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Onion Seed Production in California

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PRODUCTION AREAS AND SEASONS

Commercial seed production for onion (*Allium cepa* L.) in California occurs primarily in the low desert of Imperial County. The Sacramento Valley (particularly Colusa County) and the San Joaquin Valley are also significant production areas. Onion seed production in the desert includes open-pollinated dehydrator varieties as well as fresh market hybrid and open-pollinated varieties. Production in the San Joaquin Valley also includes fresh market and dehydrator varieties, while seed produced in the Sacramento Valley is primarily for fresh market hybrid onions. Small amounts of onion seed are grown in California's mountain and coastal valleys. Seeds are planted from late July to September for the seed-to-seed system, while bulbs are planted from September to October for the bulb-to-seed system. In either system, seed maturity is reached and seed is harvested from late June to early August of the following year.

ONION SEED ACREAGE, PRODUCTION, AND VALUE

Year	Acres*	Average yield* (lb/acre)	Value (millions)*
2010	2,485	195	$15.53
2011	2,646	242	$16.21

*Because many counties include onion seed production statistics in "Miscellaneous" or "Seed Crops," these data underestimate actual values.

SOURCE: *County Agricultural Commissioners Annual Report Data*, California.

GROWTH CYCLE AND CLIMATIC REQUIREMENTS

Onions are cool-season, biennial plants (that is, they require two growing seasons to complete the cycle from seed to seed), but they are grown commercially as an annual crop. The seeds germinate during the first season and the plants grow vegetatively, eventually forming a bulb. Although onion seeds will germinate at temperatures as low as 35°F (2°C), a temperature of at least 55°F (13°C) is required for 70 percent seedling emergence within two weeks of planting. The optimum temperature range for germination, emergence, and plant growth is 68° to 77°F (20° to 25°C). The early growth rate of onion plants is slow compared to that of other cool-season crops due to slow leaf area development and low light interception.

Bulbing occurs when the leaf bases swell to form storage tissue. Bulbing is triggered by increasing day lengths during the first growing season. Varieties adapted to California will initiate bulbing at day lengths from about 12 to 15 hours. The mature bulb can be stored in a dormant state for varying lengths of time, depending on the onion variety and storage temperature. When a cold-stored onion bulb is planted back into the soil for its second growing season or when it overwinters in the field, it forms one or more stalks (*scapes*), each which terminates in an umbel containing several hundred flowers.

Bolting (the growth of the scape and inflorescence) is undesirable in onions grown for bulbs, but essential for onion seed production. Variety, plant size, temperature, and duration of temperature all interact to determine when and whether bolting will occur. Bulbing is not required before bolting, but the plants must have leaf bases with diameters greater than 3/8 inch (10 mm) before flowering can be induced. Seed stalk initiation requires a period of chilling known as *vernalization.* Induction of flowering occurs when plants or bulbs are subjected to temperatures of 45° to 55°F (8° to 13°C) for approximately one month or longer, depending upon the variety. Insufficient vernalization results in poor inflorescence development and low seed yields. The seed stalks elongate as temperatures rise in the spring. Flowering, pollination, and seed development follow. Mature seeds will naturally fall from the inflorescence (*shatter*) if not harvested. Although onion seed production requires two growing seasons, both seasons can occur in a single ten-month period if the seeds are planted in late summer. This allows enough time for the plants to achieve sufficient size in the fall, vernalize during the winter and produce seeds the following summer.

Onion seed production requires low-humidity ambient conditions during the spring and summer. Disease management, pollination, and seed maturation all are enhanced by warm temperatures and low relative humidities. Foliage diseases are more prevalent under humid conditions, and bees are poor pollinators during rainy weather. Preor postharvest seed drying is also achieved most easily in low humidity climates. Climates that are cool in the winter and warm to hot with low rainfall and low humidity in the spring and summer are best suited for onion seed production.

