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# Study on the Cultivated Legumes in Taungthaman Lake and Its Environ

Thai Thai Aye

## Abstract

Among the various winter crops which were cultivated in Taungthaman Lake and its environ, nine genus of twenty species were studied on their cultivation in agronomy and ecological habitation. *Arachis hypogaea* L. (Mye-pe), *Glycine max* (L.) Merrill. (Pe-boke), *Phaseolus lunatus* L. (Htaw-bat-pe, Bocake-pe, Pe-ni-gya), *Vigna mungo* (L.) Hepper. (Mat-pe), *Vigna umbellata* (Thunb.) Ohwi & Ohashi (Pe-yin) and *Vigna radiata* (L.) Wilczek. (Pe-di-sein) were favourable yield of eight legumes in the locality for economy.

Six varieties, such as *Cicer arietinum* L. (Ka-la-pe), *Cajanus cajan* (L.) Millsp. (Pe-sin-ngon), *Lablab purpureus* (L.) Sweet. *purpureus* Hort. (Pe-gyi), *Phaseolus lunatus* L. (Pe-ni-lone, Pe-ni-pya and Pe-phyu-kalae) were second recommended varieties. Other six varieties, such as *Lablab purpureus* subsp. *bengalensis* (Pe-pazun), *Lathyrus sativus* L. (Pe-chin-baung), *Pisum sativum* L. (Sa-daw-pe), *Vigna unguiculata* ssp. *sesquipedalis* (L.) Verdc. (Pe-thee-daung) and *Vigna unguiculata* (L.) Walp. (Pe-lun-pyar and Pe-lun-phyu) were also cultivated for the popular vegetables and were grown in the home garden and backyards.

**Key words:** Agronomy, Ecological habitation, Yield, Varieties

## Introduction

The selected area to study for cultivated legumes is Taungthaman Lake and its environ in Amarapura Township (Mandalay Division). This region is located about 733 meters away from Yadanabon University. It is situated between North latitudes 22° 00' - 21° 53' and East longitudes 96° 03' - 98° 00'. Topographically, this area is built on a generally flat ground and 250 feet above sea level (Fig. 15).

Leguminous crops in Myanmar are under cultivation in different climatic zones like tropical high rainfall area in lower Myanmar, the semi-arid dry central zone and the cool and high rainfall and altitude zone of Shan State (TCP/MTA/0166).

Leguminous crops at Taungthaman Lake were under cultivation in the semi-arid dry central zone. It was relatively drought resistant and usually grown in this area. Where annual rainfall was between 22 to 29

inches, temperature ranges between 22°C to 38°C and humidity percentage between 45-80 in 2004 and 2005 (Ministry of Agriculture and Irrigation of Amarapura Township).

In Amarapura Township area, 34795 acres were covered with rain crop and winter crop cultivation within plant geography including 1141 acre of Taungthaman Lake. Research areas were also utilized as the fertile soil for eight major crops of Myanmar National Project. These eight major crops were rice, sorghum, sesame, sunflower, groundnut (Myae-pe), mungbean (Pe-di-sein), blackgram (Mat-pe) and pigeonpea (Pe-sin-ngon). Legume farmers of Taungthaman planted four major legumes out of main crops as well as other food legumes. For this basic agricultural view, the manual focuses were observed.

On the other condition, the most cultivated field of Taungthaman area was flooded from July to November every year. When the water ran off, the farmers prepared their winter crop cultivations in lowland plains for rice, in semi-lowland regions for groundnut, pigeonpea, greengram, soyabean and chickpea and in semi-dry zone for blackgram, cowpea and lablab bean. The farmers had the profit once of agroclimatic condition to sow the crops. There had no irrigated land and chance to grow a repeat performance. In Taungthaman Lake and its environ, the cereals, oil crops and food legumes were grown on the soil of inundated areas as winter crop when the water had receded.

