PRODUCTION AND USE OF AND RESEARCH ON SOYBEANS IN KOREA

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Abstract

In Korea, soybeans rank third both in the area planted and production after rice and barley among all food grain crops and soybean products such as soy paste, soy sauce, beancurd and beansprouts are the primary side dishes in conventional daily Korean meals.

But the area planted to soybeans showed a decreasing trend from about 300,000 hectares of the 1967-1971 average to 183,000 hectares in 1982. The reduction was mainly due to the low income derived from soybeans compared to other competing summer crops such as red-pepper, sesame, potato, and garlic, etc. National demand also increased drastically from 319,000 tons in 1973 to 769,000 tons in 1982, mainly due to the rapid increase in the population and in the amount of animal feeds.

Compared to the major soybean-producing countries, national soybean yields are very low because two-thirds of the soybeans are planted as second crop after barley harvest and many farmers do not make any investment for inputs such as fertilizers and protectants as they believe that soybeans do not require such inputs and that soybeans are not cash crops.

To cope with the rapid increase of national demand, the Korean goverment in 1983 asked the Agricultural Cooperatives to organize Soybean Production Increase Units throughout the country. The Soybean Production Increase Units are supported by the government in many ways including subsidies and prizes. At the same time, national soybean research is focussed on the development of soybeans which can be utilized for various purposes such as soy paste and soy sauce, cooking with rice, beancurd, and beansprouts, etc. and on the mechanization of soybean cultivation in anticipation of labor shortage in the future.

Trends in soybean production

Importance of soybeans

The relative importance of soybeans among all food grains in Korea is well shown in Table 1. Soybeans rank third both for the area planted and production after rice and barley, based on the 1977-1981 data. Among all food grains, the area planted to soybeans and soybean production in the same period were 11.0 and 3.5%, respectively.

Area planted, yield, production and import

The area planted to soybeans showed a general decreasing trend from about 300,000 hectares of the 1967-1971 average to 183,000 hectares in 1982 (Table 2). In spite of the decrease in the area planted, soybean production showed nearly the same level during this period, presumably due to the fact that the yield levels of soybeans per unit area have increased considerably. However, soybean yield in the country is generally low compared to that of other major soybean-producing countries, in taking into account the fact that nearly two-thirds of all soybeans are cultivated as a second crop after barley or wheat harvest on low fertile upland fields.

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Table 1 Area planted and production of major food crops in Korea

Crop	Area planted (1,000 ha)	Ratio (%)	Production (1,000 ton)	Ratio (%)
Rice	1,229.9	61.0	5,617.5	74.0
Barley + Wheat	468.9	23.0	1,512.4	20.0
Italian millet	6.0	0.3	7.1	0.1
Sorghum	4.7	0.2	4.6	0.1
Corn	32.4	1.8	126.2	1.7
Buckwheat	10.4	0.5	8.7	0.1
Soybean	219.0	11.0	268.4	3.5
Adzuki bean	33.1	1.9	31.5	0.4
Mungbean	6.7	0.3	5.7	0.1
Total	2,011.1	100.0	7,582.1	100.0

Source : KMAF, 1982.

Table 2 Production, yield and import of soybeans by year in Korea

Year	Area planted (1,000 ha)	Yield (ton/ha)	Production (1,000 ton)	Import (1,000 ton)	Export (1,000 ton)
1967—1971 Average	299.9	0.76	227.4	33	—
1977	250.6	1.27	318.7	151	—
1978	246.9	1.19	292.8	223	—
1979	207.3	1.24	257.1	422	—
1980	188.4	1.15	216.3	417	—
1981	201.4	1.27	256.9	529	—
1982	183.0	1.27	233.0	536	—

Source : KMAF, 1982.

Regional distribution

The typical feature of soybean production in the country is that it is not much concentrated in any specific region although there are some regional differences (Table 3).

Trends in supply and consumption

Demand and supply

The trend in total demand and consumption of soybeans in Korea from 1973 to 1982 is shown in Table 4. During this period, the total demand increased from about 319,000 tons in 1973 to 769,000 tons in 1982 while the national production remained at nearly the same level or even slightly decreased. The great increase in the demand is mainly due to the rapid increase in the population and in the amount of animal feeds. To meet the national demand, 536,000 tons of soybeans were

imported in 1982.

