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SEED PRODUCTION AND INTENSIVE FARMING TECHNIQUES OF

Peanut

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PREFACE

Peanut (Arachis hypogaea L.*) or otherwise known as dau phong, dau phung, is a species of plant in the legume family (*Fabacaea*), native from South America, then brought to Europe, Africa, Asia then to Central America and North America. In Vietnam, among short-term industrial crops, peanut has been grown for a long time and is the first oil crop in terms of area, productivity and export, contributing greatly to the total export value of agricultural products of our country. Peanut is a food with high nutritional value, rich in protein and lipid oil. Products made from peanuts are very rich and diverse. In recent years, peanut yield has been significantly improved thanks to the application of new technical advances in peanut production, including selected high-yielding varieties, new technical methods applied to limit control pests and diseases, increase the number of full fruits on the plant.*

The book ***"Seed production and intensive farming techniques of peanut"*** *is the product of the project "Innpvative Rural Development through Establishment of Seed Production and Distribution System for High-Value Crop Peanut (Arachis hypogaea* L.*) in Vietnam". This is a cooperation project between the Agricultural Science Institute of Northern central Vietnam (ASINCV) and the KOrea Program on International Agriculture (KOPIA Vietnam). The book is published to help readers, researchers, extension workers and farmers understand new advances in peanut*

varieties and seed production techniques as well as peanut intensive farming techniques to contribute to increased yield, quality, and increase the production efficiency of peanuts at the same time.

Although the authors have made many efforts in the process of synthesizing and compiling documents, shortcomings cannot be avoided. The author team is looking forward to receiving corrections from readers so that the book's content can become more and more complete and become a useful document for research, teaching and serving agricultural production today.

Group of authors

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ORIGIN, DISTRIBUTION AND CLASSIFICATION OF PEANUTS

1.1. Origin and distribution of peanuts

1.1.1. The historical origin of the peanuts

Peanut, scientific name (*Arachis hypogaea* L.) is native from South America, then brought to Europe, Africa, Asia and then to Central America and North America. In our country, peanuts have been grown ever since there is no specific document.

Bộ (*ordo*)	Fabales
Họ (*familia*)	Fabaceae
Phân họ (*subfamilia*)	Faboideae
Tông (*tribus*)	Dalbergieae
Chi (*genus*)	*Arachis*
Loài (*species*)	***A. hypogaea***

The origin of the peanut in South America was confirmed when Skie (E.G.1877) found peanut in the ancient tomb of An Con on the coast near LiMa, Peru. People have discovered here many tombs containing sitting mummies, surrounded by terracotta jars containing various foods, which are still well protected. In it, there are many jars containing peanuts. Peanut specimens discovered in An Con are related to the pre-An Con culture dating from 750 - 500 BC. According to Engen's documents, peanuts were found in Las Haldas in the pre-ceramic period about 3,800 years ago.

The Portuguese and Spanish discovered peanuts in the colonies of South and Central America, then it was spread worldwide by European traders.

In the 16th century, the Portuguese brought peanuts from Brazil to West Africa and then to South-Western India.

Peanuts were introduced to China and countries in the Western Pacific such as Indonesia and Madagascar by Portuguese traders in the 17th century and a series of American missionaries in the 19th century and then spread across Asia.

In Vietnam, the history of peanut cultivation has not been clearly verified, and Le Qui Don's book "Victory of the Language" by Le Qui Don has not mentioned peanuts.

If judging by the name, the noun "Lac" may be derived from the Chinese word "LacHoaSinh" (some people think that the Han people have transliterated the word "Arachis") which is the word that the Chinese call the peanut tree. Therefore, peanuts can be imported from China into Vietnam around the 17th - 18th centuries.

Before the 19thcentury, peanuts in South and North America were exploited by Europeans mainly for animal fodder.

African-American scientist George Washington Carver (1864 - 1943), was the first to advise poor farmers in the Americas to plant peanuts widely for food to improve their lives. He has come up with more than 100 recipes for processing peanuts for food, cosmetics, and industrial products, for which he received the Spingarn Medal of the National Association for the Advancement of Colored People (NAACP). Since then, peanuts have flourished in South, Central and North America.

1.1.2. Distribution of peanuts

Currently, peanuts have about 1,000 different varieties, widely adapted to different ecological regions, and are grown throughout tropical and subtropical countries. Because peanuts are less sensitive to light time and have good drought tolerance, peanuts are grown in more than 110 countries around the world from 40 North latitude to 40 South latitude; 1,000 m above sea level. In the world in general and in Vietnam in particular, peanut cultivation is distributed according to different ecological regions.

1.2. Plant classification of peanuts

The peanut plant belongs to the species *Arachis hypogaea*, family Fabaceae. Species *A. Hypogaea* is divided into two subspecies *Hypogaea* ssp and *Fastigiata* ssp. Each subspecies is divided into two things:

- Subspecies *Hypogaea* spp subdivided into subspecies *Hypogaea* (virginia group) and th Hirsuta;

- Subspecies Fastigiata spp is divided into Fastigiata (valencia group) and Vulgaris (spanish group).

The genus Arachis is a genus of the subfamily Faboideae with about 70 species of annual or perennial flowering plants native to Central and South America.

Cultivated peanut species: *Arachis hypogaea* L. is an annual crop. Depending on the growth behavior, previously in the world, *Arachis hypogaea* was divided into 4 groups: Spanish, Valencian, Virginia and Runner. But now, many programs to select and breed peanut varieties have created hybrids with intermediate characteristics between the above groups. The group division is difficult and unclear. Therefore, this grouping is rarely applied.

Chapter II.
PRODUCTION AND ECONOMIC VALUE OF PEANUTS

2.1. Production and consumption of peanuts in the world and in Vietnam

2.1.1. Peanut production in the world and in Vietnam

- Peanut production in the world:

According to the Food and Agriculture Organization of the United Nations (FAO), the area under peanut cultivation worldwide in the period 2015 - 2019 ranges from 26.51 to 29.70 million ha/year. In 2019, it reached 29.6 million hectares (an increase of more than 3 million hectares compared to 2015) and the productivity reached 48.76 million tons/year. The variation in productivity is not large between years. The world's average peanut production in the five years 2015 - 2019 is from 44.54 to 50.89 million tons/year. The increase in productivity was mainly due to an increase in area (table 1).

Table 1. Area, yield and productivity of peanut in the world over the years (2015 - 2019)

Year	Area (1,000 ha)	Yield (ton/ha)	Productivity (1,000 ton)
2015	26.51	1.68	44.54
2016	28.39	1.61	45.76
2017	29.30	1.64	48.00
2018	29.70	1.71	50.89
2019	29.60	1.65	48.76

(Source: FAOSTAT, 2021)

The world's peanut growing area in 2019 reached 29.60 million hectares. In which, the peanut growing area in Africa is 17,146 million ha (accounting for 57.93%), Asia is 11.114 million ha (accounting for 37.55%), America is 1.327 million ha (accounting for 4.2%), and Oceania is 10 thousand hectares (accounting for 0.03%) of the total area (table 2).

The average peanut yield in the world in 2019 reached 1.65 tons/ha. There is a large disparity between regions. The highest yield in the Americas with 3.66 tons/ha, followed by Asia with 2.45 tons/ha, Oceania 1.95 tons/ha and Africa with the lowest 0.97 tons/ha (Table 2).

Table 2. Area and production of peanuts by region in the world in 2019

Location	Area (1,000 ha)	Yield (ton/ha)	Productivity (1,000 ton)
World	29,597	1,65	48,757
Africa	17,146	0,97	16,637
America	1,327	3,66	4,850
Asia	11,114	2,45	27,250
Oceania	10.0	1.95	19.540

(Source: FAOSTAT, 2021)

Seven countries have large peanut growing areas, of which India is the country with the largest area peanut cultivation with 4.73 million hectares, followed by China with 4.51 million hectares, Nigeria with 3.88 million hectares, Sudan is 3.13 million hectares (table 3).

Table 3. Area of peanut cultivation of some countries in the world from 2015 - 2019

Unit: Million ha

No.	Year / Country	2015	2016	2017	2018	2019
1	Indian	4.56	5.31	5.34	4.89	4.73
2	China	4.41	4.47	4.63	4.64	4.51
3	Nigeria	2.80	3.46	3.60	3.77	3.88
4	Sudan	1.46	2.32	2.22	3.06	3.13
5	Myanma	0.95	0.99	1.03	1.06	1.11
6	America	0.63	0.62	0.72	0.56	0.56
7	Indonesia	0.45	0.44	0.37	0.35	0.27
8	World	26.51	28.39	29.30	29.70	29.60

(Source: FAOSTAT, 2021)

The yield of peanuts in different countries in the world is quite large and unstable over the years. In the period 2015 - 2019, the peanut yield of the US reached the highest in the world and ranged from 4.07 - 4.49 tons/ha, followed by China with 3.64 - 3.90 tons/ha and tends to increase gradually in recent years (Table 4).

Table 4. Peanut yield of some countries in the world from 2015 - 2019

Unit: Ton/ha

No.	Year / Country	2015	2016	2017	2018	2019
1	Indian	1.48	1.41	1.40	1.90	1.42
2	China	3.64	3.67	3.71	3.75	3.90
3	Nigeria	1.24	1.26	1.26	1.22	1.15
4	Sudan	0.71	0.79	0.74	0.94	0.90
5	Myanma	1.60	1.59	1.53	1.48	1.46
6	America	4.44	4.07	4.49	4.48	4.43
7	Indonesia	1.30	1.14	1.09	1.06	1.03
8	World	1.68	1.61	1.64	1.71	1.65

(Source: FAOSTAT, 2021)

In addition, there are some countries with very high yields of peanuts such as Guatemala (5.41 tons/ha), followed by Israel (5.31 tons/ha).

The world's average peanut production in the past 5 years has ranged from 44.54 to 50.89 million tons. The highest peanut production in 2018 reached 50.89 million tons and decreased to 48.76 million tons in 2019. The world's largest peanut production is China with 16.02 - 17.57 million tons, followed by India reached from 6.73 to 9.25 million tons, ranked third in production was Nigeria with 3.47-4.45 million tons (table 5).

Table 5. Peanut production of some countries in the world from 2015 - 2019

Unit: Million ton

No.	Year / Country	2015	2016	2017	2018	2019
1	Indian	6.73	7.46	7.46	9.25	6.73
2	China	16.02	16.42	17.16	17.39	17.57
3	Nigeria	3.47	4.36	4.52	4.60	4.45
4	Sudan	1.04	1.83	1.65	2.88	2.83
5	Myanma	1.52	1.57	1.58	1.56	1.62
6	America	0.59	0.50	0.41	0.37	0.28
7	Indonesia	2.82	2.53	3.23	2.49	2.49
8	World	44.54	45.76	48.00	50.89	48.76

(Source: FAOSTAT, 2021)

- Peanut production in Vietnam:

In Vietnam, Peanut is a traditional, long-standing crop and an industrial crop for short-term oil production, ranking first in area, productivity and export, making a large contribution to the total value of export turnover every year agricultural exports of our country.However, before 1990 peanuts were still not paid

enough attention, so the area, productivity and output achieved were very modest, 1987 was the peak of peanut production at this time, but the area reached 237,000 hectares, but yield is only 0.97 tons/ha and output is approximately 231,000 tons.

In the period 1990 - 1995, peanut production tended to increase in area and output, but the yield was still low, only over 0.1 tons/ha. In the period 1995 - 2000, the yield of peanuts had increased by leaps and bounds, especially in 1999 the yield reached 1.43 tons/ha, the highest in this period.

According to the General Statistics Office in 2010, the peanut area nationwide reached 231,284 hectares, the yield was 2.1 tons/ha.

According to FAOSTAT (2021), in the period 2015 - 2019, the peanut area tends to decrease year by year, the peanut area in 2015 was 200.33 thousand hectares and gradually decreased to 177.04 thousand hectares (in 2019). However, peanut yield tends to increase gradually from 2.27 tons/ha (in 2015) up to 2.48 tons/ha (in 2019), peanut yield has a spectacular improvement next year compared to the previous year, put peanuts in the top 10 agricultural products for export, achieving export turnover of 30 - 50 million USD/year. The increase in productivity is due to the application of new technical advances in peanut production such as: applying new varieties with high yield and good quality, advanced technological processes suitable for each region, changing gradually the former peanut farming practices of farmers.

Although productivity increases year by year, but due to the decrease in production scale, peanut production in Vietnam tends to decrease, peanut production in 2015 was 453.95 thousand tons, in 2019 it was only 438.86 thousand tons.

Table 6. Area, Yield and Productivity of peanut in Vietnam in the period of 2015 - 2019

Unit	Year				
	2015	2016	2017	2018	2019
Area (1,000 ha)	200.33	184.79	195.35	185.90	177.04
Yield (ton/ha)	2.27	2.31	2.35	2.46	2.48
Productivity (1,000 ton)	453.95	427.19	459.85	456.76	438.86

(Source: FAOSTAT, 2021)

At present, peanuts are distributed mainly in 4 major regions: Northern mountainous and midland region, Red River Delta, North Central region and Southeast region. These four regions account for three-quarters of the area and production, while the rest are scattered in some other regions.

The potential to improve the productivity of peanuts in our country is still very large. Among 25 peanut growing countries in Asia, Vietnam ranks 5th in terms of output. Research results in recent years show that on a large area of tens of hectares, by planting new varieties and advanced technical measures, farmers can easily achieve a peanut yield of 4-5 tons/ha, as much 3 times the average peanut yield in mass production. It proves that advanced techniques widely applied in production will make a very significant contribution to increasing productivity and output in our country. The main problem now is how to make new varieties and advanced techniques reach the farmers and be adopted by the farmers.

In recent decades, with the implementation of the policy of restructuring the agricultural sector, the food problem has not only been resolved, but Vietnam has also become the second largest rice exporter in the world. Since then, people have active conditions to gradually shift a part of rice growing area lacking

water to grow crops of higher economic value, in which peanuts play an important role in agricultural production. goods, as well as contribute to the improvement and use of land resources, in order to take advantage of the tropical climate. At the same time, the use of new high-yielding varieties and advanced peanut intensive farming techniques are also widely applied. Thanks to that, the yield of peanuts in our country is increasing, next year is higher than the previous year.

- The situation of peanut production in the North Central region:

The North Central region including the provinces (Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue) is the region with the largest peanut growing area in the country, with an area of 46,900 - 60,300 ha (accounting for 28). ,1% of the total peanut growing area of the Northern provinces). However, the area planted to peanuts tends to decrease over the years. The main reason is that a part of peanut land in the North Central region has been converted to industrial zones and public use purposes (Table 7).

Table 7. Peanut cultivation area in the North central provinces in the period of 2015 - 2019

Unit: 1,000 ha

Province	Year				
	2015	2016	2017	2018	2019
Thanh Hoa	12.8	11.9	11.5	10.5	9.9
Nghe An	16.2	15.7	15.4	14.1	13.4
Ha Tinh	19.0	16.1	16.3	17.4	12.3
Quang Binh	4.9	4.8	5.0	4.5	4.8
Quang Tri	4.0	4.0	3.8	3.6	3.3
TT. Hue	3.4	3.5	3.4	3.3	3.2
Total	60.3	56.0	55.4	53.4	46.9

(Source: Statistical Yearbook 2019)

Table 8. Peanut yield in the North Central provinces in the period of 2015 - 2019

Unit: quintal/ha

Province	Year				
	2015	2016	2017	2018	2019
Thanh Hoa	10,00	20,90	21,00	21,23	21,82
Nghe An	23,00	24,98	24,79	25,50	28,66
Ha Tinh	21,70	22,00	23,60	24,05	25,69
Quang Binh	20,00	21,04	21,40	23,33	22,50
Quang Tri	20,00	19,00	19,74	20,28	21,52
TT. Hue	22,65	20,57	21,18	22,42	17,19
Average	19,56	21,42	21,95	22,80	22,89

(Source: Statistical Yearbook 2019)

The yields of peanuts in the North Central provinces has increased gradually over the years and ranges from 19.56 to 22.89 quintals/ha. Nghe An is the province with the highest peanut yield in Nghe An in 2019 (28.66 quintals/ha), followed by Ha Tinh (21.69 quintals/ha), the lowest yield is Hue (17, 19 quintals/ha) (Table 8).

Although the area of peanuts in the region has decreased over the years, due to the increase in average yield, the output has decreased but not significantly. The average peanut production in 2015 was 116.8 thousand tons and decreased to 115.0 thousand tons in 2019 (table 9).

Table 9. Peanut production in the North Central provinces in the period of 2015 - 2019

Unit:1,000 tons

Province	Year				
	2015	2016	2017	2018	2019
Thanh Hoa	12.8	24.9	24.2	22.3	21.6
Nghe An	37.3	39.2	38.2	36.0	38.4
Ha Tinh	41.2	35.4	38.5	41.8	31.6
Quang Binh	9.8	10.1	10.7	10.5	10.8
Quang Tri	8	7.6	7.5	7.3	7.1
TT. Hue	7.7	7.2	7.2	7.4	5.5
Total	116.8	124.4	126.2	125.3	115.0

(Source: Statistical Yearbook 2019)

According to scientists, the potential to improve productivity and output of peanuts in other countries is still very large that need to be exploited. While the world's average peanut yield is just over 1.64 tons/ha, the results of small-scale trials in China have yielded about 12 tons/ha, 8 times higher than the yield. world average. On an area of tens of hectares in Taiwan, peanut yields can reach over 6.3 tons/ha (Faostat, 2021).

2.1.2. Consumption of peanut products in the world and in Vietnam

- The situation of export - import of peanuts in the world

According to data on the market (import and export) of peanut products of FAO, peanuts are circulated in the market with 4 main product groups: raw peanuts, peanut oil, butter and peanut cakes with transaction value. about 800 - 900 milliondollars annually. Countries with large output are India, USA, Argentina,

Netherlands, Senegal..., while importing countries with large output are Indonesia, Germany, Mexico, Russian Federation, China, Canada.. .

