. They used to scatter faba beans at festivals and ceremonies in ancient times, just as we scatter roasted soybean at the traditional end of winter in East Asia. Accordingly, legumes, as valuable crops and foods, offered mental and spiritual sustenance to agricultural people, and this “legume crops belief” still remains with the traditions and customs today.

In regard to the relationship between legume crops and human beings, I have long been emphasizing that there would be another history. I am referring to the way the Australian aborigines and some African tribes, who didn’t choose to get into farming activities and continue to make their living by gathering and hunting up to today, have been utilizing plant species. They have shown an intimate knowledge where and when they could get edible plant species. They also understand how to eliminate and avoid toxic components, and utilize as food sources all parts of the plants such as flowers, fruits, grains, new buds, central part of stems, roots, and resin and nectar for sweetener. What the Australian aborigines call “Bush potato” are enlarged roots of wild *Vigna* sp., for example. It is reported that 27 species from 10 genera of *Leguminosae* plants are utilized as food sources. This accounts for about 10% of edible plant species, thus making *Leguminosae* the most profusely utilized family among plant species as a food source for humans.

Three cereal crops (emmer wheat, einkorn wheat and six-rowed barley), a fiber crop (flax), and 4-5 grain legumes were included in the unearthed articles from the remains of incipient agriculture in Southwest Asia, the area called the Fertile Crescent. These crops are called “founder crops”. There were no roots and tubers included in the unearthed articles. The reason why archeobotanical information on roots and tubers was limited is that their tissues were perishable and hence, difficult to preserve and identify. According to the famous classic book entitled “Origin of Cultivated Plants” by A.P. de Candolle (1883), there were many different views and discussions on the origin and diffusion of food crops. In Table 1 in the handout, the origins and centers of secondary diffusion of food crops, where grain legumes, cereals, and roots and tubers existed and developed side-by-side, are summarized.

As per the FAO statistics on crop production, 17 leguminous crops are separated into two groups, “Beans” and “Pulses” with soybean and groundnut grouped as “oil seeds” and not “pulses”. Also in Japan, groundnut (peanuts) is classified as “nuts”. However, from an academic and educational point of view, I would like to propose to treat soybean and groundnut to be classified as “pulses/legumes”.

Now, I am going to focus my talk on the diffusion and acceptance of soybean and groundnut in Southeast Asia, an area where domestication of their own unique legume crop did not occur in its history.

As you know very well, till the time when the oceanic routes became well developed at the end of the 8<sup>th</sup> century, the Silk Road was a very important trade route by land starting from Luoyang in China via Changan, Dunhuang, Loulan, and Persia towards Rome in Europe. It was recorded that the Silk Road had more than one route, but soybean was cultivated at the starting point of the eastern end, and many leguminous crops were grown in Southwestern Asia as the western end of the road. Therefore, I would call Silk Road as “Soybean Road” or “Legumes Road”. Black soybean in Northern India and slightly flat soybean in Java, Indonesia are considered to have been delivered through the route from Yunnan, China, via Laos and Thailand, to the Himalayan area. However, no definitive evidence was recorded on when and how soybean had been dispersed into Southeast Asia. As you know, generic names of crops had been developed based on their vernacular generic name at the place of origin, and modifying words describing the crop's features, such as seed color, shape, and name of the place of origin, were further combined. As a result, the generic name of crops is mostly a so-called compound word. Therefore, if the history of cultivation is longer and spread wider, vernacular generic names of the crop tend to increase more in number through adaptation of and modification by other languages during the dispersion.

If we draw our attention to the Malaysian and Indonesian people, it is said that their ancestor was the Han populations who moved from Chang Jiang, China to Taiwan and further to the south about 5,000 years ago. They used the Austronesian language as common language. Therefore, I surveyed the vernacular generic names of soybean in Southeast Asia to explore the pathways by which the soybean was dispersed. A part of the results is summarized in Table 2 and Figure 1. Here, I would like to provide the gist of the detailed research.