Utilization

Utilization of soybeans by year in Korea is shown in Table 5. From the early 1970s to 1981, the increase from 27,000 tons in 1971 to 388,000 tons in 1981, mostly involved animal feeds with the ratio of annual mean increase being 30.5% while that of non-animal feeds was only 3.2%. Among the non-animal feeds, soybeans for industrial use (soy oil and soy milk, etc.) showed the greatest increase while that for foods (soy paste, soy sauce, beancurd, and beansprouts, etc.) remained at the same level. No further detailed data for each item are available.

Table 3 Regional distribution of soybean production in Korea

	For soybean			Production	
	Area planted (1,000 ha)	Rate of all upland areas (%)	Yield (ton/ha)	Amount (ton)	Ratio (%)
Kyunggi	20.0	19.3	1.17	23.4	9.1
Kangweon	14.6	16.2	1.33	19.4	7.6
Chungbuk	14.9	17.1	1.41	21.0	8.2
Chungnam	28.4	28.3	1.15	32.8	12.8
Jeonbuk	15.7	21.4	1.21	18.9	7.4
Jeonnam	45.4	32.9	1.29	58.4	22.7
Kyungbuk	35.6	24.0	1.44	51.3	20.1
Kyungnam	18.4	22.1	1.40	25.8	10.0
Total (average)*	201.7	22.9	1.27	256.9	100.0

* Total (average) includes data for Seoul, Busan, and Jeju.
Source: KMAF, 1982.

Table 4 Demand and supply of soybeans in Korea

Year	Demand (1,000 ton)	Production (1,000 ton)	Import (1,000 ton)	Ratio of self-sufficiency (%)
1973	318.8	245.8	73.0	77.1
1974	367.9	318.4	49.5	86.5
1975	367.2	310.6	56.6	85.6
1976	442.8	294.9	147.9	66.6
1977	451.8	318.7	133.1	70.5
1978	531.8	292.8	238.6	55.1
1979	679.1	257.1	422.0	37.9
1980	633.3	216.3	417.0	34.1
1981	786.1	256.9	529.2	32.7
1982	769.0	233.0	536.0	30.3

Source: KMAF, 1982.

Table 5 Utilization of soybean in Korea

Unit : 1,000 ton

Year	Animal feeds	Non-animal feeds				Losses	Total
		Foods	Industrial use	Seeds	Subtotal		
1971	27 (9.6)	110 (39.1)	111 (39.5)	19 (6.8)	240 (85.4)	14 (5.0)	281 (100)
1975	46 (12.4)	109 (29.3)	176 (47.3)	21 (5.6)	306 (82.2)	20 (5.4)	372 (100)
1981	388 (53.4)	100 (13.8)	219 (30.1)	10 (1.4)	329 (45.3)	10 (1.3)	727 (100)
Mean ratio of annual increase 1971—1981	30.5				3.2	10.0	

( ) indicate indices of values to total.

Methods of cultivation currently applied

Cultural practices

Planting time Soybean croppings in Korea can be largely classified into three different groups according to the planting time and growth duration : summer-type, full-season type (monoculture), and after-barley crop. The planting time varies which the cropping. The summer-type crop which does not account for a large area is generally planted from mid-to late April and harvested in early August. Thereafter autumn vegetables are usually cultivated. The full-season soybean, which is more common in the north-central and the southern mountainous areas where there are few days without frost compared to the rest of country, is planted in the middle of May. The after-barley soybean which accounts for the largest area planted to soybean, (about 56 % of the total area) is planted from mid-to late June. Sometimes the planting is delayed and takes place in early July due to labor competition for barley harvest and rice transplanting (Table 6).

Land preparation and planting For land preparation, a small cultivator (Korean made, 8 H.P.) is generally used. Soybean fields are thoroughly plowed and harrowed except in the lowlands where two or four plowed ridge hill plantings are more common. No-tillage and broadcasting of barley stubbles by hand or no-tillage and drilling by seed-planter are common practices for saving labor in after-barley plantings. There are two kinds of soybean planters which are very popular with the soybean growers. One is a planter which can be attached to the cultivator (Korean made, 8 H. P.) and the other is a hand-planter.

