

Organic asparagus production

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INTRODUCTION

Asparagus has few pest or disease problems and can be grown without artificial pesticides, making it a relatively easy crop to grow organically. Good weed management, particularly during establishment, is essential to promote healthy growth and satisfactory yield and quality.

Organic asparagus production, like other vegetable production systems, involves developing a functional system that provides adequate fertility while maintaining effective weed management. A well-managed asparagus stand may stay productive for 15 years or more.

An understanding of the annual growth habit will help in planning an organic management program.

GROWTH HABIT

Asparagus is a perennial plant. It produces dark green fern-like foliage during summer and in cooler climates becomes dormant over winter months.

Asparagus spears begin as leaf buds below the soil surface, elongating to form the spears above ground as temperatures warm in the spring. These are then cut during harvest, making way for new spears to initiate from buds on the crown below the soil. Harvesting of the spears continues until spear quality deteriorates (during hot weather) or market prices fall.

When harvesting ceases, the spear is allowed to develop into its fully expanded leaf, or fern. During this stage the plant photosynthesises and replenishes its nutrient reserves in the crown for the next year's harvest. In colder districts, the asparagus fern will



Asparagus can be a relatively easy crop to grow organically.

'die off' during winter in similar fashion to a deciduous tree.

The fern is then mulched into the soil or removed in preparation for harvest of the new asparagus spears in spring. The fern is not removed until completely 'dead' so that the asparagus root or crown is replenished as nutrients are reabsorbed from the stem and foliage. This step is followed by a shallow cultivation prior to spear emergence to incorporate the trash, clean up weeds and provide a clear surface for harvesting.

VARIETY SELECTION

Potential growers will need to source an asparagus variety that has market acceptability, is suited to your local climate and, ideally, is raised organically (this is a requirement of the National Standard for Organic and Bio-Dynamic Produce).

Some varieties will be more suited to processing; others to the fresh market. Will you grow green or white asparagus? Many European varieties are unsuitable for

warmer inland and northern districts as the spears tend to lose quality as the leaf bracts open prematurely in the hotter weather. Research has shown that certain Californian varieties are best suited under these conditions. Select varieties that have been bred for disease resistance, specifically *Fusarium sp.* and *Phytophthora sp.* resistance.

PRE-PLANTING AND ESTABLISHMENT

Establishment is the critical growth stage for asparagus. Seedling transplants are common, although these are relatively slow to establish and full production can not be expected for at least three years. Crowns are more reliable and may yield earlier depending on crown size. The young crowns are usually planted in a shallow trench which is gradually filled in as the crown matures. This leaves the asparagus growing on a low mound (the mound is higher for white asparagus).

CROP NUTRITION AND SOIL MANAGEMENT

Asparagus grows in a wide variety of soils but grows best in a light well-drained soil with a high nutrient content. Deep alluvial soils provide optimum conditions for growth. However, these soils can be prone to erosion, low in organic matter and may be leached of essential nutrients.

The soil should be analysed for its nutrient status well before planting to determine pre-planting nutrient requirements and a fertility program should be implemented at least 2 years before planting.

If a green manure crop is to be grown as part of the

DISCLAIMER

The information contained in this publication is based on knowledge and understanding at the time of writing (February 2004.) However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.

ALWAYS READ THE LABEL

Users of agricultural or veterinary chemical products *must always* read the label and any permit, before using the product, and strictly comply with the directions on the label and the conditions of any permit. Users are not absolved from compliance with the directions on the label or the conditions of the permit by reason of any statement made or not made in this publication.



Compost is an important addition to an organic soil management program. This compost was produced at the Yanco organic demonstration site.

fertility program it will require incorporation well before planting so that organic residues are properly decomposed. Compost is an excellent soil amendment and should be considered an essential addition pre-planting, with annual applications for the established asparagus stand.

Fertiliser recommendations vary with soils and growing conditions, but as a general guide NSW asparagus producers apply 150 kg actual nitrogen (N), 50 kg actual phosphorus (P) and 50 kg actual potassium (K) per hectare per year to asparagus.

