

History of Maodou Production in China

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Production and Utilization of Soybeans in Ancient Chinese Literature

Significance of soybeans in ancient Chinese food structure

Two monographs review the ancient Chinese literature on the history of soybean production. The first is “Dou Lei” (**Legumes**) published in 1958 by Li Chang-Nian from the Chinese Agricultural Heritage Institute, and the second is “The History of Soybean Cultivation in China” published in 1993 by Guo Wen-Tao from the same institution. The two books review the ancient Chinese literature, including *Jing-Shi-Zi-Ji*, ancient agricultural writings, local historical records, ancient medical writings, and notes and poems with focus on the origin of soybean production, soybean food and processing, rotation and cropping system, cultivation and management, and genetic resources and cultivars.

Early records about soybean and related events appeared in original writings as soon as Chinese characters were invented in ancient times. Some of the early expressions and records mentioning soybean are listed below:

- (1) **{Shi-Jing•Da-Ya•Shen-Min}** (Note: Here in the brackets *Shi-Jing* is the name of the book; *Da-Ya* is a section of the book; and *Shen-Min* is a chapter of the section; those are separated with a dot. The same is true for the later text.) (Poems in Western Zhou Dynasty, 6th century B.C.): “Yi zhi ren-shu, ren-shu pei pei” [Mao Zhuan (2nd century B.C.): “Ren-shu is rong-shu”; Zheng Xuan (2nd century): “Yi means growing, rong-shu is soybean (*Glycine max*)”].
- (2) **{Shi-Jing•Xiao-Ya•Xiao-Yuan}** (Poems in Western Zhou Dynasty, 6th century B.C.): “Shu is distributed in the central plain. People used to pick and harvest it.”
- (3) **{Shi-Jing•Lu-Song•Bi-Gong}** (Poems in Western Zhou Dynasty, 6th century B.C.): “Hundreds of fortunes were brought to human beings after Hou-Ji was born. Broomcorn millet (*Panicum miliaceum*) matures later than millet (*Setaria italica*), and soybean is planted earlier than wheat.”
- (4) **{Zhou-Shu•Yue-Ling-Jie}** (Warring States, 5-3rd century B.C.): “In middle summer,the emperor lives in a bright temple, rides in a red carriage, drives red horses, carries red flags, wears red clothes, decorates with red jade, eats soybean and chicken.”
- (5) **{Zhou-Li•Tian-Guan-Zhong-Zhai-Xia}** (Late Warring States, 3rd century B.C.): “To use five tastes, five crops, and five medicinal materials for curing the patient”. (Zheng Xuan: Five crops means hemp, broomcorn millet, millet, wheat, and soybean.)
- (6) **{Meng-Zi•Jin-Xing-Zhang-Ju-Shang}** (Late Warring States, 3rd century B.C.): “The wise man looks upon to have enough soybeans and millets for well-management of the country. If soybeans and millets are enough, people will be all benevolent.”
- (7) **{Mo-Zi•Shang-Xian}** (Late Warring States, 5-4th century B.C.): “Agriculture makes the accumulation of soybeans and millets, so that the people will have enough to eat.”
- (8) **{Xun-Zi•Tian-Lun}** (Late Warring States, 3rd century B.C.): “Gentlemen eat stewed soybeans and drink plain water. It is not block-minded, but the requirement of moral

integrity.”

- (9) **{Li-Ji-Tan-Gong-Xia}** (Western Han Dynasty, 1st century B.C.): “Kon-Zi□□□□ said: ‘to eat stewed soybean and drink plain water, and to enjoy the pleasure, it is so-called filial piety.’”
- (10) **{Zhan-Guo-Ce-Han-Juan}** (Western Han Dynasty, 1st century B.C.) “what the people eat are mainly soybean as meal and soy leaf as soup.”

In ancient Chinese, **{Shi-Jing}** is the oldest literature and is a collection of poems circulated among the people from Western Zhou Dynasty to the Spring and Autumn Period. Some of them might be works from the Shang Dynasty. The book was edited and finished in the middle Spring and Autumn Period (6th century B.C.). Mao Heng (Western Han Dynasty, 2nd century B.C.), Zheng Xuan (Eastern Han Dynasty, 2nd century), Lu De-Ming (Tang Dynasty, early 7th century), Kon Yin-Da (Tang Dynasty, 642 A.D.) made notes to explain **{Shi-Jing}**. The other ancient literature mainly recorded the history of their respective dynasties. From the above literature, the following points can be derived about soybeans:

(1) Soybean and millet accounted for a significant role among the five or nine major crops during the period from Western Zhou Dynasty through the Spring and Autumn Period and Warring States, even to the Qin and Han Dynasties. This is indicated by statements about gentlemen using stewed soybean as their major meal and even the emperor taking soybeans and chicken. as his major daily food.

