Crop Profile for Beans (Snap) in Delaware

Prepared: June, 1999
Revised: September, 1999; Chemicals Revised July, 2006[1]

General Production Information

- In 1997, 275,540 acres of snap beans were harvested in the United States.
- In 1997, 293,140 acres of snap beans were planted in the United States.
- National production for processing purposes has increased from 1995 (695,450,000 Cwt) to 1997 (733,000,000 Cwt).
- The value of national production in 1996 and 1997 was $293,055,000 and $286,130,000 respectively.
- National production for fresh market use has declined from 1995 (4,441,000 Cwt) to 1997 (3,790,000 Cwt).
- Approximately 570 acres of snap beans were planted in Delaware in 1997 for fresh market. Between 980 and 2,000 acres were planted for processing.
- The cash farm income to snap bean producers in Delaware for years 1995 to 1997 was $759,000, $496,000, and $651,000 respectively.
- From 1995 to 1997, Delaware production averaged 40 Cwt./A for a total of 20,000 Cwt.
- In 1997 88,660 acres of snap beans were planted in the United States for sale at fresh market. In the same year 204,480 acres were planted for use in processing.

Production Regions

Most snap bean production in Delaware is centered in Sussex County.

Cultural Practices

All snap beans for processing and most for fresh market are harvested with mechanical harvesters. Processors require beans at different stages of maturity and will advise when crops grown for them are ready for harvest. For fresh market, pick beans when the majority of pods have filled out. After harvest, keep beans cool (40 to 50F) and at 90% or more relative humidity to avoid wilting. Beans do not store well and should be moved to market as soon as possible.

Beans do well in warm weather and do not tolerate frost. Bean seed will not germinate below 55F. Optimum soil temperature for germination is 70 to 75F. Temperatures above 80 and below 50F slow growth.

Beans should be grown on fertile, light-to-medium texture, well drained soil. Heavy, poorly drained soils will result in losses from root rots. Uniform soil type and texture promotes uniform emergence, growth, and maturity, which is essential for machine harvest.

Beans grow best at pH 6.5 to 7.0. Optimum soil test levels are 150 pounds available P and 300 pounds available K per acre. P and K should be broadcast and plowed down prior to planting. Apply nitrogen at the rate of 40 pounds per acre in a band 2 inches to the side and 2 inches below the seed at planting.

Very dry bean seeds are subject to mechanical injury during handling and planting. When injured seeds are planted in cool soils, physiological diseases often occur. To avoid injury, expose bean seeds to the air for few days to raise the internal moisture levels.

Plant snap beans May 1 to July 30. Plant seeds 1/2 to 1.5 inches deep, depending on soil moisture and temperature. Plant seeds as shallow as possible as long as sufficient moisture is available. Beans can be planted in 18 to 40 inch rows, depending on harvest method. Plant 6 to 8 seeds per foot in 30 to 40 inch rows (70 pounds seed per acre) and 5 to 7 seeds per foot of row in 18 to 30 inch rows (90 pounds seed per acre).

Impact of Loss of Chemical Control

As will be shown in this crop profile, there would be a major impact on snap bean production if Orthene were lost. This is because of the zero tolerance requirement for European Corn borers inside the beans.

There are no alternatives for control of ECB. Lannate is also crucial in ECB and Corn Ear Worm control. Los of either would be detrimental.

Insect Pests

The following insect pests are know to attack snap beans in the mid-Atlantic area: seed corn maggot, thrips, potato leafhopper, spider mites, Mexican bean beetle, European corn borer, and corn earworm. The occurrence of economic levels of any one insect pest can vary from year to year depending on tillage practices, cover crops, planting date and weather factors. The following discussions are based on averages of the last 5 years of field observations.

Seed Corn Maggot

This insect is primarily a pest of spring planted beans, It is primarily a problem during cool, wet growing seasons. Only a few maggots per seed or plant can significantly reduce stands. Maggots overwinter as puparium in the soil with flies emerging as early as late February. Eggs are laid in freshly plowed fields as well as at the base of overwintered spinach plants. Outbreaks are favored by planting into freshly plowed ground that is high in organic matter; freshly manured fields; and/or heavy crop residues (e.g. small grain covers) where tillage is delayed and/or surface residue is visible after tillage operations.