According to the United States Department of Agriculture (USDA), thanks to increased exports of peanuts from Senegal and Sudan in the 2021/2022 crop year, world trade in this agricultural product will remain stable at 4.68 million tons. while the 2020/2021 crop is 4.7 million tonnes, despite the drop in Indian exports. This will meet China's import demand, which is still at a record high, as the impact of the Covid epidemic has reduced 100,000 tons in the 2021/2022 crop year. The world consumption of peanuts will also continue to increase as the trend of "snack" and "snap" is maintained, along with the ever-increasing demand for peanut oil.

Peanuts are consumed in different ways in different countries. In the United States, 57% of production is used to make peanut butter, about 23% for roasted peanuts, 19% for ingredients for everyday food processing, and only 1% for peanut oil, in China, 53% Peanut is used for oil pressing, 40% for food, 3% for export and 4% for seed. Currently, in China the main products from peanuts include oil, beverage, butter and confectionery.

Peanut oil is obtained by different pressing methods and is mainly consumed in Asia, especially India, China... The world production of peanut oil has increased from 4.53 million tons per year. 2000 to 4.91 in 2010, of which China (44%), India (20%) and Nigeria (11%) are the largest.

Concerning the quality of raw peanuts, the market is interested in organoleptic quality, physico-chemical and nutritional quality, and processing-related quality characteristics.

(1) The organoleptic quality of peanuts is the external morphological characteristics of the shell and kernel (fruit shape,

silk skin, granule shape, odor, hundred fruit weight and hundred seed weight); (2) The physico-chemical and nutritional quality of peanut is an intrinsic quality characteristic of peanut, which is closely related to the nutritional value and functional characteristics of peanut (crude protein, crude fat, dietary fiber, etc.) crude, ash, total sugar, amino acids, fatty acids, vitamin E, phytosterols, squalene, resveratrol,..); (3) Processing-related quality characteristics include kernel ratio, oil yield, protein content, etc.

Table 10. Export – import of peanut in the world in the period of 2015 - 2019.

Year	Import		Export	
	Production (million ton)	Money (billion USD)	Production (million ton)	Money (billion USD)
2015	1.80	2.31	1.70	2.03
2016	2.03	2.42	1.99	2.27
2017	2.27	2.89	1.90	2.31
2018	2.27	2.75	1.97	2.20
2019	2.67	3.05	2.58	2.81

(Source: FAOSTAT, 2021)

- The situation of import and export of peanuts in Vietnam:

In In Vietnam, peanut imports are still limited, mainly for export. However, our country's peanut exports are mainly through the small quota. The quantity exported through official channels is too small. The export market for peanuts is mainly to Southeast Asian countries and China. The decrease in the export of peanuts through official channels is not only due to the fact that Chinese traders come to buy and raise prices, there are many other reasons.

Currently, many businesses are severely undercapitalized, with persistent losses that have not been handled for many years. These businesses have not paid enough attention to building a

truly reputable brand in the market, the ability to access information is both slow and one-sided.

According to FAOSTAT, in 2015 - 2016, our country imported 19,720 tons, while there was no export of peanuts. Peanut exports started in 2017 with an output of 13,104 tons and a value of $21.7 million. By 2019, the export value reached 68,931 tons, the value reached 105.1 million USD (table 11).

Table 11. Export - import of peanut in Vietnam in the period of 2015 - 2019.

Year	Import		Export	
	Production (ton)	Money (1,000 USD)	Production (ton)	Money (1,000 USD)
2015	2,619	4,176	-	
2016	19,720	30,531	-	-
2017	13,784	23,418	13,104	21,765
2018	11,950	16,367	26,428	39,635
2019	33,221	56,143	68,931	105,050

(Source: FAOSTAT, 2021)

2.2. Values and products from peanuts

2.2.1. Nutritional value of peanuts

Peanut is a food with high nutritional value; It is a rich source of lipids and proteins. The biochemical composition of peanuts can vary depending on: variety; variation in climatic conditions between years; farming mode; position of the seed in the fruit.

- Oil in peanuts:

Peanut oil is a mixture of glycerol, consisting of 80% unsaturated fatty acids and 20% saturated fatty acids. Fatty acid composition in peanut oil varies depending on cultivar and

growing conditions. The fatty acid composition of peanut oil is as follows:

- Unsaturated fatty acids (80%): Oleic acid accounts for 39-65.5%, linoleic acid accounts for 17 - 38%.

- Saturated fatty acids (20%): Palmitic acid accounts for 6 - 13%, the rest is stearic acid.

In peanut oil, people are interested in the ratio of oleic acid to linnoleic acid (This ratio fluctuates in the range of 1.2 - 1.5% or can be up to 2%). The higher this ratio, the easier the oil is to store.

- Peanut protein:

For a long time, people only paid attention to the oil in peanuts, but did not pay attention to the high protein content in the seeds and in other parts of the peanut plant. The current shortage of protein in the world requires a comprehensive study on the use of this plant, an oil and nitrogen plant.

In terms of quality, the protein in peanuts is mainly composed of 2 globulins (arachin and conrachin), accounting for 95%. Conrachin is nutritionally superior to arachin and has 3 times more metionin content. In peanut protein, there are 2/3 arachin and 1/3 conrachin.

The amino acid composition, the protein of peanut has 8 amino acids which cannot be substituted compared with the target set by FAO on the content of irreplaceable amino acids in the food protein composition, the peanut protein has 4 amino acids with the quantity lower than standard

- In terms of energy supply: Because peanuts have a high oil content, the energy provided is very large such as: in 100 grams of peanut seeds, it provides 590cal, the same amount in soybeans provides 411cal, plain rice provides 411cal. provides 353cal, lean pork provides 286cal, duck egg provides 189cal...

Due to its high nutritional value, peanuts have long been used by humans as an important food source. Direct use (young fruit boiled, old fruit, roasted, cooked...). Press oil to make cooking oil and dry oil to make sauces and other foods.

Recently, thanks to the development of the food industry, people have processed into many valuable food products from peanuts, such as oil, peanut butter, peanut cheese, peanut milk, peanut candy...

Nutrients in 100 grams of ripe and dried peanuts

Energy	2385 kJ (570 kcal)
Carbohydrate	21 g
Sugar	0,0 g
Dietary fiber	9 g
Fat	48 g
Saturation	7 g
Monounsaturated	24 g
Polyunsaturated	16 g
Protein	25 g
- Tryptophan	0,2445 g
- Threonine	0,859 g
- isoleucine	0.882 g
- Leucin	1,627 g
- Lysine	0,901 g
- Methionine	0,308 g
- Cystine	0,322 g
- Phenylalanine	1,300 g
- Tyrosine	1.020 g

- Valine	1,052 g
- Arginine	3,001 g
- histidine	0,634 g
- Alanine	0,997 g
- Aspartic acid	3,060 g
- Axit glutamic	5,243 g
- Glycine	1,512 g
- Proline	1,107 g
- Serine	1,236 g
Water	4,26 g
Thiamine (vit. B1)	0,6 mg (52%)
Niacin (vit. B3)	12,9 mg (86%)
Axit pantothenic (B5)	1,8 mg (36%)
Vitamin B6	0,3 mg (23%)
Folate (vit. B9)	246 mg (62%)
Vitamin C	0,0 mg (0%)
Canxi	62 mg (6%)
Iron	2 mg (15%)
Magie	184 mg (52%)
Phosphorus	336 mg (48%)
Kali	332 mg (7%)
Zinc	3,3 mg (35%)

Note: Percentage of daily requirement for adults as recommended by the US.

(Source: United States Department of Agriculture (USDA) Nutrient Database 2015)

2.2.2. Value for use in agriculture

- Use in livestock:

+ Peanut oil meal has the same nutritional composition as other types of oilseed meal. In animal feed rations, peanut meal can account for 25 - 30%. So peanut oil meal is a rich source of protein for animal husbandry. Currently, peanut meal in the world ranks third in the vegetable oils used in animal husbandry (after soybean meal and cotton) and plays an important role in the development of the livestock industry.

+ The leaves and stems of peanuts with a yield of 5 - 10 tons/ha of green matter (after harvest) can be used to raise livestock.

+ Peanut shell bran: Peanut shell accounts for 25 - 30% of the weight of the fruit. In food processing, people often separate the seeds from the pods, and the pods become a by-product, used to grind into bran for livestock. Peanut shell bran has a nutritional composition similar to that of rice bran used to raise industrial pigs and chickens.

Thus, from peanuts, one can use dry oil, green leaf stalks and peanut shell bran to make fodder for livestock, making an important contribution to livestock development.

- Cultivation value:

Peanut is an important crop for many countries around the world, especially for poor countries in the tropics. In addition to the economic value of peanuts, for oil pressing, in the food industry, in animal husbandry, peanuts also have great significance in soil improvement due to its ability to fix nitrogen (N). As with other legumes, peanut roots can form nodules caused by a symbiotic microorganism called Rhizobia, which is located in the root nodules. These bacteria have a special ability to fix nitrogen from the atmosphere into ammonia (NH_3). The chemical reaction is:

$N2 + 8H+ + 8\ e- \rightarrow 2NH3 + H2$

Ammonia is then converted to another form, ammonium (NH4+), which can be absorbed by some plants by the following reaction:

$NH3 + H+ \rightarrow NH4+$

According to many authors, the fixed nitrogen content of peanuts can reach 70-110 kg N/ha/crop. Also thanks to the ability to fix nitrogen, after harvesting, the chemical composition of the soil is improved markedly, the amount of nitrogen in the soil increases and the abiotic microflora in the soil is enhanced, which is beneficial for the following crops.

2.2.3. Value for industrial use

Peanuts are used for oil pressing industry, peanut oil is used as food and processed for other industries such as (plastics, printing ink, diesel oil, as a solvent for pesticides...). Peanut and soybean meal used for processing into protein includes 3 groups (flour, fine powder, crude protein, concentrated protein), peanut and soybean meal can be processed into more than 300 different products serving the food industry. products, over 300 kinds of agricultural and industrial products.

2.2.4. Some products are made from peanuts

- Peanut seeds used as food directly such as:

+ Peanut fruits: Used to make boiled peanuts, roasted peanuts.

Boiled peanuts

Roasted peanuts

+ Peanut seeds (peanut kernel): Used to process many dishes such as: roasted peanuts, salted sesame peanuts (Pearnut salt dish is made from small roasted peanuts, mixed with salt and sugar to make a popular dipping sauce to taste. eaten with sticky rice, sticky rice, sometimes also with roasted sesame seeds), roasted peanuts puree used to sprinkle in dishes, make cakes, peanut candies, used to cook tea, sticky rice, sticky rice..

Peanut sticky rice

Salted sesame peanuts

Peanut jam

Peanut butter cake

Peanut candy

“Cu đơ” Candy

- Peanut seeds are used as processed foods such as:

+ Peanut butter: Peanut butter is a type of butter made from roasted peanuts. It is a popular food in North America, the Netherlands, the United Kingdom, Australia, and some Asian countries such as the Philippines and Indonesia. Peanut butter is eaten with sandwiches, jams, chocolates, cheeses or mixed with vegetables. The United States is a leading exporter of peanut butter in the world.

Peanut Ice cream

Peanut butter

+ Peanut flour: Peanut flour is made from ground peanuts that have been pressed to remove oil, the fat in peanut flour is lower than in peanut butter but high in protein. The tribe is used to flavor dishes such as stir-fries and soups, and to enhance the rich, aromatic flavors in breads, cakes, and main dishes in the Americas. Peanut powder can be mixed with boiling water to drink like peanut milk.

+ Peanut milk: Peanut milk is a lactose-free drink made by using peanuts soaked in water and ground, filtered, and boiled to drink. Peanut milk is used as a substitute for milk, it is suitable

for people who are lactose intolerant. Same as in the production of almond milk, soy milk and rice milk

Commercial peanut milk in San Francisco (USA) in 1999, received attention as a health beverage in the US.

+ Peanut oil: Peanut oil is a vegetable oil extracted from peanut seeds. Oil extracted from roasted peanuts has a strong peanut flavor and aroma, similar to sesame oil.

Peanut oil

Packing peanuts

Peanut oil is commonly used in China, South Asia and in Southeast Asian cuisines. Peanut oil has a high boiling point, so it is often used for frying food.

According to data from the United States Department of Agriculture (USDA), in 100g of peanut oil contains 17g of saturated fat, 46g of monounsaturated fat and 32g of unsaturated fat.

The main components of peanut oil are fatty acids such as oleic acid (46.8%), linoleic acid (33.4%), and palmitic acid (10.0%). In addition, it also contains some stearic acid, arachidic acid, arachidonic acid, behenic acid, lignoceric acid and other fatty acids.

Antioxidants such as vitamin E are sometimes added, to preserve the oil.

In the United States, high-quality refined peanut oil has eliminated peanut allergens and is considered safe for everyone, including those with peanut allergies.

Refined peanut oil in the US is exempt from allergen labeling laws.

Nutritional composition in 100g of peanut oil

Energy	3,699 kJ (884 kcal)
Starch	0 g
Fat	100 g
Saturated fat	17 g
Monounsaturated fat	46 g
Unsaturated Fats	32g
Protein	0 g
Vitamins E (105%)	15.7 mg
Zinc (0%)	0.01 mg
Cholesterol	0 mg
Selenium	0.0 mcg

(Source: United States Department of Agriculture (USDA), 2015)

2.2.5. Peanuts are used as medicine

- According to Traditional medicines:

The parts of the peanut tree that are used as medicine are very precious, including the stem, wings, leaves, fruit, kernel and outer membrane of the kernel, peanut oil... are all medicines that have been used for a long time in traditional medicine and in medicine.

Peanuts have a sweet, fleshy, fatty taste; It has the effect of tonifying spleen, nourishing taste, laxative, laxative, laxative, expectorant, regulating blood and qi, swelling,

hemostasis, diuretic, increasing milk secretion, cooling throat, lowering cholesterol, anti-aging.

The Chinese give this nut names such as: fruit of immortality, sugar with bean paste...

Peanut is used to treat weakness (overwork), labor, combined with cinnamon and ginger, to soothe stomachaches. Stems and leaves are used to treat colon gas.

However, it should be noted that people with low body weight stagnation and diarrhea should abstain from eating peanuts. Or eating too much roasted peanuts will easily get burned (discomfortable people). Absolutely do not eat peanuts that have been molded.

Here we would like to introduce some traditional medicines from peanuts:

(1) Cure cough with a lot of phlegm: 30g peanut kernels, cooked until then mixed with 30g honey, eaten twice a day will cure.

(2) Cure a long-term cough that does not go away: Human peanuts plus jujube, honey, each take 30 g of decoction to drink water, drink 2 times a day.

(3) Cure cough for a long time, little phlegm: 15g peanut kernels, 15g sweet almonds and then crushed. Take 10 g each time, mix with a little honey, mix with boiling water and eat.

(4) Cure chronic tracheitis: Eat 30 g of peanuts every day in the morning and evening.

5) Treatment of hoarseness: Cook 60-100 g of peanuts and then eat (including the outer shell of the bean kernel). Eat once a day, if eaten with honey, the effect is better.

(6) Treatment of high blood pressure, high blood fat:

- Peanut kernels cover the whole shell and then soak in vinegar, then cover the mouth of the jar. After a week, take out the soaked beans to eat, eat 10 seeds each time, eat 2 times a day. (According to vietbao.vn).

- Take 125g of hard shell of peanuts (can be crushed), cook to drink water, 10g each time, drink 3 times a day. (According to vietbao.vn).

- Peanut leaves, young peanut stalks 30g each, excellent for drinking water, 1 month per day. (According to vietbao.vn).

- Take 100g peanut shell, drink water instead of tea during the day. Or ground peanut shells, finely ground, sifted, stored in sealed jars for use gradually. Daily use 2-3 times, each time 9g, use warm water to cure the drug.

(7) Treatment of anemia: - 100g peanut kernels, jujube, red sugar 50g each, well cooked, eat once a day.

- Peanuts, red beans, green beans, 30 g each; Red sugar, white sugar, 10g alum each, then cooked until smooth, eat once a day. (According to vietbao.vn).

- Seeds of peanuts, lotus seeds with skin removed and lotus center 30 g each; crane starter 15 g; 9 jujubes, a little red sugar, then add 300ml of water and cook until soft, eat 1-2 times a day.

(8) Treatment of leukopenia: Thin film wrap 10g peanut kernels, 10 jujubes, cook. Peanuts, seeds (bobo seeds), small red beans, jujubes, 30g each, cooking, once a day.

(9) Cure stomach ulcers and duodenal onions: 100g peanuts cooked with pork or chicken eggs to eat. You can also take 2 tablespoons of cooked peanut oil in the morning, then start eating breakfast after half an hour. Use this way for 1-2 weeks continuously to see results.

(10) Cure blood in the urine due to exercise:

- Peanuts, lotus seeds have removed the hard shell and lotus center 30 g each. After boiling, let it simmer on low heat, then add 1 tablespoon of sugar to cook again, eat it after a while, eat once every 2 days.

- The outer shell of the peanut kernel is about ½ cup, dry roasted and then crushed, mixed with water and drank 1-2 times a day.

(11) Cure rhinitis: 30g peanuts cooked, add a little rock sugar and eat it all during the day.

(12) Treatment of joint pain: 60g peanut root, cooked with a little lean pork and then eaten.

(13) Cure foot edema: Take peanut kernels (leave the shell membrane), bare skin, and cook garlic into a very good soup.

(14) Cure spermatozoa: 6g peanut shell, cook and drink 2 times a day.

(15) Cure chronic nephritis: Use peanut kernels, roasted lentils with red sugar to eat, or peanut color with jujube to drink.

(16) Cure nervous weakness, insomnia: Use fresh peanut leaves (may include branches) 100g or 40g dried branches and leaves, put in a pot, fill with water, put on the stove to boil, then simmer more 10 minutes is fine. The distilled water is divided into 2 drinks in the morning and in the evening. Liaoning Hospital (China) has tested using this remedy to treat insomnia, the results show that after taking the drug 4-7 days, in the majority of patients, sleep is improved to the most extent. determined. The drug also has the effect of regulating blood pressure and cholesterol levels in blood serum.

