

Asparagus officinalis



Scientific classification

Kingdom: Plantae

Clade: Angiosperms

Clade: Monocots

Order: Asparagales

Family: Asparagaceae

Subfamily: Asparagoideae

Genus: Asparagus

Species: *A. officinalis*

Binomial name *Asparagus
officinalis*

Origin-History

- The word asparagus originates from the Greek language meaning "sprout" or "shoot".
- Asparagus is a member of the lily family. Cultivation of asparagus began over 2,000 years ago in the eastern Mediterranean Region. Romans and Greeks alike ate asparagus for the rich flavor and medicinal qualities.
- The lily vegetable spread to all parts of the Mediterranean; from Egypt to Spain. France and England developed the taste for asparagus as a delicacy traced back to 16th century gastronomic literature.
- Asparagus came to America with the early colonists. Cultivation spread west to include Michigan, California and Washington State.



Asparagus odor

Certain compounds in asparagus are metabolized to yield ammonia and various sulfur-containing degradation products, including various thiols and thioesters, which give urine a characteristic smell.

Some of the volatile organic compounds responsible for the smell are:

- methanethiol
- dimethyl sulfide
- dimethyl disulfide
- bis(methylthio)methane
- dimethyl sulfoxide
- dimethyl sulfone

Subjectively, the first two are the most pungent, while the last two (sulfur-oxidized) give a sweet aroma.

Global trade and production

Top asparagus importers:

- United States (92,405 MT)
- European Union (external trade) (18,565 MT)
- Japan (17,148 MT)

World's largest producers:

- China (6,960,357 MT)
- Peru (335,209 MT)
- Germany (92,404 MT)
- U.S. production concentrated in CA, MI and WA
- annual German white asparagus production 57,000 MT (61% of consumer demand).

FAO Stat (2010)





**Table 1. Asparagus
Nutritional value per 100 g (3.5 oz)**

Energy	85 kJ (20 kcal)	
<u>Carbohydrates</u>	3.88 g	Sugars 1.88 g; Fiber 2.2 g
<u>Protein</u>	2.2 g	
<u>Fat</u>	0.12 g	
<u>Vitamins</u>		RDA
<u>Vitamin A equiv.</u>	38 µg	4 %
<u>-beta-carotene</u>	449 µg	5%
<u>-lutein /zeaxanthin</u>	710 µg	
<u>Thiamine (B1)</u>	0.143 mg	12%
<u>Riboflavin (B2)</u>	0.141 mg	12%
<u>Niacin (B3)</u>	0.978 mg	7%
<u>Pantothenic acid (B5)</u>	0.274 mg	5%
<u>Vitamin B6</u>	0.091 mg	7%



Table 1(cont). Asparagus
Nutritional value per 100 g (3.5 oz)

<u>Folate (B9)</u>	52 µg	13%
<u>Choline</u>	16 mg	3%
<u>Vitamin C</u>	5.6 mg	7%
<u>Vitamin E</u>	1.1 mg	7%
<u>Vitamin K</u>	41.6 µg	40%
<u>Trace metals</u>		
<u>Calcium</u>	24 mg	2%
<u>Iron</u>	2.14 mg	16%
<u>Magnesium</u>	14 mg	4%
<u>Manganese</u>	0.158 mg	8%
<u>Phosphorus</u>	52 mg	7%
<u>Potassium</u>	202 mg	4%
<u>Sodium</u>	2 mg	0%
<u>Zinc</u>	0.54 mg	6%

