

# Crop Profile for Dry Beans in Idaho

## General Production Information



Idaho ranks sixth nationally in commercial dry bean production and accounts for 7% of the U.S. dry bean crop. In 1998, Idaho harvested 2.1 million cwt of dry beans valued at \$39.7 million from 103,000 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.

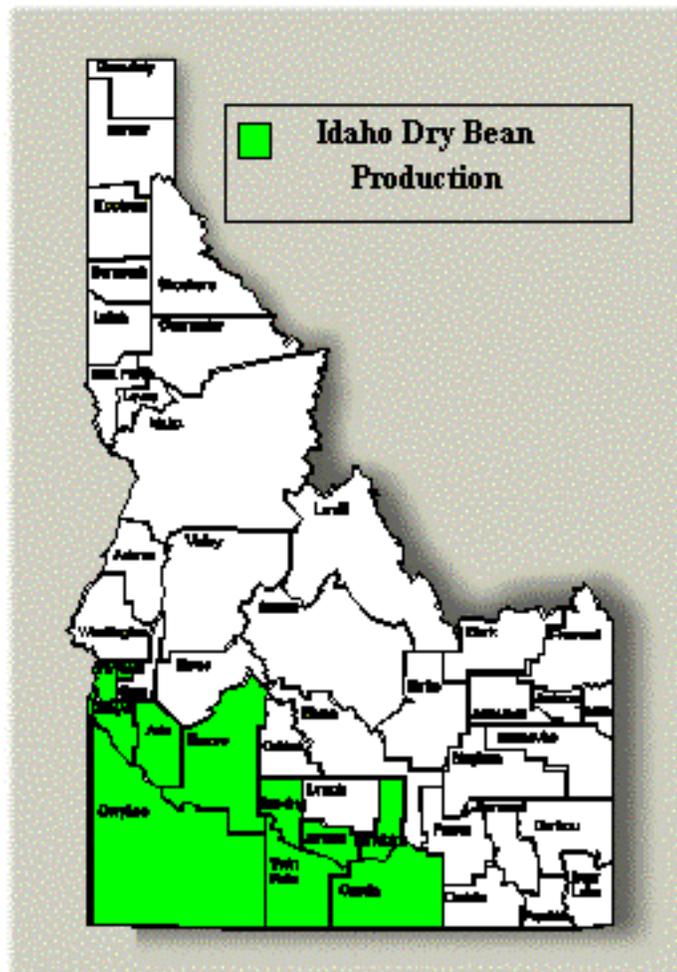
Yields averaged 1,500-2,000 pounds per acre for the major market classes of dry beans grown in Idaho.

Production costs vary with cropping practices and by location, but generally average \$500-\$700 per acre.

In 1998, Idaho dry bean production consisted of following market classes:

- 42% Pinto beans
- 17% Pinks
- 12% Small Reds
- 8% Great Northern and Garbanzo beans
- 10% Cranberry, Black, Turtle, Small White, and several other bean classes

## Production Regions



Idaho dry bean production occurs along the Snake River Plain from south central to southwestern Idaho where water is available for irrigation and the climate is favorable for dry bean production. South central Idaho produces about 80% of the dry beans grown in Idaho. Production occurs in Twin Falls, Jerome, Minidoka, Cassia, and Gooding counties. The remaining 20% of dry beans are grown in southwestern Idaho in Canyon, Owyhee, Elmore, Ada, and Payette counties.

Historically, the production of dry beans in southern Idaho have related to the favorable climatological factors of the region. The semiarid climate receives 10-14 inches of annual precipitation, primarily in the

late fall, winter and early spring. The warm, dry and sunny days of summer, together with the availability of irrigation in the region, has made possible the production of healthy, disease-free dry beans.

Dry bean market classes are categorized on differences in seed size, color, and shape. Small seed size 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, other major differences exist among classes in growth habit, disease reaction, and adaptation. This diversity in seed size, shape, and color permits the targeting of commercial classes to meet specific regional and cultural market needs overseas. In any given year, about 20-40% of Idaho beans are exported. Great Northerns are marketed in Europe and North Africa, Navy beans are marketed 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 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 are an important crop to Idaho agriculture because they provide growers with an additional cash crop that fits well in rotation with alfalfa, clover, small grain cereals, potatoes, and sugarbeets. Dry beans are grown as a rotation crop every two to four years. Successive bean production on the same field is discouraged because of buildup of disease and insect problems and a reduction in soil fertility and organic matter. Idaho dry beans are certified to assure the grower that the seed is of high quality and free from varietal mixtures, seedborne disease, objectionable weed seed, and will meet the 85% minimum germination requirement. Current embargo prohibits importation of foreign bean seed. This embargo includes foreign countries and United States east of the Continental Divide.