An incorporated green manure crop can supply from 80 to 150 kg actual N per year, while composted cow manure (analysed at 2% N on a non-dry weight basis), applied at 6 tonne / hectare / annum, could supply 120 kg actual N. Because of variability between batches of compost each should be separately analysed for nutrient content. If externally sourced, you should also test for heavy metals.

Phosphorus should be applied as Reactive Phosphate Rock (RPR) a season prior to planting as well as under the plants at planting and in each year

Table 1. Estimated annual nitrogen budget for 1 Ha asparagus, green manured and fertilised with composted cow manure.

Input / Losses	kg actual N /ha / year
I. Inputs	
a) Gains that remain in the soil and in crop residues:	
N in green manure crop (clover/vetch)	140 _b
N in rain	8 ^c
N ₂ fixation (non-symbiotic)	5 ^c
	subtotal 153
b) Gains in composted cow manure applied @ 6 tonnes / ha (analysed at 2% N on dry weight basis)	120 _d
	subtotal 120
Total input	Total gains 273
II. Losses in the field	
sale of spears (yld 8t/ha, untrimmed)	34 _e
fern removal	negligible as most nutrients returned to crown _e
composted manure	2 _b
leaching, surface run-off and volatilisation	200 _c
Total Losses	Total losses 236
III. Net accumulation of N in soil	Net +37kg N/Ha

Sources:

a Alenson, 1989.

b Lampkin, 1990.

c Kaffka and Koepf, 1989.

d Analysis Rockdale Feedlot Pty Ltd. Based on 2% N on dry weight basis.1993.

e Prior, L. Nutrition of Asparagus. Paper presented at 'Asparagus Growers Seminar, 1988'. Wagga Wagga, NSW. Dept of Agriculture, NSW and Vic. Dept.of Agriculture and Rural Affairs.

of production. RPR should be checked for cadmium. Levels should not exceed 20 ppm – mg/kg in fertilisers or manures.

Potassium can be supplied organically through composts and seaweed extracts.

Commercial organic fertilisers that can supply most nutrients are available, but these must be carefully evaluated for cost and effectiveness. Some organic certification organisations have approved a range of commercial organic fertilisers. Reliance on these, as opposed to good soil management practices (green manuring and use of compost) is discouraged.

Annual fertiliser applications should be applied prior to the pre-harvest cultivation.

Research has shown that N, P, and K extraction by crops is in the vicinity of 34, 6 and 18 kg/Ha, respectively, so you should aim to replace these amounts annually. Allowances should also be made for other losses to the system such as those from leaching, surface run-off and volatilisation (evaporation) of nutrients.

Research has also shown that asparagus seedlings are

particularly sensitive to deficiencies in magnesium, calcium, copper and sulfur.

A nutrient budget can help you to assess your crop's nutritional requirements a couple of seasons in advance, and helps to identify potential losses and gains of nutrients to the system. Table 1 gives an example of a possible budget for nitrogen inputs in asparagus production.

WEED MANAGEMENT

Weed control is critical during asparagus establishment and is best started well before planting. This involves selecting an area with few weeds and using cultivation and sowing activities to encourage pre-planting germination of weed seeds. Green manure and cereal crops planted prior to asparagus will help to out-compete weeds as well as adding to soil organic matter and fertility levels. Difficult to control weeds may need to be removed by hand.

Weed management following planting can be difficult as the young asparagus plant lacks vigour and the competitiveness of a mature stand.

Mulch can be applied around seedlings. Research has

shown that mulches such as straw, sawdust and bark spread at 100mm depth can provide adequate to good control of weeds. In cooler districts, mulching may delay the emergence of spears in spring and prolong harvest later in the season due to its cooling effect on the soil. This may be advantageous if a later harvest gives you a market niche, or disadvantageous if there is a market glut. Mulch may also increase the risk of frost damage to emerging spears.

Weed control during harvest (particularly self-sown asparagus) needs to be achieved.

Flaming weeds is an option prior to spear emergence. A clean-up during harvest could also be achieved by removing all spears protruding above the ground and then flaming the weeds. Note that flammers are most effective on newly emerged weeds.