Table 6 Regional distribution of soybean planting times in Korea

Region	No of farmhouses	Early to late April (%)	May (%)	June (%)	Early July (%)
Total	450	3	50	41	6
Northern	108	—	92	8	—
Central	162	6	46	39	9
Southern	180	1	28	64	7

Source : ORD-TDB,1982.

Planting density of 222, 222 plants per hectare, with an interval of 60 cm between rows, 15 cm between hills, 2 plants per hill, for the summer-type and full-season cropping and 333, 333 plants per ha, 10 cm between hills with the same distance between rows and number of plants per hill, for after-barley croppings are recommended, respectively.

Fertilizer application In most cases, compound fertilizer is applied as basal dressing. About 40 kg of N, 70 kg of P_2O_5, 60 kg of K_2O are applied per hectare. Fertilizer particularly suitable for soybeans which contains 2 kg of N, 3.5 kg of P_2O_5, and 3 kg of K_2O with a net weight of 25 kg is sold at markets for soybean growers. Along with the above fertilizer, 1.5-2.0 tons of limestone and 10 tons of compost are additionally applied.

Management Inter-tillage and hilling up are performed twice or three times before flowering for weeding and prevention of lodging. A cultivator, or more often cattle power, is used for that purpose.

Herbicides are commonly applied at the early stages of soybean growth to control weeds, especially in the southern area after barley cropping compared to the northern and central areas, as shown in Table 7. Granule type herbicides are preferred by farmers to powder or hydrated ones.

Table 7 Results of sample investigation for the application of herbicides on soybean in Korea

Region	No of farmhouses investigated	No of farmhouses applying herbicides	Ratio (%)
Northern	108	35	32
Central	162	46	28
Southern	180	105	58

Source : ORD-TDB, 1982.

Although several fungal diseases such as purple seed stain (*Cercospora kikuchii*), pod and stem blight (*Diaporthe phaseolorum*), and black root rot (*Clandrocladium crotalariae*), etc. impair considerably seed quality and yields, the amount of fungicides sprayed on soybeans is comparatively small except in cases of severe infestation. In contrast, insecticides are often sprayed, if necessary.

Because nearly all the soybean fields are located on mountain slopes, it is practically impossible to irrigate soybean fields though soybean crops often experience severe drought conditions.

Harvesting and processing Harvesting time of soybeans differs with the type of cropping mentioned before. Summer-type soybean is harvested in early August while full-season (monoculture) soybean is harvested from late September to early October. After-barley soybean is generally harvested from early to late October.

Hitherto no harvesting machines for soybeans have been developed in the country and in the farms soybeans are harvested by uprooting the whole plant or cutting the stalks with a sickle.

Harvested soybeans are generally tied up in bundles and dried in the sun.

Marketing and procurement No reliable investigations on the commercialization ratio of soybeans in recent years are available. However the ratio reached 64.1 % in 1975. Marketing channels for soybean in Korea are illustrated in Fig. 1. There are two main buyers of soybeans : the peddler and the agricultural cooperative. There are no significant differences between farmgate and wholesale prices. Soybean prices are actually regulated by the government's purchasing prices which are announced annually and determined in taking into account related price levels.

Cropping patterns Cropping patterns of soybeans have markedly changed in recent years from the very simple pattern of barley (or wheat) - soybean which accounted for nearly 70 to 80 % of all upland cropping patterns in the 1960s-1970s to the very complicated ones which include high economic cash crops such as red-pepper, sesame, garlic, etc. as partner crops (Table 8).