Units

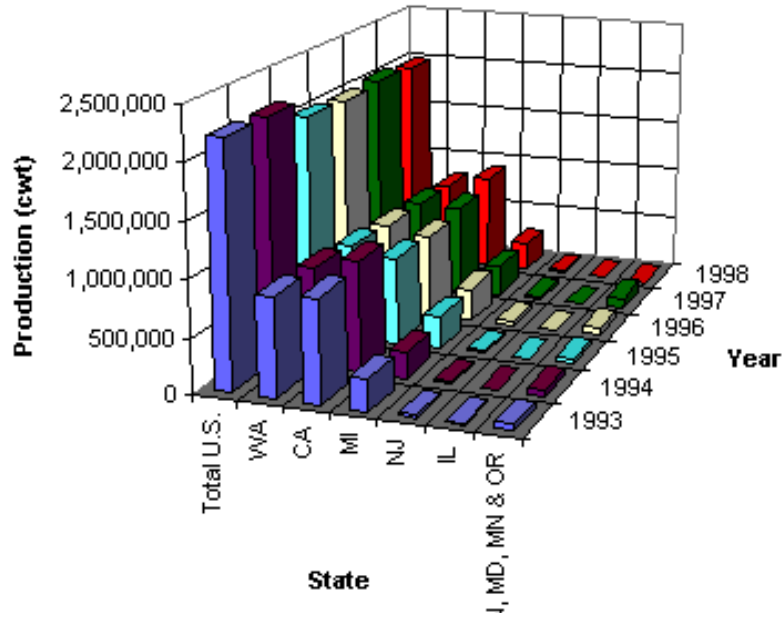
µg = micrograms

mg = milligrams

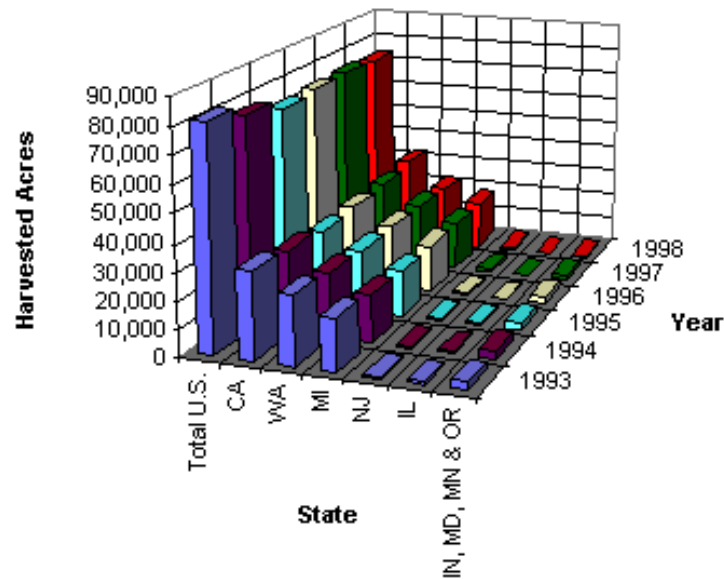
IU = International units

Source: USDA Nutrient Database

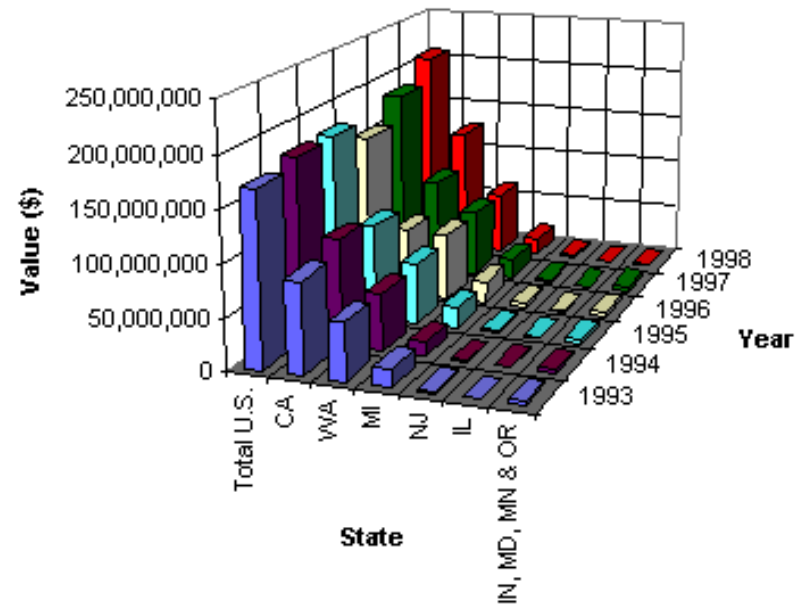
**U.S. Asparagus Production (Fresh Market + Processing)
Production (cwt) (1993 - 1998)**