(2) The way to eat soybeans during that time was to stew the seeds as meal and to cook young green leaves as soup. These ways of preparation had a significant influence to the later adoption of eating immature green beans (maodou).

(3) In ancient China proverbs about soybeans existed before relevant Chinese characters were invented. Texts related to soybeans were recorded as soon as relevant characters were created about 2700-3000 years ago. Oral works from the Shang Dynasty recorded in **{Shi-Jing}** date to 3600 years ago. From these records, it can be inferred that soybeans existed during the Yan-Huang and Hou-Ji period, 5000 years ago.

Literary and archeological evidence indicate that soybean had its origin in ancient China. According to literature from the Han Dynasty, 2nd century, soybeans were introduced to Korea through a North China pathway, and then to Japan. It was introduced to India, Indonesia and Vietnam, then extended northwestward to Europe and Russia in 16-17th century, and to the US in 18th century. The expansion of soybean was accelerated after it was exhibited at the Vienna International Exhibition in 1873. Soybean is called soy, soja, co, in the western countries which originated from the pronunciation of the Chinese character “Shu.”

Utilization and processing of soybeans in ancient China

In ancient China, various ways of utilization and processing were developed.

(1) It was indicated in the literature cited above that dried seeds were stewed for daily meals, and the young leaves, or were used as a vegetable to make soup. These were the major ways of utilization.

{Zhou-Li-Bian-Ren} (late Warring States, 3rd century B.C.) “In a bamboo basket filled with cakes made of a mixture of soy flour and stewed soybean and rice”, which was for offering sacrifices to gods or ancestors and treating guests or visitors according to Zheng Xuan (2nd century).

(2) The seeds, stems, leaves, and pods were used as animal feed.

{Shi-Jin-Xiao-Ya-Bai-Ju} (Poems in Spring and Autumn Period, 6th century B.C.): “Eating my soybean leaves in the field, are the little young white foals.”

{**Qi-Ming-Yao-Shu**} (Late Wei of Northern and Southern Dynasties, 630s A.D.): “For feeding a thousand sheep, to sow six or seven hectares of soybeans in March or April for their seeds and straws”, “The young pigs grow quickly if millets and soybeans are distributed for them,” and “A duck can produce more than hundred eggs if fully fed with millets and soybeans.”

(3) Soybean was used for medical purposes.

{**Sheng-Nong-Ben-Cao-Jing-Zhong-Jing**} (Three Kingdoms of the Eastern Han Dynasty, 3rd century): “Huang-Juan (dried soybean sprouts), tasted sweet and plain, appropriate for curing wandering arthritis and rheumatism; immature raw soybean seeds, external application being effective for curing swelling; boiled water solution of soybean seeds, used for relieving pain”.

(4) There are various kinds of soyfood processing technology developed in ancient China.

{**Chu-Ci-Zhao-Hun**} (between the Warring States and the Western Han Dynasty, 1st century B.C.) “Soybean nuggets taste salty and sour.” This indicates soybean nuggets or Dou-Chi, a fermented whole soybean food, had been discovered more than 2000 years ago.

References that tofu processing was developed by Liu An who had a nobility rank of Huai-Nan-Wang appeared in the literature of Song, Yuan, Ming, and Qin Dynasties. In the Ming Dynasty, Li Shi-Zheng who wrote the medical book “**Ben-Cao-Gang-Mo**” in 1578 A.D. indicated again that tofu processing was invented by Liu An, and described the materials and steps for tofu processing in detail. But after a stone tablet carved with the whole tofu making process was dug out from the Da-Hu-Ting No. 1 ancient tomb of the Eastern Han Dynasty located in Mi County, Henan province, it was confirmed that the tofu making process was actually discovered in the Han Dynasty.

In {**Qi-Ming-Yao-Shu**}, the processing procedures of dou-chi and dou-jiang (a thick sauce made from fermented soybean) were described. Su Shi Northern Song Dynasty, 1036-1101 A.D. in his “**Wu-Lei-Xiang-Gan-Zhi**” first mentioned soy oil; and said that to fry tofu with soy oil made it taste excellent; and to mix soy oil with tung oil to fill gaps made boats and ships waterproof. Therefore, the history of soy oil processing is at least about 1000 years. Meng Yuan-Lao in his “**Dong-Jin-Mong-Hua-Lu**” (Southern Song Dynasty, 1147 A.D.) mentioned the goods in the market, including soybean sprouts. Zhou Mi in his “**Nan-Song-Shi-Si-Ji**” (Yuan Dynasty, 13th century) recorded the soy foods in the market, including stems with green soybean pods, soybean sprouts, soybean biscuit, soybean porridge, soybean ball, etc. Accordingly, there appeared many foods made of soybeans in the market during the last millennium in China.