There are many vernacular generic names for leguminous crops in Southeast Asia. Excluding “Sandaek” in Khmer of Cambodia, “Pé” in Tibetan-Burmese in Burma, and diverse vernacular generic names of ethnic minority groups in island areas, the names of leguminous crops in Southeast Asia are mostly classified into 3 groups, i.e., “*kacang*” group, “*dau*” group, and “*kedele*” group. Regarding the *kacang* group, the origin of the word is not clear yet, but since the integration of the Indonesian and Malaysian languages in 1977, the spelling has become common. As shown in Table 2-A, “Soybean” is called *kacang soya* (soya for soy sauce in Japanese) or *kacang depoon* (*depoon* for Japan), which means that the legume is from Japan. Groundnut, a geocarpic legume, is called *kacang tanah*, which means “bean in soil”, as it is also commonly called in other languages. Other names for groundnut in this region are *k. china* or *k. goreng*, where the words *china* and *goreng* mean China and oil, respectively. In this group, they call pigeon pea as *k. kayu* (bean on tree), cowpea as *k. panjang* (long bean), adzuki bean as *k. merah* (red bean), and mung bean as *k. hijau* (green bean).

Next is the group of *dou*, *tou* and *tua*, as shown in Table 2-B. These names were considered to have originated from the Chinese character 「豆: *dau*」. These generic names are used in Vietnam, which was mediatized by force of arms to China about 1,000 years ago. In Laos and Thai, they also use these names. In Japan, we also read out this Chinese character as *tou* or *zu*, and as *dou* in Korean.

In Chinese, bean sprout 「豆芽」 is pronounced as *dou-ya*. The “*Kacang* group” people in Malaysia and Indonesia call bean sprout *taoge*, *toge* or *taugih*, which sound relatively similar to Japanese. In Sarawak, Malaysia, 「豆腐」 is called *toufu*, and as *tafu* in Indonesian. This indicates that soybean as a crop and as food, such as bean sprout and bean curd, were dispersed and accepted into Southeast Asia in different times and through different routes. Details have not been researched yet, but overseas Chinese merchants would play important roles in the dispersion and acceptance of soybean and its culture. In addition, groundnut is *Luò-huashēng* in Chinese, and *Lac-hoasin* (or *aulac* for short) in Vietnamese when it is written in Chinese character.

The third group is *kedele* as shown in Table 2-C. Soybean is called *kedele* or its modified variations in the Malaysian peninsula. There is a name *kacang-kedele* which combined *kacang* and *kedele* together. In 1930, J.J. Ochse published a great and famous book; its English edition was titled “Vegetables of the Dutch East Indies” (1980). The book contained a vast amount of vocabulary (more than 7,000 terms) related to agriculture and food in different languages (in Malay, Javanese and in the languages of the island areas in Indonesia). The vernacular generic names of the *kacang* group and *kedele* as soybean were listed in this book; however, the origin of *kedele* was not mentioned at all.

In other reference sources, it was described that peas were called *atar* in one of the Ethiopian tribal languages, and there might be some relation with *matar*, a generic name of peas in Hindi, India. Therefore, I searched the Hindi words for leguminous crops and the results are summarized in Table 2-D-1. Chickpea, already had been spread about 3,000 years ago in India, is called as *kadale*, *kadala*, or *kadalai*, very similar to *kedele* by Telegu, Tamil, Kannada and Malayalam, which all belong to the Dravidian languages in south Indian states.

Furthermore, although soybean and groundnut had only been introduced relatively recently into India, both names are considered as names in line with *kadele*. Indian names of crops are mostly based on the Sanskrit language and further linguistic verification will be needed, but I have assumed the classification of both *matkalai* for groundnut and *garikalai* for soybean in Bengali language belongs to the Aryan language group, similar to Hindi, to be included into the *kadale* group.