Monitoring: Scouting and applying rescue treatments after the damage is observed are ineffective. Management options must be applied to high-risk fields prior to planting.

Controls:

Biological: None Available

Cultural: The use of cultural management practices before planting is critical to reduce the potential for economic problems. A combination of the following cultural strategies can be used: (1) plow down cover crops at least 3-4 weeks before planting or transplanting, (2) completely bury cover crops or previous crop residue to reduce fly attraction to rotting organic matter on the soil surface, and (3) avoid the use of heavy manure applications close to planting.

Chemical: Seed treatments containing chlorpyrifos should always be used. If a combination of the above factors occurs, a seed treatment plus a soil insecticide may be needed.

- Thimet 20G - 4.5 - 7.0 oz/1000 ft of row; Has provided poor control ; Do not contact seed; Used on 5% of the acreage.

Thrips

This insect is also a pest of spring planted beans with peak populations generally occurring one month after planting. During hot, dry weather, feeding damage can result in yellow leaves, stunted plants, delayed maturity, and reduced yields.

Monitoring : Sample for thrips from plant emergence through bloom. Collect 5 leaves in each of 10 locations throughout the field and count the number per leaflet. Leaflets should be selected from the middle and top half of non-consecutive plants. An insecticide treatment may be needed if thrips populations exceed 6 per leaflet. If plants are drought stressed and other insects are present, the threshold may need to be reduced by one third to one half.

Controls:

Biological: None

Cultural: None

Chemical: In general, soil insecticides are not recommended for thrips management. When weather conditions are favorable for thrips outbreaks, foliar applications are often still needed. Snap beans generally mature in 60 days or less. Asana XL - 5.8 - 9.6 oz/acre; Labeled for crop but not the pest; Has provided good control; 3 day PHI; One application per season; 30% of the acreage treated Dimethoate 4E - 1 pt/acre; Labeled for crop but not the pest; Provides good thrips control; can not be applied during bloom; 0 days PHI; One application per season; 15% of the acreage treated. Lannate LV - 1.5 - 3 pt/acre (1.5 pt/a = 1 day PHI; over 1.5 pt/a = 3 day PHI); One application per season for thrips control; used on 10% of the acreage Orthene 75S - 1.33 lb/acre; Sprayed often aimed at both thrips and corn borer control; 14 day PHI; One application for thrips; Used on 40% of the acreage Sevin 80S - 1.25 lb/acre; 0 days to harvest; Used on 0 % of the acreage

Potato Leafhopper

During the 1997 and 1998 growing seasons, significant damaged occurred to seedling stage snap beans. Early migratory populations combined with dry weather conditions resulted in an early increase in leafhopper populations. Plants appear yellow and stunted, with the typical "hopper burn" damage on the tips of the leaves. Both yields and plant maturity can be affected by leafhopper feeding from the seedling to pre-bud stage. Once pods are present, economic damage is less likely to occur.

Monitoring: Fields should be sampled for leafhopper adults and nymphs on a weekly basis from the seedling through the pod development stage. A standard 15-inch sweep net should be used to take 10 sweeps in 10 locations. A treatment should be applied if you find 5 or more leafhoppers per sweep

during the prebloom stage, 10 per sweep during the bloom stage, and 25 per sweep during pod development.

Controls: Biological - None

Cultural: None

Chemical:

- dimethoate 4EC - 0 day PHI; 0.5 - 1 pt/A; 1 application, to 20% of the acreage. During '97-'98 90% of fields were treated.
- Lannate LV - 1 day PHI; 1.5 - 2pt/A; 1 application, to 20% of the acreage
- Orthene 75S - 0 day PHI; 0.67 - 1.33 lb/A; 1 application, to 0% of the acreage
- Sevin 80S - 0 day PHI; 0.67 lb/A; 1 application, to 0% of the acreage
- Asana XL - 3 day PHI; 5.8 - 9.6 oz/acre; One application per season, to 30% of the acreage

Spider Mites

Spider mites can be a problem in snap beans, especially during hot, dry weather. Damage will first appear as a white stippling on the leaves with eventual plant death if economic levels go undetected. They are primarily found on the undersides of leaves making the leaves appear tan or yellow in color. Mites feed on the plant sap and can defoliate fields in a few weeks in hot, dry weather. Defoliated plants will produce poor yields and quality beans.

