

By **George Kuepper & Raeven Thomas**
NCAT Agriculture Specialists
December 2001

Asparagus has excellent potential as a fresh crop for local markets. According to *Pick-Your-Own Farming* (1), a practical handbook on truck farming and direct marketing by Wampler and Motes, asparagus has been among the top ten moneymakers. Before planting, though, farmers should make sure that the local market for asparagus is not already saturated. To estimate how many acres to plant, first determine the population residing within 25 miles of the farm. One acre of asparagus for every ten thousand people is a good rule of thumb.

Direct fresh-market options include pick-your-own, roadside stands, farmers' markets, and peddling to local grocery stores or restaurants. Growers may also be able to market part of their asparagus crop through brokers, wholesale chains, or processors if the local market becomes saturated.

Organic crop production disallows the use of synthetic pesticides or conventional commercial fertilizers. Instead, organic growers rely on biodiversity, cultural practices, and alternative, environmentally friendly inputs. As a commercial crop, asparagus can be somewhat challenging to produce organically because of potential difficulties managing weeds.

Because asparagus is a perennial crop that will be in the ground for at least 10 to 15 years, attention to selection and preparation of the planting site is especially important. Asparagus performs best if the soil pH is within a range of 6.5 to 7.5. Phosphorous, potassium, and lime amendments—based on a soil test—should be incorporated prior to planting. If perennial weeds are a problem, a sequence of tillage and cover cropping—with smother crops like sorghum-sudan or buckwheat—at least a year in advance of planting will help control weeds. Green manure crops also improve soil structure and enhance soil fertility.

Variety Selection

Variety selection is a critical decision to be made prior to planting. A number of highly productive asparagus varieties are available. UC-157 and its hybrid lines replaced Mary Washington as the leading commercial variety many years ago. Among the more recent developments is the release of nine all-male hybrid varieties in the Jersey line (e.g., Jersey Giant®, Jersey King®, etc.) Research has shown these all-male hybrids to yield 2.5 to 3 times more than Mary Washington. Also of possible interest for local specialty marketing is Purple Passion, a burgundy-colored variety that is sweeter-tasting than green types. The enclosed article by Carl Cantaluppi provides descriptions of many common varieties. For further information on varieties and which perform best in select regions, please contact Cooperative Extension and local nurseries.



Insect Pests

Several insect pests affect asparagus. The most damaging insects include the asparagus beetle, spotted asparagus beetle, and asparagus aphid.

The asparagus beetle is a common pest wherever asparagus is grown. Both adults and larvae feed on the plant. In the spring they feed on the spears and reduce the quality of the crop. In the summer they defoliate the ferns and reduce the food supply to the crowns, thus affecting future yields.

Spotted asparagus beetle is also widespread but is more common in the Eastern United States. Adult spotted asparagus beetles emerge later than common asparagus beetles. The injury caused by the adult is similar to that of the common asparagus beetle; however, the larval stage does little damage to the crop because it feeds primarily on the fruits or berries.

Sanitation is one of the principal preventative strategies for suppressing these pests. This usually involves fall/winter burning of dried fronds and other “trash” to eliminate sites where the beetles overwinter (2). However, this may be undesirable if it leaves the soil vulnerable to erosion. On small acreages, enclosing the asparagus beds and letting hens forage on the beetles is one possible strategy for control (3). Rotenone or rotenone-pyrethrum mixtures are an organic control measure for larger acreages. Natural predators include a chalcid wasp and lady beetle larvae.

Asparagus aphid is a European native that was first reported in the U.S. in 1969. It has since spread across most of the country. Asparagus aphid feeding causes bushy, stunted new growth called “witches broom.” If not controlled by natural predators and parasites, aphids are readily managed using insecticidal soap and rotenone-pyrethrum sprays.

Disease Pests

Asparagus is affected by an array of diseases, of which the following are the most common and troublesome:

Fusarium, which causes assorted crown and root rots and wilts, results in poor stands and yellowing and wilting of seedlings in new plantings. In established plants, wilting of individual ferns occurs and the foliage turns yellow to tan. Diseased crowns will have a yellowish-red internal discoloration, and the major roots will be rotted. The severity of fusarium wilt varies between different asparagus growing regions in the country. In most instances, fusarium rarely becomes serious in well-managed plantings. If fusarium does become serious, the field may have to be destroyed and not replanted to asparagus (4). Salt has been found to be somewhat effective in suppressing fusarium. See further discussion on the use of salt in the section on weed control. Note that the use of salt in this manner may not be acceptable for organic certification.

