

COMMERCIAL ASPARAGUS PRODUCTION

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Asparagus has been grown for many years. The Ancient Greeks and Romans relished this crop. It originated in Asia Minor and is a member of the lily family. California, Michigan, and Washington are the major producing states, but there is some commercial production in many of the northern and western states. Warm regions such as Northern Mexico and Southern California also grow it. Recent research has shown that asparagus can be grown at a profit in North Carolina.

Asparagus is a perennial and when grown according to recommended practices, it should produce profitable yields in NC for at least 15 years. There are records of asparagus fields producing for 50 years. Establishment practices are very important in successful production. Errors made at planting are not easily corrected after planting and can reduce profit.

PREPARE TO PLANT

Varieties - Many new asparagus varieties are now available. All male hybrids are more productive and do not produce seed which sprouts to become a weed. Jersey Gem, Jersey Giant and Greenwich produced superior yields in North Carolina (Table 1). Jersey Gem has the added benefit of having tolerance to the disease cercospora leaf spot. The increased yields of hybrids make them worth the extra seed cost.

Soils and Soil Preparation - Well drained soils are a must for successful production, and very sandy soils are preferred. Good drainage is important in control for crown rot disease of asparagus. Commercial plantings of asparagus should not be made in soil that is heavier than a sandy loam. Avoid sites which retain standing water for more than 8 hours after a heavy rain.

Table 1. Yield of several recommended asparagus varieties, 1989 to 1992 in North Carolina (planted 1985).

Variety	Type*	Pounds marketable per acre				Average
		1989	1990	1991	1992	
UC-157	MFH	2252	1915	2458	1261	1972
Jersey Giant	MH	2839	2871	3514	1921	2786
Jersey Gem	MH	2694	2859	3340	2154	2761
Greenwich	MH	2615	2970	3165	2153	2725
Jersey Knight	MH	2127	2350	2622	2622	2430
Viking KB3	OP	1973	1664	1693	1035	1591

*M = male, F = female, H = hybrid, OP = open pollinated

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Choose a site free from bermuda-grass, nutgrass and johnsongrass (see NC Ag Chem Manual). A soil analysis should be made. Take soil samples from 2 depths: 0 to 6 inches and 6 to 12 inches. Keep the samples separate for analysis. Asparagus is planted 6 inches deep. This is where the roots feed, so fertilize and lime for the 6- to 12-inch depth of soil. Take a soil sample for each field or 10-acre block of land.

Soil pH should be in the 6.2 to 6.8 range. Test soil the first year and then every other year. Lime according to soil test results. Apply lime the first year by spreading it on the surface and moldboard plowing the field to a minimum of 10 inches. Plowing will incorporate the lime to the deeper levels where it is needed. Do not disk or harrow the lime before plowing, so that it can be incorporated through the plowed layer. Lime should be applied as early as possible and preferably 6 months before planting time. Lime should be applied every other year.

Phosphorus is important to root growth and especially during establishment. Phosphorus fertilizer is needed only at planting. The soil test will indicate how much phosphorus is needed. In addition, band 20 pounds of phosphate per acre as super phosphate treble super

PLANTING

Crown Planting - Plant asparagus crowns (roots plus plant buds) so the top of the crown is 6 inches below the undisturbed soil level. This means the planting furrow will have to be 8 inches below the undisturbed soil level (Fig. 1) and as much as 16 inches from the top of the soil removed from the furrow. Single or double rows with in-row spacings from 6 to 12 inches can produce good yields (Table 2). The yield during the first 5 years is increased when double rows and in-row spacings as close as 6 inches are used. However, with double rows, weed control by cultivation is difficult and crown costs for very high plant populations may not make close spacing profitable. A single row with 12 inch in-row spacing and 4.5 to 5 feet between rows produces good yields.

Depth of planting is critical; if planted too shallow, asparagus will produce a large number of small spears that are not commercially saleable. If planted too deep, spears will be very large, but will be few in number.

Plant crowns 12 inches apart in the row with the buds upright, and 5 feet between rows to have 8,700 crowns per acre. Cover crowns with 2 to 3 inches of soil after

Table 2. Total marketable yield of asparagus in single or double rows, 6 or 12 inches in row from crowns, transplants or direct seeding; 1982-1991, Princeville variety.

Row number	In-row spacing (inches)	Crowns	Transplant Yield lb/A	Direct seeded*
1	6	17,328	16,149	11,048
2	6	19,933	19,131	15,014
1	12	15,980	9,307	--
2	12	18,738	16,621	--

*Direct seeded 2" in row.

phosphate. After the first year, asparagus will recycle the phosphorus and no additional is needed.

