QUESTION: What do I need to know about growing buckwheat?

C.F.
California

ANSWER: Buckwheat, *Fagopyrum esculentum*, is a broad-leaved summer annual in the smartweed family. It is an erect plant, reaching about three feet in height, that flowers indeterminately. Buckwheat is grown for livestock and poultry feed, as a commercial grain crop, honey crop, wildlife cover, and multipurpose cover crop.

As a grain crop, buckwheat is milled and sold as buckwheat flour. Buckwheat flour is used in pancake mixes and made into noodles. Soba, or buckwheat noodles, is a traditional food in Korea and Japan. Soba pasta is popular in macrobiotic cooking. In the United States, buckwheat noodles are commonly available in natural foods stores. Hulled buckwheat grain is cooked and consumed whole (groats) and cracked (grits) as a breakfast cereal. Kasha, an ethnic grain dish, is roasted buckwheat. Buckwheat seed is also sprouted and used in salads and on sandwiches.

If a producer is growing buckwheat for the certified organic grain market, no herbicides or commercial fertilizers can be used during cultivation; nor can these materials be used on crop land three years prior to harvest. Growers interested in producing an organic crop should see the several helpful documents in ATTRA's Organic Farming series.

Buckwheat, along with amaranth and quinoa, is categorized as a dicot pseudocereal. Dicot pseudocereals are good, plant-based protein sources due to their high lysine content, an essential amino acid generally deficient in monocot cereals like rice and wheat.

The Buckwheat Grain Crop
Because flower set is hampered by hot temperatures, the commercial buckwheat crop is centered in the cooler regions of the United States. A partial list of states producing commercial buckwheat includes California, Idaho, Minnesota, the Dakotas, Wisconsin, New York, Illinois, Indiana, and Pennsylvania.

There are no standard markets for buckwheat. It is grown on contract for sale to flour mills, natural foods processors, and Japanese buyers. A full production contract implies that all seed produced, whether 5,000 lbs or 50,000 lbs, must be delivered to the buyer. Contracts specify which varieties must be grown. Seed varieties are protected, and growers cannot save seed for future plantings.

Japan imports about 45,000 tons of buckwheat a year. Harris Peterson at Minn-Dak Growers Ltd. explained that 'Kolbam' and 'Koto' (large-seeded types) are the two most common varieties raised on contract because they are popular with Japanese importers.

Russia, where buckwheat is a staple grain, used to produce about 700,000 tons of buckwheat each year. When the Soviet era ended around 1990, however, the collective farming system came unraveled, and agricultural production is down in all sectors. Since Russia produced only about 200,000 tons of buckwheat in 1999, exports to Russia are playing an increasingly important role in how much buckwheat is being contracted with growers in the U.S.

Because buckwheat's quality deteriorates in storage, only the current year's crop may be sold. Birket Mills (1) in Pen Yan, New York, is the largest processor of buckwheat in the United States. Minn-Dak Growers Ltd. (2) of Grand Forks, North Dakota, is another major buyer. Nationally, growers received about $12 per hundredweight for buckwheat in 1996, with an average price of $11.20 per hundredweight between 1980 and 1996. In 2003, buckwheat commanded about $15 (U.S.) per hundredweight in the Canadian wholesale market.

Buckwheat varieties vary between large- and small-seeded types. About a half dozen varieties make up the commercial seed pool. Contractors usually specify which cultivar to plant. The cost of seed ranges from $0.22 to $0.35 per lb.

When planted to harvest as a grain crop, buckwheat is normally drilled at 40 to 55 pounds of pure live seed per acre in 6 or 7 inch rows. This rate should be doubled if the seed is broadcast.

Buckwheat produces a mature seed crop in 9 to 12 weeks after planting, depending on location. The planting date is usually scheduled 60 to 90 days before the first frost. Frost kill halts flowering and initiates drying down; however, it also increases potential for shattering. Following frost, buckwheat is adapted to direct combining. Prior to frost, it is common to swath buckwheat after 75 percent of the seeds have matured and then combine after the plants and seeds have dried in the windrow.

Yields of buckwheat range from 500 to 2,500 pounds per acre. Due to the difficulty of harvesting grain, good average yields range from 1,200 to 1,600 pounds per acre. At 48 lbs. per bushel, this is about 25 to 35 bushels per acre.