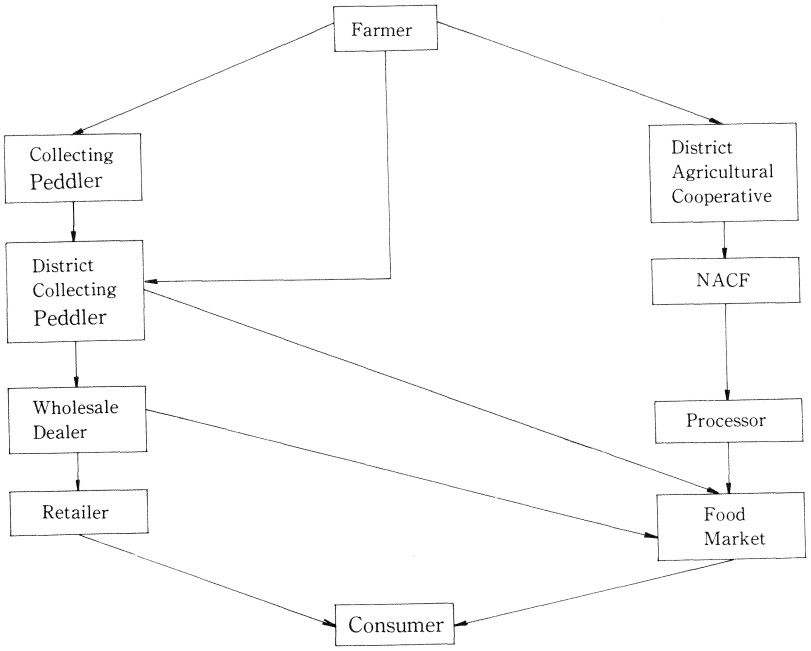

Fig. 1 Marketing channels for soybean in Korea.

Table 8 Change of cropping systems in the central part of Korea

Location	1960s		1980s	
	Cropping system	Percentage planted	Cropping system	Percentage planted
Cheongyang	Barley-Soybean	80	Chinese matrimoney vine	60
			Tobacco	10
Gonju	Barley-Soybean	70	Red-pepper	70
			Water melon-Vegetables	20
			Barley-Soybean	10
Seosan	Barley-Soybean	80	Garlic-Soybean, Radish	40
			Tobacco-Radish, Cabbage	15
			Potato-Vegetables	10
			Ginseng	5
Dangjin	Barley-Soybean	90	Radish-Sesame	40
			Radish-Garlic	10
			Lettuce-Cabbage	10
			Carrot-Garlic	25
			Onion	15

Source : ORD-FMO, 1982.

Competitive power Competitive power of soybean is indicated in Table 9. The farm income derived from soybean ranges only between half to one tenth of that of major summer crops (Table 9). This is the main reason for the rapid reduction in the area planted to soybeans.

Table 9 Farm income derived from major summer crops in Korea

Crop	Farm income (US $/ha)	Index (%)
Soybean	982	100
Potato	2,764	281
Corn	2,363	241
Radish	4,432	451
Chinese cabbage	6,422	654
Red-pepper	10,587	1,078
Water melon	6,439	655
Tobacco	5,590	569

Source : ORD-FMO, 1980.

Varieties and their distribution

Some of the characteristics and geographical distribution of the main soybean varieties which are currently recommended to the farmers are shown in Table 10. Ten soybean varieties are presently recommended to the farmers. On the basis of after-barley cropping, the days to maturity for the varieties range from 113 to 130 days. Compared to other soybean-producing countries, most of the soybean varieties except those for beansprout purposes have heavier seed weight (over 20 gram). Seed weight of less than 16 gram is preferred for beansprout purposes. Soybean varieties with large seeds are cultivated in the northern area while those with small seeds are cultivated in the southern part of Korea.

Except for the soybean varieties shown in Table 10, many local varieties of beansprout and vegetable-type are cultivated throughout the country.

Table 10 Characteristics of main soybean varieties currently recommended and their geographical distribution in Korea

Variety	Year of release	Maturity* (days)	100 seed* weight(g)	Province recommended
Hill	1967	130	14.5	Jeju
Kwangkyo	1969	120	20.2	Entire country except Kangweon and Jeju
Bongeui	1970	125	22.2	Kangweon
Kanglim	1974	127	24.5	Jeonnam and Kyungnam
Dongbuktae	1974	113	23.0	Chungbuk and Chungnam
Backcheon	1977	130	16.0	Jeju
Danyeobkong	1978	130	15.0	Jeonnam, Jeonbuk, Kyungbuk, Kyungnam
Jangyeobkong	1978	115	25.0	Kyunggi, Kangweon, Chungbuk, Chungnam
Hwangkeumkong	1980	116	24.0	〃
Jangbaegkong	1982	126	16.0	Entire country except Jeju

* Data from crops after barley.

