

Asparagus Crop Management and Alternative Production Strategies for High Yields

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Asparagus grows best when diurnal temperatures do not change greatly. Soil temperatures above 40°F trigger bud break and spear elongation in spring. Once spears emerge, spear growth is controlled by air temperature. Emerged spears are cold (33-40°F) tolerant but are frost (<32°F) sensitive so cold weather and frost regularly delay productivity. High and low tunnels (Photo 1) are used in Europe and Asia to increase earliness and manage productivity. Tunnels require careful temperature manipulation to maintain spear quality. At temperatures above 80°F, spears branch earlier and tips open, which downgrades quality and marketability. Very few studies have looked at tunnel production in asparagus. High tunnels constructed in existing perennial plantings and annual asparagus systems may offer new production opportunities, enhance early harvest, and improve yields.



The root system in asparagus influences nutrients and carbohydrate (CHO) storage, which determines crop health and productivity. Farm management decisions this year determine the next years' crop performance. Asparagus buds form and enlarge in July and August; therefore, crop management practices during fern growth (nutrition, water, pest control) lead to more productive spear growth next year (Fig. 1).

Strategic changes to production practices like varietal selection, high or low tunnels, and higher plant densities may allow farms to produce “annual” asparagus and move away from perennial systems. This presentation will discuss alternative production strategies for asparagus.

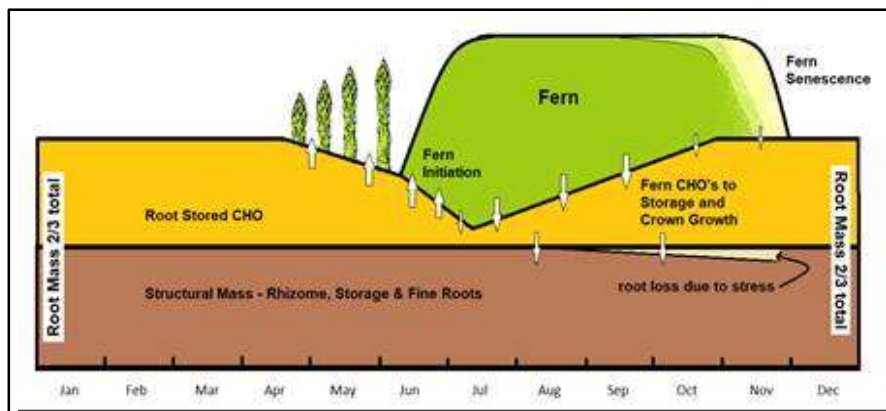


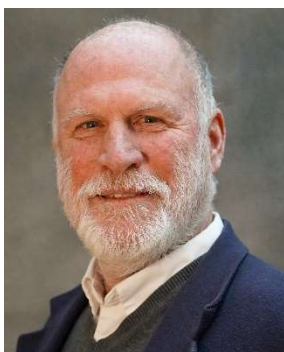
Fig. 1. Seasonal pattern of spear, fern, and root biomass accumulation in mature asparagus. Arrows indicate direction and amount of carbohydrate (CHO) movement from roots to spears/fern (spring/summer) and from fern to roots (summer/autumn).

In 2021, we installed high or low tunnels in perennial asparagus systems to enhance early spear production, provide early yields for local markets, and extend the annual production season to improve farm profitability (approaches used in European systems). In addition, perennial crops like asparagus come into full production slowly and are not profitable for several years. Work in Japan demonstrated that annual asparagus was feasible and productive. Their system used existing plant populations (10-12,000 plants/A), was very early relative to field production, and was financially viable for the grower. High tunnels advanced spear production by 3-weeks and produced 27% greater yields than low tunnels or open field grown asparagus.

We also compared locally grown transplants (cheaper?) to purchased crowns (bigger?) to evaluate if an “annual” asparagus was feasible and economic. Work in California showed that at higher plant populations (20-25,000 crowns/A) produced 30-40% greater yields but spear size was smaller than desired. We found that annual asparagus grown in high tunnels enhance early emergence (harvest began in March) and crowns performed better than transplants (Table 1). Field crowns yielded better than transplants with harvest delayed until late April. Average yield in the HT and field were similar for both transplants and crowns. Increasing plant densities had a variable effect on yield in both the high tunnel and the field. Studies are being repeated but early results suggest crowns at higher than traditional plant populations may be justified. Economic costs/returns are being developed.

Table1. Annual asparagus production: high tunnel and field systems (2022).

Planting System	Plant Spacing	Plants/acre	Spear Yield (lbs. / acre) – 31 cuts	
			High Tunnel	Open Field
Transplants	3" x 15"	116,160	1,306	1,859
Transplants	4" x 15"	87,120	2,294	1,604
Transplants	6" x 15"	69,700	1,708	1,863
		average	1,769	1,775
Crowns	6" x 18"	58,080	3,374	2,140
Crowns	8" x 18"	43,560	3,419	3,389
Crowns	12" x 18"	29,040	1,955	3,381
		average	2,916	2,970
	Harvest window		Mar 24 - May 5	Apr 27 - Jun 10



Dr. Daniel Drost is a Professor of Horticulture and Vegetable Specialist in the Department of Plants, Soils and Climate at Utah State University. Dr. Drost grew up in western Michigan and has graduate degrees from Michigan State and Cornell University. He has studied asparagus physiology and production for 40 years and his research program focuses on improving productivity and profitability by understanding the dynamics of root and bud development.