Asparagus rust (*Puccinia asparagi*) can be a problem if the cultivars being grown are not rust-resistant. Rust can cause premature defoliation or death of the ferns, reducing yields and increasing the incidence of root or crown diseases (5). Symptoms generally occur after the cutting season. Small yellow-to-orange spots first appear on the “needles;” in the second stage of the disease, dusty brick-red pustules appear on both the shoots and the needles; later they turn black. Rust is most severe during times of heavy rain, high humidity, or abundant dew. Planting resistant cultivars is the best control. Increasing the planting distance between rows and orienting the rows toward the prevailing summer winds will also help.

Needle blight (*Cercospora asparagi*) has recently become a problem disease of asparagus, especially on the newer hybrid cultivars. Like rust, needle blight is a defoliating disease prevalent during periods of high humidity or abundant rain and warm temperatures. A bad infection will severely reduce yield the following season because defoliated ferns do not manufacture and store carbohydrate food reserves very well. Symptoms appear in June, when affected ferns develop buff to gray, somewhat elliptical spots surrounded by a thin purple band (5). The lush fern growth typical of the new hybrids, especially when grown in rich organic soils, reduces air movement and creates ideal conditions for the disease.

Tillage can reduce needle blight. However, Oklahoma researchers found that burning the fern residue provided significantly greater control than tillage and is recommended as the best cultural option (6). As with rust, increasing the planting distance between rows (e.g., from 5 ft. to 6 ft.) will improve air flow and help prevent disease buildup.

Purple spot, a fungal disease that infects young spears of asparagus, is caused by *Stemphylium vesicarium*. Infection causes sunken purple spots that reduce the value of the crop. Burying asparagus debris in late fall or late winter significantly reduces the severity of the disease (7). Burying also reduces the level of infection on young volunteer asparagus—an important control measure because infected volunteers are the source of fungal inoculum during the harvest period.

Weed Control

Weed control is the most serious challenge facing organic asparagus producers. Since asparagus is a perennial crop that increases in bed-width each year, cultivation for weeds “in the row” during spear harvest, and following harvest during fern production, is not possible. Thus, elimination of perennial weeds such as bermudagrass, quackgrass, johnsongrass, and nutgrass prior to planting is especially critical. Annual weeds can be controlled through a combination of cultural, mechanical, and biological control techniques.

CULTIVATION

To control winter annual weeds that have emerged in the field, cultivate at a shallow depth after the winter ferns (i.e., trash ferns from previous season) have been mowed or burned off. Avoid damage to crowns by straddling the beds. At no time should tractor tires be driven on or across the rows. Following harvest the field should be disked or tilled again to eliminate weeds that have emerged since the last cultivation and to prepare the field for summer fern production.

Cultivation between the rows with a high-clearance tractor and 3-point hitch-mounted row cultivators will control the bulk of interrow weeds during the growing season. During harvest of spears and during fern production, in-row cultivation opportunities are limited. Yet, these in-row weeds pose the greatest threat because weed competition with ferns interferes with crown storage and reduces yield the following growing season.

MULCHES AND WEEDER GEES

During fern production, alternative weed control options in the row include hand weeding, mulching, and/or the use of weeder geese. On large-scale operations, mulching can be mechanized using straw spreaders or forage wagons carrying green chop or shredded dry mulch. Weeder geese are an alternative to mulching, and have a history of use in asparagus. Contact ATTRA for additional information on weeder geese.

FLAME WEEDING

Flame weeding, which is done with propane flammers, is another possibility for in-row weed control. Hand-held or backpack flammers can be especially useful for spot treatment, though tractor-drawn rigs are available. As a general rule, flame weeding is most effective against annual broadleaf weeds, moderately effective against annual grasses, and a poor option for perennial weed management. Flaming should be considered a potentially useful though experimental tool. ATTRA has additional information on the uses of flame weeding in vegetables, available on request.

