

IDAHO CROP PROFILES

Dry Beans

Production Facts

- Idaho ranks sixth nationally in commercial dry bean production and accounts for 7% of the U.S. dry bean crop. In 2001, Idaho harvested 1.4 million cwt of dry beans valued at \$27 million from 73,000 acres.
- Idaho is the number one producer nationally of small red and pink beans, second in production in great northern beans, and fourth in the production of pinto beans.
- Yields averaged 1,950 pounds per acre for the major market classes of dry beans grown in Idaho.
- Production costs vary with cropping practices and by location, but generally average \$400 per acre.
- In 2001, Idaho dry bean production consisted of the following market classes: 30% pinto beans, 38% garbanzo, 7% pinks, 5% small reds, 6% great northern, and 11% cranberry, black, turtle, small white and several other bean classes.

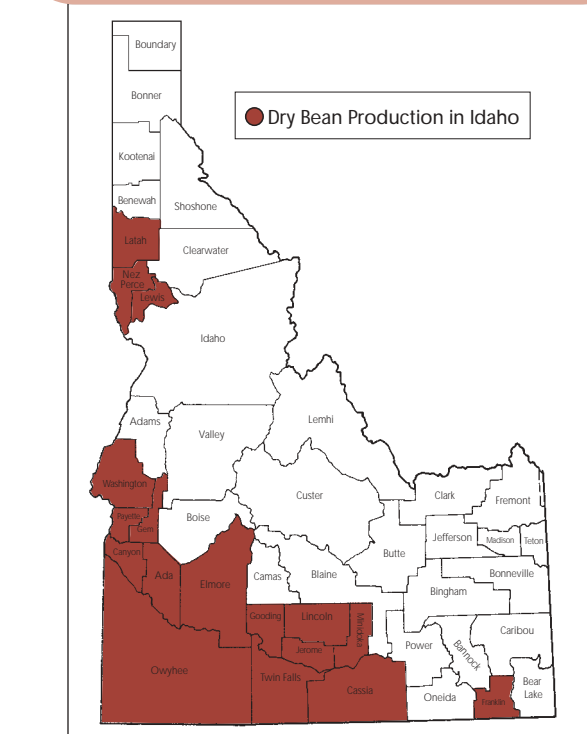
Production Regions

Idaho dry bean production occurs along the Snake River plain from southcentral to southwestern Idaho where water is available for irrigation and the climate is favorable for dry bean production. Southcentral Idaho produces about 80% of the dry beans grown in Idaho. Production occurs in Twin Falls, Jerome, Minidoka, Cassia, Gooding and Franklin counties. The majority of the remaining dry beans are grown in southwestern Idaho in Canyon, Owyhee, Elmore, Ada, Payette, Gem, Washington and Lincoln counties. Minor dry bean production is found in Latah, Nez Perce and Lewis counties.

General Production Practices

Historically, the production of dry beans in southern Idaho has related to the favorable climatological factors of the region. The semiarid climate receives 10 to 14 inches of annual precipitation, primarily in the late fall, winter and early spring. The warm, dry, sunny days of summer, together with the availability of irrigation in the region, have made possible the production of healthy, disease-free dry beans.

Dry bean market classes are categorized based on differences in seed size, color and shape. Small-sized beans include navy and black turtle beans, medium-sized beans include pintos, great northern, pink, and red Mexican beans and large-sized beans include kidney and cranberry beans. The white seed classes include navy and great northern beans, and mottled classes include pinto and cranberry. In addition to obvious seed trait differences among classes,



major differences exist in growth habit, disease reaction and adaptation.

This diversity in seed size, shape and color permits the targeting of commercial classes to specific regional and cultural markets overseas. In any given year, about 20 to 40% of Idaho beans are exported. Great northern beans are marketed in Europe and northern Africa, navy beans in the United Kingdom and pinto and black beans in Mexico, Dominican Republic, Venezuela and Brazil. Exports of beans to Africa are likely to increase.

About 80% of the beans grown in the United States are consumed nationally. Pinto beans are a dry-pack commodity, usually canned and marketed as refried beans, but also prepared in Mexican and South American dishes. Great northern

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beans are canned in brine and commonly used for soups, casseroles and baked dishes. Pink beans are typically canned in spicy brine and are popular in barbecue-style dishes. Red Mexican beans are preferred beans for chili sauce.

Dry beans provide Idaho growers with an additional cash crop that fits well into rotations with alfalfa, clover, small grains, potatoes and sugarbeets. Dry beans are grown every two to four years. Successive bean production on the same field is discouraged because of the buildup of disease and insect problems and a reduction in soil fertility and organic matter.