There had a specific information from farmers. It was that they used only application of organic fertilizers and they did not apply chemical fertilizers. That message was interesting for the analysis of legume cultivation.

## **Materials and Methods**

### **1. Collection**

The cultivated legumes of family Fabaceae that are grown in Taungthaman Lake and its environs were used in this research work. The specimens were collected from Taungthaman Lake and its environ during March 2004, 2005 and 2006. For the identification, the vegetative and reproductive parts of each species were collected and pressed at the time of their flowering periods. All the fresh specimens was photographed and noted field record of distinct characters.

## 2. Soil tests

Soil samples from the four sites of farmland of Taungthaman Lake were collected and analysed physical characters and chemical constituents of soil in Land Use Department of Myanmar Agricultural Service of Yezin.

## 3. Climatological data collection

Maximum and minimum temperature, humidity per day and daily rainfall in 2004 were collected from the Meteorological Department for providing Climatological data of Mandalay Division.

### Results

#### 1. *Arachis hypogaea* L. Sp. Pl. 1:741. 1753

**Local Name** : Mye-pe (Fig.1)

**Common Name** : Groundnut; Peanut; Earthnut; Ground pea

Flowering and fruiting from February to April.

**Outstanding feature:** Trailing herbs; stem subterete. Leaves 4 foliolate compound. Inflorescences axillary spike with few flowers. Fruit torulose, glabrous. Seed oblong, variable in colour.

**Cultivation:** By harrow with 4 feet, apart 15 inches each with 2-3 seeds in the holes.

**Harvesting:** After 6 month of cultivation, the crop is harvest by men yield from 40-80 baskets per acre. Small Japan can yield 35-60 baskets of dried pod per acre.

**Folk uses:** Peanuts as boiled and fried edible food, fodder, manure and fuel.

**Pests and diseases:** Leaf spot, collar rot, mosaic disease, chlorosis and insect pests

#### 2. *Cicer arietinum* L. Sp. Pl. 738.1753; Baker in Hook. f. Fl Brif. Ind. 2:176. 1876

**Local Name** : Ka-la-pe; Myinsa-pe; Singaung-pea (Fig. 2)

**Common Name** : Chick pea; Bengaligram; Dhal; Garbanzo; Pois chiche.

Flowering and fruiting from December to March.

**Outstanding feature:** Annual herbs; stem tetragonus. Leaves, unipinnate; leaflets 5-15. Flower solitary, reddish-violet or white. Pods oblong or subglobose, pale-green, glandular hairy, dehiscent. Seeds 1-2, subglobose or irregularly, pale yellow or white.

**Cultivation:** Planted after rice by hand broadcasting.

**Harvesting:** After 95-120 days, harvest by hand or animal. Yield, about 10-20 baskets/acre.

**Folk uses:** Various meat dishes, salad, other snacks, vegetables and vinegar.

**Pests and diseases:** Wilt diseases and stunt disease.

3. *Cajanus cajan* (L.) Millsp., f. *bicolor* (DC.) Bak., Legum. Trop. Afr. 460 (1929)

**Local Name** : Pe-sin-ngon (Fig. 3)

**Common Name** : Pigeonpea; Dhal; Gandual; Red gram; Congo pea; Bungo pea

Flowering from October to December.

**Outstanding Features:** Perennial or annual shrubs; stems angular or ridged. Leaves pinnately trifoliolate compound. Inflorescences axillary raceme with 4-6 pairs flowers. Pods oblong, compressed, pubescent. Seeds 4 to 7, ovate, brown or red, glabrous.

**Cultivation:** Sown in rows.

**Harvesting:** Green pods are harvested for home consumption as vegetable. Threshing by hand or wooden rod on smooth ground (Ta-linn). Yield about 10-15 baskets/acre.

**Folk uses:** Vegetables, green manure, fodder and fuel.

**Pests and diseases:** Mosaic disease, Wilt disease and Termites.

4. *Glycine max* (L.) Merrill. Int. Rumph. Herb. Amb. 247. 1917.

