

DRY EDIBLE BEANS

A High Value Alternative Legume

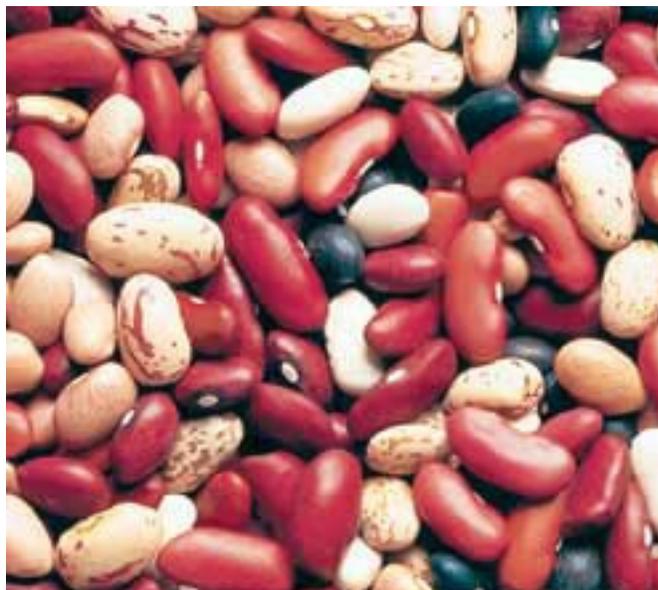
Overview

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 color, 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. Now, instead of the Native American practice of planting dry beans and squash right among corn plants, a different bean, soybean from China, has found its place with corn. The other key difference, of course, is that our modern corn and soybean crops primarily feed livestock, instead of being strictly for human food like the old corn and dry bean system used for thousands of years.

Although grown on a much smaller acreage than soybeans, dry beans are still an important food crop in the U.S. The leading states in dry bean production are North Dakota, Michigan, Nebraska, Colorado, California and Idaho. Total U.S. production is approximately 2 million acres. Pinto beans are the market class occupying the largest acreage, followed by navy beans. Dry beans have occasionally been grown under contract in other states. Dry beans are generally more variable in yield and price than soybeans. However, the advantage of dry beans as an alternative is their relatively high price, ranging from \$9 to \$20 per bushel.

Plant Description

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



Dry beans come in a variety of market classes reflected in the variety of sizes, shapes and colors shown here.

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 (some varieties are even shorter). Pods, each containing 2 to 4 seeds, are borne upon the length of the stem.

Dry bean seed averages about 22% protein. 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 Northerns, 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 cooking, is needed to break down the trypsin inhibitor to make the beans

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How to Grow Dry Beans

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 southern areas, dry beans can easily be double cropped after wheat. Double cropping dry beans is possible north of Interstate 70, but questionable. In most years, dry beans will mature before frost if planted July 1, but yields may be lower. Since dry beans have 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. You can also contact the Jefferson Institute for additional information on market classes and available varieties (573-449-3518).

Planting

Depending on location, dry beans can be planted between mid-May and early July. 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.

Seeding rates vary by market class (due to differing seed sizes) and row spacing, with narrow rows requiring a higher planting rate. Seeding rates (in lbs./acre) are:

| | wide rows | drilled |
|--------------|-----------|---------|
| black beans | 50 | 60 |
| pinto beans | 60 | 90-100 |
| navy beans | 50 | 60 |
| kidney beans | 100 | 120 |
| pink beans | 55 | 65 |

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. Banded P and K are recommended for top yields, with the band one inch to the side and two inches below the seed. Soil pH should be between 6.5 and 7.0 for best dry bean yields. Liming is recommended if soil pH is below 6.5.

Pest Management

Weeds

As a short statured crop, dry beans are not very competitive with weeds. Since they are often planted in June, there is time to do a tillage pass a couple of weeks before planting to sprout weeds, then come back right before planting with additional tillage to kill those weeds. Drilling the crop in narrow rows can also help with weed control. There is a fairly long list of herbicides* labeled for dry beans, including: Assure II, Basagran, Dual, EPTC, Frontier, Lasso, Outlook, Paraquat, Poast, Prism, Prowl, Pursuit, Roundup, Select, sodium chlorate, Sonalan and Treflan. Check the product label to confirm that dry beans are covered and has guidelines.

