INTRODUCTION

This guide for organic production of processing peas provides an outline of cultural and pest management practices and includes topics that have an impact on improving plant health and reducing pest problems. The guide is divided into sections, but the interrelated quality of organic cropping systems makes each section relevant to the others.

This guide attempts to compile the most current information available, but acknowledges that effective means of control are not available for some pests. More research on growing crops organically is needed, especially in the area of pest management. Future revisions will incorporate new information providing organic growers with a complete set of useful practices to help them achieve success.

This guide uses the term Integrated Pest Management (IPM), which like organic production, emphasizes cultural, biological, and mechanical practices to minimize pest outbreaks. With limited pest control products available for use in many organic production systems, an integrated approach to pest management is essential. IPM techniques such as identifying and assessing pest populations, keeping accurate pest history records, selecting the proper site, and preventing pest outbreaks through use of crop rotation, resistant varieties and biological controls are important to producing a high quality crop.

1. General Organic Management Practices

1.1 Organic Certification

To use a certified organic label, farming operations grossing more than $5,000 per year in organic products must be certified by a U.S. Department of Agriculture National Organic Program (NOP) accredited certifying agency. The choice of certifier may be dictated by the processor or by the target market. A list of accredited certifiers (Link 4) operating in New York can be found on the New York State Department of Agriculture and Markets Organic Farming Resource Center web page (Link 5). See more certification and regulatory details under Section 4.1 and Section 10: *Using Organic Pesticides*.

1.2 Organic Farm Plan

An organic farm plan is central to the certification process. The farm plan describes production, handling, and record-keeping systems, and demonstrates to certifiers an understanding of organic practices for a specific crop. The process of developing the plan can be very valuable in terms of anticipating potential issues and challenges, and fosters thinking of the farm as a whole system. Soil, nutrient, pest, and weed management are all interrelated on organic farms and must be managed in concert for success. Certifying organizations may be able to provide a template for the farm plan. The following description of the farm plan is from the NOP web site:

The Organic Food Production Act of 1990 (OFPA or Act) requires that all crop, wild crop, livestock, and handling operations requiring certification submit an organic system plan to their certifying agent and, where applicable, the State Organic Program (SOP). The organic system plan is a detailed description of how an operation will achieve, document, and sustain compliance with all applicable provisions in the OFPA and these regulations. The certifying agent must concur that the proposed organic system plan fulfills the requirements of subpart C, and any subsequent modification of the organic plan by the producer or handler must receive the approval of the certifying agent.

More details may be found at the Agricultural Marketing Service's National Organic Program website (Link 6). The National Sustainable Agriculture Information Service, (formerly ATTRA), has produced a guide to organic certification that includes templates for developing an organic farm plan (Link 7). The Rodale Institute has also developed resources for transitioning to organic and developing an organic farm plan (Link 8).

2. Soil Health

Healthy soil is the basis of organic farming. Regular additions of organic matter in the form of cover crops, compost, or manure create a soil that is biologically active, with good structure and capacity to hold nutrients and water (note that any raw manure applications should occur at least 120 days before harvest). Decomposing plant materials will support a diverse pool of microbes, including those that break down organic matter into plant-available nutrients as well as others that compete with plant pathogens in the soil and on the root surface.

Rotating between crop families can help prevent the buildup of diseases that overwinter in the soil. Rotation with a grain crop, preferably a sod that will be in place for one or more seasons, deprives many, but not all disease-causing organisms of a host, and contributes to a healthy soil structure that promotes vigorous plant growth. The same practices are effective for preventing the buildup of a number of root damaging nematodes in the soil, especially root know nematode, but keep in mind that certain grain crops are also hosts for some nematode species including lesion nematodes. Rotating between crops with late and early season planting dates can help prevent the buildup of weed populations. Organic growers must attend to the connection between soil, nutrients, pests, and weeds to succeed. An excellent resource for additional information on soils and soil health is Building Soils for Better Crops by Fred Magdoff and Harold Van Es, 2010 (Link 10). For more information, refer to the Cornell Soil Health website (Link 11).