I think it would be very interesting to further study vernacular generic names in the *kadale* group and the *dou* group, with its many modifying words, but I have not touched this area in detail yet. There is a theory that *kadale* originated from the word *kalaya* for roasted chickpea in ancient India. According to the Rigveda, a collective name for the Brahmanic religious scriptures written in the period from 1,200 to 1,000 BC, it is said that the word *khalva* in Sanskrit for “seeds” or “grain legumes” might be the origin of the word *kadale*.

Please look at Slide 7, Figure 1. As you can see, Indochina peninsula covers a wide part of Southeast Asia. Since it is located in the middle of India and China, it is said that Indochina hindered both Chinese and Indian civilizations from spreading into Southeast Asia. As a result, it is said that Sinicization in Southeast Asia was limited only to northern Vietnam, and Indianization also occurred only in island areas but not to the continent area.

Almost one fourth of the Indian population were Dravidians, and they were very active in trades and cultural exchanges with Southeast Asians through the ages. As you can see in this map, the *kadale* group in South India and the *kedele* group in Southeast Asia are spread and linked, while the *dau* group is geographically quite limited. Taking these facts into consideration, Dravidian people in India could play an important role for the dispersion and acceptance of soybean into island areas in Southeast Asia. Also, vernacular generic names indicate that the Sanskrit language was important for Indianization, as it is often said that Chinese characters played essential roles for Sinicization. Furthermore, according to Ochse's literature as cited before, 50 examples of vernacular generic names for soybean in Malaysian and Indonesian languages were counted, but for groundnut, about 100 examples, which account for twice as many as soybean. The point to consider is how we analyze these facts. In ancient times, the journey from the Chinese continent to the south used to be very difficult either by land or by ocean. However, in 13<sup>th</sup> century, the maritime route had become developed, allowing the Cape of Good Hope to sail via the eastern coast of West Africa to the Indian Ocean and even to Japan. In 1498 May, Vasco da Gama came to the western coast of India, which was only a month later than Columbus' discovery of the “New World”. So, we can presume that groundnut might have been dispersed to the island areas of Southeast Asia earlier than soybean, or that groundnut might have spread much quicker than soybean. As the West African people pointed out, people in Southeast Asia may have also recognized that cultivation of groundnut easier than soybean and became more prevalent. Or, it might be for the simple reason that groundnut grew bigger and much tastier grains.

Today, I have presented the history of two important leguminous crops, soybean and groundnut, in agriculture and in the food culture of Southeast Asia from the view point of crop science. To conclude my keynote speech, I would like to share with you the words of Dr. Norman Borlaug in his award lecture titled “The Green Revolution, Peace, and Humanity”, for the Nobel Peace Prize in 1970 for his achievement through the Green Revolution. He said, “In my dream I see green, vigorous, high-yielding fields of wheat, rice, maize, sorghums, and millets, which are obtaining, free of expense, 100 kilograms of nitrogen per hectare from nodule-forming, nitrogen-fixing bacteria. These mutant strains of *Rhizobium cerealis* were developed in 1990 by a massive mutation breeding program with strains of *Rhizobium* sp. obtained from roots of legumes and other nodule-bearing plants. This scientific discovery has revolutionized agricultural production for the hundreds of millions of humble farmers throughout the world...” He passed away at 95 years old in 2009, but his dream has not come true yet. At the end of my presentation today, I would like to express my sincere hope that the new green revolution in leguminous crops will come true in the near future through the work of young scientists here and throughout the world. Thank you very much.

**Chair Doi**

Thank you Dr. Meada for the perspective of origins of names of legumes are deeply connected with their histories. What a romantic phrase Silk Road was soybean road, I am sure I will use that phrase in other occasions.

I think we understand about importance of leagues and both presentations set the baseline of today's symposium. Please join me in giving a big applause to our excellent keynote speakers. Thank you very much.