VARIETIES

There are few public onion breeding programs in the United States (and none in California), but many private seed companies are involved in developing onion varieties. The result is that a large number of competing varieties are available for any given area, with the emphasis on the development of hybrid rather than open-pollinated varieties. Most commercial fresh market bulb onions are now hybrids, though open-pollinated varieties are still used for dehydrator bulb onion production. Thus, production of both open-pollinated and hybrid onion seed is needed.

Onion varieties are generally classified by day-length requirement (short, intermediate, or long), market use (green, fresh bulb, or dehydration bulb), and bulb color (yellow, brown, red, or white) within the fresh market class. A continuum of varieties adapted to various day lengths has been developed, but the distinction between the different day-length classes is not always obvious. In general, short-day fresh market bulbs are of the Granex, Grano, or combination Granex-Grano types. Granex types are flat to thick flat in shape and Grano types are large and globe or top shaped. Short-day dehydrator varieties are generally derivatives (progenies) or selections (best plants from local areas) from Creole or related lines.

Many varieties that are commonly considered intermediate types are selections or derivatives from Sweet Spanish types (which may also be long-day) or short-day X long-day hybrids. Most of these are globe shaped, though some are flattened, and all must have some resistance to bolting since they are grown through the winter. At the California latitudes of 37° to 42°N (i.e., north of Fresno) or altitudes above 1,000 to 2,000 feet, numerous Sweet Spanish types are adapted, as are Fiesta types (Sweet Spanish X Yellow Globe cross). Market color types of red, white, and yellow are available and are grown. The long-day white dehydrator varieties that are important in California are derivatives or selections from Southport White Globe.

Onion seed for all day-length types is produced in California, but the short and intermediate day-length varieties predominate. Most onion seed produced in the Imperial Valley (32° to 33°N latitude) is for short-day varieties, though some intermediate-day variety seed is also produced. Any long-day varieties grown for seed in the Imperial Valley usually fail to bolt or are extremely late and they do not tolerate the valley's heat, whether grown from bulbs or seed. A few Spanish varieties are exceptions: these are grown seed-to-seed for green bunching onions. Seed of both shortand intermediate-day onion varieties is grown in central California (36° to 40°N). Long-day varieties can be grown for seed in the Sacramento Valley, but production is improved when they are grown at the more northern latitudes of Oregon and Idaho (43° to 45°N). Short-day lines grown at the northern latitudes are mostly used as pollinators, not as female parents.

PLANTING

Most onion seed production in California is accomplished via the seed-to-seed system. This system eliminates much of the handling and expense of bulb storage and replanting required in bulb-to-seed production. The bulb-to-seed method may be preferable, however, for open-pollinated production; bulb quality is more variable in open-pollinated onions, and the bulb-to-seed method allows seed producers to select high-quality bulbs for seed production. Bulb-to-seed may also be used in hybrid seed production to stagger planting dates and manipulate the flowering times of male and female lines. The bulb-to-seed system is used for stock or parent seed production to maintain high quality characteristics and genetic purity. With seed-toseed methods, many short-day varieties produce multiple scapes while longer-day varieties tend to produce only single scapes.

For the seed-to-seed system, the onion seed are planted in the field in August or September. Planting must be early enough for the plants to attain sufficient size to be vernalized before growth slows with cooler winter weather. Bulbs are generally planted in mid-September to November, since they require less time to become established. Before planting, the grower should ensure that sufficient isolation distance is present around the field. Onions are pollinated by insects, so onion seed fields must be isolated by a minimum of 1 to 1½ miles from any other onion seed fields to prevent cross-pollination. Onions of different colors grown for seed require 3 miles' isolation.