3. Cover Crops

Unlike cash crops, which are grown for immediate economic benefit, cover crops are grown for their valuable effect on soil properties and on subsequent cash crops. Cover crops help maintain soil organic matter, improve soil tilth, prevent erosion and assist in nutrient management. They can also contribute to weed management, increase water infiltration, maintain populations of beneficial fungi, and may help control insects, diseases and nematodes. To be effective, cover crops should be treated as any other valuable crop on the farm, with their cultural requirements carefully considered including their cultural requirements, life span, mowing recommendations, incorporation methods, and susceptibility, tolerance, or antagonism to root pathogens and other pests. Some cover crops and cash crops share susceptibility to certain pathogens and nematodes. Careful planning and monitoring is required when choosing a cover crop sequence to avoid increasing pest problems in subsequent cash crops. See Table 3.1 for more information on specific cover crops.

A certified organic farmer is required to plant certified organic cover crop seed. If, after contacting at least three suppliers, organic seed is not available, then the certifier may allow conventional seed to be used. Suppliers should provide a purity test for cover crop seed. Always inspect the seed for contamination with weed seeds and return if it is not clean. Cover crop seed is a common route for introduction of new weed species onto farms.

3.1 Goals and Timing for Cover Crops

Adding cover crops regularly to the crop rotation plan can result in increased yields of the subsequent cash crop. Goals should be established for choosing a cover crop; for example, the crop can add nitrogen, smother weeds, or break a pest cycle. The cover crop might best achieve some of these goals if it is in place for the entire growing season. If this is impractical, a compromise might be to grow the cover crop between summer cash crops. Allow a two or more weeks between cover crop incorporation and cash crop seeding to permit decomposition of the cover crop, which will improve the seedbed and help avoid any unwanted allelopathic effects on the next crop. Another option is to overlap the cover crop and the cash crop life cycles by overseeding, interseeding or intercropping the cover crop between cash crop rows at final cultivation. An excellent resource for determining the best cover crop for your situation is Northeast Cover Crop Handbook, by Marianne Sarrantonio (Reference 3), the Cornell's online decision tool to match goals, season, and cover crop (Link 9) or Cover Crops for Vegetable Production (Reference 4).

Leaving cover crop residue to remain on the soil surface might make it easier to fit into a crop rotation and will help to conserve soil moisture, but some of the nitrogen contained in the residue will be lost to the atmosphere, and total organic matter added to the soil will be reduced. Turning under the cover crop will speed up the decomposition and nitrogen release from the crop residue.

3.2 Legume Cover Crops

Legume cover crops should be avoided before peas because many are closely related to peas and share pests.

3.3 Non-Legume Cover Crops

Barley, rye grain, rye grass, Sudangrass, wheat, oats, and other grain crops left on the surface or plowed under as green manures or dry residue in the spring are beneficial because these plants take up nitrogen that otherwise might be leached from the soil, and release it back to the soil as they decompose. It is important to note that including grain crops either as the cash crop or cover crop in the rotation will reduce build-up of most root rot pathogens in peas. If incorporated as green manures, allow two weeks or more for decomposition prior to planting to avoid the negative impact on stand establishment from actively decomposing material. Three weeks might not be enough if soils are very cold. In wet years, this practice may increase slug damage and infections by fungal pathogens such as pythium and phytophthora, often affecting stand establishment.

3.4 Biofumigant Cover Crops

Certain cover crops have been shown to inhibit weeds, pathogens, and nematodes by releasing toxic volatile chemicals when tilled into the soil as green manures and degraded by microbes or when cells are broken down by finely chopping. Degradation is quickest when soil is warm and moist. These biofumigant cover crops include Sudangrass, sorghum-sudangrasses, and many in the brassica family. Varieties of mustard and arugula developed with high glucosinolate levels that maximize biofumigant activity have been commercialized (e.g. Caliente brands 199 and Nemat).

Attend to the cultural requirements of the cover crops to maximize growth. Fertilizer applied to the cover crops will be taken up and then returned to the soil for use by the cash crop after the cover crop is incorporated. Biofumigant cover crops like mustard should be allowed to grow to their full size, normally several weeks after flowering starts, but incorporated before the seeds become brown and hard indicating they are mature. To minimize loss of biofumigant, finely chop the tissue early in the day when temperatures are low. Incorporate immediately by tilling, preferably with a second tractor following the chopper. Lightly seal the soil surface using a culti-packer and/or 1/2 inch of irrigation or rain water to help trap the volatiles and prolong their persistence in the soil. Wait at least two weeks before planting a subsequent crop to reduce the potential for the breakdown products to harm the crop, also known as phytotoxicity. Scratching the soil surface before planting will release remaining biofumigant. This biofumigant effect is not predictable or consistent. The levels of the active compounds and suppressiveness can vary by season, cover crop variety, maturity at incorporation, amount of biomass, fineness of chopping, how quickly the tissue is incorporated, soil microbial diversity, soil tilth, and microbe population density.