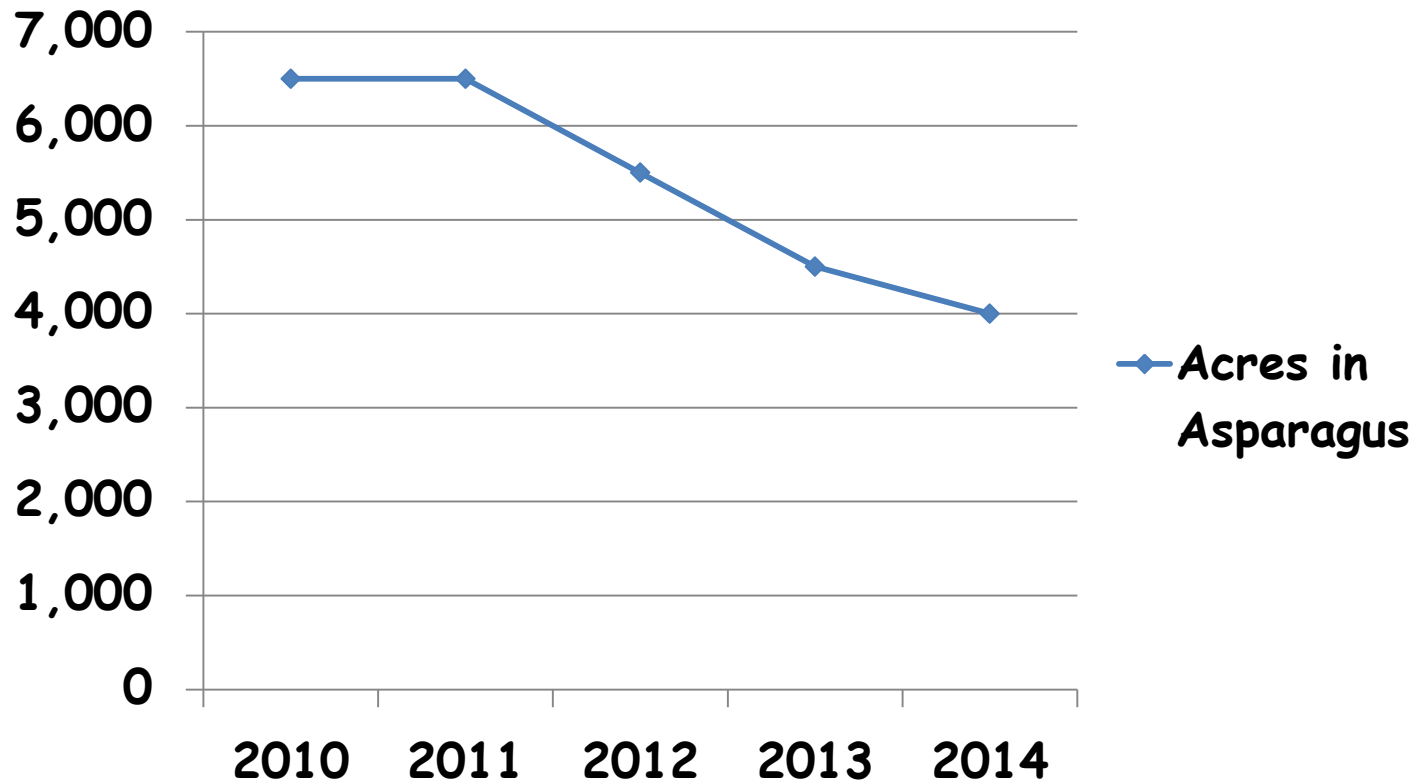
**U.S. Asparagus Production (Fresh Market + Processing)
Harvested Acres 1993 - 1998**



