Production and Marketing of Specialty Soybeans

Walter R. Fehr
Iowa State University, wfehr@iastate.edu

Follow this and additional works at: https://lib.dr.iastate.edu/icm
Part of the Agriculture Commons, and the Agronomy and Crop Sciences Commons

https://lib.dr.iastate.edu/icm/1994/proceedings/21
The soybean breeding project at Iowa State University has been involved in the development of soybean cultivars for specific end uses for more than 40 years. The initial objective was to develop cultivars with unique characteristics for food products, including tofu, miso, and vegetable soybeans. In the late 1960's, research began at Iowa State on the development of cultivars with modified oil composition. Until the 1980's, the interest of other public institutions and of private companies in breeding specialty cultivars was limited. The situation changed dramatically in the 1980's as more breeders in the public and private sector began to develop specialty cultivars. As a result of research in the public and private sector, the number of different markets for specialty cultivars has increased substantially. As the markets expand, more acres of specialty cultivars will be required and farmers will have the option of producing commodity cultivars or specialty cultivars.

There are several common principles that apply to the production and marketing of all specialty cultivars, regardless of their unique characteristics and end uses. The most important principle is that the identity of specialty cultivars must be maintained during planting, harvest, storage, and delivery to the end user. Identity-preservation presents some interesting challenges for the farmer who is accustomed to the production of commodity grain.

The selection of specialty cultivars is limited to those that have the characteristic of value. For example, in 1994 an Iowa company contracted with farmers to grow cultivars that had a yellow seed hilum. The list of cultivars with yellow hilum that were adapted to Central Iowa was limited. Although the list may have seemed short, it was much longer than the list of cultivars that are acceptable for other specialty markets. For example, there are only a few cultivars that are suitable for use in Iowa to produce edamame, which requires an unusually large seed. To produce edamame, intact green pods are harvested from the plant when the seeds are approaching full size. The green pods are canned or frozen for sale to the consumer. When consumers eat the green seeds as a vegetable, they prefer to eat a few large ones instead of many smaller ones.

A second principle common to the production of soybeans for specialty markets is that a contract is developed between the farmer and the company that wants the crop. It generally is not in the best interest of the farmer to produce a specialty cultivar unless there is a known market. The contract will specify the cultivars that can be grown, any unique production conditions that should be considered, the time and place of delivery, and the premium to be paid. The premium includes any extra cost associated with identity preservation and any yield difference between the specialty cultivars and commodity cultivars. The amount of the premium may be dependent on the quality of the grain that is delivered, such as the percentage of splits.
The marketing of specialty soybeans is a time consuming, expensive, and risky business. Farmers commonly wonder if it would be possible to market their crop directly to the end user, instead of selling it to a company that markets specialty grain. They hear about the high prices that end users pay for some specialty soybeans and would like to capture some of the apparent profit for themselves. The profit realized by marketing specialty soybeans requires more time, money, and risk than most farmers are likely to want to consider. In addition, some specialty markets are not accessible to them because there are no public cultivars available that have the necessary characteristics.

It seems likely that the number of acres devoted to specialty cultivars will increase in the future. The increase will vary depending on the maturity of the market. The future possibilities will be assessed by reviewing the specialty types that were produced commercially in 1994 and some of the types under development.

Tofu soybeans: The production of specialty cultivars for tofu is a relatively mature market. There are Iowa companies that have been producing soybeans for this market for more than 20 years. Any soybean can be used for making tofu, but the quality of tofu depends on the cultivar that is used. Commodity soybeans generally produce a lower quality tofu than the tofu made from cultivars with high protein, large seed size, and yellow hilum, such as Vinton 81 and HP204. Some Iowa companies concentrate on serving the market with commodity soybeans while other companies market specialty cultivars to the manufacturers that produce premium grade tofu. Commodity cultivars yield more than the specialty tofu cultivars, therefore, the premium paid to farmers and the price of the soybeans paid by the end user are directly related to the type of cultivar involved.

There is extensive competition in the tofu market. It does not seem likely that the market will expand appreciably in the future. Public cultivars are available to anyone who wants to produce and market soybeans for tofu.