Table 3.1 Non-leguminous Cover Crops: Cultural Requirements and Crop Benefits

Species	Planting Dates	Life Cycle	Cold Hardiness Zone (Link 1)	Heat	Drought	Shade	pH Preference	Soil Type Preference	Seeding (Lb/A)	Comments
				--Tolerances--						
Brassicas e.g. mustards, rapeseed	April or late August-early Sept.	Annual / Biennial [a]	6-8	4	6	NI	5.3-6.8	Loam to clay	5-12	+Good dual purpose cover & forage +Establishes quickly in cool weather +Biofumigant properties
Buckwheat	Late spring-summer	Summer annual [a]	NFT	7-8	4	6	5.0-7.0	Most	35-134	+Rapid grower (warm season) +Good catch or smother crop +Good short-term soil improver for poor soils
Cereal Rye	August-early October	Winter annual	3	6	8	7	5.0-7.0	Sandy to clay loams	60-200	+Most cold-tolerant cover crop +Excellent allelopathic weed control +Good catch crop +Rapid germination & growth +Temporary N tie-up when turned under
Fine Fescues	Mid March-mid-May OR late Aug.-late Sept.	Long-lived perennial	4	3-5	7-9	7-8	5.3-7.5 (red) 5.0-6.0 (hard)	Most	16-100	+Very good low-maintenance permanent cover, especially in infertile, acid, droughty &/or shady sites

Table 3.1 Non-leguminous Cover Crops: Cultural Requirements and Crop Benefits

SPECIES	PLANTING DATES	LIFE CYCLE	COLD HARDINESS ZONE (LINK 1)	HEAT	DROUGHT	SHADE	pH PREFERENCE	SOIL TYPE PREFERENCE	SEEDING (LB/A)	COMMENTS
				--TOLERANCES--						
Oats	Mid-Sept-early Oct.	Summer annual [a]	8	4	4	4	5.0-6.5	Silt & clay loams	110	+Rapid growth +Ideal quick cover and nurse crop
Ryegrasses	August-early Sept.	Winter annual (AR)/ Short-lived perennial (PR)	6 (AR) 4 (PR)	4	3	7 (AR) 5 (PR)	6.0-7.0	Most	14-35	+Temporary N tie-up when turned under +Rapid growth +Good catch crop +Heavy N & moisture users
Sorghum-Sudangrass	Late spring-summer	Summer Annual [a]	NFT	9	8	NI	Near neutral	NI	10-36	+Tremendous biomass producers in hot weather +Good catch or smother crop +Biofumigant properties

NI-No Information, NFT-No Frost Tolerance. AR=Annual Rye, PR=Perennial Rye.
Drought, Heat, Shade Tolerance Ratings: 1-2=low, 3-5=moderate, 6-8=high, 9-10=very high. [a] Winter killed. Reprinted with permission from Rodale Institute www.rodaleinstitute.org M. Sarrantonio. (1994) Northeast Cover Crop Handbook. (Reference 3).

4. FIELD SELECTION

For organic production, give priority to fields with excellent soil tilth, high organic matter, good drainage and airflow.

4.1 Certification Requirements

Certifying agencies have requirements that affect field selection. Fields cannot be treated with prohibited products for three years prior to the harvest of a certified organic crop. Adequate buffer zones are required between certified organic and conventionally grown crops. Buffer zones must be a barrier, such as a diversion ditch or dense hedgerow, or be a distance large enough to prevent drift of prohibited materials onto certified organic fields. Determining what buffer zone is needed will vary depending on equipment used on adjacent non-certified land. For example, use of high-pressure spray equipment or aerial pesticide applications in adjacent fields will increase the buffer zone size. Pollen from genetically engineered crops can also be a contaminant. An organic crop should not be grown near a genetically engineered crop of the same species. Check with your certifier for specific buffer requirements. These buffers commonly range between 20 to 250 feet depending on adjacent field practices.