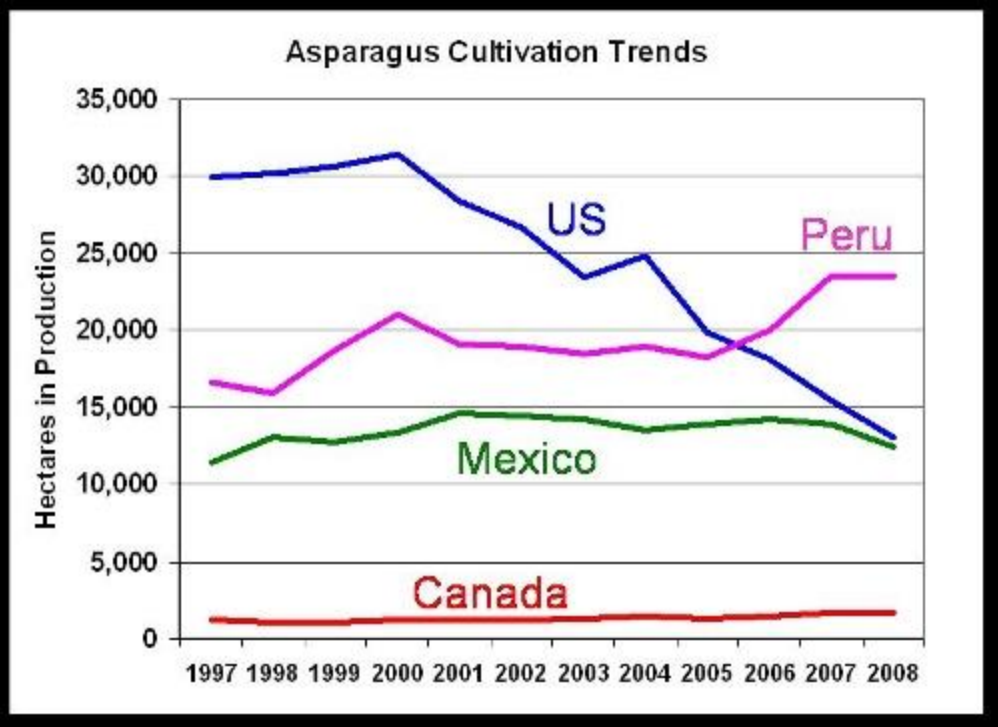
**U.S. Asparagus Production (Fresh Market + Processing)
Value (1993-1998)**



Acres in Asparagus- Washington



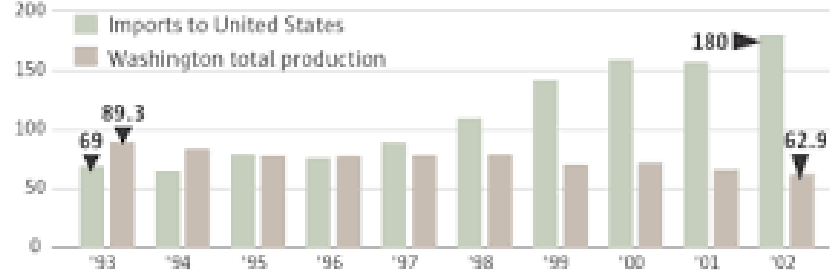
1990's average: 16,000



Outsourcing asparagus

Washington state asparagus production has fallen steadily and imports have risen since 1993, when the United States dropped its tariffs on Andean crop imports.