Major diseases and pests

There are numerous diseases and pests which impair the growth, quality and yield of soybeans in Korea. Among all the soybean diseases the most destructive ones are those caused by viruses, mainly soybean mosaic virus (SMV) and necrotic soybean mosaic virus (SMV-N). Mosaic virus caused the most destructive soybean disease before the new soybean varieties developed by artificial crosses were released. But most of the newly developed varieties are nearly immune to soybean mosaic virus because utmost efforts were made to breed varieties resistant to this disease. SMV-N which is not endemic to Korea but often becomes epidemic in the country severely impairs soybean production, especially in the northern part of Korea. This disease reduces soybean yield up to 100 % when soybean plants are infected at the early stage of growth. No seed-burn has been reported in this disease but it is considered that the disease is transmitted by aphids sucking soybean plants infected with common soybean mosaic virus. Soybean varieties susceptible to SMV are never infected with SMV-N while those resistant to SMV are generally susceptible to SMV-N. A few soybean varieties have been found to be resistant to both SMV and SMV-N.

Black root rot caused by *Clandrocladium crotalariae* also impairs soybean production, especially in wet years. A yield loss of 21 % was reported at the Crop Experiment Station in 1980 (ORD-CES 1980). No resistant varieties to this disease have been identified hitherto.

Purple seed stain caused by *Cercospora kikuchii* is also a serious soybean disease in Korea. It does not reduce the yield *per se* but impairs the seed quality of soybeans especially that of the summer-type soybeans harvested in the summer season.

The major pests are the pod borer (*Leguminivora glyconovorella*), beanfly (*Melanagromyzae sojae*), and cyst nematode (*Heterodera glycines*), etc. but the yield losses caused by these pests have not been accurately documented so far.

Problems in farm cultivation

Due to the low income derived from the soybean crop, the farmers do not pay much attention to any inputs which might increase soybean yields up to the levels that compensate for all their investments. An ORD investigation (ORD-TDB 1982) on soybean farming in Korea well illustrates this fact. According to the investigation, the ratio of soybean growers using fertilizers and protectants was only 58 and 51 %, respectively. Another problem was the planting density of soybean. Only 46 % of the farmers followed the government recommendation that the planting density should be 333, 333 and 222, 222 plants per hectare for the full-season and after-barley croppings, respectively. The rest of the farmers planted soybeans with a low density of less than 100, 000 plants per hectare. Although two to three plants per hill were recommended, more than 4 plants per hill were planted by 29 % of the farmers.

Soybean research and extension service

A diagram illustrating the research and extension activities on soybeans in Korea is shown in Figure 2.

The Crop Experiment Station (CES), Office of Rural Development which is located in Suweon is the central research institute for soybean in Korea. Two more CES, Youngnam Crop Experiment Station and Mokpo Sub-Crop Experiment Station, also conduct some research on soybean for the southern part of Korea. Research on varietal development is conducted at the three CESs mentioned above. Each province has its own Provincial Office of Rural Development and one or two research workers are carrying out research mainly for the improvement of cultural practices. Except for the researchers under ORD, several researchers at universities and a semi-government agency, the Korean Atomic Energy Institute, are carrying out some research on soybeans. The name of the related institutions, location and number of researchers are shown in Table 11.

Extension services are better organized in Korea. Under the Extension Bureau of the Office of Rural Development, there are 9 PORDs extension bureaus, 300 county extension offices and 3,000