Preplant application of nitrogen and potassium will depend on the soil test. Generally 75 to 100 pounds per acre of nitrogen and 150 to 250 pounds per acre of potassium is needed for most North Carolina soils. Spread the fertilizer for the first year on top of the soil and plow in the same as for lime.

planting. As plants grow, gradually fill in the rest of the furrow with 1 to 2 inches of soil in 3 to 5 cultivations, but do not completely cover plants. The furrow should be completely filled by July of the first year. These timely cultivations can control weeds.

Plant crowns in late January or early February in eastern North Carolina and about 2 weeks later in western North Carolina. Plant before the buds begin to appear in the spring.

Use only certified crowns produced in North Carolina or crowns which have been certified by the North Carolina Crop Improvement Association. (For information on crown production see *Hort. Information Leaflet No. 2-C*). Asparagus crowns can carry several diseases, thus take care to get certified crowns.

Both direct seeded and transplanted asparagus can be planted in single or double rows with 5-foot spacings between beds (Table 2). Single rows should be

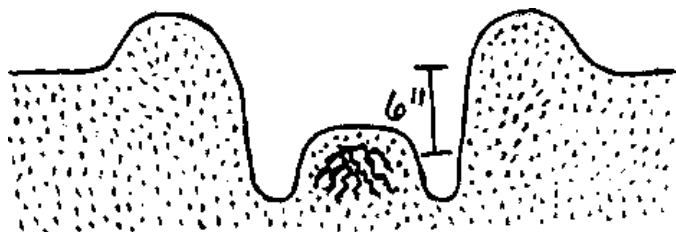


Figure 1. Single row asparagus crown planting depth.

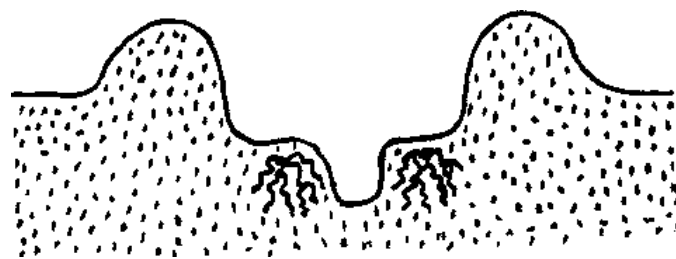


Figure 2. Double row asparagus crown planting depth.

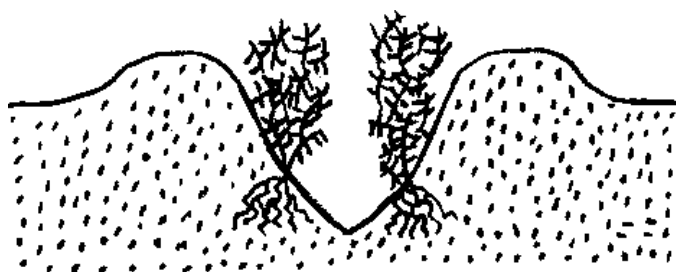


Figure 3. Double row asparagus transplanting; note "V" for extra soil to wash into.

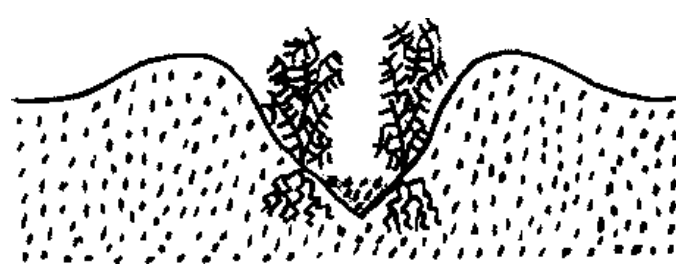


Figure 4. The "V" shaped row with soil washed into the middle.

planted on top of "W"-shaped beds (See Fig. 1). The "W" shaped rows are formed with a wide furrow opener followed by a bedshaper. Double rows of direct seeded or transplanted asparagus should be planted on shelved beds (Fig. 2). Transplants can also be planted on the side of an angle-shaped furrow (Fig. 3). The "V" shape in the middle of the row is important since it provides a place for soil washed from the side of the beds during rains (Fig. 4).

Irrigation - Adequate moisture should be maintained for good germination and early seedling growth. Do not let asparagus plants become dry while they are establishing a root system during the first two months. Water stress during this early stage can reduce yields during life of the bed. After the root system is established, irrigation is needed only during extreme drought.

Direct Seeding Methods - Precision seeders such as a Stanhay, Gasparado, Nibex, or John Deere 33 which precisely space single seed are best. Seeds should be placed 2 inches apart in the row, $\frac{3}{4}$ to 1 inch deep. Single row seedings require 2 to 3 pounds of seed per acre and double row seedings require 4 to 6 pounds per acre. Asparagus seeds germinate best at 75°F. Direct-seed when the soil is at least 60°F (mid to late April in eastern North Carolina and later in western North Carolina).