In millions of pounds



Source: Washington Asparagus Commission

Asparagus for Fresh Market and Processing Area Planted and Harvested, Yield, Production, Price, and Value — Washington: 2003-2013

Planted		Harvested				
Year	Acreage (acres)	Yield (cwt)/acre	Production 1,000 cwt	Average price ¹ \$/cwt	Value Million\$	Value \$/acre
2003	17,000	38	608	52.00	31.6	1,977
2004	15,000	43	602	52.80	31.8	2,272
2005	14,000	41	532	51.80	27.5	2,122
2006	9,000	42	378	50.00	18.9	2,101
2007	8,000	43	301	59.10	17.8	2,543
2008	7,000	42	273	67.10	18.3	2,817
2009	6,500	44	264	76.90	20.3	3,384
2010	6,500	38	228	77.10	17.6	2,931
2011	6,500	40	240	78.90	18.9	3,156
2012	5,500	43	202	90.00	18.2	3,868
2013	4,500	47	202	95.10	19.2	4,269

¹ Price for 2003 and 2004 are based on F.O.B. (shipping point) for fresh market vegetables and at processing plant door for processing vegetables. Prices for 2005 fresh vegetables are the average prices producers received at the point of the first sale.

U.S. No. 1. Asparagus

"U.S. No. 1" consists of stalks of asparagus which are fresh, well trimmed, and fairly straight; which are free from decay and free from damage caused by spreading or broken tips, dirt, disease, insects, or other means.

- (a) Size. Unless otherwise specified, the diameter of each stalk is not less than one-half inch.
- (b) Color. Unless otherwise specified, not less than two-thirds of the stalk length shall be the color of the lot.
- (c) Tolerances.

WAC 16-409-024 Size requirements for Washington asparagus grades.

The following size designations apply to all grades of asparagus in Washington state.

1. *Jumbo*: Stalks at least $13/16$ inch in diameter.
2. *Extra large*: Stalks at least $10/16$ inch in diameter.
3. *Large*: Stalks at least $7/16$ inch in diameter.
4. *Standard*: Stalks at least $5/16$ inch in diameter.
5. *Small*: Stalks at least $3/16$ inch in diameter.

All size designations, as defined in WAC 16-409-024, may be packed in all grades and in all containers.