Onions grown for seed in the Imperial and San Joaquin Valleys are most commonly grown in double rows on raised beds 40 to 42 inches (102 to 107 cm) wide. In the Sacramento Valley, single-row, 30-inch (76 cm) wide raised beds are generally used. The rows are seeded using precision vacuum planters, plate planters, or occasionally belt planters. The desired final plant population is approximately 15 to 20 seed stalks per foot of bed for 30-inch beds or 20 to 25 per foot of bed for double-row 40-inch beds (about 30 seed stalks per m^2). Approximately 3 to 5 pounds of seed are planted per acre (3.5 to 5.5 kg/ha) in either configuration. Raw seed is generally used, although coated or pelleted seeds are available that carry fungicides or insecticides. Onion seeds are planted only ½ to ¾ inch (13 to 20 mm) deep, requiring a well-prepared soil surface that must be kept moist until seedling emergence.

Bulbs for the bulb-to-seed system are generally planted in single rows on beds and spaced at 2 inches (or as close as possible) in furrows sufficiently deep for a soil cover of approximately 1 inch (2.5 cm). Since bulbs produce multiple seed stalks, the final per-acre population of seed stalks is similar, regardless of whether the onions were planted as bulbs or as seed.

Hybrid seed production requires some special considerations. The time period from seeding or bulb planting to flowering differs among onion varieties. To achieve simultaneous flowering ("nicking") of the male parent of one variety and the female parent of another, they may need to be planted on separate dates. Another method to attain proper nicking is to direct-seed one of the hybrid parents and plant bulbs for the other. Seed producers try to avoid planting bulbs for both parent lines. Most commonly, seed companies attempt to develop hybrid varieties from parents that have similar flowering dates. Ideally, the male (pollinator) parent should be flowering shortly before, during, and after the female parent's flowering period. To achieve this, split plantings of the pollinator are sometimes used. It is essential that seed producers work closely with seed company representatives who know the flowering characteristics of the parent lines.

In the Central Valley, onion seed or bulbs should be planted in north-south rows or parallel to prevailing winds to lower the humidity around the plants and thus reduce the likelihood of foliage diseases. In the Sacramento Valley, early drying of the soil in the spring is critical for timely cultivation and fertilization. With two rows per bed and beds running east-to-west, the south row of each bed would grow more quickly and larger than the north row. In the Imperial Valley, the row direction of onion seed crops varies to best suit the individual field's irrigation slope.

Crop rotation is an important consideration for both onion bulb and onion seed production. To minimize disease, nematode, weed, and soil insect problems, onion crops should not be planted in the same field more often than once every four to five years. A crop rotation of four to five years also helps to avoid volunteer onions of a variety different from the planted crop.

SOILS

Onions are shallow-rooted and grow best on a friable soil with good moisture retention. Onions will grow in a wide range of soil types, but excessively dense clay soils interfere with root growth, while sandy soils require very frequent irrigation. Onion seed germination and seedling emergence require a uniform, clod-free, firm seed bed several inches deep. Because raised beds provide better drainage and an area for salt accumulation away from the onion root zone, they are preferred to planting on the flat or small ridges. Onions are sensitive or moderately sensitive to salinity, primarily at germination and emergence stages; once the plants are established they can tolerate higher levels of salinity. Yield reductions of 50 percent are not uncommon at a salinity of 4 to 5 mmhos/cm (dS/m). Onions are more sensitive to salinity, sodium, and boron than are lettuce, cauliflower, broccoli, and cabbage.

IRRIGATION

Sown onion seed must not dry out and the soil surface must not be allowed to crust during the post-planting, pre-emergence period, which can last 10 to 20 days after the initial irrigation. Since onion seed is planted in the summer when temperatures are high, sprinkler irrigation is the best management practice for stand establishment. Because they have a shallow root system, onions require frequent irrigation or rainfall throughout the season. They extract very little water from depths beyond 24 inches (60 cm); most of their water is from the top 12 inches (30 cm) of soil. Onion roots are essentially non-branching, and all roots originate at the stem (basal) plate of the plant. Thus, the upper soil areas must be kept moist to stimulate root growth and provide adequate water for the plant. The onion plant's rates of transpiration, photosynthesis, and growth are reduced by even mild water stress. Unlike many plants, onions show little capacity to reduce their leaf water potential by osmotic adjustment to compensate for reduced availability of water at the root, whether caused by salinity or by drying of the soil. Stressed onion plants will exhibit poor flower and pollen development, reduced seed yields, lower seed weights, and decreased seed vigor and reduced nectar production and honeybee visitation.