Seedling Transplants - Asparagus seedlings can be grown successfully in peat pots, plastic pots, trays, peat pellets, or Speedling-type trays. Seedling growth and survival are usually better with larger cells up to 2x2 inch seedling cells. The size and shape of asparagus seed make it easy to singulate and plant mechanically. Most of the artificial soil media produce a good transplant.

Good growth above the crown and good root system development require planting the seed not more than $\frac{1}{2}$ -inch deep. The developing root system will fill the soil reservoir in the cell by planting time.

Asparagus will germinate and emerge in 10 to 14 days when the temperature is 75°F. Soaking the seed for 4 days will hasten emergence. The temperature during growth period should range from 65°F at night to 85°F during the day and seedlings will be ready for

transplanting in 8 to 12 weeks. Seedlings will be 6 to 10 inches tall and have 4 to 6 stems with the developing crown having several buds.

Asparagus seedlings are removed from the growing trays and packed in moisture-resistant boxes for shipment to the field. If short distances are involved, plants may be shipped in the growing trays. Plants can be held several days before transplanting if medium moisture is maintained.

Seedlings can be set by hand or machine, using a peat pot transplanter or modified bare root transplanter. The bare root transplanter can be used by widening the throat to accommodate the asparagus root ball. Also, replace the rubber plant grippers with softer rubber to prevent crushing tender stems. Use a starter solution such as 10-52-17 at 3 lbs per 50 gallons in the transplant water and 1/2 cup per plant. Transplants should be spaced at 12 inches in either single or double rows per bed. Double rows should be 12 to 14 inches apart (Fig. 2 and 3). Following transplanting the plantings should be irrigated as often as needed during the first two months.

Transplant seedlings after the threat of frost is past but before temperatures get above 90°F. Favorable conditions usually occur in April and May. You can also transplant in early to mid August which allows an early crop such as cucumber, snapbeans, tomatoes, peppers or small grain to be harvested during the year of transplanting.

Direct seeding and transplanting asparagus have the following advantages over crown planting: reduced costs, mechanization of planting, freedom from disease, and increased yields are a few of the advantages. But these methods require more care, closer attention, irrigation, and better management than crown planting.

CROP MAINTENANCE

Asparagus ferns (also called brush) produce food which is stored in the roots and determines the yields of spears the next year. Weed, insect, and disease control and proper fertilization are all important for good fern growth and good yields. Cultivate very shallowly since serious injury to the roots may result from deep cultivation. Ferns will not be killed by the

first frost and should be allowed to grow until it turns brown (usually in early December).

When fern has turned brown, mow with a rotary mower or forage chopper. Fern stubble should decompose by spring and provide a good source of organic matter. A schedule of operation for the first 4 years is presented in Table 3.

Fertilization - During succeeding years apply 50 to 75 pounds per acre of nitrogen and 75 to 125 pounds of potassium twice each year. Make one application just before first appearance of spears in the spring in early March. Apply the same amount of fertilizer at the conclusion of the harvest season in mid-May. Thus 100 to 150 pounds of nitrogen and 140 to 250 pounds of potassium will be applied each year. Apply the fertilizer to the top of the soil or with very shallow incorporation.

Growers may wish to use stable manure to increase soil humus. Manure can be beneficial, but is not necessary. Do not use in excess 3 to 5 tons per acre of chicken manure, or 6 to 10 tons per acre of swine or cow manure. Over-fertilization with manure can result in excessive nitrogen and poor growth.

Weed Management - Weed control in asparagus production is very important. Timely cultivation is a critical part of any asparagus weed control program, especially during the first two years. The first year asparagus should be cultivated at least once a month until September, or 6 times. The number of cultivations may be reduced by using herbicides. Weed control for asparagus is detailed in the *NC Ag Chem Manual*.

Remove all weeds that are present after harvest. Use only very shallow disking (1 to 2 inches) to remove these weeds. Deeper disking will damage crowns and can drastically reduce yield.

Disease Management - Asparagus is affected by 6 diseases, of which the first 4 can be devastating if appropriate precautions are not used. If precautions are followed, the diseases pose no barrier to good crop production.

Asparagus is affected by two *Fusarium* diseases. The first is *Fusarium oxysporum v. asparagi* and is called crown rot, and *Fusarium moniliforme* which is called

root rot. The root rot pathogen may be spread on asparagus seed. Make sure your crown producer has treated his seed as described in Hort. Leaflet No. 2-C. The crown rot fungus is found in most soils but at very low levels. If asparagus crowns are planted that have crown rot they will not produce for more than 4 to 7 years, and this is not profitable. Do not plant asparagus in soil in which asparagus has been grown in the last 5 years. Do not purchase crowns grown in soil where asparagus was grown in the last 5 years. Purchase ONLY certified crowns. KEEP ASPARAGUS GROWING RAPIDLY to reduce crown rot disease by following the management practices described here.