Washington Size Grades



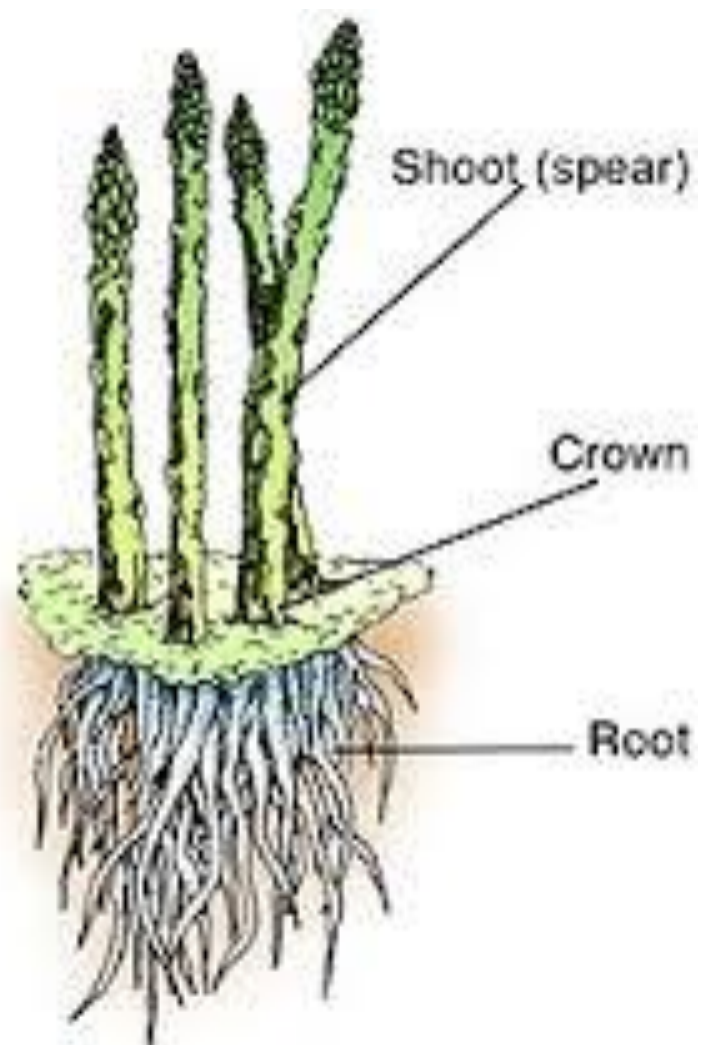
Standard

**Small
Large**

Large

X-Large

**All Green
Jumbo**



CLIMATE

- Production is most successful in areas where freezing temperatures or drought terminates plant growth and provides a rest period. Without this rest period, reduced yields are likely.
- Asparagus tolerates great temperature variations: it grows in the Imperial Valley of Southern California, where temperatures can reach 115° F, and it grows in Minnesota, where temperatures can plunge to -40° F.
- Asparagus can be grown in a wide range of soils and under various climatic conditions, but it
- Thrives in fertile well-drained soils in moist temperate regions that have long growing seasons and sufficient light for maximum photosynthesis.

SITE SELECTION AND PREPARATION

- Unlike most other vegetables, asparagus is a perennial crop which can be productive for 15 years or more.
- it is important to pay particular attention to site selection and preparation for this crop.
- Asparagus is grown on many different soils ranging from sandy coarse-textured soils to clay fine-textured soils.
- Highest yields are usually obtained on medium-textured sandy loam to loam soils.
- Asparagus plants have a deep root system that will penetrate at least six feet.
- Shallow soils or soils prone to a high water table should be avoided.
- Asparagus roots will not tolerate saturated soil conditions.

ASPARAGUS VARIETIES

- Asparagus varieties should be both high yielding and disease resistant.
- Asparagus is a dioecious plant, both male and female plants.
- Generally, females produce larger spears than males, produces berries
- males produce greater numbers of smaller diameter spears.
- High yielding all male asparagus lines are most typically used in commercial production.
- all-male hybrid benefit is that it doesn't produce seed
- Asparagus spears produced from all male hybrids are usually very uniform.

- For many years, the most common varieties have been from the Washington series (Mary, Martha, Waltham), from USDA which are dioecious.
- all-male hybrids developed in New Jersey (Rutgers University) .
- 'Jersey Giant', 'Jersey Knight', offer proven higher yields and increased rust resistance and tolerance to fusarium crown rot and are often the preferred choice
- excellent resistance to fusarium include 'Jersey Jewel', 'Jersey King' (green spears with purple bracts), 'Jersey General', and 'Jersey Titan' (green spears with purple bracts).

ASPARAGUS VARIETIES(cont.)

- 'Guelph Millenium', newer all male hybrid released from the University of Guelph has performed very well in Washington
- Jersey hybrids have had winter kill at temperatures of -30°F with no snow cover.
- Purple Passion is a variety that produces attractive purple spears for an added twist.
- California Varieties are bred for warm climates (Peru) and do not possess the longevity or hardiness needed in Northern climates.

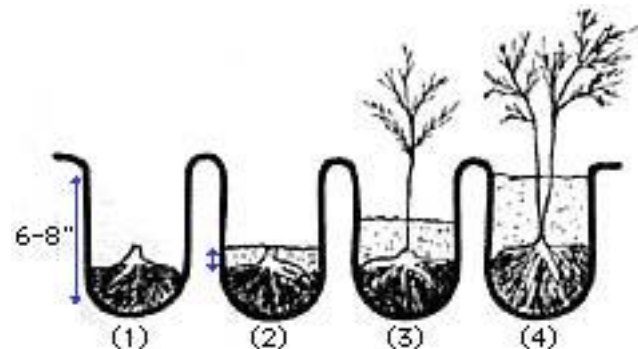
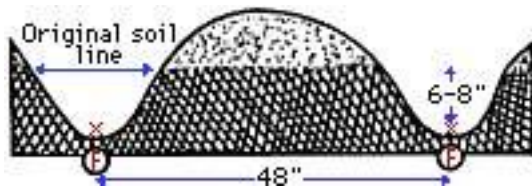