The required amount and frequency of irrigation will depend on the irrigation method, soil type and conditions, and weather (e.g., rainfall amounts and timing, temperature, evapotranspiration, etc.). The optimal time for irrigation is when 25 percent of available moisture in the top 2 feet (60 cm) has been depleted. In general, an onion seed crop will use 25 to 35 inches (65 to 90 cm) of water. With 70 to80 percent efficiency, water applications of 35 to 45 inches (90 to 115 cm) may be required. If more water than that is being used, the frequency and length of irrigation should be examined or a different method of irrigation (e.g., drip, surge, or sprinkler) should be considered.

FERTILIZATION

Because onions are shallow rooted and are generally grown in cool soils, they are quite responsive to fertilization. The optimal fertility program will provide nutrients to the upper 6 to 15 inches (15 to 40 cm) of the soil over the entire growing season. Typically, no more than one-third of the nitrogen (N) should be available at planting, one-third at early season (3- to 4-leaf stage), and one-third at midseason or when seed stalks are visible. High N availability late in the season can delay maturity, but the effect on seed quality is not known. Onions are sensitive to ammonia, so formulations that contain high levels of ammonia should be avoided. However, fall foliar applications (soon after planting) of liquid ammonium nitrate have proven beneficial to onion growth, and may have the side benefit of controlling young weed plants. Total supplemental nitrogen needs may vary from 100 to 400 pounds of N per acre (110 to 450 kg/ha), depending on soil and cropping history and irrigation efficiency. High rates of phosphorus (200 lb P_2O_5/ac [225 kg/ha]) may be necessary if beginning soil levels are low or deficient; moderate rates are sufficient in other soils. Onions are not responsive to potassium in most California soils. Five to ten tons per acre (11 to 22 t/ha) of composted manure are sometimes used to meet planting and early season N requirements and other nutrient needs. Soil tests and tissue analyses are available for all nutrients, and preliminary quick tests on tissues for N are available.

Soil analyses are the best indicators for phosphorus (P), potassium (K), and micronutrient needs, while tissue analyses combined with soil and cropping history are the best indicators for nitrogen (N) needs. For phosphorus, less than 8 to 10 ppm P with sodium bicarbonate extraction is a deficient level; for potassium, less than 80 to 100 ppm K with ammonium acetate extraction is a deficient level. Micronutrients, if needed, are most effectively applied at planting time, banded 2 to 4 inches (5 to 10 cm) below the seed or, if bulbs are planted, at the depth of the bulb bases but to the side of the planting row. For zinc, less than 0.5 ppm Zn by DTPA or dithizone extraction is a deficient level; zinc is commonly applied to onion seed crops, both at planting and as foliar application. Other micronutrient applications may be needed depending upon the specific micronutrient's availability in the soil.

INTEGRATED PEST MANAGEMENT

Pests, weeds, and diseases need to be well managed in onion seed production to achieve high yielding and high-quality seed. The UC Integrated Pest Management Guidelines for onions, including photographs, are available for weed, insect, disease, and nematode pests. Sanitation, crop rotation, resistant varieties, appropriate pesticide use, and frequent monitoring are essential components for prevention and control of the many pests afflicting onions. Visit the UC IPM website at http://ipm.ucdavis.edu/PMG/selectnewpest.onion-and-garlic.html for more information.