Monitoring: Since mite infestations can begin along field margins next to grassy areas, be sure to carefully sample these areas early in the season. Once populations explode in hot, dry weather, control is extremely difficult. Look for the early signs of white stippling at the base of the leaflets. Mites can be identified by shaking leaves onto a sheet of white paper and watching for moving specks or by using a hand lens to count the number of mites per leaflet. From early July through mid-August, examine 5 leaflets in 10 location throughout a field for the presence of mites and feeding damage. A treatment should be applied when white stippling is first noticed and you find 20 or more mites per leaflet

Controls:

Biological: None

Cultural: None

Chemical:

- dimethoate 4EC - 0 day PHI; 1 pt/A; applied 2- 4 times per acre to 50 % of the acreage in

outbreak years. In recent years, control has been extremely poor. This may be a result of poor coverage, resistance, storage conditions of the chemical, and/or high pH/iron content of the spray water.

- Kelthane MF - 7 day PHI; 1 pt/A; Applied 2- 3 times per acre to 50 % of the acreage in outbreak years. In recent years, control has been extremely fair to good.

Mexican Bean Beetle

This insect is the major defoliating pest of beans in the mid-Atlantic region. In recent years, weather conditions have helped to reduce population levels in the region. Adult beetles overwinter in hedgerows, ditch banks and woodlands near host crops. Adults become active in late April to mid-May. If overwintering populations are heavy, damage can occur in early-planted snap beans at plant emergence. In general, economic levels of the Mexican bean beetle (MBB) are not found before late July. Both adults and larvae can cause damage to beans. Feeding damage can reduce bean yields and pod quality if defoliation exceeds 10%, especially after bloom.

Monitoring: At plant emergence, sampling should begin on a weekly basis along field margins next to overwintering sites. When plants are small, examine the undersides of all plants in 3 foot of row and count the number of adults and larvae and estimate the percent stand reduction or defoliation. Since populations of overwintered adults tend to occur in "hotspots', be sure to note the predominant life and the location of the infestation. When plants are larger, a sweep net or drop cloth should be used to assess the population. Before the first trifoliate stage, a treatment should be considered if you find 6 or more beetles per row foot and no more than a 25% stand reduction. At the first to third trifoliate, the treatment threshold is 2 or more beetles per plant and 20% defoliation. After the third trifoliate and before the bud stage, treatment is suggested if defoliation exceeds 20 percent. From the bud stage until harvest, treat if defoliation exceeds 10% and populations are increasing.

Controls:

Biological: On farms with a succession of bean plantings, the release of the parasite, *Pediobius foveolatus,* may provide effective control. **Caution:** This system has only been demonstrated on soybeans and additional information will be needed to demonstrate its effectiveness on snap beans.

Cultural Controls: The use of an early planted trap crop for overwintered beetles may be effective for controlling MBB in later plantings of snap beans. A trap crop consisting of a mixture of snap beans and soybeans planted at least 3 weeks before the main crop will attract overwintering beetle. Beetles found in the trap crop could then be control by plowing under or spraying the trap crop with an insecticide. **Caution:** This system has only been demonstrated on soybeans and additional information will be needed to demonstrate its effectiveness on snap beans. Growers/consultants comment that this will not be practical for them.

Chemical:

- Disyston 15G - 6 - 12 oz per 1000 foot of row; applied at planting only, to less than 5% of the acreage.
- Lannate LV - 1 day PHI; 1.5 - 2 pt/A; 1 application, to 10 % of the acreage
- Orthene 75S - 0 day PHI; 0.67 - 1.33 lb/A; 1 application, to 0% of the acreage
- Sevin 80S - 0 day PHI; 0.67 lb/A; 1 application, to 0% of the acreage
- Thimet 20G - 4.6 - 6.9 oz per 1000 foot of row; applied at planting only, to 20% of the acreage.
- Asana XL - 3 day PHI; 2.9 - 5.8 oz/acre; One application per season, to 10 % of the acreage

European Corn Borer(ECB)

This insect is the major pest of snap beans mainly because larvae cause contamination problems. Larvae can cause economic yield loss; however, the contamination level is usually reached before this point. If egg hatch occurs before bloom, young larvae feed on the leaves for a 7-10 days before boring into the stems. Since larvae do not pupate in the stems, older larvae emerge and bore into the pods. If egg hatch occurs at or after bloom, larvae of all sizes will bore directly into the pods.