Dry beans are a warm season crop that are 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 to 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 movement of salt into the plant root zone. Increasing the number of irrigations but at a lower volume will provide sufficient water for plant growth while preventing salts from moving up into plant root zone.

Dry beans are planted when soil temperatures reach 55°F or higher, around May 15-June 20. These dates have proven practical because the bean crop will have an opportunity to produce blossoms before the onset of hot, July weather. 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 3-4 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. The field is soaked from corrugates to provide adequate moisture for seed establishment. Beans are commonly planted using a 22 inch and 24 inch row spacing. Seeding rate depends on the type of bean planted and ranges from 30-60 pounds per acre. Bean fields are cultivated once or twice during early season for weed control.

Harvest of dry beans begins around September 10 and continues through October 20. The beans are cut and windrowed in early September and left to dry for about 2 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 (IPM):**

Proper crop rotation with alternate crops is an essential practice in bean production 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 will plant the most disease-resistant variety available for a particular "class market" 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 insecticides 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 chance of damage to dry beans.

### **Two-Spotted Spider Mites**

*Tetranychus* spp.

The early spring generation of spider mites develop 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 leaves of bean plants 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 50-100 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*

Esfenvalerate (Asana) - Esfenvalerate use varies by location and from year to year. In an average year, 5-10% of the bean acres are treated with esfenvalerate at a rate of 0.5 pounds active ingredient per acre, one time per year. In years of severe infestation, esfenvalerate would be applied to about 50% of the dry bean acres.

## **Seed Corn Maggot**

*Della platura*

Seed corn 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, seed corn maggots can reduce the yield of beans by 5-10%. The adult is a gray colored 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 are often killed.

### *Chemical Control*

Chlorpyrifos - 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 seed corn maggot.

### *Cultural Control*

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

- Planting beans into a well-prepared seedbed.
- Avoiding planting into cool wet soils
- Avoiding planting in soils containing organic matter (manure, crop or weed residues) that was incorporated within two weeks before planting
- Good weed control practices
- Fall plowing 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 cause damage to beans by transmitting curly top virus to beans. 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 plant dates, and applying at-planting systemic insecticides.

### *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 10% reduction in bean yield. Adult WBC matures in overwintering larval cells in the ground and emerges during July. Peak moth flight occurs late July. The larvae are found in late July and August. The larvae 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 the WBC. Applications are made 10-20 days after peak moth flight. The light trapping program (BEACON) developed by the University of Idaho can inform growers the most effective time to treat for WBC.

### *Chemical Control*

Esfenvalerate - Esfenvalerate is applied to 5-10% of the dry bean acres at a rate of 0.5 pound active ingredient per acre, one time per year. Esfenvalerate provides 90% control of the WBC.

## **Thrips**

*Thrips* spp. and *Frankliniella* spp.

Thrips are a pest of dry beans with peak populations generally occurring about a month after planting. Damage is usually most severe on younger plants. The plants eventually recover from feeding but with lower yields and later maturity.

With the drying of native weed hosts, maturing grain and peas, and the cutting of hay crops, thrips are forced to move from these crops into bean fields in southern Idaho. Thrips do not reproduce well in beans, therefore their injury to dry beans is usually of minor importance. Proper fertilizer 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 pounds active ingredient per acre, one time per year. Dimethoate is applied as thrips populations develop, usually during the early season.

## **Red-Backed Cutworm**

*Euxoa ochrogaster*

The red-backed cutworm is the most important species of the cutworms that occasionally cause damage to beans in Idaho. The moth deposits eggs in mid to late summer. Those eggs hatch the next spring, and in about 45 days the cutworms have completed 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 - Esfenvalerate is applied to 5-10% of the dry bean acres at a rate of 0.5 pounds 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 are a serious pest in dry bean production, especially during plant establishment. Weeds cause problems by competing with beans for irrigation water, nutrients, and sunlight. Beans can usually grow through dense weed infestations, but yields will be greatly reduced. Left uncontrolled, weed infestations can reduce bean yield by 50-75%. 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 herbicide. Beans are then cultivated one or twice in early season for weed control and to establish corrugates for surface irrigation. More than two cultivations are not recommended because of undue injury to the bean root system.