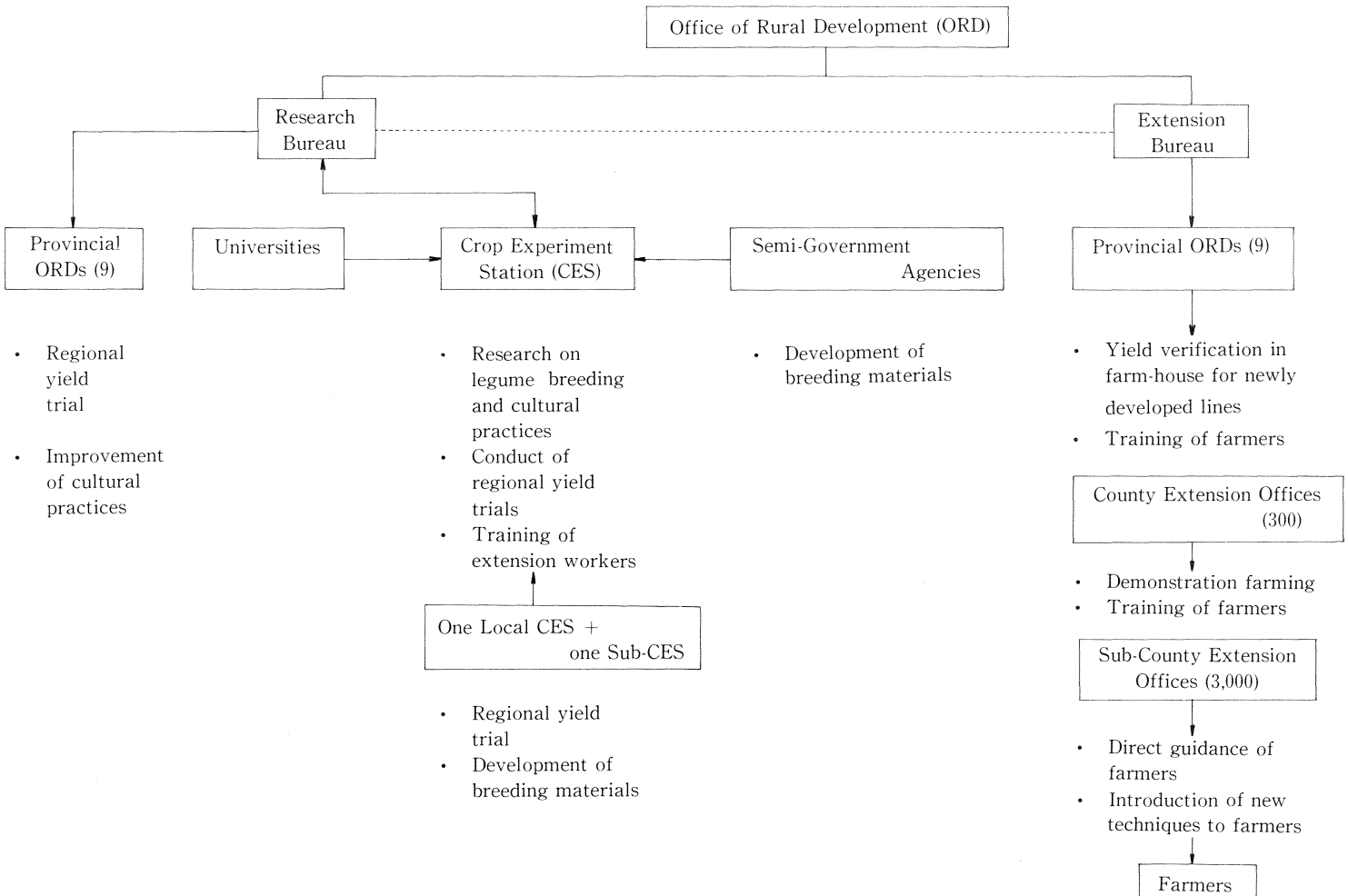

Fig. 2 **Flow chart of soybean research and extension services in Korea.**

Table 11 Research institutions, location and number of researchers related to soybeans in Korea

Institution	Location	No of researchers
Crop Experiment Station (CES) Office of Rural Development	Suweon	5
Youngnam CES, ORD	Milyang, Kyungnam	2
Mokpo Sub-CES, ORD	Mu-ahn, Jeonnam	2
Provincial Office of Rural Development(9)	One for each province	9
Korean Atomic Energy Institute	Seoul	5
Universities (12)	Three in Seoul, one for each province	12

sub-county extension offices in the country. Each extension office has one or two well-trained officers not only for soybeans but also for most of the upland crops.

