UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

Specialty Soybeans

Introduction

The first commercial use of soybean (*Glycine max*) was for its oil; however, this crop is now considered a valuable source of protein as well. Specialty or novel soybeans are used to produce various soyfoods of Asian origin, such as tofu, miso, soy sauce, natto, soymilk, and tempeh. Assorted health food snacks, energy foods, and cereals are also produced from specialty soybeans. Other uses include bean sprouts and soy nuts. Edamame, specialty varieties of edible green vegetable soybeans, is discussed in a separate profile of that title.

Types of Specialty Soybeans

Low (reduced) linolenic soybeans have half the linolenic acid level of standard soybeans. This trait reduces the need for hydrogenation, a process used in converting vegetable oils to margarine that results in the production of unhealthy trans fatty acids.

Natto beans are small-seeded soybeans typically used for the fermented soyfoods of the same name. These beans have a clear hilum, a thin seed coat, and high carbohydrate levels. Natto is a popular food in Japan.

Non-GMO (non-genetically modified organism) soybeans are varieties that have not been genetically altered through bioengineering technology. Consumer concern over the potential long-term health risks of ingesting genetically manipulated foods has led to a greater demand for non-GMO soybeans by some food processing companies.

Tofu / clear hilum food grade soybeans with large seed size and high protein levels are primarily used for tofu and soymilk production.

Triple-null lipoxygenase soybeans lack the three enzymes that produce off-flavors usually found in conventional soybeans. Triple-null soybeans can be used for edible soy products, such as soymilk and tofu.

Organic food-grade soybeans are produced using pest management and fertilization methods that do not include synthetic compounds. Growers producing and selling soybeans that are labeled “organic” must be certified by a USDA-approved state or private agency. The top selling organically produced soy products in the U.S. are tofu and soymilk.

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Other specialty soybeans include varieties with low saturated fat, high isoflavone,

high sucrose, high oleic acid, high stearate, or high protein. Large-seeded soybeans with a clear hilum and thin seed coat are preferred for the soy nut market, while small to medium-sized seeds are preferred for sprouts.

Marketing

Specialty soybeans are generally grown under contract agreements. The processor will typically specify quality requirements, price premiums, and the number of acres to be planted. More precisely, buyers require a quality rating of Grade U.S. No. 1 or higher. Using non-GMO soybeans as an example, the price premium ranges from $1.40 to $3.00 per bushel depending on the level of competition among buyers. A buyer may also provide growers with seeds and production information for the crops. Before participating in a contract agreement for specialty soybeans, growers should consider the trade-off between higher prices and lower yields, as well the cost and time requirements to identify buyers, negotiate contracts, and make shipping arrangements. A buyer contract should be in place *prior* to planting.

Market Outlook

Specialty soybeans are currently grown to meet demand rising from niche markets. Specifically, the primary demand has been from two markets: i) Asian countries (Japan is a major buyer) and ii) U.S. consumers who wish to know where the production comes from and realize the health benefits of soybeans in their diet. Besides the demand for non-GMO soybeans, an increased demand for oils, such as low linolenic and natto beans, is also noticed. This trend is expected to continue as products become available at local supermarkets in addition to specialty and health food stores.

Production Considerations

Site selection and planting — General

Soybeans do best in deep or moderately deep, well-drained, fertile soils. Gently sloping land where flooding, run-off, and erosion are minimal is also recommended. Seeds require a soil that is warm, moist, and free of living weeds. Fields known to have high populations of soybean cyst nematode should be avoided.

The optimum planting period in Kentucky is from early May to mid-June, when soil temperatures have reached the 65° F minimum necessary for rapid emergence. Typical crop rotations often include corn-soybeans and corn-wheat (or barley)-soybeans. Tillage methods successfully used with full season soybeans include conventional, reduced tillage, and no-till.

While production practices for specialty soybeans are similar to those of standard types, it is important to know the contract requirements before the soybeans are grown. Certain production management practices may be required to obtain the highest possible yield while maintaining the designated grain characteristics. For example, contracts could specify fertility, plant population, planting date, as well as harvest, drying, and handling practices. Agronomists in the UK Department of Plant and Soil Sciences are currently testing a number of specialty soybean varieties and researching optimum seeding rates.

The grain identity of specialty soybeans must be preserved from planting through delivery to avoid contamination that would reduce premium prices and decrease marketability. In addition, non-GMO soybeans must be isolated from GMO soybeans during production to ensure varietal purity. Extra effort and care are required to produce a high quality soybean for the specialty food market, but the effort may be compensated for by premium prices.

Site selection and planting — Organic

For grain to be marketed as certified organic, the site selected must have been free of prohibited substances for the previous 3 years. Soil fertility is managed by using cover crops, manure, and compost rather than synthetic fertilizers. Organic specialty soybeans must be physically isolated

from non-organic soybeans during all phases of production and harvest.