**Local name** : Pe-boke (Fig. 4)

**Common name** : Soybean; Soyabean

Flowering from December to January.

**Outstanding features:** Annual, bushy herbs; stems cylindrical, sericeous. Leaves pinnately trifoliolate compound; leaflets ovate-rhomboid. Inflorescences axillary raceme with 2 to 5 flowers. Pods linear-oblongoid, slightly curved, compressed with wooly beak hooked. Seed 2 to 3 ovoid, rhomboid, pale yellow.

**Cultivation:** Sowing by broadcasting.

**Harvesting:** After 4 months of cultivation, harvesting by sickles or by uprooting whole plant by hand. Yield of grain was about the 5-7 baskets per acre.

**Folk uses:** Vegetable, processing bakery products, dairy products, snacks and fuel.

**Pests and diseases:** Leaf spot disease, mosaic diseases and rust disease.

5. *Lablab purpurecus* (L.) Sweet. subsp. *purpurecus* Hort. Brit ed, 1, 481. 827.

**Local name** : Pe-gyi (Fig. 5)

**Common name** : Lablab bean; Hyacinth bean; Benavist; Chiearos; Chink; Egyptain bean; Pharao

Flowering from October to December.

**Outstanding feature:** Annual twinning, sub-erect herbs, stem cylindrical with twining tips, tomentose. Leaves pinnately trifoliolate. Inflorescences axillary racemes, erect; flowers 2 on the peduncle, white, fortid. Pods obliquely oblong, glabrous and dehiscent. Seeds 3-5, rounded or kidney shaped, white, with prominent white hilum.

**Cultivation:** Sowing in rows.

**Harvesting:** After 300 days, harvest by hand and sickle. Yield about 10-12 baskets/acre.

**Folk uses:** Edible bean by fried or boiled and salted.

**Pests and diseases:** Fusarium root rot, leaf spot and powdery mildew.

6. *Lablab purpurecus* subsp. *bengalensis* (Jaeq.) Vexdc. in Kew bull. 24.411. 1870.

**Local name** : Pe-pazun (Fig. 6)

**Common name** : Nil

Flowering from September to March.

**Outstanding feature:** Perennial twining herbs, wood; stem and branches, puberulous. Leaves pinnately trifoliolate; Inflorescences axillary, erect raceme; flower 2 nate. Pods obliquely oblong, Seeds 3-6, slightly compressed white or black or brown.

**Cultivation:** Sowing in holes. Not sown for economic value but vegetable only.

**Harvesting:** Pods are harvested by hand.

**Folk uses:** Vegetable.

**Pests and diseases:** fusarium root rot, leaf spot and powdery mildew.

7. *Lathyrus sativus* L. Sp. Pl. 1:730. 1753; Baker in Hook. f., Fl. Br. Indy 2; 179. 1876; Alli in Biologic 11(2): 7. 1965.

**Local Name** : Pe-chin-baung; Pe-khesari (Fig. 7)

**Common Name** : Grass pea; Kesari-pe

Flowering from December to February.

**Outstanding features:** Annual procumbent herbs, stem cylindrical glabrous. Leaves unipinnately compound, alternate; leaflets 2-4, opposite. Inflorescences axillary, solitary flower, blue or purple. Pods oblongs, flattened dorsally 2 winged, green, glabrous. Seeds 2-3, oblong, slightly compressed, green, glabrous.

**Cultivation:** Sowing in rows in standing paddy.

**Harvesting:** When pod are not fully ripe; the seeds plants is reaped with sickle or uprooted by hand. Yield about 6-8 baskets per acre.

**Folk uses:** Vegetable and fodder.

**Pests and diseases:** Powdery mildew, oil diseases, rust and Aphids.

8. *Phaseolus lunatus* L. Sp. pl. ed. 1:724. 1753.