COVER CROPS

Cover crops are another useful tool in asparagus weed management. Two cover crop systems that have potential in asparagus are “dying mulches” and “living mulches.”

Dying Mulches

A dying mulch is a cover crop planted out of season. While growing it suppresses weeds; then it dies back out on its own without requiring the use of herbicides, mowing, or tillage. Winter rye—planted in the spring—has been used successfully in this manner in several agronomic and horticultural crops.

In asparagus here’s how this might work. Following post-harvest tillage of the asparagus field, the field is over-seeded with winter rye at 120 lbs. per acre to establish the living mulch. Since the winter rye is planted in late spring, and consequently does not receive normal winter vernalization (cold treatment), it never tillers (i.e., it stays short) and eventually “cooks out” by mid-summer. By this time, the asparagus ferns form a thick canopy that shades out most underlying weeds.

The success of this system is dependent on proper timing and good luck. Timing is critical to get the rye established early enough to promote germination when the soil temperatures are still relatively cool, but at the same time, late enough that a cold spell is avoided. Vernalization can occur when the rye is exposed to only 10 days of 45° F night temperatures.

Dr. Astrid Newenhouse, formerly with the University of Wisconsin, conducted cover crop research in horticultural crops and provided some preliminary insights into dying mulch and living mulch systems for asparagus. Dr. Newenhouse tried the non-vernalized rye system described above. She agreed that timing was critical with respect to a cool spell. As a result of a cold snap one year, her rye headed out and created additional management problems. Biological farming strategies, like conventional farming strategies, don't always work as expected (8).

Living Mulches

Living mulches are cover crops grown in association with annual or perennial crops, primarily for weed suppression and as a soil management practice. The goal is to plant a low-growing cover that suppresses weeds without competing too much with the main crop.

In Wisconsin, Dr. Newenhouse's living-mulch work in asparagus focused on two cover crops: perennial ryegrass and 'Dwarf White' Dutch white clover. Both cover crops were fall-established and managed the following growing season with one to three mowings using a walk-behind sickle-bar mower. Preliminary results indicated that perennial ryegrass performed better than the Dutch white clover the first growing season. However, in the second growing season these results were reversed, with the Dutch white clover performing better. This research found that living mulches could be highly effective in weed suppression but also quite competitive with the crop, reducing asparagus growth 50-75% in some instances (9). Clearly, more research is required to find living mulch systems that are more viable.

The ATTRA publication *Pursuing Conservation Tillage for Organic Crop Production* has additional information on the use of cover crops for vegetables.

Salt

For generations, grower recommendations have included the application of salt to the soil because plantings were observed to respond favorably and weeds were suppressed. The practice fell into disfavor with the introduction of herbicides. It did not revive in the organic community, ostensibly because salt can be detrimental to soil structure. More recently, however, researchers have learned that salt helps control fusarium crown and root rot. It is this factor that is believed to be of the greatest benefit to asparagus (10).

As a weed control agent, salt is only reasonably effective against young, germinating seeds; it does not kill established weeds nor does it provide a long-lasting effect. Sodium chloride (basic rock, table, or pickling salt) may be used. Applications of 1 lb. per 20 row feet (spread to a width of 2.5 feet) are recommended (11). Reasonable caution should be used; while asparagus is salt tolerant, excessive levels can damage the crop and the soil. As mentioned earlier, this tactic may not be permitted in certified organic production. Growers should consult their certification agent before using salt in this manner.

Herbicides

Herbicides, though prohibited in certified organic production, are commonly used in integrated pest management programs. The number of herbicide combinations available now also make it possible to manage weeds in the row at reduced-input rates and still manage between-row weeds through cultivation or use of living mulches. Herbicide recommendations are available through the Extension Service.

Corn gluten meal is accepted in organic production and has proved effective as a pre-emergent herbicidal material. It would likely be effective in controlling some weeds in asparagus and could become an option for organic producers. However, at recommended application rates the cost would be quite high at present.

Asparagus Harvest

The harvest period in a mature asparagus planting lasts about eight to nine weeks. Spears are hand picked by snapping them just above the ground. Most growers build their own harvest aids to

increase harvest efficiency. These low-lying platforms can either be attached to the front or rear end of a tractor, or be self-propelled.

