



Photo by: Keith Weller, courtesy of USDA ARS

Bean is a common name for large plant seeds of several genera of the family Fabaceae used for human food or animal feed. Although “beans” usually means the seeds of bean plants, it can also mean the whole young pods of bean plants, which if picked before the pods ripen and dry, can be tender enough to eat whole, whether cooked or raw.

- Taken from Wikipedia, The Free Encyclopedia; [www.en.wikipedia.org](http://www.en.wikipedia.org), search Beans.

## Introduction

Dry edible beans, or field beans, come in a wide variety of market classes, including kidney bean, navy bean, pinto bean and black bean. These beans, although differing in seed size and coloring, are all just different types of a single species, *Phaseolus vulgaris* L. Originally domesticated in Central and South America over 7,000 years ago, dry beans moved their way northward through Mexico and spread across most of the continental U.S. These beans were commonly grown with corn and sometimes squash. Beans are an excellent source of complex carbohydrates for energy, as well as protein for growth and repair of body tissue. Many health organizations, including the American Cancer Society, American Heart and American Diabetes Associations recognize beans as a healthy and versatile way to meet nutritional guidelines. Beans are rich in protein, B-vitamins, iron, fiber and many other nutritional needs.

## Market Information

The United State is by far the world leader in dry bean production. Each year, U.S. farmers plant from 1.5 to 1.7 million acres of edible dry beans. And while Americans are the chief consumers of these beans, 40 percent are shipped to

international market in more than 100 different countries around the globe

The leading states in dry bean production are North Dakota, Michigan, Nebraska, Colorado, California and Idaho. Pinto beans are the market class occupying the largest acreage, followed by navy beans.

The major uses of dry beans include dry packaged beans for home use, canned beans (both whole beans and otherwise), brine-packed whole beans and bean flour for commercial baking. The four largest producers of beans are India, Brazil, Mexico and the United States. The United States exports pinto, navy, great northern and light red kidney beans. The majority of U.S. exports are purchased by Mexico (22 %), United Kingdom (16 %), Canada (9 %), Italy (6 %) and Japan (5 %). The United States held 95 percent of the Mexican import market and 80 percent of the Canadian market.

Per capita consumption of edible dry beans from 1991 to 2002 averaged 7.4 pounds. An increase in average per capita consumption of 22 percent from the 1980s. The U.S. population consumed an average of 3.4 pounds of pinto beans per person annually from 1991 to 2002, which is an increase of 43 percent from the

1980s. This increase may be due to increased public recognition of possible health benefits of beans and to a higher Latino population, which consumes more beans on average than the population at large.

Supermarket sales and restaurant use of edible dry beans has increased during the past 10 years. Supermarket sales include bagged dry beans and canned products such as refried beans, soups, chili and baked beans. Restaurants use edible dry beans in foods such as tacos, burritos and chili. Approximately 77 percent of all beans consumed were obtained from retail stores and considered food at home. Away from home sources accounted for 23 percent of the total cooked bean consumer market, which includes fast food, restaurant, schools and other. Restaurants and the fast food market accounted for 11 and nine percent, respectively, of cooked bean consumption.

Households in the lowest-income bracket, with income less than 30 percent of the poverty level (the cutoff point for food stamp eligibility), have the highest per capita consumption of dry cooked beans. In contrast, individuals in the higher-income bracket, with income above 300 percent of the poverty level, have the lowest per capita consumption of dry cooked beans.

# Production Considerations

Dry beans are the same species as green beans (snap beans) commonly grown in gardens. If you've seen green beans growing, you have a good idea what dry beans look like, with the difference being that dry bean varieties have higher seed yields. Some dry bean varieties are vine-like garden bean varieties, while others are more of an erect, bushy plant like soybeans. Dry beans do not grow as vigorously as soybeans, usually reaching only about 18 to 24 inches in height. Pods, each containing 2 to 4 seeds, are borne upon the length of the stem.

Dry beans average about 22% protein in the seed. The amino acid profile of dry beans complements that of corn and other cereal grains, which is why the corn-bean diet was so standard through the Americas. Dry beans are sold in a variety of forms. Great Northern, navy beans or mixes of beans, are the most likely to be sold as whole seeds in unprocessed form. Navy beans and kidney beans are both found in canned form, with kidney beans also common in chili mixes. Pinto beans and black beans are both made into refried beans, among other uses. Red beans are used for baked beans. Dry beans which do not meet quality standards for food use are typically sold for livestock feed. Like soybeans, dry beans have a trypsin inhibitor which prevents protein digestion in non-ruminant animals, including humans. Heat, applied during

processing or home cooking, is needed to break down the trypsin inhibitor and make the beans fully digestible.

Dry beans should be grown on well drained soils. They are not well adapted to heavy clay soils, and are not tolerant of water logging. Since dry beans are a relatively high value crop, they should be grown on the best soils on the farm. To reduce potential disease problems, it is best to plant dry beans following a grass crop such as corn, wheat or sorghum, rather than after soybeans or sunflowers. Dry beans should not be grown in the same field consecutively.