**Local name** : Htaw-bat-pe (Fig. 13)

**Common name** : Lima bean; Butter bean; Madagascar bean

Flowering from October to January.

**Outstanding features:** Annual, twinning herbs; stem cylindrical, pubescent. Leaves trifoliolate compounds; leaflets ovate-triangular. Inflorescences axillary racemes with 2-4 flowers. Pods oblong, flat, slightly curved, puberulous. Seeds 2-4, variable in shape and in size, hilum with radiating translucent lines ex-albuminous.

9. *Phaseolus lunatus* L. cv. **Pe-ni-gya:** Pe-ni-gya may be distinguished from Htaw-bat-pe by sub-ovoid, reds with white blotches seeds (Fig. 14).
10. *Phaseolus lunatus* L. cv. **Pe-ni-pya:** Pe-ni-pya may be distinguished from Htaw-bat-pe by ovate to kidney shape and red seeds (Fig. 13).
11. *Phaseolus lunatus* L. cv. **Pe-ni-lone:** Pe-ni-lone may be distinguished from Htaw-bat-pe by sub ovoid swallowed and reddish blue seeds (Fig. 14).
12. *Phaseolus lunatus* L. cv. **Pe-phyu-kalae:** Pe-phyu-kalae may be distinguished from Htaw-bat-pe by ovoid swallowed and white seeds (Fig. 14).
13. *Phaseolus lunatus* L. cv. **Bocake-pe:** Bocake-pe may be distinguished from Htaw-bat-pe by large ovoid to oblong and white red lined seeds (Fig. 13).

**Cultivation:** Sowing in rows.

**Harvesting:** After 4 months, harvest by hand or sickle. Yield, about 10-15 baskets/acre.

**Folk uses:** Food and fodder.

**Pests and diseases:** Wilt disease, collar rot and powdery mildew.

14. *Pisum sativum* L. Sp. pl. 1:727. 1753

**Local name** : Sa-daw-pe; Pe-laik-pyar (Fig. 8)

**Common name** : Garden-pea

Flowering from October to December.

**Outstanding features:** Annual, tendril climbing herbs; stem tetragonous. Leaves unipinnately compound; leafy stipule present; leaflets 1-3 pairs. Inflorescences axillary, solitary 2-3 racemes; flowers white or purple. Pods oblong, compressed, glabrous. Seeds globose, smooth or wrinkled, pale green or yellowish-green, glabrous.

**Cultivation:** Sowing in rows.

**Harvesting:** After 52-75 days of cultivation, harvest by hand.

**Folk uses:** Vegetable and fried snack.

**Pests and diseases:** Powdery mildew disease, wilt diseases, bacterial blight.

**15. *Vigna mungo* (L.) Hepper in kew Bull. 11:128. 1956.**

**Local name** : Mat-pe (Fig. 9)

**Common name** : Black-gram

Flowering from December to January.

**Outstanding features:** Annual, erect bushy herbs; stem cylindrical, reddish brown hairy. Leaves pinnately trifoliolate compound, stipulate; leaflets ovate-oblong to lanceolate. Inflorescences axillary racemes with 5-6 flowers. Pods cylindrical erect or sub erect, woolly seeds oblong, black with white-hilum, glabrous.

**Cultivation:** Broadcasting and row.

**Harvesting:** Harvest after 70-140 days. Yield about 10-12 baskets/acre.

**Folk uses:** Food and fodder.

**Pests and diseases:** Powdery mildew disease and leaf spot disease.

**16. *Vigna radiata* (L.) Wilczek, Fl. Congo. Belge 6:386. 1954.**

**Local name** : Pe-de-sein (Fig. 10)

**Common name** : Mungbean; Green gram

Flowering from December to January.

**Outstanding features:** Annual, erect, herbs; stem cylindrical, long stiff-hairy. Leaves pinnately trifoliolate compound; leaflets ovate. Inflorescences axillary, racemes with flowers, yellow or greenish yellow. Pods long and cylindrical, black when mature, beak short. Seeds 10-15, cylindrical ovoid, yellowish-green or grayish-green.