The relative importance of soybean research or research programs among all agricultural research projects in Korea can not be easily defined but the share of the research programs on a certain crop generally corresponds to the importance of the crop in the country. In taking into account the fact that soybean is the third most important staple food crop after rice and barley in Korea, the priority given to soybean research or research programs is considered to be commensurate to the importance of the crop.

Soybean research trends in Korea can easily be estimated from the present main breeding objectives. The main breeding objectives are as follows : 1) Adaptability to late (after-barley) planting, 2) Varieties for specific use such as soy paste, beansprout, cooking with rice, and vegetable type, 3) Resistance to major agronomic disasters such as diseases, insects, drought, excessive humidity and cold damage, etc., 4) Adaptability to mechanization and cropping systems (shattering and lodging). Along with the above breeding objectives, emphasis is placed on the improvement of cultural practices such as the use of seed planter and no-tillage for after-barley planting, cropping systems related to high income cash crops, and effective weed control by herbicides, etc.

According to the 1983 plan for seed production and distribution of soybeans in Korea, 1,275 tons of certified soybean seeds will be supplied to the farmers to cover a cultivated surface of 33, 000 hectares or 13 % of the total soybean acreage. Four classes of soybean seeds are produced in Korea. *Breeder seeds* are produced at both CES and Youngnam CES. *Foundation seeds* are grown

Table 12 Amounts, area planted, and production for every class of soybean seeds in Korea in 1982

Class	Production office	Amount of seeds aimed (ton)	Area planted (ha)	Amount of seeds planted (ton)
Breeder seeds	Crop Experiment Station, Youngnam CES	0.3	0.9	—
Foundation seeds	Provincial Office of Rural Development(9)	10	12.7	0.4
Registered seeds	Office of Seed Production and Distribution	78	86.2	3.9
Certified seeds	Agricultural Cooperative	1,275	1,275	63.8

Source : 1983 Plan for Seed Production and Distribution in Main Crops, KMAF, 1983.

at 9 PORDs. Each PORD grows the foundation seeds of the soybean varieties which are recommended in the province. *Registered seeds* are grown by the Office of Seed Production and Distribution (OSPD) which is a government office affiliated to the Ministry of Agriculture and Fisheries.Soybean seeds multiplied by OSPD are grown as *Certified seeds* by Agricultural Cooperatives. Certified seeds are distributed to the farmers each year. Government's plan for soybean seed supply follows the system of once-in-6 years. The amounts, area planted, and production for every class of soybean seeds are indicated in Table 12.

Government participation in and support for soybean production

Since the ratio for the national self-sufficiency in soybeans dropped below 30 % in 1982 and in view of the considerable increase in domestic demand, the Korean government set up a plan to promote the increase of soybean production in 1983. The government asked the Agricultural Cooperatives to organize 2,000 Production Increase Units (PIU) throughout the country. Each unit is in charge of 10 hectares of soybean fields. The number of farmers in a unit varies from unit to unit depending on the size of the cultivated area by the members of the unit. Each unit receives compound soybean-fertilizer (N-P_2O_5-K_2O=8-14-12), 30 % free and 70 % free of interest. Soybean seeds of good quality (1,000 tons in 1983) will also be supplied in parts. The government plans to purchase 20,000 tons out of the 30,000 tons which are expected to be produced by all the PIUs. The government will give a prize to 3, 27, and 500 top yielders in the country, county, and sub-county respectively. At the same time, 3, 9, and 40 best units in the country, county, and sub-county, respectively will also receive a prize from the government. The government plans to set up an additional number of PIUs and to subsidize the farmers next year to further promote the national soybean production.

Undoubtedly, the most effective way to promote national production increase is to raise the soybean prices. Actually national soybean prices have always been much higher than those of imported soybeans, as shown in Table 13. Imported soybean price was only one third of the government purchasing price for domestic soybeans in 1982. This wide gap in prices between imported and national soybeans forces the government to import cheaper foreign soybeans. Considering the fact that the ratio of commercialization for domestic soybeans is over 60 %, the amount of soybeans purchased by the government, i.e. 0.9 % of the total production in 1982 (Table 13), was too small. This could be one of the reasons for the relatively low price of soybeans compared to that of other main food crops.