## Chemical Control

- Trifluralin - Trifluralin is applied pre-plant to 75% of the bean acres at a rate of 0.5-1 pound active ingredient per acre, one time per year. Trifluralin provides broad spectrum weed control during crop establishment.
- Ethalfluralin (Sonalan, Curbit) - Ethalfluralin is applied pre-plant to 30% of the bean acres at rate of 1.5 pounds active ingredient per acre, one time per year. Ethalfluralin is applied to bean acreage not treated with trifluralin.
- 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.
- 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.
- Metolachlor (Dual) - Metolachlor is applied preplant to 3% of the bean acres at a rate of 2 pounds active ingredient per acre, one time per year. Metolachlor can be applied as a substitute for 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, increasing the use of sprinkler irrigation systems has altered 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. There are Pinto bean varieties that 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.

### Fungal Diseases

#### Sclerotinia Wilt

*Sclerotinia sclerotiorum*

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 25-50% within as short of period as 2 weeks during the later part of the growing season. This disease has increased in severity partly due to the increase use of

sprinkler irrigated fields. The fungus requires high humidity and 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 can destroy the entire field within 7-10 days under ideal conditions. The disease is characterized by a rapid, soft rot of infected tissues, which are usually covered by a mass of white fungus growth. Fungicides are beneficial in suppressing 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**

*Fusarium solani*

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

### **Pythium Wilt**

*Pythium* spp.

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.

#### *Chemical Control*

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

- Benomyl (Benlate) - Benomyl is applied as a foliar treatment to 10% of the bean acres at a rate of 0.9 pounds active ingredient per acre, one time per year. Benomyl is specifically applied to control white mold, frequently rotated with thiophanate methyl to reduce the buildup of resistance.
- Thiophanate methyl (Topsin M) – Thiophanate methyl is applied as a foliar treatment at a rate of 0.5-1 pound active ingredient acre, 1-2 times per year. Thiophanate methyl activity is similar to benomyl in white mold control and should be applied at early bloom. It is usually applied at 10-30% bloom and is a critical fungicide for the control of white and mold.
- Captan (Captan 400) – Captan is applied as a seed treatment a rate of 1 ounce per 100 wt of seed to control seed rots and seedling blights. Frequently combined with mefenoxam and fludioxonil.
- Mefenoxam (Apron XL LS) – Applied as a seed treatment at a rate of 0.32 fluid ounces per acre.

Mefenoxam offers good control of *Pythium* spp. Frequently combined with fludioxonil to extend control to *Rhizoctonia* and *Fusarium*.

- Fludioxonil (Maxim 4 FS) – Fludioxonil is applied as a seed treatment at a rate of 0.08 fluid ounces per 100 wt of seed. Fludioxonil is an important fungicide to control *Rhizoctonia* and *Fusarium* sp. Frequently combined with mefenoxam to control *Pythium* spp.

### **Alternatives:**

- Streptomycin (AGRI-STREP 500, AS-50) - Streptomycin is applied as a seed treatment to all dry bean seed at a rate of 1% or at 5% in years when bacterial infection is predicted to be severe. Streptomycin provide broad spectrum control surface bacteria.
- *Streptomyces griseoviridis* (Mycostop) - Mycostop is a biofungicide agent that offers activity against *Pythium* spp. and *Fusarium*. Use varies among growers and by year.

## **Bacterial Diseases**

### *Pseudomonas savastanoi* pv. *Phaseolicola*

*Pseudomonas savastanoi* pv. *Phaseolicola* 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. This bacteria-caused disease is carried on and in the seed, which enables the survival from year to year and 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 order quarantine was imposed which required infected fields to be plowed down and imported bean seed to be free of bacterial infection. The regulation remains in effect to day 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.

## **Viral Diseases**

Bean common mosaic virus (BCMV) has been in Idaho for the past 70 years with recent major outbreaks occurring in 1977 and in 1989. BCMV can be seed-borne and pollen-borne. 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 help control this viral disease. Most dry bean cultivars are resistant to one or more strains of BCMV but no cultivars are resistant to all strains.

## **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 the most resistant bean variety available. Cultivars in the Pink, Pinto, and small red market classes are resistant to curly top.

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