**Cultivation:** Sowing in rows and broadcast.

**Harvesting:** After 4 months, harvest by sickle or hand. Yield about 8-15 baskets/acre.

**Folk uses:** Various fried foods, bean sprouts and fodder.

**Pests and diseases:** Powdery mildew disease and leaf spot disease.

**17. *Vigna umbellata*** (Thunb.) Ohwi & Ohashi, Jap-J-Bot-44:31. 1969.

**Local name** : Pe-yin; Pe-nauk-sein; Kaxhin-pe; Hto-pyin-pe; (Fig. 11)

**Common name** : Ricebean; Climbing mountain bean; Manbibebean; Oriental bean.

Flowering from December to January.

**Outstanding features:** Annual herbs; stem cylindrical. Leaves trifoliolate compound; stipulate, tomentose; leaflets ovate-oblong. Inflorescences axillary racemes with 2 nate flowers. Pods cylindrical, 10-15 seeded, covered with reflexed short hairs; beak short. Seeds cylindrical-oblong, yellowish green or grayish-green, glabrous.

**Cultivation:** Broadcasting or mixed other plants for forage such as sorghum and corn.

**Harvesting:** After 70-140 days, harvest by using sickle. Yield about 32 pyi per acre.

**Folk uses:** Food and fodder

**Pests and diseases:** Rice bean is a pest free crop.

**18. *Vigna unguiculata*** (L.) Walp.; Rep. 1:779. 1842. ssp. *sesquipedalis* (L.) Verdc. In Devis, Fl. Turk.3:266. 1970; in Rew. Bull. 24:544. 1970.

**Local name** : Pe-lun-nyo; Pe-thee-daung; Pe-daung-she; Taing-taung-pe;

Tha-la-pe; Taw-talin-pe.

**Common name** : Yard-long bean; Asparagus bean; Pea bean.

Flowering from January to March.

**Outstanding features:** Annual, climbing herbs; stem cylindrical, glabrous. Leaves pinnately trifoliolate; compound, stipulate; leaflets ovate-oblong. Inflorescences axillary, fewflowers. Pods oblongoid, linear. Seeds 15 to 18, kidney-shaped.

**Cultivation:** Sowing in rows. Mixed with such other peas as blackgram, limabebean.

**Harvesting:** After 60-90 days, harvest by hand or sickles.

**Folk uses:** Vegetable and cooking plants and leaves as good forage.

**Pests and diseases:** Nematodes, aphids and powdery mildew.

**19. *Vigna unguiculata* (L.) Walp.;** Rep. 1:779. 1842.

**Local name** : Pe-lun-phyu; Pe-ngashan; Tazaungmon-pe; Bocake-pe.  
(Fig. 12)

**Common name** : Cow pea; Growder-pea; Black-eyed pea; Southern pea.

Flowering from March to April.

**Outstanding features:** Annual, bushy shrubs; stem cylindrical, glabrous. Leaves pinnately trifoliate compound: stipulate; leaflets ovate-rhomboid. Inflorescences axillary, fewflowers. Seeds 3 to 20, sub-rhomboid, dark brown with black spots seeds.

**20. *Vigna unguiculata* (L.) Walp.;** cv. **Pe-lun-pyar:** This cultivar can be distinguished from cultivar Pe-lun-pyar by yellowish-white flowers and sub-reniform, white seeds.

**Cultivation:** Sowing in rows, broadcast and mixed with other plant.

**Harvesting:** After 5-6 months, harvest by hand. Yield about 10-12 baskets/acre.

**Folk uses:** Vegetable and seeds are exported to other countries.

**Pests and diseases:** Rust, Wilt, mildew, and charcoal rot.

### Discussion

Norman (1979) discussed the tropical cropping systems of which annual crops (excluding vegetables) were a dominant or important component made the task of classification somewhat easier at general-purpose farming systems. His classes based on increasing cultivation frequency; that was the duration of the cropping phase as a percentage for 1 year.