Monitoring: Direct field sampling for ECB larvae is not practical because of the low tolerance level for pod damage. Recommended treatment schedules are based on the level of moth activity as determined by black light trap monitoring. For the most precise decisions, traps should be placed within one mile of each field. Traps should be serviced 3 times per week, preferably daily when moth activity increases. The most critical time for corn borer treatment occurs at the bud-early bloom and pin stages. As a general guideline, treatment should begin when trap catches average 5 ECB moths per night. However, if moths can be observed readily in a field and trap catches have not reached 5 per night, sprays should still be applied at the bud-early bloom and pin stages. After the pin spray, the following thresholds and spray intervals should be used:

Number ECB Moths/ 5 Days	**Spray Interval**
Less than 10	No Spray
11 - 25	7 Day
26 - 50	6 Day
51 - 75	5 Day

76 - 250	4 Day
250 +	3 Day

Controls:

Biological: None

Cultural: None

Chemical:

- Orthene 75S- 14 days PHI; 1.33 lb/acre; Excellent corn borer control; Two application generally needed at bud to early bloom (20-25 days from harvest) and at early pin (14 days from harvest); Used on 90% of the processing acreage and 5% of the fresh market acreage
- Asana XL - 3 day PHI; 7.7 - 9.6 oz/acre; Poor to fair ECB control; One to three applications, on 10% of the acreage.
- Lannate LV - 1.5 - 3 pt/acres; 1.5 pt/a = 1 day PHI; over 1.5 pt/a = 3 day PHI; One to four applications used from the pin stage until harvest in processing snap beans; Two to four sprays used on fresh market snap beans; used on 70% of the processing acreage and 90% of the fresh market acreage

Corn Earworm (CEW)

This insect is mainly a pest of late planted beans. In some years it is the predominant pest. In other years it is found at the same time and level as the ECB. Severe corn earworm infestations can result in significant yield loss but in recent years this insect has also caused contamination problems.

Monitoring: Although the standard drop cloth method is used for earworm detection in snap beans and soybeans, this method may detect worms too late in snap beans and should only be used to detect small larvae. Black light traps, pheromone traps, and direct observation of moths in fields should be used to monitor moth activity. As a general guideline, sprays should be applied on a 3-7 day schedule when black light trap catches exceed 20 per night. The spray interval will vary depending on corn borer moth activity and temperature. During periods of high temperatures, young larvae move directly to the pods. Since specific thresholds based on pheromone trap catches are not available, these traps are used to detect the first occurrence in a peak in moth activity.

Controls:

Biological: None

Cultural: None

Chemical:

- Orthene 75S- 14 days PHI; 1.33 lb/acre; Very poor CEW control; Not recommended;) 0% acreage treated with Orthene for CEW control
- Asana XL - 3 day PHI; 7.7 - 9.6 oz/acre; Good CEW control; One to three applications, on 40% of the acreage.
- Lannate LV - 1.5 - 3 pt/acres; 1.5 pt/a = 1 day PHI; over 1.5 pt/a = 3 day PHI; One to four applications used from the pin stage until harvest in processing snap beans; Two to four sprays used on fresh market snap beans; used on 60% of the processing acreage and 90% of the fresh market acreage

Weeds

Scout once prior to harvest to determine weed potential for next season's snap beans

Weeds	Sampling	Threshold
Perennials: Horsenettle, Groundcherry, Yellow Nutsedge, Common Milkweed, Hemp, Dogbane, Bindweed	Scout field in a zigzag pattern. Sample 10 random locations of 100 square feet. This is the width of two 30" rows, 20 feet long or one 30" row, 40 feet long. Whichever pattern best suits existing conditions. Map the location of these sampled areas and weeds.	Presence

Notes:
The fruit or seeds of these weeds are contaminants in the raw and processed product. Select control measures to eradicate these perennials for the next cropping season. See "Postharvest Perennial Weed Control" for treatment options. Avoid planting snap beans in fields with severe infestations of weeds.