(17) Cure malnutrition causing edema: Take peanut kernels stewed with carp and wine to eat.

(18) Cure lack of milk, pregnant women with constipation: Take the peanut kernels to stewed with pig's feet to eat.

- According to medicine:

Modern medical research shows:

+ Peanut kernel has the following effects: Increase energy, nourish the body, lower blood pressure, reduce blood fat and stop bleeding.

+ Silk shell (thin shell covering peanut kernel) has the effect of stopping bleeding, curing bleeding and stimulating the spinal cord to create platelets.

+ Peanut shell (hard outer shell of peanut) has the effect of lowering blood pressure and reducing blood fat.

+ Stems and leaves of peanuts: In addition to lowering blood pressure and reducing blood fat, it also has sedative effects, anti-insomnia.

Modern medicine also has many studies on medicinal properties from peanuts. Here are some of the recorded results about the effects of peanuts:

(1) Reduce the risk of birth defects: The source of folic acid contained in peanuts is essential for women during pregnancy. Many studies show that women before or during pregnancy, if supplemented with 400 micrograms of folic acid per day, can reduce the risk of having a baby with a neural tube defect by 70%;

(2) Stabilize blood sugar: 1/4 cup of peanuts can provide your body with 35% of the daily need for manganese. Manganese is a mineral that plays a role in the metabolism of fats and carbohydrates, helps in calcium absorption and maintains blood sugar stability;

(3) Preventing gallstones: Maybe this will come as a surprise. But over 20 years of research, it has been shown that eating 1 ounce (equivalent to 28.35g of peanuts or peanut butter) for a week reduces the risk of developing gallstones by 25%;

(4) Prevention of depression: Peanuts are also a rich source of the amino acid tryptophan, which is necessary for the production of serotonin. Serotonin is beneficial for the brain, helping to improve mood, reduce depression.

(5) Enhance memory: Why are peanuts listed as food for the brain? That's because the source of vitamin B3 and niacin contained in peanuts has many health benefits, including improving brain function and promoting memory performance.

(6) Lowers cholesterol: Nutrients that boost memory energy also help reduce and control cholesterol levels. In addition, these substances can also cut bad cholesterol and increase good cholesterol, which is beneficial to the body.

(7) Cardiovascular protection: According to many studies, regularly eating legumes can reduce the risk of cardiovascular disease. Peanuts are rich in unsaturated fats, which are good for the heart. Besides, it also contains powerful antioxidants, typically oleic acid. Eating a handful of peanuts 4 times a week can help you avoid cardiovascular diseases as well as coronary heart disease.

(8) Fights dementia in old age: Research also shows that the significant source of niacin found in peanuts can reduce the risk of Alzheimer's disease by 70%. Eating 1/4 cup of peanuts per day will give you 1/4 of your daily need for niacin.

(9) Cancer prevention: Phytosterols found in many vegetable oils, nuts, including peanuts not only help protect the heart by limiting cholesterol absorption, but can also prevent cancer by inhibiting tumor growth.

(10) Reduce the risk of weight gain: Eating peanuts or nuts regularly can reduce the risk of weight gain. Previous studies have shown that people who eat peanuts and nuts at least twice a week are less likely to gain weight than those who almost never eat them.

However, in the medicine, there are also warnings when using peanuts:

(1) Aflatoxin: Peanuts and peanut products are susceptible to the fungus Aspergillus flavus, which produces aflatoxin toxin, which can cause direct food poisoning and is a carcinogen. Therefore, you should be careful when eating peanuts and peanut products, make sure to choose the right safe products.

(2) Peanut allergy: A type of food allergy, a type of hypersensitivity reaction to dietary substances from peanuts that causes an overreaction of the immune system that in a small percentage of people can lead to severe physical symptoms… The prevalence of peanut allergy in the United States is 0.6% of the population with varying degrees of severity. The most severe allergies can often lead to anaphylaxis, an emergency situation that requires immediate attention and treatment with epinephrine. Peanut allergy symptoms can include vomiting, diarrhea, angioedema (swelling), acute abdominal pain, severe atopic eczema, asthma, and, in the worst cases, anaphylaxis.

2.2.6. Other uses of peanuts

- Peanut oil for industrial use

+ In medicine: Peanut oil is used to make soap in civil and medical applications. In the US, according to research by George Washington Carver, peanut oil can be used as a massage oil to beautify the skin for women.

+ In fuel: In France in 1900, at the 1990 Paris exhibition, the Otto company, at the request of the French government, demonstrated that peanut oil could be used as a fuel source for diesel engines. , this opens up a first prospect of biodiesel technology.

Chapter III.
BOTANICAL CHARACTERISTICS AND ECOLOGICAL DEMAND OF PEANUT

3.1. Botanical characteristics of peanuts

3.1.1. Germ and hypochlorite axis

During early germination, the cotyledon has almost half of cotyledon leaf and other half cotyledon roots. Lateral roots do not appear on day 2, but they may be fully grown by day 5.

The hypochlorophyll axis is located between the root and leaf of cotyledons, which are long enough to lift the cotyledon leaf above the ground. If sowing is deep, the axis of chlorophyll is long and vice versa.

Germination process of seeds

Germination ends on the 10th day and the hypothalamic axis is about 10 - 11 cm long, this time it is no white more but turns brown like the roots, after 4 weeks it is no longer distinguishable between the chlorophyll axis and taproot as well.

3.1.2. Roots and nodules

- Roots

The peanut root system is a taproot, consisting of a main root and an accessory root. The main root comes first, the secondary roots come after, the main root of peanuts develops from the root embryo.

The main roots of peanuts develop rapidly during early growth. Observed in the Spring crop in our country, 10 days after sowing, the main roots are 5cm deep. After 20 days of sowing, the main root is 10cm deep and the root system has developed. When the peanut has 5 leaves, the peanut root system is relatively complete with 1 main root from 15 - 20 cm deep, the root system develops with 2nd, 3rd grade roots and nodules have the ability to fix nitrogen.

Under favorable conditions, the main root can reach up to 1m deep. However, the majority of rootlets are distributed in the topsoil from 0 to 30 cm (accounting for 60 - 80% of the weight). The weight of roots varies depending on the cultivation conditions, soil properties, water regime in the soil. Early and healthy root development is an important basis for increasing peanut yield.

- Nodules

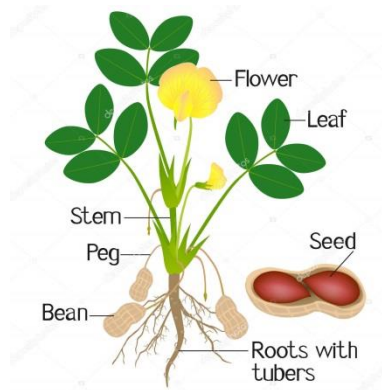
Peanut roots have the ability to fix atmospheric nitrogen by symbiotic Rhyzobium bacteria. Because of that, peanuts can partly meet the requirements for nitrogen use.

The quantity and quality of nodules on the roots depend on many factors such as chemistry, soil physics, fertilizer regime (especially nitrogen). The number of nodules on a tree can be up to thousands of nodules (800 - 4,000 nodules). The quality of nodules depends on the amount of lighimoglobin and the number of ribosomes. Nodules with a lot of lighimoglobin and ribosomes will have a pink color, with a large nodule mass, the ability to fix nitrogen is high.

3.1.3. Stems, branches and leaves

- Stems

The peanut tree grows by sprouts growing at the top of the tree and the top of the branches, the trunk is soft, when it is young, it is round, after flowering, the upper part of the stem has hollow branches, or has edges. The body has 15 - 25 segments, at the bottom of the short segment, in the middle and above the body is long.



The peanut stem has two segments: the lower part of the cotyledon (root neck) and the upper part of the cotyledon. The lower segment is a long or short sprout depending on the depth of seed filling. If you fill the seeds too deep, this long stem will affect the growth of the upper height.

Stem color: peanuts stem are often blue or purple red, some varieties have purple eyebrows, white hairs on the body, more or less depending on the variety. The trunk is relatively tall (30-40 cm) and depends mainly on genetic traits of the breed. Besides, plant height also depends on environmental and nutritional conditions.

- Branches

The development of peanuts depends on genetic characteristics. Commonly grown peanut varieties in our country usually have two levels of branches: first-class branches and second-level branches.

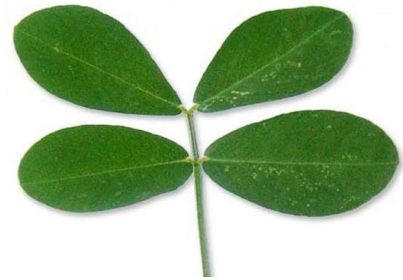
- Level 1 branches: Level 1 branches arise from the 1st to 6th segments of the main body, equivalent to 7 branches, but usually only branches at the 1st - 4th segments will give firm fruit (5 level 1 branches from the base up).

The first two branches grow from the axils of the cotyledons. Because the two cotyledons are almost opposite, these two branches are also located in nearly opposite positions through the main stem and appear at the same time. In fact, it is very difficult to distinguish the first and second branches, so they can be considered as the first pair of branches. This pair of branches appears when the plant has 2 - 3 true leaves. Branches 3^{rd}, 4^{th} grow from the axillary of true leaves 1, 2. Peanut leaves grow apart, but the 2nd segment is usually shorter than 1 and 3, so branches 3 and 4 are closer together and form a pair of 2nd and 5^{th}, 6^{th} branches are also relatively closer together, forming the third branch.

- Level 2 branches: Level 2 branches appear when there are 5, 6 leaves on the main stem. The number of branches of a contact is directly related to the number of fruits. Level 2 branches only arise at the first node of the first 2 level 1 branches, so there will be a maximum of 4 level 2 branches on a peanut tree.

The number of flowers and fruits in the first layer of branches (pairs of branches 1, 2 and level 2 branches) account for about 50 - 70% of the total number of flowers and fruits/tree; The second layer of branches only accounts for 20 - 30% and the third layer is usually less than 10% of the flowers and fruits.

- Leaves



Peanut leaves are feathery compound leaves consisting of 2 pairs of leaflets, petioles 4-9 cm long. There are often metamorphosed leaves with 1, 2, 3, 5 or 6 - 8 leaflets. Stemless leaflets opposite, often oval, elongated, ovate inverted, light green or dark green, yellow.

Light or dark depending on the variety. Leaf color varies according to growing conditions. (The soil is too watery, the leaves are yellow green, the dry soil is dark green). Moderate moisture, open soil, strong N-fixing bacteria provide enough N for plants, leaves are dark green. Can see the color to judge the nutritional status of the plant.

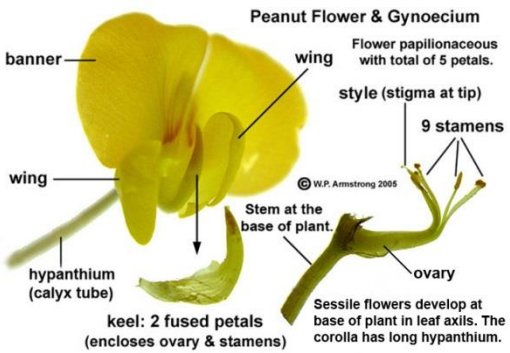
+ The development of leaves

On the main stem of the peanut plant, the number of leaves can reach 20-25 leaves. When harvested, the total number of leaves on the plant can reach 50-80 leaves. However, because the old leaves fall early, the number of leaves on the tree is highest at the time of fruit and seed formation, usually reaching 40-60 leaves. The growth of peanut leaf area from sprouting to fruit and seed formation corresponds to the growth of stem height. The period from flowering to fruit and seed formation is the period when stems and branches develop strongly. The maximum leaf area is usually at the fruit-seeding period (30-35 days after flowering), then gradually decreases due to the shedding of old leaves.

Therefore, planting at a reasonable density to achieve a high leaf area index, creating a well-developed leaf set is one of the measures to increase peanut yield.

3.1.4. Flowers and fruit beams

- Flowers



Peanut flowers are bisexual flowers, so they have all the components: sepals, petals, bracts, stamens and pistils. Peanut flowers are yellow, stemless. Flowers develop into clusters of flowers, each cluster consists of 2-7 flowers, sometimes up to 15 flowers. A bunch of flowers grows from a nutrient branch in the axils of a fully developed or incomplete leaf. On each node of the inflorescence there is a sheath and in that leaf axils a very short flower spike develops, the flower spike bears a leaf that is usually forked and in the axils of this leaf is the flower sprout. Flower branches develop on the axis of inflorescence according to the formula of 2/5 chlorophyll.

Thus, the inflorescence develops as a nutritious branch with a very small size.

- Fruit beams

After pollination, the fruit beams grow long and then burrow into the ground, when they go down about 4 - 6 cm, they begin to turn horizontally to form young fruits. If the fruit beam grows longer than 15 cm without contact with the soil, it will wilt, not form fruit or if it does, the seeds will be small and flat. The beams are geotropic, grow straight into the soil and the fruit develops in a horizontal position between 2 - 7cm below the ground.

3.1.5. Fruits and seeds

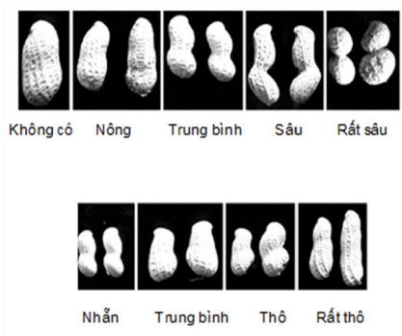
- Peanut (bean) fruit

The peanut fruit is cocoon-shaped, 1 - 8cm long, 0.5 - 2cm wide, one end has a mark with rays, the other end is a beak, the middle part is tight, separating the seeds, each fruit contains from 1 to 4 seeds. and usually have 2 seeds. The beak, constriction, size, and weight of the fruit are the characteristics to classify peanut varieties.

So peanuts fruit form from the outside to the inside, the shell comes first, the seed comes after, the flower blooms for 30 days, then the shell is formed. The flower blooms for 60 days and the seeds are formed. Because the inner rind between the ovule and

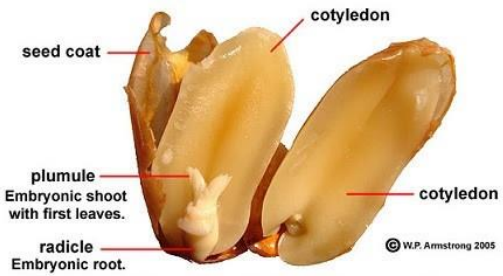
the outer pod grows rapidly, it forms a very thick layer of soft tissue. Then to the stage of seed formation, the bigger the ovule, the more the inner shell collapses and disappears when the seed is old.

* Fruit shape:



The shape of the fruit varies depending on the variety. The beak is obtuse, slightly obtuse or pointed, the waist is clear, the waist is clear or not, the veins on the shell are more or less the indicators used to classify peanut varieties. The color of the pods varies a lot according to the external conditions of the peanut, all of which are dried. In sandy soil, the pods are bright yellow, glossy. Fruit waist and rind surface smoothness also vary widely depending on the variety.

- Peanut seed



Peanut Seed (*Arachis hypogaea*)

Peanut seed consists of silk shell and embryo. Silk shell is a very thin shell covering the embryo, with pinkish, white pink, red, dark red, light purple, dark purple colors. If stored for a long time and not well, the silk skin turns light brown, with silver spots and oil stains.

The seed shape is round, oval or short, the part that comes into contact with the neighboring seed is usually straight. In a fruit, the seeds in the anterior compartment are long and small, the seeds in the posterior compartment are short and large. Silk shell color can be white pink, red purple. Textured or not. Silk skin color is less influenced by external conditions is a similar characteristic. The seed coat color observed after drying, the new shell is correct. The number of seeds in a fruit changes mainly due to variety, less affected by external

conditions. Most fruits have 2 seeds, some varieties have 3 seeds, 4 seeds. The fruit has 1 seed. Usually like large fruit, the fruit has few seeds, like the small seed, the fruit has many seeds. Choosing varieties with many fruits, fruits with many seeds and large seeds means to increase high yield. The percentage of seeds and fruits varies from 68 to 80%; Varies depending on variety and growing conditions. Peanuts contain oil up to 50%.

3.1.6. The growth and development stages of peanuts

- Seed germination period

In favorable conditions in the field, the first 8 hours after sowing, the seeds have absorbed 70 - 90% of the water needed and the peanut seeds absorb water mainly in the first 24 hours when they are put into the soil. The water absorption capacity, the amount of water absorbed and the time of water absorption depend on the vigor of the seed, the moisture content of the seed, the moisture content and the soil temperature.

Germination process of seeds

The soil is fertile and the temperature is suitable, the time from sowing to the time when the two cotyledons rise above the ground is about 6 - 7 days (about 10% of the seeds have cotyledons out of the ground).

The process of seed germination is manifested primarily by the root embryo emerging from the seed coat and rapidly growing into the depth of the soil. Simultaneously, the fast-growing lower stem of the cotyledon is as long as the depth of seed filling and brings the two cotyledons above the ground. The upper part of the cotyledon grows rapidly, causing the 2 cotyledons to separate and the germ to appear clearly.

- Seedling and pre-flowering period

+ Seedling stage: Determined from the time the plant spreads its cotyledons until the plant has 3 true leaves. At this time, the peanut root system is only fully developed, with enough main roots, auxiliary roots and nodules, but the activity of the roots is still weak. Especially at this stage, nodule bacteria are invading and forming but not yet able to fix nitrogen, they take nutrients from seedlings. Therefore, it can be seen that the seedling period is a period of nutritional crisis, especially nitrogen nutrition.