At the Taungthaman Lake and its environ, the duration of the cropping phase was observed the boundary between semi-intensive and intensive cultivation frequency of 30 to 70 %. The farmers had the duration of the cropping phase between November up to April of next year when the flood water had receded.

The energy and protein requirement of tropical peoples vary with weight and age. The average energy supply per head in developing countries is  $9.2 \text{ MJd}^{-1}$  and the average protein supply  $55 \text{ gd}^{-1}$  (FAO, 1981). Although seed legumes are considered primarily as sources of protein, they are, of course, of direct value as energy food. Thus cowpea provides 13.9, pigeonpea 14.8, soybean 18.0 and groundnut  $22.9 \text{ MJkg}^{-1}$ , compared with an average of  $15 \text{ MJkg}^{-1}$  for cereals.

In Taungthaman region, the cultivated twenty species of legume gave the value of the role in human nutrition by their production of pea and bean. In order to increase productivity and production of grain legumes in different cropping systems and agro-ecological situations, the information on crop management optima is of paramount importance. This information is scarce even on cultivation practices such as date of planting, depth of planting, population density, method of sowing and causes of diseases and insect pests which inflict heavy losses to grain legume crops (TCP/MYA/0166).

The farmers of this region noticed date of planting, depth of planting, land preparation and tillage. But hand broadcasting of seeds was a common practice than rows or line sowing method in cultivation of chickpea, limabean, blackgram, mungbean and rice bean. This method was not more chance of productivity and affected the population density of germination, seedling, branching, fruiting and loses of products in harvesting. Sowing could be done manually or by seed drill. The seeds should be placed at a depth of 1-2 inches. Germination and emergence of seedling were severely affected if deep sowing was practiced. Other weakness of farmers was the control of weeds. Weeds competed with legume crop for moisture, nutrients and sunlight. So, hand weeding or mechanical means could be control inter-cultivation and after sowing.

In Taungthaman field, the cultivation of groundnut, soybean, pigeonpea, grass pea, gardenpea, cowpea and yard-long bean were planted by rows and row spacing was recommended.

The farmers of Ohebo, Htantaw, and Taungthaman village utilized the suitable recommended varieties of legumes. These recommended varieties were suitable to select for a particular region and season. Farmers should choose the cultivars that most closely meet their requirements and economy.

The blackgram (Mat-pe) was most cost for export legume of (Myanmar Time News, 2<sup>nd</sup> week of March, 2006). Groundnut was the most commercial legume for this region. Grasspea, gardenpea, and yard-long bean cultivated popularly for vegetables with a few acre. In the Taungthaman Lake under U Pain Bridge, the cultivars of *Phaseolus lunatus* (Htaw-bat-pe, Pe-ni-lone, Pe-ni-pya, Pe-ni-gya, Bocake-pe and Pe-phyu-kalae) were cultivated the most choice field area.

Integrated pest management, control of disease of legumes were inhibited by local dry condition and by rotation with maize, grain sorghum for three year without destroying natural enemies (friends of farmers).

### Conclusion

This local research might be assumed that the farmers would be promoted in legumes for specialization of cultivars for export and local needs, planting method cropping pattern and crop management yield estimation by using their othodox fertilizers.

Webster and Wilson (1966) stated that leguminous covers in the tropics generally fixed nitrogen under field conditions and growing annual legumes as green manures in rotation with others crops was only like to be of value when sufficient soil moisture was available.

In the present investigation, root nodule formation was found to be the highest in Taungthaman field in groundnut, pigeonpea, greengram, blackgram, soybean, and grass pea.