Pest management
The major insect pests and diseases of specialty soybeans are generally the same as those of conventional soybeans. Disease and insect management relies heavily on employing sound agronomic practices, such as crop rotation and, when available, resistant varieties. Insecticides and fungicides are infrequently applied to soybeans. Weed control can be achieved by a good crop rotation program and herbicides.

Organic soybean production can be challenging in Kentucky due to the pest problems that can reduce harvest quality and yields. Since synthetic pesticides cannot be used by organic growers, these producers will need to rely more on non-chemical Integrated Pest Management (IPM) practices to help manage pest problems. Weed management often includes inter-row field cultivations conducted in a timely manner during the growing season. Perennial weeds, however, may be difficult to control. Predatory beneficial insects, microbial pesticides, and certain other organically acceptable pesticides are available for insect control.

Harvest and storage
Soybeans are usually harvested when they are at or below a moisture level of 13 percent. Prior to harvest, equipment should be carefully cleaned to prevent contamination with non-specialty soybean types previously harvested. The visual appearance of specialty soybeans is very important to the buyer. Damaged beans will result in price reductions or rejection. If storage is necessary, facilities must be clean, dry, and free of any human toxins.

Labor requirements
Soybean production is highly mechanized in Kentucky and, with the exception of scouting, requires little or no hand labor. Total labor needs are approximately 2½ to 4 hours per acre. Additional labor may be required for organically grown beans; for example, if hand weeding of perennial weeds becomes necessary.

Economic Considerations

Initial investments include land preparation and purchase of seed. For the majority of specialty soybeans, production costs are relatively similar to that of standard soybeans, with the only difference being cost of seed. Growers can expect seed costs for specialty varieties to be 50 percent (or more) higher than standard varieties. Non-GMO soybeans exhibit lower seed costs, but savings are likely outweighed by additional herbicide costs.

Operating costs (2013) for specialty soybeans are estimated at $180 to $200 per acre. Ownership costs are estimated at $45 per acre, which will not vary based on variety produced. This brings total costs to about $225 to $245 per acre. Not included in these figures are transportation costs to market, which could be significant.

Specialty soybeans may have lower yield potential compared to conventional varieties; however, they may compensate for this reduction with adequate premiums. Returns of $450 to $470 to land, labor and management might be expected based on yields of 45 bushels per acre selling at $15.50 per bushel including premiums. The net returns for some specialty beans may have the potential to be significantly higher based on greater yields and more favorable price premiums.

It is important to note that the figures above are not representative of organic soybeans. Organically grown soybeans require greater amounts of labor, and traditional management practices do not apply. With this in mind, organic soybean production should be investigated thoroughly before any production decisions are made. Even though organic soybean costs could greatly exceed that of both standard soybeans and other specialty soybeans, producers may be compensated with up to $29 per bushel.

Selected Resources

- Breeding Triple-Null Lipoxygenase Soybean Cultivars; Optimum Seeding Rate for Novel Soybean Production; Testing Novel Soybean Varieties in *New Crop Opportunities Research Report,* pp. 66-70 (University of Kentucky, 2003) http://www.ca.uky.edu/agc/pubs/pr/pr483/specialty.pdf
- Economists look at new niche for soybeans (FarmProgress.com, January, 2013) http://magissues.farmprogress.com/MDS/MS01Jan13/mds007.pdf
- Edamame (University of Kentucky, 2009) http://www.uky.edu/Ag/cdbrec/introsheets/edamame.pdf.
- Corn and Soybean Budgets (University of Kentucky, 2013) http://www.ca.uky.edu/agecon/index.php?p=29
- Grains Crops Extension: Soybean (University of Kentucky) http://www.uky.edu/Ag/GrainCrops/soybean.htm
- Integrated Crop Management Manual for Soybeans (University of Kentucky, 2009) http://www.uky.edu/Ag/IPM/manuals/ipm3soy.pdf
- IPM in Kentucky Farm Stored Grain (University of Kentucky) http://www.ca.uky.edu/entweb/storage/open.html
- Profiles in Agriculture Entrepreneurship: Iowa Soy Specialties, LLC, Vinton, Iowa (University of Kentucky, 2000) http://www.uky.edu/Ag/CDBREC/cases/iowasoy.pdf
- Soybean Planting in Kentucky, AGR-130 (University of Kentucky, 2011) http://www.ca.uky.edu/agc/pubs/agr/agr130/agr130.pdf
- Specialty Soybean Production and Management in Kentucky (University of Kentucky, 2004) http://www.ca.uky.edu/agc/pubs/agr/agr182/agr182.pdf
- Arkansas Specialty Soybean Market (AgFax.com, 2012) http://agfax.com/2012/11/29/arkansas-specialty-soybean-market-could-be-worth-up-to-15m/
- Choosing Specialty Soybeans for the Right Niche Market (Plant Management Network) http://www.plantmanagementnetwork.org/edcenter/seminars/SpecialtySoybeans/
- Soybean Premiums (Illinois Soybean Association) http://www.soybeanpremiums.org/
- Soyfoods: Adding Value to Soybeans (ATTRA, 2001) https://attra.ncat.org/attra-pub/summaries/summary.php?pub=273

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