Weed management. Onions are poor weed competitors because of the long period before they achieve ground cover and because the long growing season permits the emergence of successive flushes of both winter and summer weeds. Onions for seed are planted in the summer and grow through the fall, winter, spring, and following summer, so they encounter all types of weeds: summer annuals, winter annuals, perennials, grasses, and broadleaves. Field bindweed is a particularly troublesome weed because the seed is similar in size, shape, and color to onion seed, so it is very difficult to separate by seed conditioning. Since field bindweed is a federally designated noxious weed, commercial onion seed must be completely free from bindweed seed. Considerable amounts of good onion seed can be sacrificed during cleaning to remove even a small contamination with bindweed seed. Thus, control of bindweed in the production field is essential.

Early weed control is essential: cultivation often becomes impossible in the winter due to rains, and the result of a lapse in control is the growth of winter annual weeds. The limited availability of pre- and early post-emergence herbicides makes site selection, pre-plant weed management, and early season weed management via cultivation essential components of onion seed production. Hand weeding can damage the onion root system, so field selection, pre-irrigation followed by cultivation or a general herbicide application, and a good early cultivation program, are essential. Nonetheless, one or two cycles of hand hoeing are required in many cases to ensure low weed populations. Postemergence herbicides are available that can be applied at the 3- to 4-leaf stage, and later. Soil solarization is another potentially useful tool. The onion seeds are not planted until mid to late summer, so one to two months of solarization can be completed without disrupting most rotation schemes. Additional information on solarization is available in UC ANR Communications Services Publication 21377, *Soil Solarization: A Nonpesticidal Method for Controlling Diseases, Nematodes, and Weed Pests.* Pre-plant fumigation is another effective tool that has been used increasingly since the removal of early season herbicides from the market.

Disease identification and management. The disease problems encountered in onion seed production are similar to those encountered in bulb production. The most serious disease threats to onion seed are downy mildew (*Peronospora destructor*) and botrytis leaf blight *Botrytis squamosa*), sometimes called botrytis blast. Botrytis blight usually occurs during the fall and winter on onion seed crops. As temperatures rise in spring, and if they are accompanied by high humidity, rain, or sprinkler irrigation, downy mildew becomes the dominant springtime disease. Preventive fungicides, cultural practices that promote leaf drying, and avoidance of sprinkler irrigation are the most effective management practices.

Purple blotch (*Stemphylium vesicarium* [most common in California] and *Alternaria porri*) and Fusarium basal rot (*F. oxysporum* f. sp. *cepae*) are potentially serious diseases as well. Bacterial rots (*Pseudomonas* and *Erwinia* spp.), which start as foliar diseases before they spread into the bulb, can be a threat throughout the season to plants grown under sprinkler irrigation. Pink root (*Phoma terrestris*) and white rot (*Sclerotium cepivorum* Berk.) are potentially serious root and bulb diseases that are managed through avoidance, including field selection and crop rotation. Pink root can also be managed through use of resistant plants and soil fumigation. Black mold (*Aspergillis niger*), neck rot (*Botrytis allii*), and blue mold (*Penicillium hirsutum*) are common harvest and postharvest diseases of bulb crops, but rarely constitute serious threats to the onion seed crop.

Iris yellow spot virus (IYSV) is a relatively new disease for California onion seed and bulb production. This disease is vectored by onion thrips (*Thrips tabaci*). Symptoms include straw-colored lesions on leaves and scapes that result in plant dieback and serious losses in seed yield and quality. Management practices include maintaining good fertility and adequate soil moisture to reduce plant stress, removing and destroying infected plants along with cull piles, eliminating weeds in and around onion fields (especially volunteer onions and wild alliums), and controlling onion thrips.

Insect identification and management. Field monitoring is an important tool for identifying pest problems in onion seed production. Thrips (onion and flower, *Frankliniella occidentalis*) are frequently found and are most likely to cause economic problems if they become numerous on the umbel. Onion thrips is a major concern because this pest vectors IYSV. Onion maggot is also a potentially serious insect pest, while mites, seed corn maggot, leafminers, and armyworms are occasional problems.