Fig 1 Cultivated field of groundnut



Fig 2. Fresh pods and seeds of Ka-la-pe-phyu



Fig. 3. Habit and inflorescence of Pe-sin-ngon



Fig. 4. Nodulation of Pe-boke



Fig.5. Cultivated field and fresh seeds of Pe-gyi

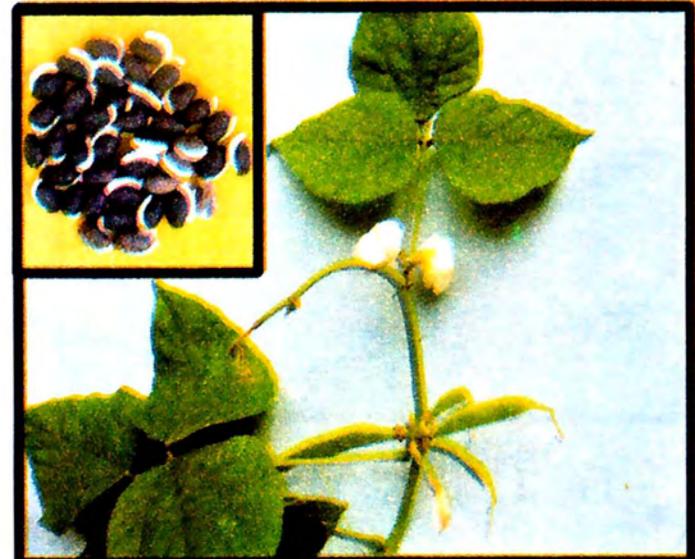


Fig. 6. Habit of Pe-pazun



Fig. 7. Habit of Pe-chin-baung



Fig. 8. Habit of Sa-daw-pe



Fig. 9. Mature pods of Mat-pe



Fig. 10. Habit of Pe-de-sein



Fig. 11. Seeds of Pe-yin



Fig. 12. Fresh pod and dry seeds of Pe-lun-phyu



Fig. 13. Seeds of Bocate-pe, Htaw-bat-pe and Pe-ni-pya

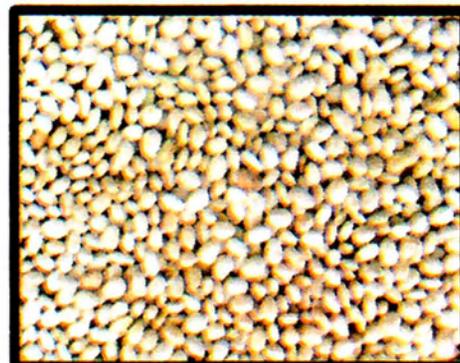
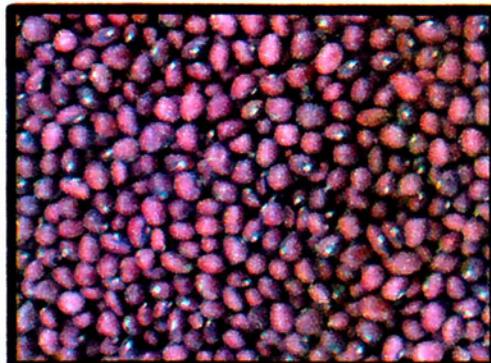
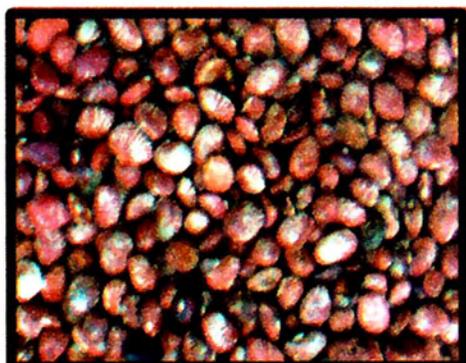