Buckwheat is also an important honey crop. An acre of buckwheat will yield about 100 to 150 pounds of dark honey with a distinctive flavor, while increasing grain yield through improved pollination.

Buckwheat as a Cover Crop and Green Manure

Buckwheat has multiple uses as a cover crop/green manure, and is grown throughout much of the U.S. for this reason. It makes an excellent smother crop because it germinates rapidly and produces a dense canopy that shades the soil and underlying vegetation. It has been recommended for eradication of quackgrass, Canadian thistle, sowthistle, leafy spurge, Russian knapweed, and several other pernicious weeds (3). Often a sequence of plowing, cover cropping, green manuring, and repeated cover cropping over the course of a growing season may be necessary for adequate control of perennial weeds.

Buckwheat is a popular green manure crop that provides a quick plowdown in only 30 to 40 days after planting. It is especially useful as a catch crop to provide short term soil cover between early and late season cash crops. When plowed under, the plant material decays rapidly, making nutrients available to the following cash crop. The potential for improvement of soil organic matter is good, too, because buckwheat can produce up to 3 tons of dry matter per acre in a 6 to 8 week period.

Cover crops are gaining wider recognition among sustainable farmers as a habitat and food source for beneficial insects. "Insectary" plants such as buckwheat offer nectar, pollen, honeydew, and herbivorous insects and mites as food to these adult natural enemies of crop pests. Beneficials observed on buckwheat include lady beetles, hover flies, insidious flower bugs, predatory wasps, tachinid flies, and syrphids.

Typically, buckwheat is plowed down about seven to ten days after flowering to avoid seed set and creation of a potential weed problem in the following crop (4). Thus, techniques that extend buckwheat's flowering period but prevent seed set may be used to provide beneficials with habitat over a longer period. Planting in succession and mowing in strips to allow migration of beneficials are a couple of possibilities. A sidebar mower (also known as a sickle-bar mower) is less disruptive to beneficial insect populations than rotary or flail mowers.

The buckwheat plant, like lupine and sweetclover, is widely recognized for its ability to extract and accumulate phosphates from soils. Apparently, organic acids released from their roots solubilize phosphate precipitates in the soil profile and subsoil. Practically speaking, this means buckwheat will thrive on low phosphorus soils, and that it can function as a phosphorus cycling cover crop. Buckwheat, however, is not a substitute for phosphorus fertilizer on low fertility soils. It may, however, be especially useful as a phosphorus-absorbing catch crop following application of rock phosphate (see appendix for more information).

A related species of buckwheat, tartary buckwheat, *F. tataricum*, is sometimes grown as a green manure in Canada and the mountainous regions of the eastern United States because it is less subject to frost injury. Also called "rye buckwheat," "duck wheat," and "India wheat," tartary buckwheat can be planted two to three weeks earlier than common buckwheat. At one time tartary buckwheat was valued because it contains rutin, a flavonal glucoside used as a medicinal agent in the treatment of vascular disorders. Alternative botanical sources for rutin have since been found. The flour, feed, and honey derived from tartary buckwheat are inferior to those from common buckwheat. Consequently, tartary buckwheat shows promise as a green manure in frost sensitive areas, but little commercial value otherwise. In fact, in some parts of Canada it is considered to be a nuisance weed.

Supplemental resources on buckwheat are listed in the Further Reading and Web Resources sections below. The bibliographical citations from Advances in Cereal Science and Technology, CRC Crit. Rev. Food Science and Fagopyrum (Buckwheat Newsletter) contain the important literature reviews on food characteristics and crop production on buckwheat. If you have a need to read any of this literature, photocopies can be obtained through a land-grant university library or the Inter-Library Loan service.

References:

1) The Birkett Mills
[Contact: Clifford Orr]
P.O. Box 440
Pen Yan, NY 14527
315-536-3311

2) Minn-Dak Growers Ltd.
[Contact: Harris Peterson]
Box 13276
Highway 81 North
Grand Forks, ND 58208-3276
701-746-7453

3) Oplinger, E.S. et al. 1989. Buckwheat. In: Alternative Field Crops Manual.
Cooperative Extension Service, University of Wisconsin, Madison, WI. 7 p.