+ Pre-flowering stage:

This is the period when the plant has from 4 to 8 leaves, due to the strong root activity, the growth power also gradually increases (the growth rate is about 0.3 - 0.6 cm/day).

- The period when the peanut plant flowers, peg, and makes fruit

The flowering period of peanuts is about 30 days, but the accumulated dry matter accounts for 40% of the total dry matter. This is a critical period in the plant's life cycle.

- The period of fruit and seed formation

At the end of the flowering period, many rays have penetrated the soil, and the tree enters the fruiting period.

At this stage, the leaf stem gradually slows down and may stop growing, and the fruit grows rapidly in size and weight. The development process of peanuts is divided into two stages: the pod formation stage and the seed formation stage.

After stabbing the ray into the ground for 5 - 6 days, the new ray expands to form a stick, the growth point changes to a horizontal direction.

After 9 days, the flower bulb turns into a bird's beak, the seeds (at the base) begin to swell, forming young fruit, longitudinal glands of the pods.

After 12 days, fruit size doubled at 9 days.

After 20 days, the length of the fruit increased by 5 times, the width was 3 times, the fruit was shaped like a succulent rind, and two seeds were clearly visible.

After 30 days, the seeds develop very quickly, the pods are hard, and the seeds are shaped.

After 48 days, the pods are dry, have clear veins, the seed coats are thinner and bear the color of the seed coat as prescribed.

After 60 days, the seeds are fully ripe and can be harvested.

3.2. Ecological conditions and external requirements of peanuts

With plants, climate ecology and soil are considered as two factors determining the survival of trees. Fully exploiting their advantages will help plants grow, develop well, give high yields and bring many other economic benefits.

- Climate factor

Climate is a factor that greatly affects the growth, development and yield of peanuts as well as the distribution of peanuts in the world. In which, heat and water regimes directly affect the growth cycle, vitality and yield of peanuts.

* Temperature:

Peanut likes a stable temperature, the most suitable temperature is from 25 - 33^0C. However, peanuts germinate fastest at temperatures of 30 - 32^0C. If the temperature is low, the germination time is prolonged and below 15^0C the seeds do not germinate. High temperatures above 41^0C adversely affect germination, above 54^0C or below 5^0C seeds lose their germination power.

The time from growing to flowering sooner or later depends on the temperature. Depending on the characteristics of the

variety, the optimal temperature is 24 - 28^0C, the temperature is below 24^0C, the plants have few flowers and are not concentrated. If the temperature drops to 18^0C this time is extended. The large day-night temperature difference adversely affects the growth and the time of first flower appearance. The temperature range of day and night reaches 6^0C, suitable for pollination and fertilization.

* Humidity:

Peanut is often considered a drought tolerant crop. In fact, peanuts are only relatively drought tolerant at a certain growth period. Lack of water at any time affects yield. Water status in the soil greatly affects the growth and development processes of peanuts. In the condition of lack of water, the roots grow poorly, so the leaves and stems grow poorly, the flowers and fruits are few. Peanut leaves are limited, smaller and thicker, the number of stomata is less, and the size and number of water-conducting cells change.

Total rainfall and rainfall distribution during the growth cycle of peanuts greatly influence the growth stages and final yield of peanuts. In our country, the climatic conditions are generally suitable for the requirements of peanuts. In the Northern provinces, the planting season for peanuts is mainly from February to September. The early sowing time can be January and the late sowing season can be harvested in December.

* Light:

During germination, light inhibits the rate of water absorption of seeds, root growth and elongation of embryonic shafts. In the fruiting period, the rays in the light grow slowly and the fruit can only develop in the dark. The number of hours of sunshine/day has a significant effect on the growth of peanuts. The blooming process is favorable when the number of sunshine hours reaches over 200 hours/month. In the northern provinces in the spring crop, it is advisable to arrange the planting time for

peanuts to flower in April of the solar calendar. If peanuts flower early (March), the number of flowers/day will decrease, and the total number of flowers/plant will decrease. So in the climatic factors, light is the factor that has less influence on the growth and yield of peanut than other climate factors.

- Soil for Peanut cultivation

* Soil:

Soil for peanut cultivation does not require high natural fertility, but because of the physiological characteristics of peanuts, peanuts require strict physical conditions of the soil. Good soil for peanuts is usually light, light-colored, loose, well-drained soil. Soil for peanuts must always be porous to satisfy the following basic requirements:

- Roots thrive in both depth and breadth.

- Sufficient oxygen for the growth of nodule microorganisms and nitrogen fixation.

- The beam hits the ground easily.

- Easy to harvest.

In which, the requirement for the piercing and development of the fruit is the specific requirement of peanuts. Therefore, porous or dry soil will interfere with the process of irradiation and fruit formation. In clay soils, the soil is easy to stick, peanuts are usually smaller than the average size of the variety.

So the first criterion for choosing peanuts is soil mechanical composition: The soil suitable for planting peanuts must be light soil, with coarse sand composition, fine sand more than clay, in general, sandy soils, light sandy soils, has pellet structure, soil density 1.1-1.35 degrees, hole 3850%, is suitable for growing peanuts. These types of soils are easily porous, have good water holding capacity and drainage.

Peanuts require soil with a slightly acidic pH, near neutral (5.5 - 7) which is suitable for peanuts. However, peanut's tolerance to pH is very high. Peanuts can tolerate pH 4.5 to 8 - 9. Peanuts prefer light soil, organic matter content less than 2%, on these soils, peanuts often reach large fruit size, light skin, easy harvest, Both fruit and seed quality are high.

- The role of nutrition

+ The role and absorption of organic fertilizers:

Organic fertilizers used for peanuts include manure, green manure that has been processed, rotted for at least one month.

Organic fertilizer for peanuts not only improves the humus content in the soil, but also provides the plant with a part of

nitrogen, phosphorus, potassium and trace elements, and enriches the microorganisms in the soil.

+ Role and absorption of nitrogen (N):

Nitrogen is a component of amino acids that mainly make proteins, and nitrogen is present in the chlorophyll structure, in the composition of cell protoplasm.

Lack of nitrogen, poor growth and development, yellow leaves, red-brown stem. If there is a serious deficiency, the tree will die after two months of planting.

+ Role and absorption of phosphorus (P):

As an important element in the metabolism of organic compounds, phosphorus participates in the composition of

nucleotites, nucleic acids, Nucleproteites, Phospholipids and in the enzyme system in glucose exchange... energy metabolism in the process of photosynthesis. and respiration.

For peanuts, phosphorus is an essential element during growth and development, increases oil content, strongly promotes root growth and nodule formation, phosphorus

enhances immobilization capacity. plant protein. Soybeans, like peanuts, use phosphorus throughout their growth and development. In the late stage, phosphorus changes from leaf stem to fruit and seed, in soybean seeds, the phosphorus content is from 1.35 - 2%, 2 times larger than that of Cove beans and mung beans but very little compared to peanuts.

- Expression of Phosphorus deficiency: Plants lack phosphorus, grow poorly, leaves turn dark to purple (due to antoxian accumulation), defoliate, affect fruit, seed, and ripening quality peanut.

+ Role and absorption of potassium (K):

Potassium plays an important role in the growth of plants such as:

Participating in the process of photosynthesis, ie synthesizing glucose and carbohydrates;

Involved in the formation of protein (when applying potassium increases the ability of plants to absorb N);

Play the role of water balance, enhance resistance to pests and diseases, enhance resistance such as: cold resistance, drought resistance.

Plants absorb the highest potassium in the flowering period, at the end of the period, up to 50% of the total amount of plants absorbed.

For peanuts, potassium is an essential element for fat accumulation. In the process of biosynthesis, it participates in enzyme activity as a regulator and catalyst. Therefore, without potassium, biosynthetic processes cannot be carried out.

- Expression of potassium deficiency: Lack of potassium shows that the leaves change color (6^{th} leaf or more), the leaf edges are burned, and the leaves are bent prematurely.

+ Role and absorption of calcium (Ca):

This is the basic element of the soil that controls the pH of the soil, and is an essential nutrient element for peanuts. At the right pH they prevent the toxicity of aluminum and other toxic elements, create favorable conditions for the activity of nodular bacteria and increase the effectiveness of other elements.

Calcium exists in peanuts in the form of calcium pentate, which is a cell binder and is required for cell division.

Expression of Calcium deficiency: Lack of calcium, the fruit is less firm, the stem is black, the peel and rays are brittle, the color is dark, the percentage of effective flowers is reduced, and the roots are poorly developed.

In addition to the above mineral elements, other elements such as magnesium (Mg) and sulfur (S) are also essential for peanuts. However, because these elements are often present in some forms of inorganic fertilizers and in some chemical pesticides, the effectiveness of these two elements is not evident in the experiments.

+ The role of trace elements: On light soils planted with peanuts, the phenomenon of lack of trace elements is very clear. The trace elements necessary for the operation of peanuts are copper, iron, zinc, Molybdenum, Bo, and Manganese. In which, two elements Molybdenum (Mo) and Bo (B) are necessary and show the most obvious effect.

Molybdenum (Mo): Mo has the effect of increasing the activity of nodule bacteria, increasing the assimilation of nitrogen. Most of our country's peanuts are deficient in Mo. When peanuts were sprayed with Mo, yield increased by 16%. Mo deficiency causes typical nitrogen deficiency, so the effect of Mo is very obvious in places where N is deficient. Mo deficiency has poor bacterial activity and poor root development. However, peanuts require very little Mo. People often use Mo in the form of ammonium molybdate or sodium

sodium molybdate. When liming increases the effectiveness of Mo.

Bo helps the process of root formation is good, the fruit rays are not cracked, limiting the penetration of fungi and diseases. Deficiency of Bo reduces the rate of fruit set, seeds are flat, seed vigor is reduced, seeds develop abnormally (the concave ring between the seeds is large and when the leaves are dropped prematurely, they are brown). When applying Bo, the effective flower rate increases and the seed quality increases. When spraying boric acid solution can increase yield by 4 - 10%.

+ Using microbial fertilizers:

The world has used microbiological fertilizers (Nitrazin) popularly in the past 30 years. Vietnam has been intensively researched and used since 1980. Microbial fertilizers are suitable for all peanut varieties and increase yield.

When using microbial fertilizers should pay attention: the storage time of this fertilizer is very short (about 4 months in relatively good storage conditions).

On the basis of microbial fertilizer production technology, people combine phosphorus and a few other macronutrients and micronutrients into the composition; with the purpose of creating convenience for consumers and improving the efficiency of biofertilizers. However, when using it, it is necessary to comply with the terms of use.

+ Using synthetic fertilizer NPK: This type of fertilizer is being used commonly and is effective for many crops, especially for peanuts

+ Using fertilizers sprayed on leaves: These fertilizers help plants quickly absorb nutrients, especially trace elements. For peanuts, pay special attention to spraying in the period when the tree has 3 leaves.

Chapter IV.
VARIETY AND SEED PRODUCTION TECHNOLOGY

4.1. Varieties

4.1.1. The concept of varieties

- Varieties are a group of plants with similar economic, biological and morphological characteristics that, in a suitable environmental condition and cultivation technique, produce products that meet human requirements.

- Varieties must ensure DUS (Distinctiveness, Uniformity and Stability) according to National Technical Regulation QCVN 01-67:2011/BNNPTNT issued in Circular No. 67/2011 /TT-BNNPTNT dated October 17, 2011.

- Varieties must have the value of VCU (Valued of Cultivation and Use) according to National Technical Regulation QCVN 01-57:2011/BNNPTNT issued in Circular No. 48/2011/TT - BNNPTNT dated 5/7/2011.

4.1.2. The role of peanut seeds in production

Agricultural plant varieties in general and peanut varieties in particular are the most important factors determining productivity, product quality and production efficiency. In today's production conditions, high-quality peanuts are considered a prerequisite for success, the number one important issue in production. When starting a new production crop, farmers often think of choosing the right peanut variety for cultivation. Because, good seed plays an important role in increasing productivity, quality and efficiency of investment.

Therefore, good quality peanut varieties play an important role in production and are always of special interest to farmers.

Currently, the source of peanut seed for mass production is mostly self-seeding and partly bought floating in the market, so the quality of peanut seeds is often not guaranteed in terms of purity and germination rate, leading to risks. during production.

4.1.3. Some popular peanut varieties that grown today

Peanut varieties used by farmers in the Northern provinces are quite diverse, such as:

- Early ripening group (3 months peanut): Cam Lo bunch, Cuc Nghe An,...

- Group of medium ripeness (4 months peanuts): L20, L27, L14, TK10, L18, L23, L26, TB25, Nghe An Sen, Lot Lotus, Senlai, V79...

Within the framework of this book, we would like to introduce to our readers some peanut varieties with a growth period of 110130 days (in the group of medium maturity). These are newly selected peanut varieties with many valuable characteristics such as: high yield; medium to large grain size; mild to moderate foliar diseases; wide adaptability; subject to intensive farming.

** L20 peanut variety:*

- Origin: The L20 peanut variety was researched, selected and created from the combination of BG78 x ICGV 87151 by the Department of Immunogenetics and the Center for Agricultural Research and Development of the North Central Region (now the Agricultural Science Institute of Northern central Vietnam-ASINCV) has been recognized by the Science and Technology Council of the Ministry of Agriculture and Rural Development for official production under Decision No. 2953/QD-BNN-TT dated July 7, 2017.

- Characteristics:

The peanut variety L20 is a peanut variety that can adapt to many ecological regions, especially in the North Central region. The peanut variety L20 belongs to the Spainish plant form, is highly tolerant of intensive cultivation, and has light green leaves. L20 has a medium growth period. Spring crop is about 115 - 120 days and autumn-winter crop is 105 - 110 days. L20 is quite resistant to major pests and diseases.

The L20 variety has a yield of 35 - 50 quintals/ha, 11 - 20% higher than the control L14. The weight of 100 fruits is 150 - 160g, the weight of 100 seeds is over 60g (belonging to the group with average fruit weight and seed weight), the seed coat is pinkish white, the kernel ratio is quite high over 70%.

** L14 Peanut variety:*

- Legumes Research and Development Center - Field Crops Research Institutes. The variety was selected according to the population selection method from the QD5 peanut line from the imported peanut corporation of China. The variety is officially recognized as

TBKT variety according to Decision No. 5310/BNN-KHKT dated November 29, 2002.

- Characteristics:

L14 gives high yield and has many good agronomical characteristics. The variety is in the form of a Spanish plant, upright stem, compact canopy, good fall resistance, dark green leaves. Growing time: 120 - 135 days (spring crop); 90 - 110 days (autumn and autumn-winter crops). Main body height 30 - 50 cm, large fruit, shallow waist, shallow veins, pink silk skin, 100 fruit weight 155 - 165 g, 100 seed weight 60 - 65g, kernel/fruit ratio 72 - 75 %. Yield is 45 - 60 quintals/ha. Resistance to pests and diseases: relatively high resistance to leaf diseases (brown spot, black spot, rust...) Tolerant of intensive cultivation for high yield.

** L23 peanut variety*

- Origin:

L23 is a peanut variety selected by the Center for Research and Development of Legumes - Institute of Food Crops and Food Plants.

Varieties were selected from sources collected in 2001. L23 was recognized as TBKT variety in 2008 according to Decision No. 111/QD-TT-CCN dated June 3, 2008.

- Characteristics:

The growing time of spring crop is about 110 - 120 days, autumn-winter crop is from 100 to 105 days. Hardy tree, main stem height from 45 - 50 cm, compact canopy, dark green leaves. Fruit medium waist, clearly ribbed, light pink silk skin, highly resistant to intensive farming. Average yield is from 40

to 50 quintals/ha, intensive farming can reach 55 quintals/ha, dry fruit yield is 13 - 23% higher than L14 in Spring crop and 20% in Autumn-Winter crop. The weight of 100 fruits is 145 - 150 grams, the weight of 100 seeds is 58 - 61 grams, the multiplication rate is 70 - 72%. L23 has drought tolerance, high resistance to rust, brown spot, bacterial wilt and sucking insect, medium resistance to black spot disease, good shedding resistance.

* L26 peanut variety

- Origin:

Peanut variety L26 was selected and created from a crossbreeding of peanut varieties L08 and TQ6 according to pedigree method. The peanut variety L26 was selected and created according to the goal of good quality, large grain size, for export. The variety is recognized for trial production according to Decision No. 233/QD-TT-CCN dated 14/7/2010.

- Characteristics:

Growing time: Spring crop from 120 - 125 days, Winter-Autumn crop from 95 - 100 days.

The peanut variety L26 belongs to the Spanish botanical shape, the leaves are oblong ovate, dark green, the main body is tall (40 - 45 cm), the fruit is large (165 - 185 g / 100 fruits), the veins on the fruit are clear, the beak is medium - clear, kernel ratio is 73 - 75%, seeds are large (75 - 85 g/100 seeds), lotus skin pink and not cracked. The yield is 45 - 54 quintals/ha. L26 is suitable for good soil (light flesh) active irrigation, easy drainage. Suitable for some provinces in the North Central and Northern provinces.

* TK10 peanut variety

- Origin:

TK10 is an imported peanut variety that was selected by Plant Protection scientists from a group of peanut varieties with high yield and pest resistance genes. The peanut variety TK10 was recognized by the Ministry of Agriculture and Rural Development as a trial production variety in 2009 in the northern provinces and recognized as a new plant variety in 2013.

- Characteristics:

TK10 is a strong, fast-growing variety with a strong, upright stem, good resistance to falling. Leaves are oblong, dark green in color. The average number of firm fruits is 14 fruits/tree. The fruit skin is thin, the waist is shallow, the seeds are light pink, the shape is oval, the silk skin is not cracked, the quality is good, the uniformity is high. The average yield of the variety is from 122 - 125 days in the Spring crop, 92 - 96 days in the

Summer-autumn crop and 108 - 110 days in the Autumn-Winter crop. TK10 is suitable for growing on hilly soil, sandy soil, coastal sandy soil, especially suitable for mixed sandy soil and light soil. Weight of 100 fruits is 149.4g; weight of 100 seeds reached 62.4g. The multiplication rate is from 75 to 80%. Crude oil content reaches > 52%. TK10 can be grown in all 3 crops and the yield in 3 crops is the same (39.4 quintals/ha).