Idaho dry beans are certified to assure that seed is of high quality, free from varietal mixtures, seedborne disease and objectionable weed seed, and meets the 85% minimum germination requirement. A current embargo prohibits importation of foreign bean seed. This embargo includes foreign countries and the United States east of the Continental Divide.

Dry beans are a warm-season crop that is sensitive to irrigation practices and subject to physiological damage caused by unfavorable environmental conditions. They tolerate a wide range of temperatures but are not tolerant to frost or prolonged exposure to near-freezing temperatures at any stage of plant growth.

Cool, humid or rainy weather is unfavorable to dry bean growth, and production is more successful when rainfall is light during the latter part of the growing season. Dry beans grown under sprinkler irrigation require close monitoring because water drops striking the plant can cause "bloom drop," which lowers bean yield. This is especially damaging when unexpected or excessive rain or high winds occur during bloom. Exposure to high daytime temperatures causes heat lesions, while exposure to direct or reflected sunrays causes sunscald.

High levels of salt or alkaline soils cause corrosive damage to bean leaves. To correct this problem, growers must adjust irrigation timing and the amount of water applied to reduce the movement of salt into the root zone. Increasing the number of irrigations, but irrigating at a lower volume, will provide sufficient water for plant growth while preventing salts from migrating up into the plant root zone.

Dry beans are planted when soil temperatures reach 55°F or higher, around May 15 to June 20. Land preparation for planting includes fall or spring plowing, or, when beans follow alfalfa, an application of 2,4-D to kill the alfalfa stand.

Two methods of seedbed preparation are used to plant beans. The most common is to apply preplant irrigation water to soak the ground followed by a drying period of 10 days. The soil is worked to a depth of 3 to 4 inches while incorporating pre-plant herbicides. With the second method, pre-plant herbicides are incorporated followed by the application of irrigation water through shallow corrugates placed in crop rows. With either method, enough water is applied to provide adequate moisture for seed establishment.

Beans are commonly planted using 22-inch or 24-inch row spacing. The seeding rate depends on the type of bean planted and ranges from 30 to 100 pounds per acre. Bean fields are cultivated once or twice early in the season for weed control.

Dry bean harvest begins around September 10 and continues through October 20. Beans are cut and windrowed in early September and left to dry for about two weeks. They are then harvested by combine and hauled to the warehouse in bulk to be milled, stored and eventually sold through the warehouse. The price received by the grower is reduced to cover milling and storage costs.

Integrated Pest Management

Proper crop rotation with alternate crops is an essential practice that reduces the buildup of diseases, weeds and insects. In addition, producers avoid growing beans successively in the same fields due to the potential for disease outbreak. Growers plant the most disease-resistant variety available for a particular market class of dry beans. All growers practice field scouting for pests to detect diseases, insects and weeds early in the growing season, before they reach damaging levels.

Insect Pests

Several insect pests and spider mites continually threaten Idaho bean fields, but seldom cause enough damage to warrant insecticide treatments. Insect problems vary greatly by location and from year to year. Weather conditions during the previous winter and early spring influence survival rate of insects. Mild winters increase survival rates of insects and spider mites and increase the potential for damage to dry beans.

Twospotted Spider Mites, *Tetranychus* spp.

The early spring generation of spider mites develops in weedy field margins, along ditch banks or in alfalfa, clover or small grain fields. In most years spider mites cause little damage to beans. In years of high infestations, spider mite feeding on bean leaves can cause up to 80% yield loss in individual fields. Several generations occur each summer, and severe mite outbreaks can be unnoticed if fields are not regularly monitored.

A common practice among growers to reduce mite damage is to treat a 50- to 100-foot border of the bean field adjacent to alfalfa or clover fields. Treating weedy field margins at the time of hay harvest is also effective. Severe mite infestations, however, will require an insecticide treatment of the entire field.

Chemical Control

Dimethoate (Dimethoate, Cygon)—In an average year, 5 to 10% of the bean acres are treated with dimethoate. In years of severe infestation, dimethoate would be applied to about 70% of the dry bean acres.

Propargite (Comite)—In an average year, 5 to 10% of the dry bean acres are treated with Comite. In years of severe infestation, Comite is applied to about 25% of the dry bean acres.