4.2 Crop Rotation Plan

A careful crop rotation plan is the cornerstone of organic crop production because it allows the grower to improve soil quality and proactively manage pests. Although growing a wide range of crops complicates the crop rotation planning process, it ensures diversity in crop residues in the soil, and a greater variety of beneficial soil organisms. Individual organic farms vary widely in the crops grown and their ultimate goals, but some general rules apply to all organic farms regarding crop rotation. Rotating individual fields away from crops within the same family is critical and can help minimize crop-specific disease and non-mobile insect pests that persist in the soil or overwinter in the field or field borders. Pests that are persistent in the soil, have a wide host range, or are wind-borne, will be difficult to control through crop rotation. Conversely, the more host specific, non-mobile, and short-lived a pest is, the greater the ability to control it through crop rotation. The amount of time required for a crop rotation is based on the particular pest and its severity. Some particularly difficult pests may require a period of fallow. See specific recommendations in the disease and insect sections of this guide (Sections 11, 12, 13). Partitioning the farm into management units will help to organize crop rotations and ensure that all parts of the farm have sufficient breaks from each type of crop.

A well-planned crop rotation is key to weed management. Short season crops such as lettuce and spinach are harvested before many weeds go to seed, whereas vining cucurbits, with their limited cultivation time and long growing season, allow weeds to go to seed before harvest. Including short season crops in the rotation will help to reduce weed populations provided the field is cleaned up promptly after harvest. Other weed reducing rotation strategies include growing mulched crops, competitive cash crops, short-lived cover crops, or crops that can be intensively cultivated. Individual weed species emerge and mature at different times of the year, therefore alternating between spring, summer, and fall planted crops helps to interrupt weed life cycles.

Cash and cover crop sequences should also take into account the nutrient needs of different crops and the response of weeds to high nutrient levels. High soil phosphorus and potassium levels can exacerbate problem weed species. A cropping sequence that alternates crops with high and low nutrient requirements can help keep nutrients in balance. The crop with low nutrient requirements can help use up nutrients from a previous heavy feeder. A fall planting of a non-legume cover crop will help hold nitrogen not used by the previous crop. This nitrogen is then released when the cover crop is incorporated in the spring. See Section 5: *Weed Management,* and Section 3: *Cover Crops* for more specifics.

Rotating crops that produce abundant organic matter, such as hay crop and grain-legume cover crops, with ones that produce less, such as vegetables, will help to sustain organic matter levels and promote good soil tilth (see Section 2: *Soil Health* and Section 8: *Crop and Soil Nutrient Management*). Peas generally have a low nutrient requirement (Table 4.2.1).

Crop information specific to peas

Plan at least 3 years between legume plantings. Legumes including soybean, clovers, alfalfa and hairy vetch are hosts for many soil-borne fungal pathogens and should be avoided in fields with severe root rot problems. A good rotation helps reduce the incidence of foliar diseases and lowers the population of plant pathogens that cause root rot. It is more effective to put crop rotation plans in place before pests become a major problem than to use them to try to clean up a pest problem. Corn and cereal grains are excellent rotation crops to reduce root rot problems because they are not hosts for root rot pathogens of vegetable crops or root knot nematode. They are, however, hosts for root lesion nematode.

Table 4.2.1 Crops Nutrient Requirements

	Nutrient Needs		
	Lower	**Medium**	**Higher**
Crop	bean beet carrot herbs pea radish	cucumber eggplant brassica greens pepper pumpkin spinach chard squash winter squash	broccoli cabbage cauliflower corn lettuce potato tomato

From NRAES publication Cop Rotation on organic Farms: A Planning manual. Charles L. Mohler and Sue Ellen Johnson, editors, (Link 1)

Table 4.2.2 Potential Interactions of Crops Grown in Rotation with Peas

Crops in Rotation		Potential Rotation Effects	Comments
Field Pea Bell bean	Hardy clover Lettuce	***Sclerotinia trifoliorum*** *increase*	Both these closely related diseases (varieties of *Sclerotinia trifoliorum*) can attack a variety of crops including peas and lettuce.
Beet Crucifer greens Lettuce	Pea Radish Spinach	**Double cropping**	***Second Cropping*** : Time allows for a second crop in one season. Peas will increase soil N for the subsequent crop. Short season crops such as radish, spinach, lettuce, and crucifer greens will benefit from the increase nitrogen produced by the peas.
Brussels sprouts Cabbage Cauliflower	Corn Lettuce	*Increase* **Nitrogen**	Peas will increase nitrogen for crops that have a high need for nitrogen (see table 4.2.1).