Cercospora blight (*Cercospera asparagi*) is a disease that causes the needles to fall from the mature fern. It can be identified by the browning of needles. The disease occurs when the humidity and temperature is very high. Spray with a fungicide with a HIGH PRESSURE SPRAYER (300 psi) every 7 to 10 days until the disease is controlled. (See *NC Ag Chemicals Manual* for specifics.)

Harvested asparagus is susceptible to bacterial soft rot (*Erwinia spp.*). Wash water and water used for hydrocooling should contain chlorine. Management is based on avoiding injuries and immediately cooling harvested spears.

Rust (*Puccinia asparagi*) is not common in eastern North Carolina. The most effective way to control asparagus rust is to plant resistant varieties. Rust causes small brown rusty spots on spears and fern branches.

Southern blight (*Sclerotium rolfsii*) is widespread on other crops, but is not a problem for asparagus. See *Plant Pathology Information Note No. 205*.

Asparagus is resistant to nematodes and does not require a nematicide.

European asparagus aphid can be a problem some years. This blue-green aphid forms colonies some years in August or September. When the aphid forms colonies, it causes 'Christmas tree' or bonsai effect; the new fern becomes shortened or stunted and new needles look like they are clustered. The entire fern takes on a blue-green color. The following year spears

and fern are stunted and often die. These aphids can be controlled with insecticides. (See *NC Ag Chemicals Manual* for specifics.)

Harvesting - Asparagus can be harvested on a limited basis (2 to 3 weeks, or 8 spears per plant) during the first year after planting. Harvesting should be limited during the second year; watch for slight reduction in spear size as an indication of when to stop. It takes a long time for asparagus to develop a large root system. A large root system is necessary for a healthy bed of asparagus to produce for many years. Do not harvest too much in early years because bed life can be shortened and total yield and profit drastically reduced. Harvest 6 to 8 weeks during the third year of growth. This is generally until mid-May in the east and mid-June in western North Carolina. Allow spears to reach 8 inches tall and then cut with a knife or hand snap at the soil surface. Spears should not be allowed to get taller than 9 inches. The decision on when to harvest is based on having an average of one harvestable size spear per foot of row. When temperature exceeds 80°F it may be necessary to harvest daily.

After harvest the spears should be held in a cool shaded place and sprinkled with water to prevent shriveling and wilting. A single irrigation sprinkler over the boxes works well. Asparagus should be hydro cooled before packing.

Preparation for Fresh Market - When preparing asparagus for market, spears should be uniform in length. Tie in bunches of 1 to 2 pounds or pack loose in a carton. Present standards allow lengths of 7 to 10 1/2 inches.

Asparagus loses edible quality rapidly and should be cooled as soon as possible. After bunching, place the butts of the spears in damp peat moss or blotter paper in a crate or carton. Pack 15 or 30 lbs in special pyramid-shaped crates. Cooled asparagus will remain saleable for 3 weeks or more at 32°F. Asparagus should always be shipped under refrigeration.

Economics - Asparagus can be a profitable crop if it is grown properly. For more detail on the economics of asparagus, see the production budget from N.C. Cooperative Extension Service.

Table 3. Schedule of Activities for Asparagus Production.

Month/day	Year of Age			
	1	2	3	4 and succeeding years
1/1	Apply lime to obtain pH 6.5 Plow down		Apply lime & P according to soil test.	Apply lime & P according to soil test.
before 2/15	Apply fertilizer 100-0-200	Apply fertilizer 50-0-100	Apply fertilizer 50-0-100	Apply fertilizer 50-0-100
2/15-3/15	Plant crowns 6" deep Cover crown 2" deep Band phosphorus 0-20-0	Apply herbicide Begin harvest Harvest 8 spears/crown	Apply herbicide Begin harvest	Apply herbicide Begin harvest
4/15	Apply herbicide	Stop harvest Apply herbicide & fertilizer 50-0-100		
5/15	2nd covering 1-2" soil; don't cover plants Apply herbicide		Stop harvest. Apply herbicide and fertilizer 50-0-100	Stop harvest and apply herbicide(or cultivate) and fertilizer. 50-0-100
5/15	Spray for beetles if needed	Spray for beetles if needed. Cultivate as needed.	Spray for beetles if needed.	Spray for beetles if needed.
6/1-6/15	3rd covering 1-2" soil; don't cover plants			
6/15	Inspect fields weekly Spray for beetles if needed	Inspect fields weekly Spray for beetles, cercospora, and aphids if needed	Inspect fields weekly Spray for beetles, cercospora, and aphids if needed	Inspect fields weekly Spray for beetles, cercospora and aphids if needed
7/15	4th covering	"	"	"
8/15	5th covering	"	"	"
9/15	6th covering	"	"	"
10/15	7th covering	"	"	"
2/1-15	Mow brown fern	Mow brown fern	Mow brown fern	Mow brown fern