4) Bugg, Robert L. and Ruth Tracey Ellis. 1990. Insects associated with cover crops in Massachusetts. Biological Agriculture and Horticulture. Vol. 7. p. 47-68.

Further Reading:

Anon. 1931. Buckwheat Milling and Its By-Products. USDA Circular 190. 12 p.

Auld, D.L., R.L. Mahler, and K.D. Kephart. 1986. Production of Buckwheat in Northern Idaho. Current Information Series No. 780. University of Idaho Cooperative Extension. 4 p.

Helsel, Zane. 1987. Buckwheat. Science and Agricultural Guide 4305. Cooperative Extension Service, University of Missouri. 2 p.

Leep, R.H. 1981. Buckwheat Production in Michigan. Michigan State University Cooperative Extension Bulletin E-1523. 2 p.

Marshall, Harold G. 1969. Description and Culture of Buckwheat. Pennsylvania State University Agric. Experiment Station Bulletin 754. 26 p.

Marshall, H.G., and Y. Pomeranz. 1982. Buckwheat: Description, breeding, production, and utilization. Advances in Cereal Science and Technology. Vol. 4. p. 157-210.

Meyers, Robert. 2002. Buckwheat, A Versatile Short-Season Crop. The Thomas Jefferson Agricultural Institute. 4 p. (pdf)

Pomeranz, Y. 1983. Buckwheat: structure, composition, and utilization. CRC Crit. Rev. Food Science Nutr. Vol. 19. p. 213-258.

Sando, W.J. 1956. Buckwheat Culture. USDA Farmers' Bulletin 2095. 23 p.

Smith, A.H., C.H. Rust, and D. Baldridge. 1990. Buckwheat: A Potential Montana Specialty Crop. MontGuide 8909. Montana State University Extension Service. 4 p.

Tahir, Inayatullah, and Sikandar Farooq. 1988. Review article on buckwheat. Fagopyrum (Buckwheat Newsletter) [Yugoslavian journal, printed in English]. Vol. 8. p. 33-53.

Web Resources on Buckwheat:

Buckwheat
Alternative Field Crops Manual
University of Wisconsin-Madison, University of Minnesota

Buckwheat
Delaware Cooperative Extension
Agronomy Facts Series: AF-02

Buckwheat
Oregon Cover Crops series, Oregon State University Extension

ProCrop 2000: Buckwheat Menu
North Dakota State University Extension

Buckwheat Production
NDSU Extension Service, A-687 (Revised), September 1995

Buckwheat, A Versatile Short-Season Crop
The Thomas Jefferson Agricultural Institute

Appendix

Occasionally, farmers contact ATTRA looking for information on uptake of phosphorus by buckwheat. The following abstract provides evidence as to how this mechanism works.

Cover Crops Manual, a publication that resulted from a University of California-Sustainable Agriculture Research and Education Program database project, contained the following abstract on phosphorus efficiency of buckwheat.

Annan, C. and A. Amberger. 1989. Phosphorous efficiency of buckwheat (*Fagopyrum esculentum*). Zeitschift for Pflanzenernhrung und Bodenkunde. Vol. 152. p. 181-189.
The ability of buckwheat to acquire phosphorous was characterized by investigating P uptake, morphological features, and chemical changes in the rhizosphere. Root weight and length, and frequency of root hairs were higher when plants were grown under P-deficiency. P uptake rates were only moderate, concentrations of P in the shoot were high (1.8% of dry weight). Release of Mn from MnO2- and P from FeP04- and glucose-6-phosphate were not due to a buildup of organic acids in the rhizosphere, but P release was due to high activities of acid phosphatase for plants grown with low P. The following parameters in which buckwheat is outstanding were regarded as important for its P efficiency: 1) a finely divided root system of considerable length, with a high ratio of root surface to root or shoot length; 2) a high storage capacity for inorganic P; 3) an increased release of protons and FeP04- or Mn02-solubilizing substances by P-deficient plants; 4) a favorable ratio of P uptake to root mass increase, especially at low P supply; and 5) a high activity of acid phosphatase in the rhizosphere and the capability to use P from organic sources.

Thank you for contacting ATTRA with your questions about sustainable agriculture.