TK10 has good resistance to bacterial wilt compared to native varieties, in addition, it is also resistant to black spot disease and some other sucking insects.

* L27 peanut variety

- Origin:

The Lac L27 variety was selected and created by the Center for Bean Research and Development by pedigree selection method from the hybrid giwuax L18 x L16 and has been officially recognized by the Science and Technology Council of the Ministry of Agriculture and Rural Development by decision. No. 142/QDTT-CCN dated April 22, year 2016 for the Northern provinces.

- Characteristics:

The peanut variety L27 belongs to Spanish shape, upright body, compact canopy, good fall resistance, green leaves, healthy growth, large number of fruits/plant (13 - 16.0 fruits),

concentrated flowering, and moderate infection. with leaf spot disease (rust, black spot, brown spot), resistance to bacterial wilt is better than that of L14. Weight of 100 fruits (145 - 152g), weight of 100 hats (50 - 55g), multiplication rate (70 -73%), yield from 32 - 45.4 quintals/ha depending on the season. Medium fruit waist, medium clear veins, pink lotus seed silk skin, is a variety that tolerates intensive cultivation. The L27 variety has a growth period of 95 - 125 days and can be planted in both Spring and Autumn-winter crops on different soils.

4.2. Peanut seed production methods

- Peanut is a plant belonging to the group of self-pollinating plants. However, due to outdated farming practices, peanut varieties, after being put into production, are often degraded due to the mixing of mechanized varieties.

Therefore, in order to keep the purity of the variety, the maintenance, selection and restoration of the breed is an important measure to be done regularly.

- Some terms and definitions used in peanut seed production methods:

- Breeder seed: A pure seed selected and created by the author.

- Pre-basic seed: The seed is propagated from the author's seed or restored from the seed produced by the process of restoring the super-primary seed and meeting the quality standards according to the regulations. determined.

- Basic seed: The seed is propagated from the super-primary seed according to the original seed production process and meets the quality standards as prescribed.

- Certified seed: The seed is propagated from the original seed according to the certified seed production process and meets the prescribed standards.

4.2.1. Pre-basic seeds (G1 G2) producing methods

4.2.1.1. Peanut seed production by seed multiplication or maintenance selection from super-basic seeds

Follow Scheme 1 (Appendix A)

First crop (G0):

a- Evaluation and selection of individuals in the starting material field

When the seed field is 50% flowering, select at least 500 plants. Regularly observe the characteristic morphological traits to select the satisfactory individuals according to the table of characteristic traits of the variety in Appendix C.

3 to 5 days before harvest, make a final assessment and continue to remove unsatisfactory plants, harvest satisfactory plants, wear a numbered tag for each tree to continue the assessment in the room.

b- Evaluate and select individuals in the room.

Measure the quantitative traits of each individual selected in the field, calculate the mean value ($\bar{X}$), standard deviation from the mean (s) according to the following formulas:

Mean value: X

$$\bar{X} = \frac{\sum x_i}{n}$$

Standard deviation from the mean value:

$$s = \sqrt{\frac{\sum (x_i - \bar{X})^2}{n}} \qquad (\text{if } \geq 30)$$

And $$s = \sqrt{\frac{\sum (x_i - \bar{X})^2}{n-1}} \qquad (\text{if } < 30)$$

Where:

s is the standard deviation from the mean value;

x_i is the measured value of the individual (or line), i^{th} (i from 1 ... n);

n is the total number of evaluated of indivisual or lines.

$\bar{X}$ is the mean value.

Select individuals whose values are in the range $\bar{X} \pm s$.

Observe the characteristics of fruit waist, rind surface smoothness, beak and beak shape. Separate the fruit and observe the seed shape and seed coat color.

The seeds of each selected individual must be dried, dried separately until dry, weighed separately the weight of each individual, in grams (take an odd number after the comma), stored separately for planting in the next crop.

Second crop (G1):

Sow the entire seed of the individuals selected in the first crop separately in rows or plots. The number of rows more or less depends on the number of seeds of the individual obtained. Draw a diagram of the seed field, plug in cards (piles) to mark each line.

Regularly monitor from sowing to harvest, do not remove plants of different types, except in cases where it is precisely determined that plants of different types are caused by mechanical interference, they must be removed early before the plants bloom and release pollen. Remove lines with different types of plants, poor growth and development, infected with pests and diseases and affected by unfavorable external conditions.

3 to 5 days before harvesting, make a final assessment of selected lines, collect 10 sample plants from each line at 2 random points for evaluation in the room, do not take surrender plants and trees in the border line.

Discard lines with the mean of any quantitative traits outside the standard deviation and lines with low yields. Store lines in separate bags, write line numbers.

If the number of satisfactory lines is greater than or equal to 70% of the total number of G1 lines evaluated, the mixture of these lines will be converted into super-primary seed lots. After mixing, bagging, labeling, checking seed quality according to regulations. Careful storage to produce original seeds in the next crop. The batch of seeds that meet the requirements of field inspection and seed testing according to the regulations will be certified, declared as super-primary seed batch and used for the propagation of the original.

If the number of lines that meet the requirements is less than 70% (out of the total number of G1 lines evaluated), then continue to multiply and evaluate the lines selected in the third

crop (G2) according to the method of seed restoration in production.

4.2.1.2. Producing peanut varieties by the method of seed restoration in production.

If do not have breeder seeds or bre-basic seeds, bre-basic seeds can be produced by regenerative treatment from seed of a lower quality grade available in production according to Scheme 2 (Appendix A).

The first crop (G0): Perform the same as the first case (G0), section 4.2.1.1

Second crop (G1): The technique of plot arrangement, sowing and evaluation is the same as the second crop (G1), section 4.2.1.1

Satisfactory lines are harvested, dried, cleaned, placed in separate cloth or paper bags, numbered and stored under safe conditions for planting in the third crop.

Third crop (G2):

Seeds of each G1 line were sown in a separate plot consecutively without repeating. Keep track of all the trees on the plot. Eliminate lines with different plants, poorly developed lines or infected with pests. Regularly monitor the removal of plants of different varieties due to mechanical mixing before flowering, do not remove other plants of other types.

Test the lines according to Appendix B.

The remaining lines before harvesting are randomly 10 plants in the middle of the row, set aside and line numbered for evaluation in the room, after evaluation will be mixed with the fruit or seeds of the sampled line. The remaining plants on the row are harvested separately.

Mix seeds of these lines into batches of super-primary seeds. After mixing, bagging, labeling, checking seed quality according to regulations. Careful storage to produce original seeds in the next crop. The batch of seeds that meet the

requirements of field inspection and seed testing according to the regulations will be certified, declared as super-primary seed batch and used for the propagation of the original.

4.2.2. Requirements for basic seed production (G3)

Sow density according to the characteristics of the variety to achieve the highest seed quality.

Regularly monitor, detect and eliminate plants of different types in the seed field from sowing to pre-harvest.

Carry out the test according to Appendix B.

The process of harvesting and processing seeds is both preventive and mechanized.

Basic-seeds are bagged, clearly marked with variety names, batch codes, quality checked according to regulations and carefully preserved to serve production. The batch of seeds that meet the requirements of seed field inspection and seed testing according to the regulations will be certified, declared as an original seed batch and used for certified propagation.

4.2.3. Requirements for certified seed production

Certified seed production techniques are similar to those of original seed production.

Certified seeds are bagged, stamped and labeled for quality inspection according to regulations. The batch of seed that meets the requirements for field inspection and seed testing is newly certified, announced as a certified seed batch, and then carefully preserved for production.

Appendix A

Technical diagram for multiplying and restoring of peanut pre-basic seeds

Diagram 1: The technique of multipling from breeder seed or maintaining from pre-basic seed

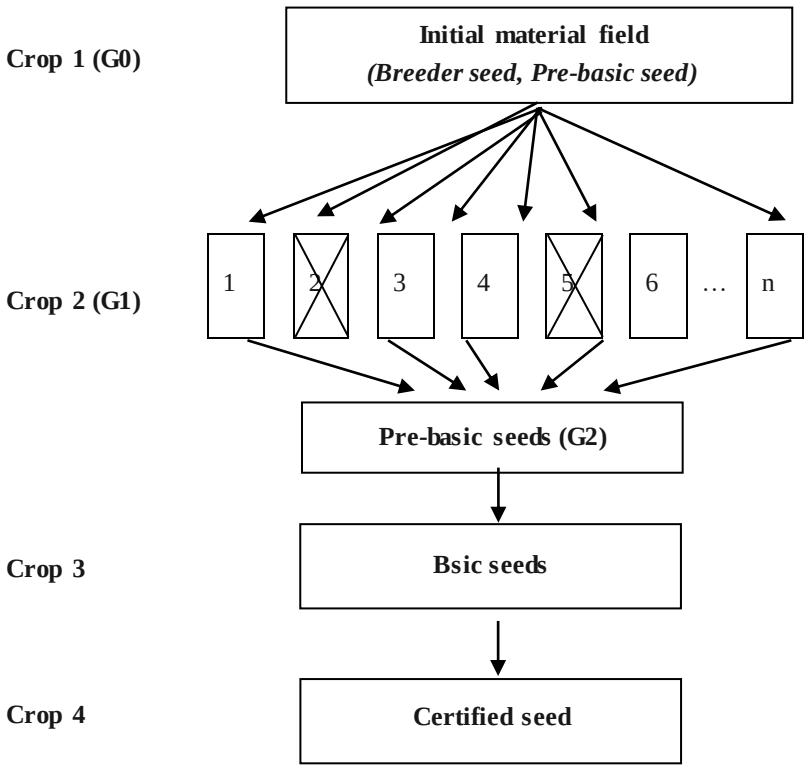
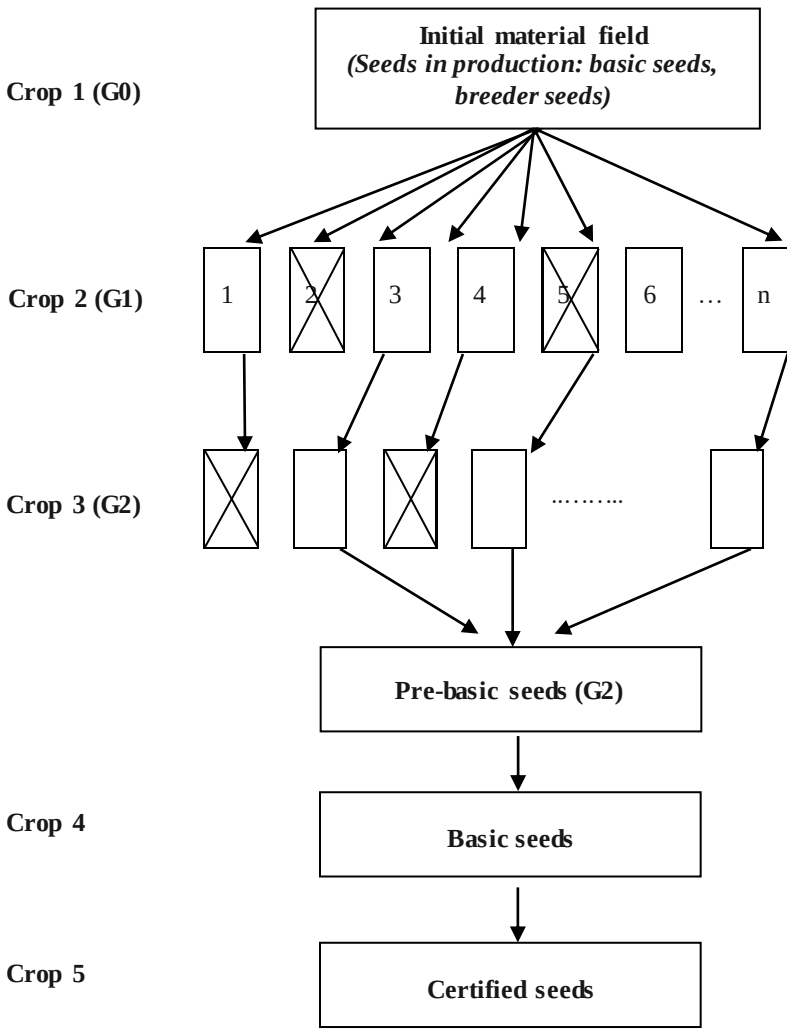


Diagram 2: Seed restoration techniques in production



Appendix B

Regulations on isolation requirements, field testing, seed purity, weeds and seed quality

Isolation method		
Seed level	**Spatial**	**Time**
All seed level	At least 3 m	-
Number of field testing		
1 st	2nd	3rd
When about 50% of the plants have flower	Before harvest	-

Field seed purity (% of plants)		
Pre-basic seed	Basic seed	Certified seed
100	≥ 99,5	≥ 99,0

Items	Quality requirements for peanut seeds		
	Pre-basic seed	Basic seed	Certified seed
Cleanness, % fruit weight	≥ 99,0	≥ 99,0	≥ 99,0
Different varieties can be distinguished, number of fruits/kg	0	1	3
Germination rate, % of seeds	≥ 70	≥ 70	≥ 70
Humidity, % seed weight	≤ 10,0	≤ 10,0	≤ 10,0

(Source: Vietnamese standard TCVN12181:2018)

Appendix C

Regulation of characteristic traits of peanut varieties

No.	Traits	Evaluation stage	Expression level	Code	Evaluation methods
1	Plant: Plant form	Blooming profusely	- Standing - Half standing - Cross over	1 2 3	Observation
2	Main body: Growth behavior	Blooming profusely	- Stand - Curled down	1 2	Observation
3	Tree: Level of branching level 1	Blooming profusely	- Little - Medium - Much	3 5 7	Count
4	Growth time	Before harvest	- Early (Less than 100 days) - Medium (from 100 to 130 days) - Late (more than 130 days)	3 5 7	Observation
5	Leaf leaflets: Size pedunde fully developed	Blooming profusely	- Small - Medium - Big	3 5 7	Observation
6	Leaf leaflets: color	Blooming profusely	- Light green - Medium green - Dark blue	3 5 7	Observation
7	Flowers: Fruit beam	Harvest	- Simple - Complex	1 2	Observation
8	Fruit: Fruit waist	Postharvest	- None or very shallow - Shallow - Medium - Deep	1 3 5 7	Observation

No.	Traits	Evaluation stage	Expression level	Code	Evaluation methods
9	Fruit: Skin surface smoothness	Postharvest	- Very smooth - Smooth - Medium - Rough	1 3 5 7	Observation
10	Fruit: No. of seeds/fruit	Postharvest	- Few (>50% fruit 1 seed). - Medium (>50% fruit 2 seeds). - Many (>50% fruit 3 seeds)	3 5 7	Count
11	Fruit: Beak	Postharvest	- None - Unclear - Medium - Obviously	1 3 5 7	Observation
12	Seed: Ripe seed coat color (fresh seeds)	Postharvest	- One color - Multi-color spots	1 2	Observation
13	Seeds: Ripe seed coat color (fresh seeds) (Particularly for the varieties with seed coats of one color)	Immediately after harvest	- Creamy white - White pink - Pink - Red - Brow - Violet	1 2 3 4 5 6	Observation
14	Seeds: Seed form	Postharvest	- Globular - Cylinder - Other image	1 2 3	Observation
15	Seeds: Weight of 100 seeds	Postharvest	- Low (<50%) - Medium (50-60%) - High (>60%)	3 5 7	Weigh in humidity of 10%
16	Seeds: Rate of seed/ fruit	Postharvest	- Low (<65%) - Medium (65 -75%) - High (>75%)	3 5 7	Count

(Source: Vietnamese standard TCVN12181:2018)

Chapter V.
SEED PRODUCTION AND INTENSIVE FARMING TECHNIQUES OF PEANUT

5.1. Seed production and intensive farming techniques without soil cover

5.1.1. Choose and make the soil

- Choose the soil:

In order for peanuts to grow and develop well, light soils such as mixed sand, mixed meat, and light meat should be selected. Light soil has an appropriate structure, both making it easy to work as well as convenient for peanuts. pierce and harvest. Light and airy soil helps nodule microorganisms to develop more favorable.

Choose soil with favorable irrigation and drainage conditions. Avoid the bare feet before planting peanuts infected with diseases such as dying, fruit rot, bacterial wilt; The land of the previous crop was planted with legumes,...

For peanut production land, it is required that the seed field be isolated from other peanut fields at least 3m.

- Soil preparation

The soil must be plowed carefully to make the soil smooth. For hard soil, medium soil, not only plowing and harrowing many times, it is necessary to use a mallet to beat. During the growing period of peanuts, the soil needs to be loose and porous. Depending on the soil conditions, the soil preparation standards are different, the general requirements are: The soil is loose, moist enough, weed-free and flat.

+ The soil is loose and porous, nodules form early and are very important for N nutrition of peanuts.

+ The beam hits the ground easily - favorable fruit formation process.

+ Easy to harvest, reduce the rate of broken beams and left fruit when harvested.

5.1.2. Seed preparation:

Seeds are prepared in different grades depending on production requirements. If the target is for seed production, the seed grade shall be selected in accordance with the industry standards mentioned in Section 4.2. In the case of commercial peanut production, the certified seed grade should be used for sowing. Whether it is seed production or commercial peanut production, before sowing, producers need to prepare the following:

- Because each variety has different seed size and different suitable sowing density, it is necessary to determine the amount of seed before sowing.

- Seeds should be peeled by hand. Select seeds that are plump, uniform in size, and not damaged during the peeling process. Check the germination rate before sowing (Growth rate > 98%).

- Seed treatment: Sprouting and disinfecting to help seeds quickly absorb water within 4-5 hours and increase germination rate.