Weeds	Sampling	Threshold
Summer Annuals, Black Nightshade, Common Cocklebur, Jimsonweed	Scout as outlined above for the presence of existing weeds. Potential weed problems are best identified by a untreated weedy check. Identify the weeds, count number of each species. Note whether specific weeds are scattered throughout the field or predominate in one area of the field.	Presence

Notes
Untreated check provides most reliable information for planning the weed control strategy for the coming season. The presence of mature weeds in the fall will be indication of species needing control the following year.

Nightshades must be controlled because of the toxicity of their berries, a contaminant in the raw and processed product. Jimsonweed plants are hallucinogenic. Common cocklebur is very competitive.

Pre-Planting Decisions: Use information obtained from past season's scouting to plan weed control program. Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Emergence to Third Trifoliate (three weeks after planting)

Weeds	How to Sample	When
Zero Tolerance Weeds: Nightshades, Horsenettle, Morningglory, Jimsonweed Summer Annuals Perennials	Scout field in zigzag pattern. Sample 10 random locations of 100 square feet. This is the width of two 30" rows, 20 feet long or one 30" row, 40 feet long. Whichever pattern best suits existing conditions. Map location of zero tolerance weeds. Determine whether weeds are predominantly within the row or between rows.	Weekly. There are not many control options. Number of annual weeds/100 square feet <1 weed very light 1-5 weeds light 5-20 weeds medium 20-50 weeds heavy >50 weeds very heavy

Threshold	
# weeds/10 ft. row or 1 sq. yd.	**Action**
Zero Tolerance Weeds: Presence	Control required.
Summer annuals: < 1.0 weed	None
1-5 weed	Control may be required.
> 5 weed	Control required.

Note: zero tolerance weed seeds or fruits are a contaminant in raw and processed product or are highly competitive. Nightshade species: berries toxic plus have the potential to stain pods. Jimsonweed plants are hallucinogenic. Morningglory is not as important for control as the others listed. The worst annual problems are pigweed, lambs quarters and jimpsonweed for their impact on harvest. Whether weeds are within the row or between the row determines if cultivation will be an effective control. Cultivate in a way that leaves the field as flat as possible to improve harvest recovery of beans.

Weeds	How to Sample	When	Threshold
All Weeds	Same as above.	1 week after control measures are implemented from the 3 week scouting.	This information is used to evaluate how well controls worked

Flowering Stage (five to six weeks after planting)

WEEDS	Sampling	Frequency

Zero Tolerance Weeds: Horse-nettle, Black Nightshade, Morningglory, Jimsonweed Summer Annuals Perennials	Scout field in a zigzag pattern. Sample 10 random locations of 100 square feet. This is the width of two 30" rows, 20 feet long or one 30" row, 40 feet long. Whichever pattern best suits existing conditions. Map location of zero tolerance weeds. Determine whether weeds are predominantly within the row or between rows.	Once 5- 6 weeks after planting

Threshold	
# weeds/10 ft. row or 1 sq. yd.	**Action**
Zero Tolerance Weeds: Presence	Control required.
Summer Annuals: < 0.25 weed	None
0.25 - 1 weed	Control may be required.
> 1 weed	Control

Size of weed is important in determining a threshold. Weeds less than 4 inches tall at this point in the season will have no impact on yield. Broadleaf weeds over 6-8 inches tall will probably not be adequately controlled with Basagram. Most grasses can be effectively controlled up to 8 inches tall. Cultivate if weeds are predominantly between the rows. Cultivate in a way that leaves the field as flat as possible to improve harvest recovery of beans. Generally weed control of any sort (spray or cultivation) is not implemented this late. Cultivation is too destructive to the crop at this stage and generally weeds are too big to spray.