Year 1 Crown production



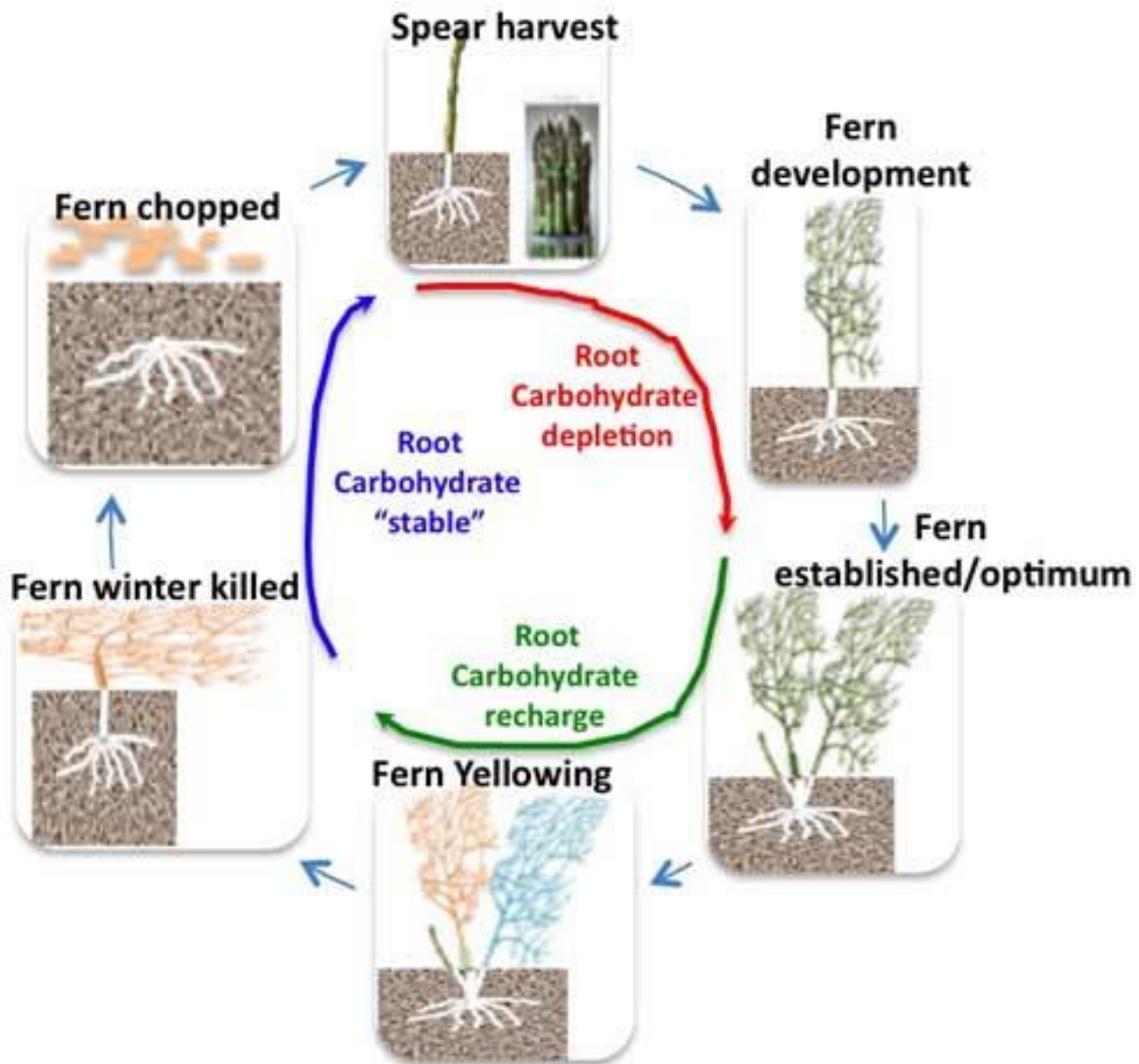
Production

- Crowns generated from seed, or purchased at nursery
- Crowns usually are hand planted with buds up, spaced 12 inches apart within rows in furrows four to five feet apart (9000 to 11,000 crowns per acre).
- Six to eight inches is the optimum depth for crown planting