Seedcorn Maggot, *Delia platura*

Seedcorn maggots may severely reduce a stand of beans when they have been planted in soil with high organic matter and when weather conditions are cold and wet. Left uncontrolled, seedcorn maggots can reduce the yield of beans by 5 to 10%. The adult is a gray fly with a slender body and long wings. Eggs are laid in the soil in the spring. Although there are several generations per year, the spring brood is the most damaging. Maggots burrow into and feed on the developing seeds and plant stems. Severely attacked bean plants often die.

Chemical Control

Chlorpyrifos (Lorsban 50 SL)—Chlorpyrifos is applied as a seed treatment to 5% of the dry bean seed at a rate of 1.8 ounces of formulation per 100 pounds of bean seed. Chlorpyrifos seed treatment is the most effective method of control for the seedcorn maggot.

Cultural Control

Cultural practices that reduce the risk of seedcorn maggot damage to beans include the following:

- Planting beans into a well-prepared seedbed
- Avoiding planting into cool, wet soils
- Avoiding planting in soils with high levels of organic matter (manure, crop or weed residues) that was incorporated within two weeks before planting
- Practicing good weed control
- Plowing in the fall and delayed planting

Many of these options can be limited by spring weather conditions such as heavy rain and cool temperatures after planting the crop.

Beet Leafhopper, *Circulifer tenellus*

Beet leafhoppers, or “white flies,” cause damage to beans by transmitting curly top virus. The leafhopper overwinters in vast areas of sagebrush, Russian thistle and mustard-type weeds that grow on rangeland and abandoned farmlands. Leafhoppers migrate long distances with the wind to summer hosts, transmitting curly top virus to susceptible plants. No effective control exists once the leafhopper has migrated to susceptible plants. Control methods that reduce curly top include planting resistant varieties, proper timing of planting dates and applying systemic insecticides at planting.

Chemical Control

Phorate (Thimet)—Phorate is applied at planting to 1% of the bean acres at a rate of 1.4 ounces active ingredient per 1,000-foot row, one time per year.

Western Bean Cutworm, *Loxagrotis albicosta*

Damage by the western bean cutworm (WBC) varies by location and from year to year. Determining treatment for this pest is usually on a field-by-field basis. Damage by the WBC typically causes a 2 to 10% reduction in bean yield. WBC mature in overwintering larval cells in the ground and emerge during July. Peak moth flight occurs late July. The larvae are found in late July and August. They feed on leaves for about 10 days and then feed at night on developing pods. The larger larvae eat through the pod and into the developing bean seed.

Treatment must be properly timed for effective control of WBC. Applications are made 10 to 20 days after peak moth flight. The light trapping program (BEACON) developed by the University of Idaho can inform growers of the most effective time to treat for WBC.

Chemical Control

Esfenvalerate (Asana)—Esfenvalerate is applied to 5 to 10% of the dry bean acres at a rate of 0.05 pound active ingredient per acre, one time per year. Esfenvalerate provides 90% control of WBC.

Thrips, *Thrips* spp. and *Frankliniella* spp.

Peak populations generally occur about a month after planting. Damage is usually most severe on younger plants, which eventually recover from feeding but show lower yields and later maturity.

As native weeds dry out, grain and pea crops mature, and hay is cut, thrips are forced to move from these hosts into bean fields in southern Idaho. Thrips do not reproduce well in beans; therefore dry bean injury is usually of minor importance. Proper fertilization and irrigation minimize thrips damage. Insecticide sprays control thrips on plant leaves but not on blooms.

Chemical Control

Dimethoate (Dimethoate 4EC)—Dimethoate is applied to 5% of the bean acres at a rate of 0.5 pound active ingredient per acre, one time per year. Dimethoate is applied as thrips populations develop, usually during the early season.

Redbacked Cutworm, *Euxoa ochrogaster*

The redbacked cutworm is the most important species of cutworm that occasionally causes damage to beans in Idaho. The moths deposit eggs in mid to late summer. Those eggs hatch the next spring, and in about 45 days the cutworms complete their development. Where soil has formed a crust layer and cutworms are feeding beneath the surface, the field must be irrigated to bring the worms to the surface before applying an insecticide.

Chemical Control

Esfenvalerate (Asana)—Esfenvalerate is applied to 5 to 10% of the dry bean acres at a rate of 0.05 pound active ingredient per acre, one time per year.

Bean Aphid, *Aphis fabae*

Bean aphids occasionally infest beans in damaging numbers, but most of the time, they prefer sugarbeets or corn as summer hosts. This species overwinters in the egg stage on plants such as snowball bush and curly dock. They colonize and feed upon plant leaves and bean pods. Chemical control is generally not required.