Excerpt from Appendix 2 of Crop Rotation on Organic Farms: A Planning Manual. Charles L. Mohler and Sue Ellen Johnson, editors. (Link 12)

4.3 Pest History

It is important to know the pest history for each field to plan a successful cropping strategy. For example, avoid fields that contain heavy infestations of perennial weeds such as nutsedge, bindweed, and quackgrass as these weeds are particularly difficult to control. One or more years focusing on weed population reduction using cultivated fallow and cover cropping may be needed before organic crops can be successfully grown in those fields.

If possible, peas should not be grown in fields with a history of root rot problems, but if there is no choice, plant on raised beds and when conditions favor rapid germination and root development.

Peas are a host for both root-knot nematode, *Meloidogyne hapla*, and root-lesion nematode, *Pratylenchus penetrans*. It is important to know whether or not these nematodes are present in the field in order to develop long-term crop rotations and cropping sequences that either reduce the populations in heavily infested fields or minimize their increase in fields that have no to low infestation levels. Refer to Section 11 for more information on nematodes.

4.4 Soil and Air Drainage

Peas are very susceptible to root diseases and need excellent drainage and soil structure. Uniform soils are preferred because peas mature faster on well-drained soils than on heavier soils. Any practice that promotes drying or drainage of excess water from the root zone will minimize favorable conditions for infection and disease development.

5. WEED MANAGEMENT

Weed management can be one of the biggest challenges on organic farms, especially during the transition and the first several years of organic production. To be successful, use an integrated approach to weed management that includes crop rotation, cover cropping, cultivation, and planting design, based on an understanding of the biology and ecology of dominant weed species. A multi-year approach that includes strategies for controlling problem weed species in a sequence of crops will generally be more successful than attempting to manage each year's weeds as they appear. Relying on cultivation alone to manage weeds in an organic system is a recipe for disaster.

Management plans should focus on the most challenging and potentially yield-limiting weed species in each field. Be sure, however, to emphasize options that do not increase other species that are present. Alternating between early and late-planted crops, and short and long season crops in the rotation can help minimize buildup of a particular weed or group of weeds with similar life cycles or growth habits, and will also provide windows for a variety of cover crops.

5.1 Record Keeping

Scout and develop a written inventory of weed species and severity for each field. Accurate identification of weeds is essential. Management plans should focus on the most challenging and potentially yield-limiting weed species in each field, being sure to emphasize options that do not exacerbate other species that are present. Alternating between early and late-planted, and short and long season crops in the rotation can help minimize buildup of a particular weed or group of weeds with similar life cycles or growth habits, and will also provide windows for a variety of cover crops.

5.2 Weed Management Methods

Planting and cultivation equipment should be set up on the same number of rows to minimize crop losses and damage to crop roots during cultivation. It may be necessary to purchase specialized equipment to successfully control weeds in some crops. See resources at the end of this section to help fine-tune your weed management system. Weed fact sheets provide a good color reference for common weed identification. See Penn State weed identification (Reference 2) or Cornell weed ecology and Rutgers weed gallery websites (Links 16-17).

Begin blind cultivation with a tine weeder, or flexible harrow, before ground crack, when weeds are at white thread stage. Peas are very susceptible to breakage when they are in the "crook" stage – from just before ground crack until the seed leaves are unfolded and horizontal. Avoid tine weeding during this period. Correct cultivation depth with a tine weeder is 2/3 of seeding depth. Note, however, that penetration will vary with soil conditions and you must avoid hitting the seed with the weeder in soft spots. Effective tine weeding is an art that requires adjustment of the weeder to obtain good weed control without harming the crop. Examples of tine weeders are the Einbock, Lely, and Kovar. The tines on various brands and models of harrows differ in flexibility. Tines that are too stiff can break pea stems. Tines with a 70 to 80 degree bend work well for peas as they hook out grassy weeds without pulling out the peas, which have a taproot. Tines with a 45-degree bend can also be used effectively.

After pea emergence, make up to four more passes using the tine weeder at about 5 to 7 day intervals depending on weed growth. Tine weeders work best on very small weeds. The final tine weeding can be more aggressive (faster and deeper) than the pre-emergence weeding or early post-emergence weeding. Test settings on a small area and adjust. Stop tine weeding before vines begin to tangle.