CULTIVATION

- control winter annual weeds that have emerged in the field,
- cultivate at a shallow depth after the winter ferns are removed
- Avoid damage to crowns by straddling the beds.
- Following harvest the field should be disked or tilled again to eliminate weeds
 - prepares the field for summer fern production.
- Cultivation between the rows with high-clearance tractor and 3-point hitch-mounted row cultivators
- During harvest of spears and during fern production, hard to cultivate
 - in-row weeds pose the greatest threat to
 - yield the following growing season





POSTHARVEST 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.



Asparagus Fungal Diseases

Anthracnose	<u><i>Colletotrichum gloeosporioides</i></u> <u><i>Colletotrichum dematium</i></u>
Ascochyta blight	<u><i>Ascochyta asparagina</i></u>
Blue mold rot	<u><i>Penicillium aurantiogriseum</i></u>
Cercospora blight	<u><i>Cercospora asparagi</i></u>
Dead stem	<u><i>Fusarium culmorum</i></u>
Fusarium crown and root rot	<u><i>Fusarium oxysporum f.sp. asparagi</i></u> <u><i>Fusarium redolens</i></u> <u><i>Gibberella fujikuroi</i></u> (mating population A) <u><i>Fusarium verticillioides</i></u> [anamorph] <u><i>Gibberella fujikuroi</i></u> (mating population D) <u><i>Fusarium proliferatum</i></u> [anamorph]
Fusarium spear spot	<u><i>Fusarium oxysporum f.sp. asparagi</i></u> <u><i>Fusarium redolens</i></u>
Gray mold shoot blight	<u><i>Botrytis cinerea</i></u>

Asparagus Fungal Diseases(cont.)

Leaf spot	<u><i>Alternaria alternata</i></u>
Phomopsis blight	<u><i>Phomopsis asparagi</i></u> <u><i>Phomopsis asparagicola</i></u> <u><i>Phomopsis javanica</i></u>
Phytophthora spear and crown rot	<u><i>Phytophthora megasperma</i></u>
Purple spot	<u><i>Pleospora herbarum</i></u> <u><i>Stemphylium vesicarium</i></u> [anamorph]
Rhizoctonia crown rot	<u><i>Rhizoctonia solani</i></u> <u><i>Rhizoctonia</i></u> sp.
Rust	<u><i>Puccinia asparagi</i></u>
Watery soft rot	<u><i>Sclerotinia sclerotiorum</i></u>
Zopfia root rot	<u><i>Zopfia rhizophila</i></u>

Asparagus Viral and Viroid Diseases

Asparagus decline	genus <u>Potyvirus</u> , <u>Asparagus 1 virus</u> (AV-1) genus <u>Iilarvirus</u> , <u>Asparagus 2 virus</u> (AV-2)
Asparagus mosaic	genus <u>Potexvirus</u> , <u>Asparagus 3 virus</u> (AV-3) genus <u>Iilarvirus</u> , <u>Tobacco streak virus</u> (TSV)

Asparagus Insect Pests

<p>European asparagus aphid*</p> <p>12-spotted asparagus beetle*</p> <p>common asparagus beetle</p> <p>green peach aphid</p> <p>spotted cutworm</p> <p>redbacked cutworm</p> <p>asparagus miner</p>	<p>*Primary insect pest -control required in fern stage</p> <p>*Fern stage, Lays eggs and feeds on the spear</p> <p>Cutworms attack spears during harvest</p>
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