Insecticides for pest control should be used with extreme caution, and not at all during bloom, to protect insect pollinators needed for onion seed production. Based on recent research, onion seed fields treated with more than four insecticides (including tank mixes and applied pre-bloom) showed a decline in honey bee activity along with subsequent yield reductions (Long and Morandin 2011; Gillespie et al. 2013). As a result, manage thrips by monitoring fields and applying insecticides only when needed. In general, onion thrips start to develop in fields in late February/early March, so if insecticides are needed, timing should begin then. See the UC IPM Pest Management Guidelines for Garlic and Onions (http://www.ipm.ucdavis.edu/PMG/selectnewpest.onion-and-garlic.html) for thrips monitoring practices.

Nematode identification and management. Stem and bulb nematode (*Ditylenchus dipsaci*) and root knot nematodes (*Meloidogyne* spp.) can be found in seed onion fields. However, they do not often cause problems in California onion seed production.

POLLINATION

Pollinator insects are necessary for onion pollination, and honey bees are used widely for this purpose. Hives should be placed in open-pollinated variety fields when about 10 percent of the flowers are open and in hybrid fields when the male variety begins flowering. Nicking (the simultaneous flowering of male and female parent varieties) is critical in hybrid fields, since without it seed production cannot occur. For open-pollinated varieties, 4 to 6 hives per acre are generally satisfactory, while hybrids may require as many as 10 to 12 hives per acre.

Many factors affect pollinator activity in hybrid onion seed production. These include the neighboring crop and weed competition for bees, bee colony strength, onion variety, irrigation management, nectar production, insecticide use, and hive placement.

Ideal neighboring crops for onion seed production are those that honey bees do not normally visit (e.g., tomatoes or grains). Roadside weeds should be controlled to eliminate plants more attractive to the bees, such as mustards and thistles. Nearby alfalfa fields should be cut before bloom.

Growers usually contract with a beekeeper for bees. Colony strength and performance can be stipulated in those contracts. Bee colony strength is dependent on hive populations, activity, and freedom from mites and diseases. Frequent inspections by the beekeepers can ensure that all contracted hives are healthy and that their performance is satisfactory.

Honey bees favor onions that produce higher amounts of nectar. Nectar production depends on the onion variety and is also influenced by irrigation management practices. Onion seed fields that are too dry or too wet have lower amounts of nectar than onions that have good irrigation management practices. Insecticides should be used with extreme caution, and not at all during bloom, to avoid negative impacts to insect pollinators. Seed fields receiving more than four insecticide treatments (including tank mixes and pre-bloom) show declines in honey bee activity and seed yields. Some insecticides may also interfere with the ability of female umbels to receive pollen, though honey bees seem to deposit enough pollen to overcome this limitation. Fungicides do not appear to negatively impact pollinator visitation.

When possible, hives should be placed in and around onion seed fields, with the hive entrances directed toward the field interior. This will help to keep the bees working the onion field instead of foraging elsewhere. Hives should be placed in the field incrementally as flowering increases to ensure the presence of sufficient pollen for the bee population. Fresh hives may also be rotated into the field to replace hives whose bees may have identified more attractive sources for nectar and pollen. Seed companies will know the relative bee-attractiveness of different onion parents and can recommend adjustments in the numbers of hives needed per acre for a particular hybrid.

Other insects also pollinate onions. Flies and leafcutter bees work onion flowers more effectively than honey bees, but they are difficult to manage or keep in controlled areas. Anecdotal evidence suggests that good onion seed yields have been obtained from fields located near dairies or feedlots.