In most years, beans will mature before frost if planted July 1, but yields may be lower. Since dry beans have a good profit potential, it is best to plant them as a sole summer crop in the central and northern part of the state. When planted in early June, dry beans will mature in 85 to 115 days. There are four maturity groups and each market class would typically have varieties differing in length of maturity.

## Varieties and Seed Sources

There are a large number of dry bean varieties available. The first step in variety selection should be identifying which market class can be most easily and profitably marketed and then decide which bean has the best yield potential. For example, if you determined that the best yielding black bean would only yield 80% of what the best navy bean would yield for your location, you might think the logical choice is the navy

bean.

Then you might find out that the black bean was worth twice the price of navy beans, was less likely to discolor during harvest, and was easier to sell -clearly, your choice would change. Seed companies that sell dry bean varieties may be able to provide some ideas on market outlets.

## Planting

Planting depth should be 1 to 2 inches. Bush-type dry bean varieties are best planted in 15 inch rows or drilled in narrow rows. Growing them in 30 inch or wider rows does allow cultivation for weed control, but at that spacing, the beans usually fail to "close the row." Planted in narrow rows, the beans can fill in the rows more quickly, shading out weeds more effectively.

## Fertility

Dry beans should be inoculated to insure *Rhizobium phaeoli* is available for nodulation. Although they fix their own nitrogen, dry beans may still show a yield response from applied nitrogen fertilizer or organic sources of nitrogen. For highest yields, especially under irrigation, it may be appropriate to apply 40 to 50 pounds of nitrogen per acre if the goal is maximizing yield. From an environmental standpoint, it might be better to let the dry beans take care of their own nitrogen needs. Phosphorous and potassium should be applied in accordance with soil test recommendations for soybeans.



## Harvest and Storage

Bush-type cultivars can be harvested with the same equipment as soybeans. Flexible cutter bars are helpful in getting closer to the soil, since dry beans tend to have pods very close to the ground. Rotary combines reportedly do a good job with dry beans. There are specialized dry bean combines available that have two cylinders made to get good seed cleaning without seed breakage. Keep in mind that dry bean seed appearance is very important to the price obtained for the crop. Dry beans need to be cleaned, and may need polished using tumbling drums or other devices to obtain full value.

Harvest can start when seeds are at 18% moisture. This is generally when some pods are brown and a majority of pods are yellow. If beans are cut when the pods are getting really dry, seed shatter can become a problem. Cutting at night or when dew is on can help reduce shattering.

One caution for harvest is that rain at the

time of harvest can cause discoloration in the seed, especially of a navy (white) bean type. Harvest should be done quickly to help avoid discoloration. Choosing a dark seeded variety or pinto variety can help minimize this problem. Seeds should be stored at about 15 to 16% moisture. A belt conveyor is recommended over a metal auger to reduce seed damage. Seeds should be handled gently and not dumped from heights onto concrete or hard surfaces. Careful handling may be more time consuming but will payoff in the price received for a quality bean product.

## Economics

Farmers considering dry beans must be prepared to investigate marketing options. If you will be growing dry beans for the wholesale market it is best to have a contract for sale of the beans before planting. A few growers have been successful in direct marketing their beans, such as to a small scale food processor.

Production costs for dry beans should be similar to soybeans. Post-harvest costs are certainly higher for dry beans, both due to the extra care needed for cleaning and storage, and the possible transportation costs. Some buyers will want the seed bagged in large food grade bags before purchasing.

Gross returns from dry beans can easily be higher than for soybeans. While yields are typically lower (20-30 bu. per ac.), prices are much higher, ranging from \$9 to \$20 per bushel. Achieving a good net profit is dependent on choosing an appropriate market class and good varieties to grow, keeping production costs under control and finding a cost efficient way to clean, store, and deliver the crop. Although dry bean prices fluctuate, as a food crop they do not follow the prices of corn and soybeans. Adding dry beans to

the mix of crops on a farm can help spread out the risk from changes in market prices.

## References and More Information

References for this paper:

- Edible Dry Bean Profile  
[www.agmrc.org](http://www.agmrc.org)
- USDA Economic Research Service  
[www.ers.usda.gov](http://www.ers.usda.gov)
- National Dry Bean Council  
[www.usdrybeans.com](http://www.usdrybeans.com)
- Thomas Jefferson Agricultural Institute  
[www.jeffersoninstitute.org](http://www.jeffersoninstitute.org)
- American Dry Bean Board  
[www.americanbean.org](http://www.americanbean.org)
- Bean: a History. New Bean Bible.  
[www.beanbible.com](http://www.beanbible.com)
- Food Reference Website  
[www.foodreference.com](http://www.foodreference.com)
- Wikipedia, The Free Encyclopedia  
<http://en.wikipedia.org/wiki/Beans>

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