Weeds	**Sampling**	**Frequency**	**Threshold**
Horsenettle, Black Nightshade, Morningglory, Jimsonweed	Scout as previously described. Map location of these weeds.	Once prior to harvest.	Presence

Notes
The fruits or seeds of these weeds are contaminants in the raw and processed product causing economically significant grade reductions. Nightshade berries are toxic and can cause staining of pods.

Weeds	Sampling	Frequency	Threshold
Perennial Weeds	Scout as previously described. Map location of these weeds.	Once prior to harvest.	Presence

Notes
This information is used to determine if a fall treatment is required to control perennial weeds.

Herbicide Program for Snap Beans

Product & Rate -Preemergence

- **Dual 1.25-1.5 pts./A**
  May be used preemergence or preplant incorporated. Dual provides excellent control of grasses and good control of nutsedge.
- **Treflan 1 pt./A**
  Treflan must be preplant-incorporated. Treflan gives excellent control of grasses, but has no activity on nutsedge.
- **Eptam**

Product & Rate-Postemergence

- **Basagran 1.5 to 2 pints/A**
  Used postemergence to control certain broadleaf weeds. Does not control pigweed, but will control cockelbur, mustards, jimsonweed, common lambsquarter, common ragweed, and morningglory. Will have some effect on Canada thistle. Temporary pronounced crop injury may occur. Use crop oil concentrate, or if temperatures above 90 degrees F, a non-ionic surfactant. Basagran is much more effective if used when the weeds are small (less than 2 inches tall).
- **Poast 1 to 1.5 pints/A**
  Will control annual grasses and certain perennial grasses. Use with crop oil concentrate at 1 percent solution (1 gallon/100 gallons of spray solution). For best results, treat when grasses are actively growing. Tank-mixing Poast with Basagran may reduce the level of grass control.
- **Reflex**
  A very important post-product.

Diseases

Prebloom Stage: Third Trifoliate to Pre-Bud

Disease	Sampling	Frequency	Threshold
White Mold	Check soil moisture during rainy periods. Place a rain gauge in the field, use a portable tensiometer & the correct forms for forecast-ing. Forecasting valid for fields up to 30 acres.	Begin 26 - 28 days after planting. 2X per week until post-bloom	Prior to Bloom: ≥ 6-10 days of wet soil conditions. Forecasting: See white mold chart.

Notes
Fields have been lost in Delaware because of white mold. White mold is generally only a problem in PA where close row spacing may create favorable environmental conditions. Treatment: apply when 70-80% of plants have ≥ 1 open blossom.

Bud Stage to Harvest

Disease	Sampling Method	Threshold
White Mold	Watch for development of white mold, especially in narrow row plantings.	Moist soil for 6 - 10 days before bloom.

NOTES
Treatment: Apply first treatment when 70-80% of plants have one or more blossoms open. A second treatment is needed in 5-6 days if soil remains wet & blossoms are still present. Generally a problem only in PA where close row spacing may create favorable environmental conditions.

Snapbean Rust

Use resistant varieties or spray with chlorothalonil.

Root rots. Rotate with non-legume crops. Avoid poorly drained spots. Pythium is the primary cause of root rot and damping-off. Avoid planting beans after beans. Fungicide treatment with Ridomil Gold in a band over the row or Ridomil Gold PC in the furrow at planting will control root rot caused by Pythium and Rhizoctonia. Root rot is very important in fields planted for fall harvest. Approximately 90% of these fields get treated.

Contacts

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- Weeds: Mark VanGessel
- Diseases: Bob Mulrooney
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[1] FOOTNOTES:

Diazinon has been cancelled for use on snap beans and has been deleted from this profile for use as a seed treatment against Seed Corn Maggot.

Thimet 15G has been changed to 20G at the same rate for use against Seed Corn Maggot.

Di-Syston 15G is no longer labeled for snap beans. While Di-Syston 8 Emulsifiable Systemic is labeled for snap beans, growers in Delaware do not use this formulation. This active ingredient has been deleted from this profile for use against thrips.

Penncap-M is no longer labeled for snap beans and has been deleted from this profile for use against Potato leaf hopper, Mexican Bean Beetle, and European Corn Borer, Ronilan (Vinclozolin) has been cancelled for use on snap beans and has been deleted from this profile for use against white mold.

Listed herbicides are currently labeled for use in snap beans.