• Method: Before separating the seeds from the shell, they should be exposed to 1 - 2 light sunlight (30 - 32^{o}C) to "wake up" and increase the germination capacity of the seeds. Soak the seeds until they are full of water and then drain, incubate them until they crack, then choose good seeds for sowing (Put seeds in warm water at 32 - 34^{o}C for 4 - 5 hours. After checking enough water, remove seeds to dry and then incubate them. with sacks and rice straw to keep warm at 30 - 32^{o}C, incubate for about 24 - 48 hours until the seed heads are cracked, and the roots are exposed.

• Note: Do this method when it's cold, dry, and the soil is moist enough.

5.1.3. Determining the planting season

Depending on the growth time and the response of the variety to the external conditions to sow in the best time frame of the peanut production area.

- Northern provinces:

+ Spring crop is sown from January 10 to February 10.

+ Summer-autumn crop is sown from June 30 to July 15.

+ Autumn-winter crop is sown from August 15 to September 15.

- Central provinces:

+ Spring crop is sown from January 15 to February 15, in some places it lasts longer until March 5 (Ha Tinh).

(Spring-Winter crop: Early dry areas should be sown from December 25 of the previous year to January 15 of the following year).

+ Summer crop is sown from May 20 to June 15 (when the soil is sufficiently moist).

+ Winter-Autumn crop is sown from August 15 to September 5.

5.1.4. Making bed and rows

The arrangement of beds depends on each foot of soil and specific terrain, according to the degree of drainage that arranges beds or different wide and narrow bands.

- High ground feet, easy to drain water, make into strips 4 - 6 m wide or 10 - 12 m wide and every 2 - 3 bands, arrange a rainwater drainage ditch when necessary.

- Low ground, easy to flood when it rains, it is necessary to make high beds, bed surface is 1.2 - 1.5m wide, 20 - 30 cm high or higher, 30 - 35cm wide trench for easy drainage and drainage fast water. The bed is divided into 4 - 5 rows along the length of the bed (2 side rows 12.5 cm from the edge of the bed, 25 cm from the row). Raise the beds in the East - West direction to make the most of the solar radiation.

* Go to bed for the following purposes:

- Create good watering and draining conditions (grooving irrigation).

- Create good care conditions (tipping, spraying, fertilizing...).

- Create conditions for the roots to develop in the deep topsoil (for infertile soils, thin plowed soles).

5.1.5. Planting density

One of the technical measures to increase the yield of peanuts is to plant a reasonable thickness. Reasonable planting

density is the density allowed to achieve the maximum yield per unit area.

* Basis to determine reasonable density:

- Based on weather conditions: If the weather is bad, plant thickly and vice versa, if the weather is good, plant thin. Peanuts planted at the end of the season and off-season are thicker than those planted in the early and main seasons.

- Based on the cultivation conditions: If the soil is bad, the planting will be thick and vice versa. Less fertilizer, poor watering, thick planting. High investment in intensive farming, planting sparsely. Planting density at the end of the season is thicker than at the beginning of the season.

- Based on the characteristics of the variety: varieties with little branching, low trees are planted thickly and vice versa.

The recommended sowing density and spacing depending on the variety and growing season are as follows:

- Sowing: Row spacing is from 30 - 33cm, spacing of plants is 7-10cm. Some specific distances and densities apply:

+ $33 \times 10 \times 1 = 33$ plants/m^2

+ $30 \times 10 \times 1 = 30$ plants/m^2

+ $33 \times 8 \times 1 = 37$ plants/m^2

+ $30 \times 8 \times 1 = 41$ plants/m^2

+ $33 \times 7 \times 1 = 45$ plants/m^2

- Sowing holes: The distance between rows is from 25 - 35 cm, the distance between the holes is from 15 - 25 cm. Some recommended distances and densities are as follows:

+ $25 \times 20 \times 2 = 40$ plants/m^2

+ $30 \times 15 \times 2 = 42$ plants/m^2

+ $25 \times 18 \times 2 = 44$ plants/m^2

+ $30 \times 20 \times 2 = 33$ plants/m^2

+ $25 \times 25 \times 2 = 32$ plants/m^2

+ $35 \times 15 \times 2 = 38$ plants/m^2

In the soil and climate conditions of the North Central region, in order to achieve maximum yield, peanuts should be sown at a density of 40 - 42 plants/m2, sowing 01 seed/hole (applicable to commercial peanut production in Winter-Spring crop) and with a density of 30-35 plants/m2, sowing 01 seed/hole (applicable to peanut seed production in Autumn-Winter crop).

* Amount of seed sown per hectare: 180 - 200 kg of shelled peanuts, equivalent to 9 - 10 kg of shelled peanuts/pole (500 m^2).

5.1.6. Fertilizers and fertilization techniques

* Bases for fertilizing peanuts:

- Based on the nutritional needs of peanuts in each period:

+ Germination period, use of nutrients in seeds.

+ Seedling stage, using 5% N.

During the flowering period, use 23% of total N requirements, 23% of P and 22% of Potassium.

+ Fruit and seed formation period, using 43% total N, 48% P and 66% Potassium.

+ In the ripening period, use 28% N, 22% P and 7% Potassium - Based on soil and farming conditions:

- Based on the season and characteristics of each variety.

+ For spring peanuts (main season): apply a lot, apply early.

+ For Autumn-Winter peanuts: apply small amounts, apply many times.

* Recommended fertilizer dosage

- For intensive farming model in Winter-Spring crop: Minimum 15 tons of manure (or 1.5 tons of microbial organic fertilizer) + 40kgN + 120kg of P2O5 + 80kg of K2O (or 1,400 kg of NPK 3-9-6) + 600 kg lime powder.

Equivalent:

15 tons of manure (or 1.5 tons of microbial fertilizer) + 110 kg of urea + 720 kg of superphosphate + 140 kg of potassium chloride + 500 kg of lime powder.

Or:

15 tons of manure (or 1.5 tons of microbial fertilizer) + 1.5 tons of NPK fertilizer (3:9:6) + 500 kg of lime powder.

In manure, add phosphorus to compost (for every 1 ton of manure mixed with 15 kg of Superphosphate), the incubation period is about 15-20 days.

- For the seed production model in the Autumn-Winter crop: 15 tons of manure (or 1.5 tons of micro-organisms) + 1,000 kg of NPK (3:9:6) + 500 kg of powdered lime.

* Fertilizer technique:

• Basal fertilizing:

- Barn: 100% + NC Phosphorus: 100% + Nitrogen fertilizer: 50% - 70% + 70% Lime.

Or: 100% Manure + 100% NPK (3:9:6) + 70% Lime.

- How to apply: Lime is sprinkled evenly on the bed surface before the final harrowing, decayed manure, or microbial organic fertilizer + Phosphorus + Nitrogen or NPK fertilizers are sprinkled in rows, then cover a thin layer of soil on top of the manure first. sow the seeds to avoid contact with manure that will cause the seeds to rot.

• First dressing: When peanuts have 3-4 true leaves with the amount of fertilizer:

- Potassium: 50%

- Protein: 30% - 50%

Fertilize the root 6 - 8 cm, combined with weeding the first phase (note not rooting).

• Second time: Apply when the first flower has faded, combined with weeding and rooting.

- Potassium: 50%

- Lime: 30%

5.1.7. Pest control and care techniques

5.1.7.1. Care techniques

- Additional planting:

Additional planting as soon as they are lost, additional as soon as possible, should be miles with seeds that have been incubated and cracked fangs so that later there will be less difference between the mile and the first sown. If it is late or the tree is dead after mile, it is recommended to mile other beans such as black beans, green beans ... because to leave the grass will grow a lot and the economic efficiency is low.

- Weeding and fertilizing:

When peanuts have 3 - 4 true leaves, weeding in the first phase (12-20 days after sowing depending on the season and weather), this time plowing shallowly (2 - 3 cm) all over the bed and making a small slit. 6 - 8 cm from the peanut base, 5 - 6 cm deep to fertilize with nitrogen and potassium for peanuts, because at this time the reserves in the seeds have been exhausted, but nodules bacteria have not yet developed to provide nitrogen for the plant. While plowing and fertilizing, pay attention to uproot the grass in the stump, dig up the peanut to expose the two scalloped leaves, combine with the Gray worm to catch the deepest, creating conditions for the first pair of first-level branches not to be buried in the ground. soil, helping branches grow strong for high yield.

Weeding the second time when the peanut has 7 - 8 true leaves (the first time the peanut flower has just faded), this time clean the grass, dig 4 - 5 cm deep, combine with potassium, lime and root cultivation for peanuts. Apply lime this time, helping to make peanuts firm and soft and at the same time helping to limit pests and diseases of peanuts.

In addition, there are a few additional technical measures that should be taken to increase the yield and quality of peanuts: spraying with specialized growth regulators for peanuts such as CF900, foliar fertilizer from Gianh river for peanuts, and Bordo drug solution. ; These measures aim to provide plants with a number of macro- and micro-elements such as: NPK, Mo, Bo, Cu, Zn... sprayed at 5 - 6 leaves, before flowering, when fruiting. has formed, will help peanut plants to flower more, increase the rate of fruit set, uniform fruit, seeds, limit pests and increase yield by 15 - 20%.

- Irrigation and drainage:

In Vietnam, the average annual rainfall is about (1,500 - 2,000 mm), compared with the ecological needs of peanuts, this rainfall ensures good growth and development of the tree. However, because the rainfall is unevenly distributed among regions, as well as between months of the year, peanuts are often threatened by drought or inundation.

Drought at any stage affects peanut yield. Appropriate moisture at the sowing stage helps peanuts germinate early, peanuts grow evenly, ensuring the necessary density. If soil moisture is not enough, water should be watered before or immediately after sowing. Mild water stress during seedling stage (up to 3 - 4 weeks after sowing) does not affect yield but can reduce plant growth to resist later diseases. The lack of water during the fruiting stage is the most dangerous, followed by the flowering stage. Therefore, after growing for 20-30 days, regularly keep the field moist. Especially, if the weather is dry, it is necessary to irrigate in 2 necessary stages: before flowering (trees have 6 - 7 leaves) and fruiting and seeding period (30 days after flowering). Irrigate the trench to cover 2/3 of the bed, let the water absorb evenly, and then drain it.

In the Northern provinces, the spring and drought crops often occur in the following periods: Sowing and flowering - results. At these stages, if there is a drought, it should be

watered in time. Near the harvest time, from early May to early June, there are often local heavy rains, leading to flooding. At this time, peanuts are physiologically ripe, so to avoid affecting the quality of not only seed but also the quality of commercial peanuts (peanut sprouts right in the field, seeds rot if waterlogged for a long time), it should be treated. immediate flooding. The autumn-winter crop usually occurs in the flowering-ripening period and waterlogging often occurs at the time of sowing and seedling development. If peanuts have a drought schedule, they need to be replenished with water in places where conditions are available and quickly drain water when flooded.

- Using spray of trace fertilizers:

Supplement with microelements (Mo, B, Zn, Mg), and some Bio-plant and Bro-plant probiotics at the appropriate time according to the instructions for use on the package. In addition, in the period of vegetative growth, the leaves of peanuts grow too strongly, we can use growth inhibitors in the period 30 - 40 days after flowering.

5.1.7.2. Pest control techniques

a- Principles when using pesticides

- Right medicine:

Each type of pest has specific drugs to control. If not used correctly, pesticides will not kill pests but also cause waste and affect other beneficial organisms.

When choosing to buy pesticides, farmers need to know the type of pest they need to prevent.

- Well-timed:

It is used at the right time based on the threshold of prevention and ensures the eradication of pests and diseases. Spray when worms are young, or early disease arises.

Crops have periods of vulnerability to pesticides. It is best to limit spraying when the plant is in bloom.

- For people who go to spray, the right time means spraying when it is least harmful to health.

- Timely spraying is not spraying too close to the date of harvest of agricultural products. Depending on the drug, stop using the drug before harvesting a certain time.

- Correct concentration and dosage:

If the concentration and dosage are too high, it will be toxic to users, affect the growth of plants and toxic residues on the product. On the contrary, using too low concentrations and doses will not kill pests and diseases and cause resistance to drugs or may stimulate the growth of pests and diseases.

- Right way:

Proper use of drugs is based on the characteristics of pests and diseases, when using drugs, it is necessary to ensure that

the drug has a lot of contact with the pests and diseases that need to be prevented. Proper use of drugs is reflected in the drug preparation stage and drug preparation, specifically:

+ Calculate how many pump bottles will be sprayed in the field to be mixed, and how much medicine should be used for each pump.

+ The pump tank must be thoroughly cleaned and checked first to see if the pump is damaged.

+ Accurately measure the amount of medicine required for a pump bottle.

- If the medicine is in liquid form, first pour 1-2 liters of water into the bottle, then slowly pour the measured amount of medicine into the pump bottle, pour the medicine into the bottle while using a bamboo stick to stir it thoroughly, then pour the water in. jar.

+ If the drug is in solid form, use a small bucket containing a little water and then pour the weighed medicine into the bucket and stir to dissolve the medicine evenly into the water. Then pour into the pump tank, then add enough water.

+ To ensure safety when mixing drugs, must have appropriate medicine preparation tools (measuring tubes, drug scales, stirring rods, medicine buckets, ...) appropriate labor protection equipment (glasses, masks, gloves). ....).

+ The next step of using the right medicine is to spray the pesticide on the field properly, spray how to make the most contact with the pest.

b- The main types of diseases and ways to prevent them

- Seedling death and disease control measures

The main cause of seedling death is due to different fungal pathogens, but mainly *Aspergillus niger, Sclerotium rolfsii, Fusartium* spp.*Rhizoctonia salani*. Sick Seedling death disease caused by seedling death fungus is actually an early stage of

root-neck black rot, stem white rot, root rot and root neck rot Diseases that cause seedling death are found in most peanut growing areas in Vietnam. our country, especially on the specialized soil. The disease is mainly spread through seeds and soil, so treat seeds with chemicals studying before sowing such as: Vicarben 50 WP, Rovral 750 WP, Thiram (dosage of 3g/1 kg of seeds) or using Trichoderma preparations (mixed with manure/microorganic fertilizer applied to the soil before sowing) will bring high prevention efficiency.

- Leaf diseases and control measures:

Among leaf diseases, black spot disease (late leaf spot) *Cercosporidium personatum*; Brown spot disease (early leaf spot) *Cercospora arachidicola* and rust (*Puccinia arachidis*) are the three most common leaf diseases, present and damaging in all peanut growing areas in our country. These diseases, spread from crop to crop, mainly through diseased plant residues. Favorable conditions for disease development are abundant rain, high air humidity, cool weather, lots of dew at night and early morning, so in the autumn-summer and winter-autumn crops, the disease is more damaging than in the spring crop. .

+ Black spot disease:

The disease appears first on the lower leaves and then spreads to the upper leaves. The lesions are uniformly black on both sides of the leaves. The disease is round in shape, the fungal layer on the bottom of the leaves is dark black, thick, with many conodi branches. Growing from the middle.

The center of the disease spreads around, the lesion has no or yellow border very small than the brown spot disease. The wound size is about 2 - 4mm. On leaves sometimes the disease spreads to cover the entire leaf area. Leaves with many diseases will turn yellow, dry and fall off.

Fungus grow best at a temperature of 25 - 30^{o}C, the minimum temperature is 10^{o}C. The source of the disease exists mainly in the form of mycelium and meristem spores on the remnants of the diseased leaves, which can survive for a long time.

+ Brown spot disease caused by the fungus *Cereospora arachidicola* Hori causes damage mainly on leaves, the lesions are brown, yellow-brown, around the disease, there are yellow pants, on the lesions there is a layer of gray mold that is the conidia sporophyte, the underside of the disease is lighter in color.

Fungus growth and development are most suitable at the temperature of 25 - 28°C, the minimum temperature is 5 - 10°C, the maximum temperature is 33 - 36°C.

+ Yellow rust disease: Caused by the fungus *Puccinla arachidis*. The disease causes spots on leaves, red-yellow like iron. The disease is as harmful as leaf spot. These are the most common diseases in peanut production areas in our country.

The disease is most severe on leaves, can be on stems. Initially on the underside of the leaves there are small clear yellow spots, then the disease emerges on the leaf surface yellow-brown, the leaf epidermis is broken to reveal a yellow-brown spore (brick color). In the spring-winter crop, the weather is favorable for disease development, the spores are often large, the lesions are large and often numerous.

Peanut yellow rust disease causes leaves to turn yellow and lose green color, so the yield and quality of peanuts are severely

reduced (20 - 50%), in severely affected fields, almost no harvest is possible.

- Preventive measures:

+ Using chemical drugs: Using Daconil; Anvil; Bayleton 0.1 - 0.3% or zinhep 0.2% spray the first time 40 - 45 days after growing, the second time 15 - 20 days apart from the first time to prevent leaf diseases causing premature defoliation. (Or other drugs can be used based on the permission of the Ministry of Agriculture and Rural Development).

+ Use resistant varieties:

+ Field hygiene: After harvesting, peanuts are used as livestock food, or burned, or plowed deep in water fields will have the effect of limiting the spread of disease.

+ Crop rotation, prolonging the isolation time between two peanut crops.

- Bacterial wilt disease and control measures:

Symptoms of the disease: The first manifestation of the disease is seen when the young leaves above are wilted (most visible in the sun), then the whole plant is wilted but the leaves are still green, finally the tree become withered. The suitable temperature for bacterial wilt disease to grow is at soil temperature of 28 - 33^{o}C.

The method of disease identification is to uproot the diseased plant, wash the main root soil, cut across the roots and dip the cuttings in a clear water solution in a cup or glass jar, look at the cup, you will see a milky white bacterial fluid secreting water. stream and cloud the water.

Disease prevention: Up to now, the use of chemical drugs for prevention has not been effective. Therefore, on soils with severe disease sources, it is necessary to rotate peanuts with

other crops that are not the same host of bacterial wilt such as rice, maize, and sugarcane. Sanitize the fields, the land around the diseased plants, collect the diseased plants, burn or dig deep for treatment. The most effective method of disease prevention deep for treatment. is to use disease-resistant varieties for planting.