Large-seeded soybeans: Specialty cultivars that have a size of about 1,700 seeds per pound have been marketed for more than 30 years by Iowa companies. The cultivars, such as LS201, are used for making miso, which is a fermented paste, for edamame, and for tofu. Their protein content is comparable to that of commodity cultivars.

The markets for large-seeded soybeans seem to be evolving. There has been little, if any, demand in recent years from the miso manufacturers for large-seeded cultivars from Iowa. It seems that the miso market is met by Chinese soybeans. There is some experimentation underway in Iowa with the production of large-seeded soybeans for edamame. This is an interesting market because it involves harvesting green pods with equipment designed for use with other vegetable crops. There are some tofu manufacturers that prefer an unusually large-seed size.

Small-seeded soybeans: Soybeans with a size of 5,000 seeds per pound or more are used for making natto, a fermented product, and soybean sprouts. The market for small-seeded cultivars is relatively mature. The market has not been important for most Iowa companies, possibly due to the lack of satisfactory cultivars adapted to the state.
Low lipoxygenase soybeans: The beany flavor of soybeans is attributed to the enzyme called lipoxygenase. There are three lipoxygenase types, which can be referred to as lipo-1, lipo-2, and lipo-3. Parent germplasm has been developed that lacks one, two, or three of the lipoxygenase types. Public cultivars are available that lack lipo-2, such as IA2006. Cultivars that lack two or more of the enzyme types are under development.

The market for low lipoxygenase cultivars has yet to be established. Cultivars that lack lipo-2 have been tried for making tofu, soymilk, and other products, but a significant market for them has not developed yet. Based on preliminary data, it does not seem likely that cultivars lacking two or more of the enzyme types will be superior to those lacking only lipo-2.

Low linolenic acid soybeans: The first large-scale production of soybeans with modified soybean oil occurred in Iowa during 1994. The cultivar 9253 of Pioneer Hi-Bred was grown on about 20,000 acres in northern Iowa. The oil of 9253 has about 2.5% linolenic acid, compared with about 8% of the fatty acid in commodity cultivars. In tests conducted by several public laboratories during the past few years, the flavor stability of the low linolenic acid oil has been markedly superior to conventional soybean oil.

The size of the market for low linolenic acid soybeans has yet to be determined. Pioneer has indicated in the popular press that it expects to increase the acres of 9253 in 1995. The production will be concentrated around processing plants that will extract the oil from the grain. The oil will be shipped to a refiner that will prepare the oil for the end user.

Reduced saturate soybeans: Soybeans with a reduced content of saturated fatty acids in the oil were grown commercially in the Midwest for the first time in 1994. The cultivar XB37ZA of Pioneer Hi-Bred was grown on several thousand acres near a processing facility. The oil will be refined, bottled, and sold to consumers. The size of the market will depend on the acceptance of the new oil by consumers.

Low stachyose soybeans: There were more than a thousand acres of production in 1994 of the first soybean cultivars with low stachyose content. The cultivars were developed through a cooperative program between Dupont and Asgrow. Stachyose is one of the components of the carbohydrates in soybean. It is considered to be less available as an energy source that other forms of carbohydrate. By reducing the stachyose, it is anticipated that the energy available to animals that eat soybeans will increase, which should improve feed efficiency. There will be extensive feeding trials conducted with the grain produced in 1994. The size of the market will depend on the value of the low stachyose soybeans in those trials.

Other possibilities for specialty soybeans: Through the use of biotechnology, soybeans are being genetically modified to produce unique products. It is clear that the soybean will produce products from genes obtained from other plants, animals, and microorganisms. The primary question is whether or not the production of a product is more economical in soybean than in some other organism. When a paper on specialty soybeans is written 10 years from now, it will be interesting to see what specialty types have been added to the list of those in commercial production.
Regardless of the specialty types that are developed in the future, the decision for the farmer regarding the production of specialty cultivars is not likely to change substantially. Farmers will have to decide if they can produce identity-preserved grain at a greater profit than they can realize with commodity cultivars.