Weeds

Weeds cause problems in bean cropping systems, especially during crop establishment, by competing with beans for irrigation water, nutrients and sunlight. Seed quality and yields are greatly reduced when weeds interfere with crop growth. Left uncontrolled, weed infestations can reduce yield 50 to 75%, and certain weeds damage the potential seed quality of harvested beans. For instance, hairy nightshade berries commonly stain beans, and weed seeds that mix with beans during harvest hinder seed certification. Troublesome weeds include hairy nightshade, yellow sowthistle, quackgrass, Canada thistle, sandbur and common mallow.

Weed control in beans begins with a pre-plant tillage operation followed by a pre-plant incorporated or a pre-emergence herbicide application. Beans are cultivated once or twice early in the season. More than two cultivations are not recommended because of undue injury to the bean root system. Some growers apply post-emergence herbicides to control later season weeds, though these applications are not as common as pre-plant and pre-emergence treatments because they offer comparatively lower economic returns.

Chemical Control

Bentazon (Basagran)—Bentazon is applied to 3% of the bean acres at a rate of 1 pound active ingredient per acre, one time per year. Bentazon is applied post-emergence to control escaped weeds such as cocklebur and thistles.

Dimethenamid-P (Outlook)—Dimethenamid-P can be applied before or after planting, but it must be applied before crop and weed emergence. Application rate is 0.65 pound active ingredient per acre. The maximum that can be applied is 0.98 pound active ingredient per year. Dimethenamid-P has recently been registered and is commonly used in a tank mix with ethalfluralin or pendimethalin.

EPTC (Eptam, Eradicane)—EPTC is applied pre-plant to 40% of the bean acres at a rate of 3 pounds active ingredient per acre, one time per year. EPTC provides the most effective hairy nightshade control of all registered herbicides. EPTC is usually tank-mixed with ethalfluralin or trifluralin.

Ethalfluralin (Sonalan)—Ethalfluralin is applied pre-plant at a rate of 1.5 pounds active ingredient per acre, one time per year. Ethalfluralin and pendimethalin are applied to bean acreage not treated with trifluralin. It is commonly used in a tank mix with EPTC or dimethenamid-P.

Imazamox (Raptor)—Imazamox is a new herbicide that is used for post-emergence weed control. It is applied after the first trifoliolate leaf, but before bloom. Application rate is 0.031 pound active ingredient per acre.

Pendimethalin (Prowl)—Pendimethalin is applied pre-plant at a rate of 0.5 to 1.5 pounds active ingredient per acre, depending on soil type. Prowl should not be applied after planting, due to possible crop injury. Pendimethalin and ethalfluralin are applied to bean acreage not treated with trifluralin. Pendimethalin is commonly used in a tank mix with dimethenamid-P.

S-metolachlor (Dual Magnum, Dual II Magnum)—S-metolachlor is applied preplant to 3% of the bean acres at a rate of 1.33 pints active ingredient per acre, one time per year. S-metolachlor can be applied as a substitute for EPTC.

Trifluralin (Treflan, Trilin)—Trifluralin is applied pre-plant to 75% of the bean acres at a rate of 0.5 to 1 pound active ingredient per acre, one time per year. Trifluralin provides broad-spectrum weed control during crop establishment and is commonly used in combination with EPTC.

Diseases

The dry climate of southern Idaho, in combination with disease quarantines, has limited the spread and severity of bacterial, viral and fungal diseases in bean production. However, the potential always exists for the outbreak of several diseases. In addition, the use of sprinkler irrigation systems alters the microclimate, which may affect the incidence and severity of several bean diseases. Bean varieties are available that have resistance to some of the serious viral diseases. Some pinto bean varieties are resistant to curly top and mosaic, and red Mexican and red kidney bean varieties are considered resistant to specific races of the halo blight pathogen.

Sclerotinia Wilt, *Sclerotinia sclerotiorum*

Fusarium Root Rot, *Fusarium solani* f. sp. *phaseoli*

Pythium Wilt, *Pythium* spp.

Rhizoctonia, *Rhizoctonia solani*

Sclerotinia, or white mold, is the number one disease threat to Idaho dry bean production. White mold can reduce bean yields in individual fields by 25 to 50% within as brief a period as two weeks during the later part of the growing season. This disease has increased in severity, partly due to the increased use of sprinkler irrigation. The fungus requires high humidity and a moist soil surface to cause infection and spread within the field.

Serious outbreaks of white mold can occur when irrigation water is applied to bean fields with a history of white mold before the soil has thoroughly dried. This practice can lead to severe outbreaks, particularly if cloudy, rainy weather prevails.