- Prevention of fruit and seed diseases (yellow mold, rind gray spot, fruit black spot)

- Yellow mold disease caused by the fungus Aspergillus flavus is a dangerous disease, harmful to human health when used as food, so all consuming countries are concerned. The fungus causes damage mainly on seeds and secretes aflatoxin toxins, the fungus infects the seeds since peanuts are still in the field. In the North, peanuts were infected with yellow mold in the spring season more than in the autumn and winter seasons. Peanuts grown on hilly soils without irrigation are more susceptible to disease than on riverbanks. Harvest time also greatly affects disease incidence. Over-ripe harvested peanuts have a higher percentage of infected marbles than properly harvested peanuts.

Control measures: Adjust the planting season reasonably to harvest peanuts at a favorable time, sunny; Avoid causing damage to peanuts during care, weeding, plowing and harvesting; Avoid damage to plants caused by soil pests; Apply gypsum or lime for peanuts at the stage of piercing; During the fruit development period, if the fruit is firm, it needs to be watered. Keep the soil sufficiently moist 1 month before harvesting; When peanuts are ripe, they should be harvested in time and removed diseased plants, injured and rotten fruits; Dry immediately after plucking (if not plucking in time, cut the trunk 15 - 20cm from the base, dry the whole root). Dry peanuts to $\leq$ 10% humidity, store peanuts in cool, dry conditions, ensure hygiene and clean from insects.

5.1.7.3 Main pests and ways to prevent them

The most common peanut pests today include: borer, green worm, leaf roller, gray caterpillar, sucker sucker (thrips, aphids, green planthoppers).

The main pest control thresholds are as follows:

- Thrips: 5 children/bud at the stage of 30 - 40 days after sprouting.

- Green planthopper: 5 - 10 individuals/plant in the period of 30 days after growing.

- Black cutworm: 20 - 25% of the damaged leaf area in the period of 30-40 days after growth.

- Other pests: 25 - 30% of the damaged leaf area in the period of 30 - 40 days after growth.

Types of preventive drugs: Can use biological insecticide NPV-Bt to prevent green insect, borer, leaf roller. Some common chemical drugs such as: Sumidicin, Alphan 5EC, Basudin, Supracide 40 NP, Ofatox 4EC...

5.1.8. Harvesting and preserving peanuts

5.1.8.1. Harvest:

Peanuts must be harvested at the right time, because peanuts grow in the soil, it is difficult to observe the ripening period. The peanut varieties grown in our country are mainly medium-ripe varieties, do not have time to rest, are harvested late, seeds are capable of germinating in the field, reducing yield, seed quality and commercial seeds. To determine the correct harvest period, people rely on the following criteria:

- Based on the growing time of the variety: This indicator is a characteristic of the variety, however, the growth time may vary depending on the average temperature in the crop and some cultivation conditions (water regime). , fertilizers).

Usually in the spring crop, the growing time varies greatly (10-15 days) due to the influence of low temperature when sowing and seedling period.

- Based on the growth characteristics of the plant: The obvious expression of the plant's growth is the set of leaves. When peanuts are ripe, because nutrients are transported to the fruit and seeds, the leaves turn yellow, wither and then fall. sequence from lower leaf to upper leaf. As a result, the leaf area is significantly reduced. When 1/2 of the leaves on a yellow tree fall, harvest. For the autumn-winter crop, when harvested, only 1/3 of the leaves are left on the tree.

- Based on the ratio of ripe fruit: The flowering time of peanuts is prolonged, so some characteristics of peanuts are uneven ripening. Harvest at the right time is when the percentage of ripe fruit reaches the highest harvest standard. This rate reaches 75 - 85% of the total number of old fruits.

* Some notes when harvesting peanuts:

When harvested, the amount of water in the fruit and seeds is still very high. Moreover, peanuts do not have dormancy, so they are easy to germinate right in the field or when brought home, but have not been able to dry or dry in the rain. Therefore, after harvesting peanuts, you should take advantage of the opportunity to pluck the fruit from the trunk.

- Picking fruit right in the field: This method can be done when there is enough labor. Harvesting fruit in the field has the following benefits:

+ Less labor to transport.

+ Peanut leaves are kept in the field to add a good source of fertilizer for the next crop.

- Picking fruit at home: If there is not enough labor to pick fruit right in the field, it is possible to transport the whole tree after harvest to home. To reduce the biomass that needs to be transported, the top half of peanuts left in the field can be cut off. This way can take advantage of secondary labor in the family or can take advantage of free time during the day (evening). However, this way has the following drawbacks:

+ It is laborious to transport because the biomass of peanut leaves is large.

+ Needs a lot of room to harvest a large area.

+ Can't make full use of peanut leaves to make fertilizer.

For peanuts:

+ Harvest at the right maturity according to peanut standards (when the fruit is 70-75% old), 7-10 days earlier than harvesting commercial peanuts.

+ Before harvesting, it is necessary to check equipment, tools, drying yard, packaging, warehouse and pay attention to manipulations during harvesting to prevent mechanical contamination during harvesting and seed processing.

5.1.8.2. Drying and preserving:

* Drying peanuts:

When just harvested, the water content in the fruit accounts for about 35 - 40 (Spring crop) and 40 - 50% (Autumn-Winter crop) fresh fruit weight. Therefore, it is necessary to quickly bring the humidity down to about 9 - 10%. For peanut varieties, the moisture content of seeds reaches $\leq$ 9% to be stored.

In our country, farmers often sunbathe to reduce grain moisture. Exposure to 3-5 consecutive sunlight, but pay attention to avoid direct exposure to strong light and high temperature. Drying at high temperature will cause peanuts to melt oil, silk skin to turn brown, lose the characteristic color of the variety. Peanut seeds or peanuts produced in the spring crop must be dried on a canvas, pine or cocoons (not directly on the brick or cement yard).

The method to reduce grain moisture in industrial countries is to use drying method. Using hot air (temperature 60 - 80^{o}C), dry (humidity 30 - 35%) moves against the flow of peanuts. With the drying method, the processing time will be short and the drying process will not be affected. affected by external

conditions. The moisture content of the seeds after drying is about 8 - 9%.

* Preservation of commercial peanuts:

Requirements: Peanuts do not change quality after storage time; Peanuts are not infected with mold, insects, so they can be used for oil pressing or as food for humans.

Principle: Handling warehouse, kill termites, termites, worms before putting peanuts into storage; Store tightly closed to avoid exposure of seeds to air (inhibits respiration of seeds); Storage must have low temperature, low humidity, can be ventilated to avoid increasing humidity and temperature of storage due to respiration of seeds.

In our country, preserving peanuts by hand is common using jars, jars or PE bags. In industrialized countries, people can control the storage at 5-10oC, 40-60% humidity, so the storage time will be longer, the quality of the seeds is guaranteed.

* Preserving peanut varieties:

In principle, the preservation of peanut seeds (as well as the preservation of commercial peanuts) must ensure that the quality of the seeds after storage does not change much, and the germination rate is high.

The most important factor for peanut seed preservation is the input seed moisture. In the condition that in our country there is no cold storage, the problem of controlling grain moisture to a minimum level (8% of grain weight) and sealed storage are basic conditions.

It is possible to preserve in the farmer's family in sealed jars and jars, to prevent the seeds from contacting the air... In many peanut production areas in our country, farmers can preserve peanut varieties 8 - 9 months in such manual conditions.

- Peanut seeds need to be packed with specifications, inside and outside of the bag with stamps and labels in accordance

with regulations. Take seed samples for quality testing according to regulations.

- When storing in the warehouse, it is necessary to arrange the bags in rows, not close to the wall, put up high, create ventilation conditions and easy to check and handle when unfavorable factors occur.

However, due to many difficulties in preserving peanuts, many places have planted Autumn-Winter peanuts for breeding, shortening the storage time of peanuts.

5.2. Techniques for seed production and intensive cultivation of peanuts covered with nylon

Technical measures to cover with nylon in peanut farming by the authors: Nguyen Thi Chinh, Hoang Minh Tam, Tran Dinh Long, Nguyen Van Thang - Legumes Research and Development Center - Vietnam Agricultural Science technology Institute (now under the Field Crops Research Institute) has successfully researched in Vietnam. The technical process of planting peanuts covered with nylon has been recognized by the Ministry of Agriculture and Rural Development as a new technical progress process under Decision No. 5218 QD/BNN-KHCN dated November 16, 2000. Up to now, the scale of application is tens of thousands of hectares per year, bringing high efficiency. The application site is mainly in the North Central region, especially in the autumn-winter crop in Thanh Hoa, Nghe An and Ha Tinh provinces.

5.2.1. Advantages and disadvantages of planting peanut techniques covered with nylon

a- Advantages:

- Increase the soil temperature from 3 - 4^{o}C, limit water vaporation, ensure good soil moisture.

- Limit nutrient leaching, prevent soil erosion, keep the soil porous, help peanuts grow fast, have a high growth rate, plant

healthy growth right at the seedling stage, early branching, fat branches, good photosynthesis, leaves are darker green.

- Limit weeds and reduce post-sowing care costs.

- Limiting late flowering and fruit formation to concentrate nutrition on early-formed fruits, increase the percentage of ripe and ripe peanuts, and shorten the growth time from 8 - 10 days. - Yield increases from 36 - 43% in spring crop and 50 - 55% in autumn-winter crop.

b- Disadvantages:

- The price of nylon in the market is increasing day by day, so it is difficult to invest in production capital at the beginning of the crop.

- Nylon is a non-degradable material that causes environmental pollution. The remedy is that after harvesting, the plastic must be thoroughly collected in the field.

- Covering with nylon will be make the soil temperature increases higher than that of non- coveringg. Harvesting spring peanuts in hot weather should be harvested at the correct maturity, 8 to 10 days before the field is covered, to avoid germinating and rotten peanuts in the field, affecting product quality.

5.2.2. Differences from growing peanuts without nylon cover

5.2.2.1. Prepare material

Different from the technique of cultivating peanuts without plastic cover, the technique of planting peanuts covered with nylon needs to prepare some additional materials before planting such as:

- Nylon specialized for peanuts is white (or colored) nylon with a thickness of 0.007 - 0.01 cm; 1.2 - 1.3 m wide; 01 kg of nylon cover for about 100 m^2 of land).

- Pre-emergent herbicides such as: Antaco 500ND, Staco 500 EC (with active ingredient Acetochlon), Lasso 48EC (with active ingredient Alachlor) DUal 720 EC (with active ingredient Metolachlon) or Raft (with active ingredient Oxadiargye) spray on the face furrows before coating with nylon.

5.2.2.2. Technique of planting peanuts covered with nylon

In this content, we would like to introduce to readers only the different work contents with the technique of cultivating peanuts without nylon covering, specifically:

- Size of beds and sowing density:

Beds and sowing densities must follow the guidelines to suit the nylon size. There are two types of nylon sizes that are convenient to use and have high efficiency.

+ For riverbank land, coastal sandy soil, high and flat inland soil, use nylon with a pipe diameter of 60 cm (120 cm in width), a bed surface of 1 m, a trench 30 cm, a bed of 15 cm high. - 20 cm. The bed surface is divided into 4 rows running

along the length of the bed, spacing 18 - 20 cm from the hole, sowing 2 seeds or 10 cm from the hole, sowing 1 seed/hole (Ensure the density of 30 - 35 plants. /m2).

+ For low-lying fields that are prone to waterlogging or actively irrigate when the term expires, nylon pipes have a diameter of 35 cm (70 cm wide), a bed surface of 50 cm wide, a trench 35 - 40 cm wide, a bed 20 - 20 cm high. 25 cm. The bed surface is divided into 2 rows running along the length of the bed, the distance between the holes is 17 - 18 cm, sowing 2 seeds or the distance between the holes is 8 - 9 cm, sowing 1 seed/hole (Ensure density 28 - 30 plants/m2). The bed size is narrow, due to the fringe effect, all plants enjoy the same optimal amount of light, nutrition, and water, making the number of fruits firmer on the tree much, the yield is not inferior to planting in wide beds.

- Steps to take:

Step 1: After harrowing the soil for the last time, go up the bed according to the size of the prepared nylon and then level the bed.

Step 2: Slit the row 8 - 10 cm deep, apply the entire amount of fertilizer as recommended in the process of planting peanuts without plastic cover in the row and then cover with soil to cover the fertilizer to a depth of 3 - 4 cm. Except for lime powder, still divide fertilizer twice.

Step 3: Sow the seeds after filling the soil with manure, sow the seeds at a depth of 3 - 5 cm, cover the seeds with soil, flatten the beds, spray with herbicides, cover them with plastic (for the winter-spring crop); Fill the soil with manure, flatten the beds, spray with herbicides, cover with nylon, punch holes and then sow seeds (for the autumn-winter crop).

Note: In case of dry soil, spray cold water first and then spray herbicide. Carefully read the instructions for use on the packaging of the medicine; The nylon covering the bed surface should be stretched and flat. The plastic edge is covered on both sides of the bed about 10 cm/side. After the nylon coating is finished, use a hoe to dredge the soil in the trenches lightly on the two edges of the beds to fix the nylon, and at the same time clean the soil in the trenches.

Step 4: After sowing about 7 - 10 days, peanuts begin to grow. When peanuts grow out of the ground, use a hole punch tool (nylon) with a diameter of 5 - 6 cm to let the tree shoot out of the plastic (applied for the winter-spring crop). This stage needs regular monitoring every 2 days to poke holes for the peanuts to be plucked out of the plastic face in time. If this operation is slow, in hot weather, peanuts will wilt and affect later growth, even peanuts will rot all leaves.

CHAPTER VI.
ADVANTAGES, DIFFICULTIES AND PROSPECTS FOR PEANUT DEVELOPMENT IN OUR COUNTRY

6.1. Advantages and disadvantages of peanut production in our country

6.1.1. Advantages

- Peanut is a traditional crop, distributed in most provinces and cities in the country. Vietnamese farmers have a lot of experience in peanut production.

- Peanut is a short-term plant, easy to grow, and uses little water, so it is very suitable for water shortage conditions for agricultural production as has happened in recent years.

- The government has certain priorities for peanut research and development with the aim of serving domestic consumption and export.

6.1.2. Disadvantages

- Outdated technology, the cultivation and production of peanuts of farmers are mainly done by manual method based on experience. Industrialization in peanut production has not been carried out. Therefore, the product cost is high, the efficiency achieved is still limited.

- The market is precarious, "If the year is good, the price will drop, if the price is good, the crop will be lost", the finished products sold are pressured by traders, plus input costs such as seeds, fertilizers, kernels. while the investment capital for peanut production of farmers is still limited.

- The peanut seed supply system is still open. Because the profit from the peanut seed business is not high, the risk is great because peanuts have high oil content, easy to lose germination during storage, so companies and businesses are not interested in this field. Currently, peanut varieties are mainly planted by farmers themselves or bought floating in the market, so the phenomenon of mixed varieties and poor quality greatly affects planting density, reducing yield.

- Although peanut is a crop that uses little water, but because of the uneven distribution of rainfall in the months, peanut production faces difficulties especially at the beginning of the winter-spring crop and in the middle of the autumn-winter crop.

+ The land fund for peanut production is mostly sandy coastal soil, hilly soil, poor nutrition, not actively watering.

+ New peanut varieties with high yield, good quality, tolerance to drought, salinity, pests, etc., which are applied in production, are still limited. Farmers in areas with limited investment funds still use local varieties for production.

6.2. Prospects and development orientation of peanuts in Vietnam

6.2.1. Prospects for peanut development in our country

- In our country, peanut is considered a crop with high economic efficiency and multi-valued.

- Currently, our country is still in the area of protein deficiency in the world, so plant protein sources are a major contributor to protein balance for the people. Easy-to-grow peanuts suitable for tropical climates - will be one of the main sources of protein for us.

- Our agricultural land is washed and weathered quickly. The lowest content of humus and nutrients is infertile soil,

ancient alluvial soil, sloping soil... Peanut is an important soil improvement crop in the system. polyculture farming system in our country.

- To improve the economic efficiency of peanuts, the problem is to create concentrated production areas to improve productivity and quality of commercial peanuts.

- In the short term, with the current level of investment, if the average peanut yield is 1.3 - 1.7 tons/ha on the infertile land, it is completely dependent on the water and the average yield in the intensive farming areas will reach 3.5 - 4.0 tons/ha will be able to compete with other crops (The average yield of peanuts in recent years for the whole country is 2.3 - 2.4 tons/ha).

- Natural conditions: Vietnam has a tropical and subtropical climate, so it is relatively suitable for peanuts to grow and develop well. Land requirements are not strict, all types of soil with light mechanical composition, loose and well drained pH 4.5 - 7.0 can be grown peanuts.

- Advances in varieties: Currently, many varieties have been selected to produce high yield and limit harmful pests and diseases. The yield of peanuts can be doubled compared to local varieties grown for a long time such as: L20, L27, L14, TK10, L18, L23, L26, TB25, Nghe An Sen, Lotus Lot, Senlai, V79...

- Technological advances in peanut farming: Nitrazine infection method for peanuts increases yield by 10-15%; Balanced NPK fertilization; Apply lime properly; Watering techniques for peanuts - Appropriate planting density; Nylon coating technique; Integrated pest control measures; develop the autumn-winter peanut crop for breeding.

- Market for consumption and processing:

Currently, peanut production is a crop with a very large consumption market, both serving the needs of family, processing and export.

6.2.2. Orientation for peanut development in our country

- In our country, peanut is considered as a crop with high economic efficiency and multi-value.

- Currently, our country is still in the area of protein deficiency in the world, so plant protein sources are a major contributor to protein balance for the people. Easy-to-grow peanuts suitable for tropical climates - will be one of the main sources of protein for us.

- Our agricultural land is washed and weathered quickly, the lowest humus and nutrient content is infertile soil, ancient alluvial soil, sloping soil... Peanut is an important soil improvement crop in the system. multi-cultivation system in our country.