The Oklahoma State University Vegetable Research Station (12) in Bixby, Oklahoma, built a self-propelled harvest aid that seats three workers. The person in the middle steers with their feet while picking. During full harvest it usually takes about 45 minutes to pick an acre using this 3-seater, according to OSU Extension Vegetable Specialist Jim Motes (13). Motes said that it takes about two person-hours per acre to harvest asparagus, regardless of whether it is picked by stoop labor or with a harvest aid. The main advantage of a harvest aid is the ability to work longer hours without back strain.

Self-propelled harvest aids are also produced commercially. Holland Transplanter Company (14) manufactures units (similar to the one used in Oklahoma) that seat from one to six workers and range in price from \$6,000–\$8,000. A single-seat pedal-powered *Crop Cart* is available from Rusty's Ag Sales (15). It sells for \$975 and can be shipped by UPS. Various articles describing other harvesting carts are included among the enclosures.

Well-drained soils, such as a light, sandy loam, are a definite advantage in asparagus production, especially when it comes to harvesting. The ability to drive equipment into the field soon after it rains is especially important. Once harvest begins, picking takes place every other day in cool weather, and every day later in the season.

When harvest is delayed by wet field conditions, the spears may open up and begin to fern out. As loose spears are non-marketable, it is sometimes necessary to clear the whole field. This can be accomplished by using either a sickle-bar mower or brush-hog. Again, care should be taken to keep tractor tires off the rows to avoid crown damage. Spear emergence following “clear-cutting” gets the harvest back on schedule but overall yields and the harvest season may be reduced.

Post-harvest Handling

As asparagus is a highly perishable crop, some method of cooling after harvest is necessary. Precooling to remove field heat prior to shipment is commonly practiced via hydrocooling. Hydrocooling is accomplished by flooding, spraying, or immersing vegetables in chilled water. Following hydrocooling, asparagus should be kept refrigerated.

According to the USDA:

Fresh asparagus is highly perishable and deteriorates rapidly above 41° F. Thus, the spears should be cooled immediately after cutting, preferably by hydrocooling, and placed at a low temperature. In addition to general deterioration, growth, loss of tenderness, loss of flavor, loss of vitamin C, and development of decay take place at moderately high temperatures.

Asparagus can be kept successfully for about 3 weeks at 35° F. It can be held for about 10 days at 32° F., but is subject to chilling injury when held longer at this temperature. (16)

High relative humidity (95 to 100 percent) should be maintained, with good ventilation to reduce carbon dioxide and ethylene buildup. Non-perforated film should not be used. Commonly, the desired relative humidity is obtained by placing the butts of asparagus on wet pads.

Enclosed for your information is *Post-harvest Handling of Fresh Market Asparagus: A Brief Review*, a University of California Extension information sheet. It provides a useful guide to maintaining quality from the field to the supermarket.

White Asparagus

White asparagus is produced when spears are grown in the absence of light. White asparagus has a milder flavor than green asparagus and thus brings a higher (“gourmet”) market price. The traditional practice for blanching asparagus was to mound up soil or straw over the asparagus row. Hand labor was required to manage and harvest the mounds and consequently the mound technique is no longer practiced in the U.S.

Dr. Don Makus, while research horticulturist with the USDA Agricultural Research Service in Booneville, Arkansas, perfected the use of simple row tunnels covered with black, opaque plastic to produce white asparagus. (Dr. Makus has since relocated to a USDA station in Texas.) Enclosed is *White Asparagus Production Using Opaque Plastic Covers*, an article describing this technique.