From the above information, it seemed that the utilization and processing of soybeans were developed and extended gradually and that soybeans were used as a principal food and then expanded into various supplementary foods. The discovery of dou-chi, tofu, and dou-jiang indicated the evolutionary use of soybeans from a staple food to supplementary foods. In addition, the medical uses of soybeans were found very early in history. All later developments to utilize the immature green pods and beans as a vegetable occurred naturally and reasonably. It is also obvious that soybean is the crop most highly developed in processing and utilization.

Historical Textual Research of Maodou in Ancient China

Soybean leaves as a vegetable, dried soy sprouts as medicine, fresh soybean sprouts as a vegetable, immature green beans as medicine, all of these uses have been found in the literature, but there was no early evidence in utilizing maodou as a vegetable until the following recorded events:

(1) Ke Zhong-Xiang in his “**Ben-Cao-Yan-Yi**” (1116 A.D.) wrote: “There are three kinds of

immature raw soybeans: green, brown and black, the larger ones mainly from Jiangsu , Zhejiang, Hunan, and Hubei. The small ones from other places.”

(2) Lu You (1125-1210 A.D.), a distinguished scholar and official in the Southern Song Dynasty, mentioned several times about picking up and eating green pods.

“On the market bridge, the velvety water shield fills baskets; in the village shop, big and fleshy soybean green pods pile up in the trays adopted from [**On the Water Route in Early Summer**]. It indicates that the green pods were for sale.

“Pick pods near the bamboo fence, and collect water celery from the pond adopted from [**Come Back From the East in Early May**].

“It makes me pleased that you pick up pods diligently; especially we can share together the rice and soybean meal with the gumbo soup.” adopted from [**To Show Children in a New Sunshine Day**]. It indicated they ate green beans and matured beans at the same time.

“The thing that makes me happy in autumn is to have new season soybean and millet to fill up my storage.” adopted from [**Writing in an Autumn Evening**]. It indicated that in addition to eating maodou , the matured soybeans were also harvested for storage.

(3) {**Tiao-Xie-Lei-Bian-Li-Shi**} (Southern Song Dynasty, by Zhao Xi-Hao, 13th century) “ There are soybeans with different seed coat color, including black, white, yellow, brown, and mottling”. It indicated during that time there existed all kinds of seed coat color for maodou production.

(4) {**Jiu-Huang-Ben-Cao**} (Ming Dynasty, by Zhu Shu, 1406 A.D.) “Soybeans now are everywhere. Every family grows them in their nursery. It is about one to two feet tall with leaves similar to black bean leaves. Their pods are bigger than the black bean’s, and the leaves taste a little sweet. For disaster relief, the young leaves can be collected, fried, and seasoned with salt and oil, or the pods can be boiled or grounded, or the young seeds can be shelled then boiled or grounded for food to eat.”

(5) {**Xue-Pu-Zha-Su-Dou-Su**} (Ming Dynasty, by Wang Shi-Mao, 1587 A.D.) “Soybean is one of the five major crops, not for home production. But there is a dark green and black large-seeded soybean that tastes a little sweet and could be used for vegetable dishes. It is an elite soybean line in my home garden.”

(6) The term of **maodou** first appeared in the literature in {**History of Horticulture of Runan**} written by Zhou Wen-Hua in Ming Dynasty in 1620 A.D. It states “Maodou with green pod shell, also named as Qingdou (green bean).....To eat the raw non-cooked maodou makes one vomit. There are different varieties which can be planted from April through August to create a continuous production, but among them, the large seeded varieties with sweet taste are elite ones.....To make soup with the beans and other materials or just boil the fresh pods in water, all taste delicious. To peel out the young seeds, boil with salt, then take out from the water, put them in an iron sieve, and then smoke to dry, this dried immature soybean is named dried qingdou that can be consumed as a snack. The matured seeds are harvested for next planting.”

(7) {**Jie-An-Man-Bi**} (Ming Dynasty, by Li Xu, 16th century) “There are some varieties with fragrant flavor and glutinous taste, and some with flavor like ginkgo seeds. Those are new varieties.” This text indicates that the high quality maodou varieties had been developed by the 16th century.

From the above literature survey, soybean was a major food crop, and was broadly utilized already for its seed, pod, stem and leaf in ancient China. It is really difficult to find the exact record and time of the initial utilization of green pods and beans. It seems that at least the habit to pick green pods and shell for immature seeds, and even put on the market for sale existed in the Song Dynasty during the 12th century. Maodou as a specific term was first used in literature in the

Ming Dynasty, during the 17th century. At that time not only were the green soybeans utilized, but roasted boiled green soybeans were also used, as snacks. After that, the term maodou was used extensively in literature, such as in [Nong-Pu-Bian-Lan] 1755, [Qi-Ming-Si-Shu] 1846, [Jin-Si-Tu-Can-Biao-Lue] 1898, [Yong-Chen-Tu-Can-Biao] 1899, and [Zhi-Wu-Ming-She-Tu-Kao] 19th century. These texts include statements such as: “Green immature soybeans are especially delicious, the fried ones can be served as vegetable dishes,” and “Huang-dou (another name of dadou or soybean) is now also called maodou. There are various varieties. It can be used as a vegetable at an early stage and then as major food later after maturity. It is necessary for people’s daily life.”