When the crop gets too large for safe tine weeding, use a row crop cultivator to control weeds between the rows. Adjust row crop cultivator for close and shallow cultivation. Minimize turning up rocks that will cause problems with the harvester. Perennial weeds will require deeper cultivation. Using a rolling cultivator is another option but they tend to work poorly on fine textured soil unless tilth is exceptionally good.

Weeds that cause contamination problems at harvest include corn chamomile, Canada thistle, eastern black nightshade, horsenettle, and other plants in the nightshade family (Solanaceae)

Resources

Steel in the Field *by* Greg Bowman: (Link 13).
Cornell Weed Ecology website: (Link 14).
Rutgers University, New Jersey Weed Gallery (Link 15).
Univ. of Vermont videos on cultivation and cover cropping (Link 16).
ATTRA Principles of Sustainable Weed Management for Croplands: (Link 17).

New Cultivation Tools for Mechanical Weed Control in Vegetables
(Link 18)

6. Recommended Varieties

Variety selection is important both for the horticultural characteristics specified by the processor and the pest resistance profile that will be the foundation of a pest management program. If disease pressures are known, Table 6.1 can help to determine which varieties will be more successful in reducing disease problems. Collaborate with processors on varieties, choosing those with some level of disease resistance if possible. A certified organic farmer is required to plant certified organic seed. If, after contacting at least three suppliers, organic seed is not available for a particular variety, then the certifier may allow untreated conventional seed to be used.

Table 6.1 Disease Resistance and Production Qualities of Processing Peas

Processing Pea Varieties	Fusarium Wilt Resistance	Root Rot Severity		Days to maturity	Vine Type	Comment
		Trial 1	Trial 2			
Bolero	F1 resistant	4.4	6.3	66	Normal	Height 24-36”, Good disease tolerance according to Stokes
Cosima	F1 resistant	-	-	62	Normal	Height 22”, Excellent resistance to bacterial disease according to research from Ontario Canada.
Durango	F1 resistant	-	-	66	Normal	24-36”, Powdery mildew resistant version of Bolero
ES 414	F1 resistant	-	-	44	Normal	18” high
EX 0794	F1 resistant	-	-	65	Afila	25” high
Icebreaker	F1 resistant	-	-	57	Afila	16-18” high
Ice pack	F1 resistant	-	-	58	Afila	
June	F1 resistant	5.8	6.8	59	Normal	23” high
Legacy	F1 resistant	-	-	68	Normal	Resistant to powdery mildew & pea enation
Pendleton	F1 & F2	4.0	4.9	65	Afila	23” high
Premium	F1 resistant	-	-	58	Normal	23” high
Tonic	F1 & F2	-	-	63	Normal	26” high

Root rot severity rated on a scale of 1 (no visible disease symptoms, healthy) to 9 (75% of root and stem tissues affected and at a late stage of decay) in two trials.

7. Planting

Because pea seed germinates in relatively cool soil (as low as 40°F), planting can begin in late March or early April and continue until May 20th-30th. Early plantings generally yield more than later plantings as they mature during the cooler part of summer.

Plant at a uniform depth of no more than one inch unless the soil is exceptionally dry. Rolling or cultipacking the soil after planting will firm the ground and push stones into the soil, which facilitates machine harvest. Attaching the roller behind the drill eliminates an additional set of tractor wheel marks and too much soil compaction on some rows of planted peas.

In general, seed does not need to be inoculated with symbiotic bacteria that fix nitrogen unless it has been more that 5 years since the last legume crop or unless the field has low nitrogen levels. If you do need inoculants, be careful to choose one that is listed by the Organic Materials Review Institute (Link 3).

Because seed size varies greatly between varieties, seeding rate must be adjusted accordingly. See Tables 7.1 and 7.2.

Table 7.1 Recommended Spacing for Peas.

Type	In-row (plants/yard)	Row (inches)
Early	18-22	7
Late	16-18	7

Table 7.2 Seeds per Row Based on Germination

Plants/yard	Laboratory Germination Rate (%) 100	95	90	85	80	75
	Number of seeds to drop/yard of row					
16	16	17	18	19	20	21
17	17	18	19	20	22	23
18	18	19	20	22	23	24
19	19	20	22	23	24	26
20	20	22	23	24	25	27
21	21	23	24	25	27	28
22	22	24	25	26	28	30

Approximate number of seeds to drop to obtain 16 to 22 plants per yard of row when laboratory germination is as indicated.