HARVEST AND DRYING

Determining the harvest date is a critical decision in onion seed production. Two objectives are in conflict: to allow maximum seed maturity, and to minimize the loss of seed from umbels shattered during harvest. Too early a harvest will minimize loss to shattering, but some harvested seeds will be immature, lightweight, poor-vigor, or nonviable. If harvest is delayed until all seeds reach optimal maturity, much of the earlier maturing seed can fall to the ground or shatter from the umbels during cutting and transport. Harvest is commonly initiated when about 10 percent of the black seed are visibly exposed in the umbel. This corresponds to a seed or whole umbel moisture content of approximately 65 percent. Shattering increases sharply below a seed or umbel moisture content of 50 to 55 percent. Umbels are cut by hand or machine with approximately 6 inches (15 cm) of the seed stalk (*scape*) attached, transferred to trailers, and removed immediately from the field. They are piled approximately 6 to 10 inches (15 to 25 cm) deep on large canvas or plastic tarps and dried under ambient conditions for 2 to 3 weeks. Canvas tarps are preferable since plastic allows less air movement through the tarp. The piles are turned frequently with pitchforks. After drying, the umbels are threshed using conventional combines and partially cleaned (*scalped*). The seed is then transported to a seed company's cleaning and milling facilities for further processing. Milling will result in the removal of additional material, generally 10 to 20 percent by weight.

Onion seed generally has a relatively short storage life, and viability decreases rapidly at high temperatures or high humidities. To retain seed quality, the grower should dry the seed quickly after harvest, while at the same time preventing the excessive buildup of heat on the tarps. Frequent (daily) turning and shading of the harvested umbels will help maintain high seed quality. Fans can be used to circulate the air and lower the humidity to speed drying. In climatic areas with persistently high humidity, forced-air drying may be necessary.

POSTHARVEST HANDLING AND STORAGE

When the seed is delivered from the grower to the processor/packager, a moisture sample is taken to ascertain that the seed is dry enough to prevent it from heating up during bulk storage. The general goal is to deliver seed with no more than 8 to 9 percent moisture content. If necessary, the seed can be dried further using forced air. An air screen cleaner separates the trash and light seed from the good seed. The seed is then passed across a gravity table separator to remove any remaining contaminants or light seed. If the seed is not sufficiently clean after these operations, and particularly if it contains noxious weeds, it may be run through the previous steps again or through a disk separator or some other specialized cleaning apparatus, depending upon the particular contaminant present. Any seed cleaning operation removes good seed along with the contaminant, so growers and processors/packers use only the minimum number of steps required to meet the desired purity standards.

After cleaning, new samples are analyzed for moisture, germination, and purity. If the results are below standards, further milling may be required to remove low-quality (generally lighter) seed. Once minimum germination standards are achieved (commonly 85%), the moisture content is checked again and brought to 6 to 7 percent before the seed is placed in storage bins. From bulk storage, the seed can be treated with pesticides using either slurry or film coating methods and packaged in metal cans or plastic buckets. Smaller quantities may be sealed in foil or plastic laminated packets. Because of the short storage life of onion seeds and their sensitivity to heat and humidity, care must be taken to protect the seeds from high humidity (using sealed packaging) and from high temperatures during shipping and storage.

MARKETING

Onion seed is grown under a contract between the grower and a seed company. The contract stipulates variety, acreage, quality standards (germination, purity, weed seeds, etc.), and the pricing structure. Pricing is commonly tiered, with a higher price for the first increment of yield per acre and a lower price for successive increments in yield. For example, hybrid seed production may be contracted for approximately $20/lb for the first 300 lb/ac and $10/lb for yields in excess of 300 lb/ac. Open-pollinated seed would be contracted for less than one-half of that price. The grower is responsible for all production inputs, and the seed company provides the parent seeds or bulbs, technical advice, and variety information. Final marketing of the seed is the sole responsibility of the seed company.

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FOR MORE INFORMATION

You'll find detailed information on many aspects of onion production and other vegetable crops in publications, slide sets, and videos from UC ANR Communication Services. Visit our online catalog at http://anrcatalog.ucanr.edu. You can also place orders by mail, phone, or fax, or request a printed catalog of publications, slide sets, and videos from

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