- To improve the economic efficiency of peanuts, the problem is to create concentrated production areas to improve productivity and quality of commercial peanuts.

- In the immediate future, with the current level of investment, if the average peanut yield is 1.3 - 1.7 tons/ha on the infertile land, it is completely dependent on the water and the average yield in the intensive farming areas will reach 3.5 - 4.0 tons/ha will be able to compete with other crops (The average yield of peanuts in recent years for the whole country is 2.3 - 2.4 tons/ha).

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TK10, L18, L23, L26, TB25, Nghe An Sen, Lotus Lot, Senlai, V79...

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- Market for consumption and processing:

Currently, peanut production is a crop with a very large consumption market, both serving the needs of family, processing and export.

- Rapidly transferring and expanding production of new technical advances already in production, suitable to the characteristics of each ecological region. To give priority to the development of peanuts in intensive and specialized farming areas and concentrated production areas for processing and export.

- Boldly invest in mechanization in peanut production.

- Enhance information, training and transfer of technical advances to producers.

- To step up processing and export.

SOME KEY RESULTS OF THE COOPERATIVE PROJECT ON PEANUT SEEDS PRODUCTION IN THE PERIOD OF 2017 - 2021

Project title: "Innovative Rural Development through Establishment of Seed Production and Diatribution System of High-Value Crop Peanut (*Arachis hypogaea* L.) in Vietnam".

- Sponsoring agency: Korea Program for International cooperation in Agricultural technology (KOPIA Vietnam).

- Implementing agency: Agricultural Science Institute of Northern Central Vietnam (ASINCV)

Project location:

+ Dien Thinh commune - Dien Chau district - Nghe An province

+ Nghi Long commune - Nghi Loc district - Nghe An province

+ Thuong Tan Loc commune - Nam Dan district - Nghe An province

- Peanutt varieties used: L20 and TK10.

I. Results of peanut seed production in the period of 2017 - 2021

1.1. Results of peanut seed production (G0, G1, G2) in the period of 2017 - 2021

- Peanut varieties: L20, TK10

- Scale:

Content \ Year	2017	2018	2019	2020	2021	Total
Maintain breeder seed G0 (m^2)	1,500	2,000	2,000	2,000	1,000	8,500
Produce Pre-basic seed G1 (m^2)	-	4,500	6,000	2,500	2,000	15,000
Produce Pre-basic seed G2 (m^2)		3	5	2	2	12

- The productivity of bre-basic seed of peanut seed (G2) produced from 2018 to 2021 reached 45 tons (average yield is 3.8 tons/ha).

1.2. Results of basic seed peanut production model in the period of 2017 - 2019

- Scale of model: 116 ha, where as:

+ Year of 2017: 30 ha (Dien Chau: 10 ha, Nghi Loc: 10 ha, Nam Dan: 10 ha)

+ Year of 2018: 36 ha (Dien Chau: 13 ha, Nghi Loc: 10 ha, Nam Dan: 13 ha)

+ Year of 2019: 50 ha (Dien Chau: 20 ha, Nghi Loc: 10 ha, Nam Dan: 20 ha)

- Main results:

Table 1. Some indicators on growth and development of peanut varieties in the conditions of the Winter- Autumn crop from 2017 to 2019 in Nghe An.

Location	Variety	Sowing - Germination 50% (day)	Rate of germination (%)	Sowing-flowering (day)	Total of Growing time (day)	Plant height (cm)	Branches level 1/ tree (branch)
Dien Chau	L20	7	79.5	32	100	45.5	4.5
	Sen that (Control)	9	75.0	31	110	43.0	4.0
Nghi Loc	L20	7	79.0	33	105	45.5	4.5
	L14 (Control)	9	75.5	32	110	41.0	4.1
Nam Dan	TK10	6	79.0	31	100	55.5	4.7
	L14 (Control)	9	75.5	30	110	41.0	4.1

Bảng 2. Some major pests and diseases on peanut varieties in the winter-autumn crop from 2017 to 2019 in Nghe An

Location	Variety	Sâu xanh (con/ m^2)	Sâu khoang (con/ m^2)	Bệnh héo xanh (điểm)	Bệnh đốm nâu (điểm)	Bệnh rỉ sắt (điểm)
Dien Chau	L20	3	4	1	3	3
	Sen that (Control)	5	7	3	5	5
Nghi Loc	L20	3	3	1	3	3
	L14 (Control)	6	7	3	5	5
Nam Dan	TK10	3	4	1	3	3
	L14 (Control)	6	9	3	5	5

Notes: For insects (mild infection: 10 - 20 insects/m^2; medium infection: > 20 - 40 insects/m^2; severe infection: > 40 insects/m^2). For diseases (score 1: very slight harm; score 3: slight harm; score 5: moderate harm; score 7: severe harm).

Bảng 3. Yields and yield componant of peanut varieties in the condition of Winter-autumn crop from 2017 to 2019 in Nghe An

Location	Variety	Otal fruit/ tree (fruit)	No. of full fruit/ tree (fruit)	P 100 fruit (g)	Seed ratio (%)	Yiel (ton /ha)	Increase compared to control (%)	Total productivity (ton)
Dien Chau	L20	19	14	160.0	77.0	2.60	18.21	114
	Sen that (Đ/c)	15	11	154.0	73.0	2.20	-	
Nghi Loc	L20	16	12	155.0	75.5	2.25	16.81	70
	L14 (Đ/c)	14	10	148.0	70.0	1.92	-	
Nam Dan	TK10	19	15	150.0	74.0	2.74	20.18	116
	L14 (Đ/c)	15	11	147.0	70.0	2.28	-	
Total								**300**

Table 4. Results of quality analysis of basic seed peanut in the condition of winter-autumn crop from 2017 to 2019 in Nghe An

Location	Variety	Cleanness (% of weight)	Germination					Humidity (% of weight)
			No. of tested day	(% of seed)				
				Normal sprouts tree	Un-normal sprouts tree	Seed do not germination	Dead seeds	
Dien Chau	L20	99.9	7	85	12	0	3	8.7
Nghi Loc	L20	99.9	7	83	12	0	5	8.0
Nam Dan	TK10	99.9	7	80	16	0	4	9.5

Note: Average analysis data in 3 years (2017 - 2019) of the National center for Testing of Seeds and Plant production.

Table 5. Economic efficiency of peanut seed production model compared with mass production model in the condition of winter-autumn crop 2017 - 2019 in Nghe An (calculated for 01 ha)

No.	Content		Seed production model			Mass production		
			Quantity	Price (1,000 VND)	Into money (1,000 VND)	Quantity	Price (1,000 VND)	Into money (1,000 VND)
I	Expense				71,900			61,900
1	Materials:				31,100			25,900
-	Variety (kg)		200	50	10,000	200	30	6,000
-	Manure (kg)		15.000	0,5	7,500	15,000	0,5	7,500
-	NPK 3:9:6 (kg)		1.000	5,4	5,400	1,000	5,4	5,400
-	Nylon (kg)		100	45	4,500	100	40	4,000
-	Lime powder (kg)		500	3	1,500	500	3	1,500
-	Bio-Pro plant growth stimulant				1,200			-
-	Pesticides				1,000			1,500
2	Labor:				36,000			36,000
-	Farmer labor (day)		200	180	36,000	200	180	36,000
3	Testing cost				4,800			-
II	Revenue:							
Yield (ton/ha)		Dien Chau	2.60	4,000	104,000	2.20	3,500	77,000
		Nghi Loc	2.25	4,000	90,000	1.92	3,500	67,200
		Nam Dan	2.74	4,000	109,600	2.28	3,500	79,800
III	Profit (II-I)	Dien Chau			32,100			13,300
		Nghi Loc			18,100			3,500
		Nam Dan			37,700			16,100

No.	Content		Seed production model			Mass production		
			Quantity	Price (1,000 VND)	Into money (1,000 VND)	Quantity	Price (1,000 VND)	Into money (1,000 VND)
IV	Profit between seed model and mass	Dien Chau			18,800			
		Nghi Loc			14,600			
		Nam Dan			21,600			
V	MBCR	Dien Chau			+ 2.70			
		Nghi Loc			+ 2.28			
		Nam Dan			+ 2.98			

Note:

- Prices of materials according to the market at the time of model implementation; Selling price of peanuts at the time of harvest.

- Determine the Marginal Benefit Cost Ratio (MBCR):

+ MBCR < 1,5: New model for low profit, not recommended.

+ 1.5 ≤ MBCR ≤ 2.0: New model for average profit, maybe acceptable for development.

+ MBCR > 2.0: New model for high profit, acceptable for development.

SOME PICTURES OF SEED PRODUCTION MODEL







VIỆN KHOA HỌC KỸ THUẬT NÔNG NGHIỆP BẮC TRUNG BỘ
MÔ HÌNH
SẢN XUẤT GIỐNG SIÊU NGUYÊN CHỦNG


VIỆN KHOA HỌC KỸ THUẬT BẮC TRUNG BỘ
MÔ HÌNH LÀNG MẪU
SẢN XUẤT LẠC GIỐNG CẤP NGUYÊN CHỦNG

II. The results of Investment, support and other products from cooperation project

2.1. Results of investment in infrastructure and equipments for the project

- Establishment of 01 project office at the ASINCV.

- 01 system of peanut seed drying storage system at the ASINCV.

- 05 sets of soil making machines (KUBOTA and LS Thaco) for the ASINCV and villages where the project implemented.

- 01 system of warehouses to preserve and process peanut seeds in Dien Thinh commune - Dien Chau district.

- 02 showrooms products of the project and local in Dien Chau and Nghi Loc districts.

- 02 systems of peanut oil presses.

- 01 set of quality certificates, labels and brands of peanut oil for Dien Thinh commune - Dien Chau district.

- New construction of 03 km electrict power system 04KV-3 Phase - 4 lines in Nam Dan district.

- To renovate and upgrade the system of drainage canals and fields cultivation for service of seed production at the ASINCV.

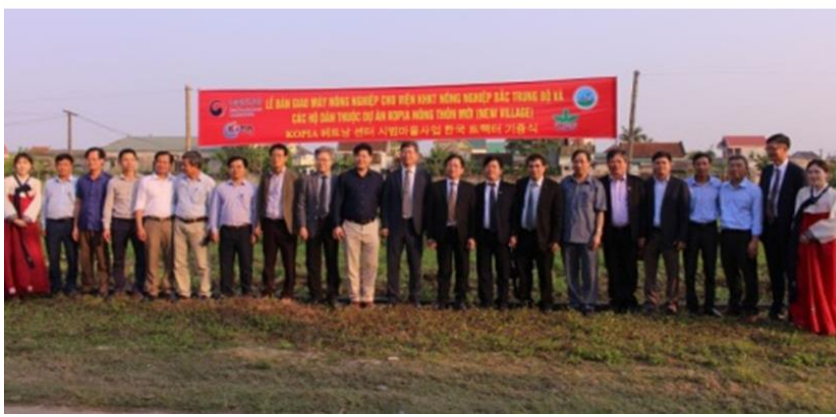

ĐẢNG CỘNG SẢN VIỆT NAM QUANG VINH MUÔN NĂM
KOPIA
LỄ KHỞI ĐỘNG
DỰ ÁN: PHÁT TRIỂN NÔNG THÔN MỚI THÔNG QUA THIẾT LẬP
HỆ THỐNG SẢN XUẤT VÀ PHÂN PHỐI HẠT GIỐNG
CÂY LẠC (Arachis hypogaea L.) Ở VIỆT NAM


KOPIA


LỄ KHÁNH THÀNH VÀ BÀN GIAO GIÀN SẤY LẠC GIỐNG
DỰ ÁN KOPIA NÔNG THÔN MỚI (NEW VILLAGE)
KOPIA


HTX NÔNG NGHIỆP NAM THỊNH
DẦU LẠC NGUYÊN CHẤT
Nam Thịnh
1L
HTX NÔNG NGHIỆP
NT
NAM THỊNH
VNPT
CHECK
0000001
Nam Thịnh


ĐẢNG BỘ VÀ NHÂN DÂN XÃ NGHI LONG
HỌC TẬP VÀ LÀM THEO TẤM GƯƠNG ĐẠO ĐỨC HỒ CHÍ MINH
LỄ BÀN GIAO MÁY NÔNG NGHIỆP


LỄ BÀN GIAO MÁY NÔNG NGHIỆP CHO VIỆN KHUYẾN NÔNG NGHIỆP BẮC TRUNG BỘ VÀ
CÁC HỘ DÂN THUỘC DỰ ÁN KOPIA NÔNG THÔN MỚI (NEW VILLAGE)

2.2. Results of training

2.2.1. Training in abroad

- 4 training courses in Korea for 40 officials and farmers in the project area on the new village model.

2.2.2. Training in the country

- 05 training classes, training for 30 technicians and 90 key farmers on the new village model and lessons from Korea.

- 13 training courses for 400 farmers participating in the model on peanut seed production techniques.

2.3.Results of the field workshop

- 5 field workshops (100 delegates/workshop) to evaluate the project's effectiveness over the years.

2.4. Publications of books, newspapers, magazines and media:

- 100 copies of 01 books on ***"Seed production and intensive farming techniques of peanuts"***.

- 04 articles published on Journal of Vietnam Agricultural Science and Technology.

- 300 copies of hand book of the ***"Peanut production technique of pre-basic and basic seed variety"***.

- 01 Video CD about project results.

- 10 news on Nghean's website and Nghean's television (NTV) about the project implementation results.

- Signing 01 MOU (Memorandum of Understanding) on Agricultural Production and consumption between ASINCV, KOPIA Vietnam, VIVIHA, Dien Chau district, Dien Thinh commune and Nam Thinh Agricultural cooperative.

HIỆU QUẢ TỪ MÔ HÌNH SẢN XUẤT LẠC GIỐNG NGUYÊN CHỦNG TRONG ĐIỀU KIỆN VỤ THU ĐÔNG TẠI NGHỆ AN

Võ Văn Trung[1], Phạm Văn Linh[1], Trịnh Đức Toàn[1], Bùi Văn Hùng[1], Trần Thị Thanh Hoa[1], Lê Ngọc Lan[2], Hyun Jong Nae[3], Joung Young Soo[3], Hong Seung Gil[4]

KẾT QUẢ XÂY DỰNG MÔ HÌNH SẢN XUẤT LẠC GIỐNG SIÊU NGUYÊN CHỦNG (G2) VỤ ĐÔNG XUÂN 2021 TẠI NGHỆ AN

Phạm Văn Linh[1], Võ Văn Trung[1], , Trịnh Đức Toàn[1], Bùi Văn Hùng[1], Trần Thị Thanh Hoa[1], Bùi Quang Đăng[2], Lê Ngọc Lan[2], Hyun Jong Nae[3], Joung Young Soo[3], Hong Seung Gil[4]

KẾT QUẢ XÂY DỰNG MÔ HÌNH SẢN XUẤT LẠC GIỐNG NGUYÊN CHỦNG VỤ THU ĐÔNG 2018 TẠI NGHỆ AN

Phạm Văn Linh[1], Võ Văn Trung[1], Trần Thị Thanh Hoa[1], Nguyễn Thị Thanh[1], Trần Thị Duyên[1], Trịnh Đức Toàn[1], Lê Văn Vinh[1], Bùi Văn Hùng[1], Lê Ngọc Lan[2]

KẾT QUẢ THỬ NGHIỆM BIỆN PHÁP CHE PHỦ VÀ GIEO HÀNG TRÊN GIỐNG LẠC DAEKWANG VÀ L20 TRONG ĐIỀU KIỆN VỤ XUÂN TẠI NGHỆ AN

Võ Văn Trung[1], Nguyễn Thị Thanh[1], Trần Thị Thanh Hoa[1], Phạm Văn Linh[1], Trịnh Đức Toàn[1], Joung Youn Soo[2], Lê Ngọc Lan[2]

III. Project effectiveness and impact

- Economic efficiency: The correct application of the Technical Regulations on seed production promulgated, and the application of new technical equipment in peanut production, and the use of newly selected peanut varieties have contributed to improving productivity and high productivity. compared with the traditional propagation method of the people from 16.8 - 20.1% (actually the average mass production yield is 1.9 - 2.0 tons/ha), the quality of the seed is guaranteed. ensure, the germination rate of the variety is improved. Since then, the selling price of peanut seeds has also been higher than that of mass-produced peanuts, increasing profits from 14.6 to 21.6 million VND/ha, contributing to raising people's incomes, eradicating hunger and reducing poverty, and improving incomes. good livelihood.

- Social efficiency: Helping people improve their skills in producing quality peanut seeds, capable of forming a value chain in seed production, increasing commercial value, farmers are proactive in production, conscious of Seed production is increasingly improved, helping farmers feel secure in production, stable output, and efficiency.

- Expansion efficiency: The results of the peanut seed production model are practical, farmers have access to new scientific and technical advances in the field, helping to improve production efficiency and reduce risks so farmers are very excited, people themselves realize the effectiveness of peanut seed production according to the technical process, thereby replicating the model in the next crops.

- The results of 5 years of project implementation have supported people to produce 300 tons of peanut basic seeds in the production conditions of the autumn-winter crop in Nghe An province, contributing to providing seeds for the spring

crop with a scale of 1,500 hectares. In addition, when the project ended, people in peanut-producing areas became self-sufficient in peanut seed production with the size of each village from 50 to 60 hectares. The results of the project have also helped people expand the production area of peanut varieties L20 and TK10 on a large scale in the North Central provinces with an estimated scale of 10,000 - 15,000 ha, yielding above average peanut varieties. in the Spring crop from 4.0 to 5.0 tons/ha.

The results of the project have also helped people form a group of production households, helped the Cooperatives form a core group of households, and managed and used equipment and infrastructure for peanut production. effective varieties; help the locality manage well the organization of production of peanut seeds and other crops, organize the development and display of local agricultural products, expand and develop a large-scale, concentrated peanut seed production model, contribute to improve land use efficiency, increase income and improve livelihoods for producers. Contributing to the development of the national target program on building new rural areas in the locality.

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