Table 13 The amount and purchasing prices of soybean by the government and the prices of imported soybeans by year in Korea

	1975	1976	1977	1978	1979	1980	1981	1982
Amount purchased by government (1,000 ton)	6.4	1.7	1.6	2.2	4.9	0.04	0.4	2.0
Ratio of total production (%)	2.0	0.6	0.5	0.7	1.9	0.01	0.1	0.9
Prices for soybeans purchased by government (US $/ton : A)	451	541	672	778	889	885	1,017	1,091
Prices for imported soybeans (US $/ton : B)	240	269	291	270	312	296	347	—
A/B (%)	188	201	231	288	285	299	293	—

Source : KMAF, 1982.

Future prospects of soybean production and main constraints

According to a preliminary estimate of the long-term demand and supply of soybeans in Korea made by the Korean Rural Economic Institute in 1982, the annual consumption of soybeans per capita will increase from 8.0 to 9.1 kg in 1991. During the same period, the national production is expected to increase from 216,000 tons to 250,000 tons while the imports should increase from 536,000 tons in 1982 to 1,240,000-1,540,000 tons. Accordingly the ratio of national self-sufficiency is expected to drop from 30 % in 1982 to below 15 % in 1991. The projected soybean yield is 1.68 or 1.92 tons per hectare based on a conservative or optimistic estimate, respectively. The government's main targets for soybean production are not the complete national self-sufficiency but reduction in foreign dependence.

In order to achieve these targets, the government has set up a long-term plan to encourage national soybean production. Some of the aspects are as follows :

(a) Gradual increase of area planted - The increase in soybean area will be realized by converting hillside paddy fields which are often damaged by drought and hillside forests into upland field.

(b) Political support for soybean growers by transferring the import-margin into production increase of national soybeans.

(c) Harmonization of high yields through the creation of additional production increase units.

(d) Large scale dissemination of new high-yielding varieties and cultivation techniques to achieve high yields.

(e) Timely planting by controlling drought.

(f) Guarantee for both amounts and price of government purchase - Government will purchase as much soybean as the farmers wish to sell and propose a purchasing price to enable the farmers to grow soybeans in being assured that their product will be purchased.

(g) Continued incentive awards to farmers who achieve high yields and adopt excellent cultivation practices.

(h) Development of labor-saving cultivation techniques through mechanization.

The main constraints to the increase of soybean production are as follows ;

(a) Insufficient varietal development and delay in the dissemination of new varieties. A great deal of yield losses is due to SMV-N and many of the varieties that have been developed are susceptible to this disease. No full-season varieties have been developed yet, although the increase in the area planted to full-season soybeans has increased in recent years.

(b) Many of the farmers do not make any investment for inputs such as fertilizers and protectants as they believe that soybeans do not require such inputs.

(c) Soybean is a low-income crop compared to other competing summer crops such as sesame, red-pepper, garlic, potato, and several vegetables, etc.

(d) Soybean planting especially after-barley cropping, is often delayed to early July due to labor competition for harvest of barley and transplanting of rice, which results in a considerable yield reduction. Control of drought is practically impossible because most of the soybean fields are located on mountain slopes although soybeans are often damaged by insufficient rainfall.

(e) There is no government guarantee for the amounts and prices of the soybeans produced.

Discussion

Pookpakdi, A. (Thailand) : It appears that soybeans in Korea respond to a longer photoperiod during growth that those grown in the humid tropics. Also the days to maturity are long. Since you use a very high population density such as 300,000 plants/ha, have you experienced any lodging problem ?

Answer : A population density of 300,000 plants/ha is recommended for the after-barley crop of soybeans. Lodging has been observed in case of heavy rains. However lodging is infrequently observed since most of the soybeans are cultivated on hillsides or mountains with marginal soils where other crops cannot grow well. On these soils, the growth of soybeans is very poor, hence lodging is seldom recorded.

Yang, C.A. (AVRDC) : You mentioned that the use of soybeans for industrial purposes was increasing in Korea. Could you define what you consider as industrial use ?

Answer : The term industrial use refers to any product manufactured through industrial processes. Thus soy oil is included in this category along with by-products such as soap, paint, etc. Soy paste, soy sauce, beancurd which are made in factories fall into the category of "industrial use".