Fig. 14. Seeds of Pe-ni-gya, Pe-ni-lon and Pe-phyu-gale

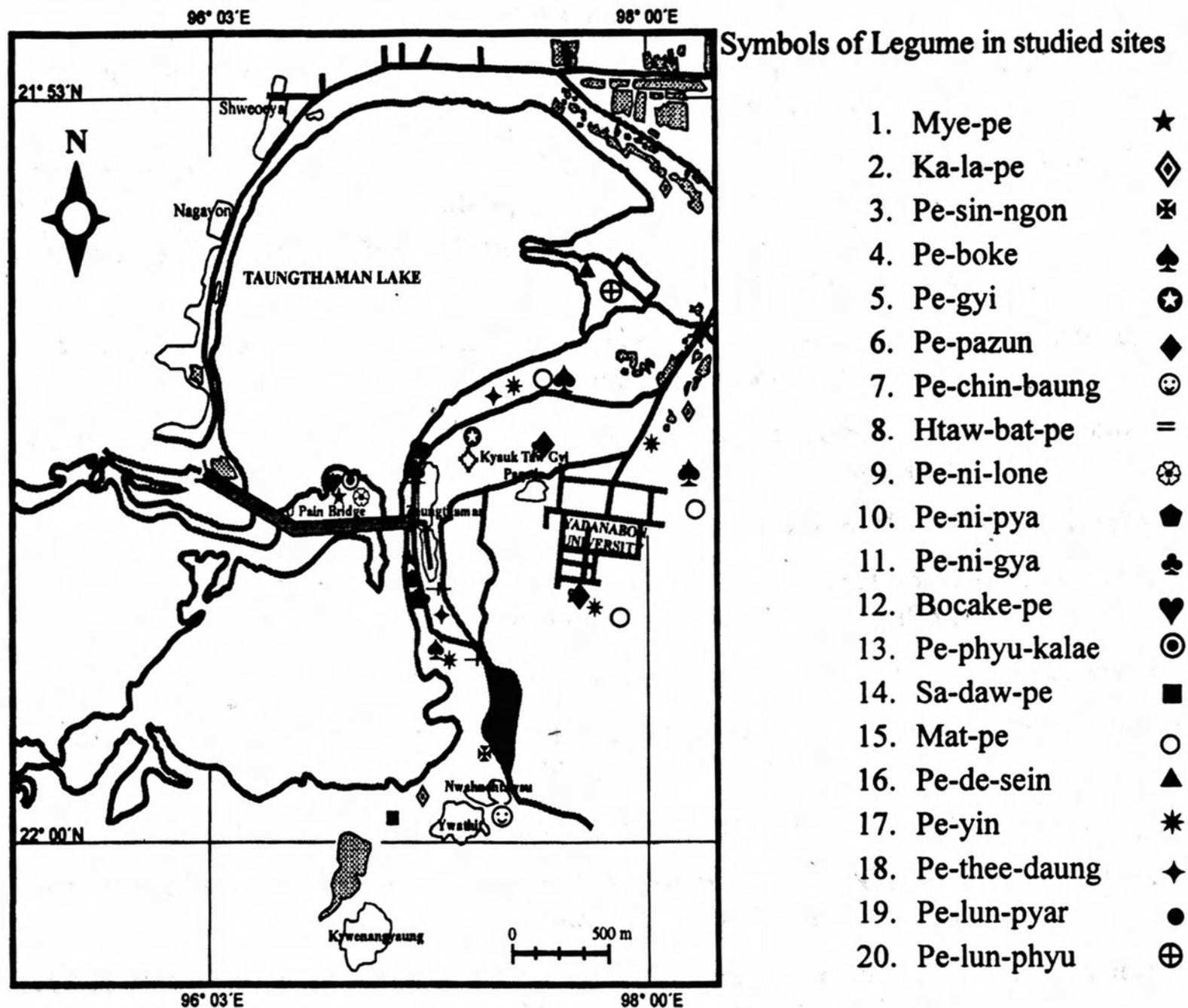


Fig. 15 Location map of Taungthaman Lake showing the sites cultivated with the varieties of legumes

This showed that root nodule formation, texture of soil, pH value of the soil and organic element played an important role for the physiological point of view.

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