Insects

There are several times when insect pests can cause damage to dry beans. Weekly scouting of fields is recommended. Like soybeans, dry beans are susceptible to bean leaf beetle, other leaf feeders and cutworms during establishment. Usually, the dry beans can tolerate up to 50% defoliation for a short period in the seedling stage, and will still bounce back nicely. As the plant develops, white flies may briefly infest the crop, disrupting plant tissues and causing wilting and stunting of foliage; whiteflies also have the potential to introduce a virus to the plants. As pods are developing, various sucking insects, such as stink bugs, can damage pods and the appearance of seeds. Since seed appearance is much more important with dry beans than with soybeans, pod and seed damage must be monitored closely. There are about 40 insecticide products labeled for dry beans, along with some organic materials such as pyrethrins that can work well.

Diseases

Dry beans are more susceptible to diseases than many crops, especially in areas with a humid climate. Viruses, fungi and bacterial diseases are all potential problems. Once a virus or bacterium attacks, there is nothing that can be done, but certain fungal diseases can be treated with one of the 30 fungicides labeled for use on dry beans. Bean rust, which shows up late in the season, and white mold, a rotting disease in wet years, are two serious diseases that can be controlled by fungicides. Some viruses can be prevented by an IPM approach to controlling the insect vectors, such as white flies, that can introduce the virus.

Disease control strategies to use with dry beans include selecting resistant varieties, rotating crops, and scouting for white flies or aphids that can introduce a disease. Avoiding poorly drained soils can also help prevent fungal diseases. Bacterial blights, which are seed borne, may be avoided by selecting only certified, high quality seed; using bin run dry beans for seed is not recommended, since they may carry blight or other diseases.

**Pesticides mentioned as being labeled in this publication are based on reference lists published in the Thomson Publications "Quick Guide" on crop pesticides, 2002 edition. These lists are believed to be accurate, but given the changing nature of pesticide registrations, labels and relevant government pesticide regulations should be checked before applying any herbicide or other pesticide.*

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.

It is important to keep in mind that dry bean seed appearance is *very* important to the price obtained for the crop. Besides the normal seed cleaning, dry beans may need to be polished using tumbling drums or other devices to obtain full value. Both swathing and direct combining are used with dry beans: the preferred approach depends on the growth characteristics of the cultivar, and the potential for rain damage on windrowed beans.

Harvest can start when seeds are at 18% moisture. This is generally when some pods are brown and a majority of pods are yellow. Cylinder speeds at high moisture can be 300 to 450 rpm, but the cylinder speed should be slowed down with drier seeds. Sieve setting should be 7/16 of an inch, with relatively high fan speeds. Concaves should initially be set 1/2 inch at front and 1/4 inch in the rear, and opened up further as the beans dry down. The combine's operating manual may have suggestions on settings for dry beans. If beans are cut when the pods are getting really dry, seed shatter can become a problem. Cutting at night or when a dew is on can help reduce shattering.

Getting good quality beans out of the field can be a challenge with dry beans, especially in areas that get regular fall rains. Late rains can stimulate mature plants to start new green growth, or cause seed discoloration. Timely harvest is important with dry beans.

Seeds should be stored at about 15 to 16% moisture. When handling, 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 pay off in the price received for a quality bean product.

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Markets and Economics

Farmers considering dry beans must be prepared to do some investigating into marketing options. Volume markets may be some distance away, but a few acres of production might be marketed through a more local retail outlet. Growers in some states have found that if they formed a small dry bean cooperative, sometimes with a common storage facility, they improved their chances of attracting buyers and getting production contracts. It is best to have a contract for sale of the beans before ever planting them; otherwise, you can end up with a bin full of dry beans and no place to easily sell them. The state department of agriculture's marketing division may be able to help identify possible buyers.

If things go well during a season, production costs for dry beans should be similar to soybeans. However, extra costs can occur, due to possibilities of replanting, spraying for insects or diseases (more likely in dry beans than soybeans), or extra labor during harvest. Nitrogen fertilizer may be put on dry beans. 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 it.

On the positive side, gross returns from dry beans can easily be higher than for soybeans. While yields are typically lower, around 20 to 30 bushels per acre, 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.



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