White mold is characterized by a rapid, soft rot of infected tissues, which are usually covered by a mass of white fungal growth if wet conditions persist. Fungicides can suppress white mold, but they must be applied before infection. Once infection has started, the only control is allowing the soil surface to dry thoroughly between irrigations.

Fusarium root rot is widespread in Idaho and may be quite destructive in soils that have been repeatedly planted to beans without proper rotation to alternate crops.

Pythium wilt is caused by a fungus that attacks the stem of the plant usually before pod formation. A soft, slimy rot occurs at the soil line and extends up into the bean plant. The fungus usually attacks the plant during the early part of July. Although this disease ordinarily is of little importance, it may cause minor damage locally when conditions favor development.

Pythium spp. and *Rhizoctonia solani* both cause seed rots and seedling blights in beans. These soil-borne fungi are most damaging when there is a period of cool, wet

weather in the first few weeks after seeding followed by hot, dry weather. Germinating seeds or young seedlings are attacked while they are still in the ground, and emerged seedlings are attacked at or below the soil line, resulting in "damping off." Control involves planting non-susceptible varieties and using seed treatments.

Chemical Control

The infection level and type of disease affecting beans vary from year to year and by location. In a given year, approximately 76 to 80% of the dry bean seed is treated with one or more fungicides. In some cases, chlorpyrifos may be added to the seed treatment for seedcorn maggot control. Fungicides are frequently applied at less than label rate and usually mixed with other fungicides.

Captan (Captan 400)—Captan can only be applied to beans as a seed treatment at a rate of 2 to 3 fluid ounces per 100 wt of seed to control seed rots and seedling blights. It is frequently combined with mefenoxam and fludioxonil.

Fludioxonil (Maxim 4 FS)—Fludioxonil is applied as a seed treatment at a rate of 0.167 to 0.334 fluid ounce per 100 wt of seed. Fludioxonil is an important fungicide to control *Rhizoctonia* and *Fusarium*. It is frequently combined with mefenoxam to control *Pythium*.

Mefenoxam (Apron XL LS)—Applied as a seed treatment at a rate of 0.32 to 0.64 fluid ounce per acre, mefenoxam offers good control of pythium damping off.

Thiophanate methyl (Topsin M)—Thiophanate methyl is applied as a foliar treatment at a rate of 1.0 to 1.5 pounds active ingredient acre and should be applied only once per year. Thiophanate methyl should be applied at early bloom when all plants have one open bloom. The spray should be directed at the sides and bases of the plants using drop nozzles; protection is not needed on the tops of the plants.

Halo Blight, *Pseudomonas syringae* pv. *phaseolicola*

Halo blight is the most common bacterial disease of beans in Idaho, although it has not been detected in Idaho commercial bean fields in the past 10 years. The bacteria are carried on and in the seed, which enables their survival from year to year and their spread to other bean fields. Other mechanisms of transport include hail, rainstorms and transportation of farm machinery, animals and insects.

After several years of major halo blight epidemics in the early 1960's, a blight quarantine was imposed that required infected fields to be plowed down and imported bean seed to be free of bacterial infection. The regu-

lation remains in effect today and is credited with saving the Idaho bean seed industry. Halo blight is identified by water-soaked, greasy-looking spots on pods and necrotic spots surrounded by a chlorotic halo on leaves.

Bean Common Mosaic

Bean common mosaic is caused by two different viruses: bean common mosaic virus (BCMV) and bean common mosaic necrosis virus (BCMNV). It has been in Idaho for the past 70 years with recent major outbreaks occurring in 1977 and in 1989. BCMV can be seedborne and pollenborne. Dispersal of the virus, within and between fields, occurs primarily from aphid feeding and movement.

Economic loss varies greatly. During severe epidemics, yields of susceptible varieties may be reduced by one-third or more. Planting resistant varieties helps control this viral disease. Most dry bean cultivars are resistant to one or more strains of bean common mosaic and some newer cultivars provide resistance to more than one strain.

Curly Top

Curly top is another viral disease affecting beans and is spread by the beet leafhopper. This disease tends to be more of a problem when winter and spring precipitation is below normal, causing the overwintering hosts of the sugarbeet leafhopper (various mustards) to die and the leafhoppers to emigrate in search of greener hosts such as beans. Control of this virus is best achieved by planting resistant cultivars. In general, cultivars in the pink, pinto and small red market classes are resistant to curly top.

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Groundwater—To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

Trade Names—To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.



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