References

- 1) Wampler, Ralph L. and James E. Motes. 1985. Pick-Your-Own Farming. University of Oklahoma Press, Norman, OK. 194 p.
- 2) Ellis, Barbara and Fern Marshall Bradley. 1992. The Organic Gardener's Handbook of Natural Insect and Disease Control. Rodale Press, Emmaus, PA. p. 271.
- 3) Philbrick, Helen, and John Philbrick. 1974. The Bug Book, Harmless Insect Controls. Storey Communications, Inc., Garden Way Publishing, Pownal, VT. 124 p.
- 4) Barnes, George L., et. al. 1986. Diseases of Asparagus in Oklahoma. OSU Extension Facts No. 7646. Oklahoma State University Cooperative Extension. 4 p.
- 5) Marr, C.W., et al. 1990. Asparagus Guide. Kansas State University Cooperative Extension, Manhattan, KS. 4 p.
- 6) Conway, Kenneth E. 1987. Summer disease control on asparagus ferns can mean increased profit next year. p. 41-43. In: Proceedings of the 1987 Oklahoma Horticulture Industries Show, Tulsa, OK.
- 7) Johnson, D.A. 1990. Effect of crop debris management on severity of *Stemphylium* purple spot of asparagus. Plant Disease. Vol. 74. p. 413-415.
- 8) Personal communication.
- 9) Paine, L., H.C. Harrison and A.C. Newenhouse. 1995. Establishment of asparagus with living mulch. Journal of Production Agriculture. Vol. 8, No. 1. p. 1-2.
- 10) Anon. 1990. New reasons to salt asparagus beds. Countryside. July-August. p. 12.
- 11) Poncavage, Joanna. 1998. Weeds in asparagus. Organic Gardening. April. p. 18.
- 12) OSU Vegetable Research Station
13711 S. Mingo Rd.
Bixby, OK 74008
(918) 369-2441
- 13) Dr. Jim Motes, Extension Specialist (retired)
Department of Horticulture and L.A., OSU
360 Agricultural Hall
Stillwater, OK 74078
(405) 744-5414
- 14) Holland Transplanter Co.
510 E. 16th St.
Holland, MI 49423
Tel: (800) 275-4482
Fax: (616) 392-7996
- 15) Rusty's Ag Sales
412 N. 7th St.
Fairbury, IL 61739
Tel: (800) 373-2809
- 16) Hardenburg, Robert E., Alley E. Watada, and Chien Yi Wang. 1986. The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks. Agriculture Handbook No. 66. USDA/Agriculture Research Service. p. 52.

Enclosures

- Anon. 2000. Work efficiency tips can help vegetable growers. American Small Farm. April. p. 28.
- Anon. 2000. Healthy Farmers, Health Profits project to work with berry growers. Northland Berry News. Summer. p. 13.
- Anon. 2000. One-row riding "strawberry picker." Farm Show. May-June. p. 18.

- Anon. 2000. Agricultural Alternatives: Asparagus Production. Pennsylvania State University, University Park, PA. 6 p.
- Bird, Christopher O. 1998. Growing white asparagus. National Gardening. January-February. p. 78, 80, 81, 82.
- Cantaluppi, Carl J. 1994. Getting started in asparagus. p. 11. In: Proceedings of the 1994 Ohio Asparagus, Strawberry, and Small Fruit Schools. Ohio State University Misc. Publ. No. 94-1. p. 11-21.
- Kren, Lou. 1994. Homemade harvesters. American Vegetable Grower. May. p. 19-21.
- Makus, Don and A.R. Gonzales. 1991. White Asparagus Production Using Opaque Plastic Covers. Arkansas Farm Research. March-April. p. 10-11.
- Motes, J. E. 1987. Asparagus Harvesting Strategy for Maximum Profit. Department of Horticulture and L.A., Oklahoma State University Extension. 1 p.
- Mullen, Bob and Bob Kasmire. No date. Post-Harvest Handling of Fresh Market Asparagus, A Brief Review. Reprinted by Department of Horticulture and L.A., Oklahoma State University. 2 p.
- Sanders, Douglas C. 2001. Asparagus Crown Production. North Carolina State University, Raleigh, NC. 2 p.
- Sanders, Douglas C. 2001. Commercial Asparagus Production. North Carolina State University, Raleigh, NC. 6 p.
- Thelander, Mike. 1988. Growing fresh market asparagus. p. 23-31. In: Proceedings of the 1988 Illinois Asparagus School. Horticulture Series 73. University of Illinois Cooperative Extension Service, Urbana-Champaign, IL. Horticulture Series 73.
- Walters, Pat. 1998. Asparagus on small acreage. AgVentures. October-November. p. 27-29.