The text, “**Ben-Cao-Yan-Yi**” mentioned the large-seeded soybeans were mainly from the lower and middle Changjiang valleys. The pictures Lu You drew in his poems were the people’s custom in Shaoxin, Zhejiang where he was originally from and his poems were written after his retirement in 1190. In “The History of Soybean Cultivation in China”, Guo (1993) reviewed the cultivars reported in ancient Chinese literature and found that many landraces were from Jiangsu, Zhejiang, Anhui, and Shanghai, and had a variety of colorful seed coats. This information indicates that the major producing areas of maodou were probably Changjiang Valleys, especially the lower and middle valleys. In those places before 1980, maodou was used as one of the major vegetables, especially during the summer and autumn seasons. The residents of this area had the tradition to eat maodou and established free markets for selling and buying maodou. The farmers sold their maodou in the forms of maodoumi (seed), maodouja (pod) and maodouqi (plant). Maodou research and production in Taiwan has been well developed since the late 1940s by immigrants from Jiangsu and Zhejiang, and especially since the establishment of the Asian Vegetable Research and Development Center (AVRDC) which included soybean as one of its four vegetable species. After the World War II, Japan also developed maodou research and production, and released a number of quality cultivars. Since the late 1980’s, maodou production has been promoted in Southeast China along the seacoast, especially in Fujian, due to easy access to international markets and rising production costs in Japan and Taiwan. The transfer of maodou production from those places to Fujian promoted the production over there.

Maodou Production in Present China

The major maodou production areas in China at present are as follows:

- (1) **Changjiang Valleys, including Jiangsu, Shanghai, Zhejiang, Anhui, Jiangxi, Hunan, and Hubei, especially the first four provinces** The total acreage of maodou in this area is about 100 thousand ha. Acreage yield is about 4.5-6.0 t/ha for spring-planted maodou, and 6.0-7.5 t/ha for summer-plants. A small area is planted in the autumn. Early spring markets pay higher prices in this area. Therefore, farmers usually grow maodou in plastic greenhouses for early pod set and early market. However most maodou is planted in the field or nurseries during the growing season. Monocropping is used for greenhouses and nurseries, while an intercropping system may be used for field production. Paddy field bunds are also used for maodou production. Chinese cultivars are mainly developed by local institutions, including provincial academies of agricultural sciences, agricultural universities, and agricultural institutes, only a few have been introduced, such as those introduced from Taiwan and Japan. Both public and private companies are involved with maodou production and marketing.
- (2) **Southeast China along the seacoast, including Taiwan, Fujian, and Guangdong provinces** The total area of maodou in this area is about 30 thousand ha. Yield varies from 4.5 to 9.0 t/ha. There are spring-planted, summer-planted, and autumn-planted maodou in this area.

Paddy field bunds are also used for maodou production. Maodou export from this area is important. The planted cultivars are mainly introduced from outside. During recent years maodou cultivar development has been emphasized for obtaining adapted cultivars to raise maodou production. Both public and private companies are involved with maodou production and marketing.

(3) **Other areas** Recently in Shangdong, Henan, Tianjin, Beijing, and Northeast China, South China, and Southwest China there some maodou production has also developed. Whether maodou production will become well-established among these areas is unknown.

Maodou research in present China has not been emphasized by the public sector and also has not modernized although production has a long history. The previous research is mainly on germplasm screening, cultivar development, cultivation technology, quality identification and improvement, development and optimal harvest time, emergence quality and seed production.

References

- Li, C.N. 1957. Dou-Lei (Legumes). Agriculture Press, Beijing., (in Chinese)
- Guo, W.T. 1993. The History of Soybean Cultivation in China. He-Hai University Press, Nanjing, Jiangsu. (in Chinese)
- Zhou, W.H. 1620. The History of Horticulture in Runan. Hand-written Book, Chinese Agricultural Heritage Institute, Nanjing Agricultural University, Nanjing, Jiangsu. (in Chinese)
- Zhu, Q.K. (ed.). 1985. 240 Questions on Literature History in China. Shangdong Literature Press, Jinan, Shangdong. (in Chinese)
- Qian, Z. S. 1989. Selected Notes on Poems in the Song Dynasty. 2nd Edn. People's Literature Press, Beijing. (in Chinese)