Suggested Information Resources

Growing Asparagus in California is University of California Extension Leaflet No. 21447. It describes climatic and soil requirements, asparagus varieties, planting methods, caring for the established plantation, pest management, harvesting, and post-harvest handling. This 24-page leaflet is available for \$2.50; checks payable to UC Regents. Contact:

ANR Publications
University of California
6701 San Pablo Avenue
Oakland, CA 94608-1239
(510) 642-2431

Asparagus Production, Management, and Marketing is Ohio State University Extension Bulletin No. 826. It contains current information on asparagus varieties, planting techniques, white asparagus culture, and general management and harvesting procedures. This 25-page bulletin is available for \$4.75; checks payable to The Ohio State University. Contact:

Extension Media Distribution Office
The Ohio State University
385 Kottman Hall
2021 Coffey Road
Columbus, OH 43210-1607
(614) 292-1607

The Ohio (formerly Illinois) Asparagus School, organized by Carl Cantaluppi (formerly of the Piketon Research & Extension Center in South-Central Ohio) is an annual growers school. *The Proceedings of the Ohio Asparagus School*, and back issues of *The Proceedings of the Illinois Asparagus School* are available for purchase through the Piketon Research Center. Contact:

OSU-Piketon Research & Extension Center
1864 Shyville Rd.
Piketon, OH 45661
(740) 289-2071

Asparagus: Pest Management Guidelines. 1994. University of California IPM *IMPACT* Pest Management Guidelines. UCPMG Publication No. 32. 23 p.

*The University of California has produced quite a few manuals on IPM for field, vegetable, and fruit crops. The *IMPACT* series of publications contain a summary of IPM material in the IMPACT IPM Database. This publication on asparagus addresses: Insects, Diseases, and Weeds. Each entry includes: Description of the Pest; Damage; Cultural Control; Biological Control; Organically Acceptable Methods; Chemical Controls; and When to Treat. Contact one of the addresses below for ordering information. This publication can also be downloaded from the internet at <<http://www.ipm.ucdavis.edu/PMG/selectnewpest.asparagus.html>>.*

UC IPM Education and Publications
University of California
Davis, CA 95616-8620
(530) 752-7691

Statewide IPM Project
University of California
Davis, CA 95616-8621
(530) 752-8350

Informational Websites

<http://aggie-horticulture.tamu.edu/extension/easygardening/asparagus/asparagus.html>

Great information about all aspects of asparagus from planting to harvest.

<http://www.msue.msu.edu/msue/iac/agnic/asparagus.html>

Highly informative site on asparagus including an asparagus reference service.

<http://www.planthealthprogress.org/current/reviews/asparagus/top.htm>

Contains information on the economically important diseases of asparagus.

<http://www.ext.nodak.edu/extnews/askext/vegetabl/1121.htm>

Addresses the various aspects of growing asparagus.

<http://www.abs.sdstate.edu/hort/asparag.htm>

A Cooperative Extension publication from South Dakota.

http://www.penpages.psu.edu/penpages_reference/29401/2940162.html

Deals with Jersey male asparagus hybrid varieties.

<http://www.orst.edu/Dept/NWREC/asparagu.html>

Deals with a myriad of asparagus terms and varieties.

Sources for the "Purple Passion" Asparagus Variety

California Asparagus Seed and Transplants,
Inc.
2815 Anza Ave.
Davis, CA 95616
(530) 753-2437

Pendleton's Country Market
1446 E. 850th Rd.
Lawrence, KS 66046
(785) 843-1409

Jersey Asparagus Farms, Inc.
105 Porchtown Rd.
Pittsgrove, NJ 08318
(800) 499-0013
<http://www.jerseyasparagus.com>

Sources for Asparagus Seed

Rupp Seeds, Inc.
17919 Rd. B
Wauseon, OH 43567
(419) 665-2658

Nourse Farms, Inc.
41 River Rd.
South Deerfield, MA 01373
(413) 665-2658
<http://www.noursefarms.com>

By **George Kuepper & Raeven Thomas**
NCAT Agriculture Specialists
December 2001

CT100/144

The Electronic version of Organic Asparagus
Production is located at:
HTML:
<http://attra.ncat.org/attra-pub/asparagus.html>
PDF
<http://attra.ncat.org/attra-pub/PDF/asparagus.pdf>