Grazing animals while the asparagus is dormant will also help to control weeds and provide additional nutrient benefits in the form of manure. Sheep and weeder geese can be used effectively, while ducks – as well as eating weeds – will also consume snails and insects.

INTERCROPPING

An asparagus crop will not reach full productivity for at least three years, so returns will be relatively low during the establishment years. The delay in economic return could be partially offset by intercropping between the asparagus rows with other vegetables or

herbs. Planting an intercrop also helps reduce weed problems in the inter-row area.

Any intercrop requires good nutrition and water management to reduce competition with the asparagus, and care is needed to ensure the crop does not host pests or diseases of asparagus.

Intercropping of asparagus with a low-growing leguminous cover crop can be effective in reducing inter-row weeds, providing nutrition to the asparagus and improving soil structure. Research has shown that there may be a competitive effect from cover crops during the establishment year and the first few years following transplanting the asparagus. Supplying ample nutrition and water to the cover crop may reduce this impact.

Two potential cover cropping systems could be adopted. The first type involves planting a low-growing perennial cover crop, such as clover, that is mulched or slashed regularly for optimum benefit. A side-throw mulcher, slasher, or alternatively a forage harvester could be used, with the cuttings directed around the asparagus plants. This provides a nutrition and mulch benefit to the asparagus plants.

If using this system, sufficient distance must be retained between the asparagus rows to allow for machinery operations such as slashing of the asparagus fern in winter, cultivation of weeds and harvest preparations. Cultivation over the crop row should be shallow or avoided altogether to avoid



If properly timed, gas flaming can be an effective weed management tool in an organic growing system.



A green manure crop ready for incorporating. This crop is oats, faba bean field peas and mustard.

damaging the crowns. Soil may need to be hilled up over rows to increase depth.

An alternative cover cropping system involves sowing an annual cover crop following removal of the fern in winter and incorporating it as a green manure or slashing / mulching it prior to spear emergence in the spring.

Regardless of the system decided upon, it is imperative to have the cutting zone free of weeds and trash during harvest.

PESTS AND DISEASES

Asparagus has few pest and disease problems.

The most significant insect pests are thrips and Rutherglen bug (*Nysius vinitor*, Lygaeidae). Both are difficult to predict and control, usually appearing 'overnight' in swarms.

Thrips are very tiny, slender insects that may feed on developing spears, causing distortion. The onion thrips (*Thrips tabaci*) is the most common. Thrips are most likely to migrate to asparagus when plants they have been feeding on have matured or dried out. A large number of weeds and ornamentals (particularly perennials) are known to host thrips, and whilst removal of host weeds will reduce the chance that

thrips may become a problem, this may not be a practical solution. Anecdotal evidence suggests basil may help to repel thrips.

Releasing predatory insects may reduce thrips numbers. Effective predators include predatory mites (*Amblyseius*) and green lacewing (*Mallada signata*). Releases should begin early in the season and may need to be made several times. Pest and predator populations should be monitored regularly.

A number of organic sprays can be used successfully to control thrips including soap, natural pyrethrum (will also kill beneficial species) and horticultural mineral oils.

The Rutherglen bug usually breeds in the seed heads of weeds and from here they move to agricultural crops. In some years they may reach plague numbers in spring and summer. Management is best achieved by removing host weeds such as Paterson's curse from areas surrounding the crop.

Minor damage due to red legged earth mite and two-spotted mite has been reported. Removing or slashing green manures prior to harvest may worsen mite problems as they could migrate onto the asparagus.

Snails and slugs can occasionally damage spears. Ducks introduced into the system consume these

and some weeds, but are less likely to eat the asparagus.

Fusarium sp. and *Phytophthora sp.* are two fungal diseases commonly reported in conventional asparagus production. With good soil and irrigation management, the use of resistant varieties and the use of well-grown nursery stock, these are less likely to be a problem.

Stemphylium sp. is the fungus that causes fern spot of asparagus. It commonly occurs in showery weather or where overhead irrigation is used. Symptoms include purple spots on ferns and spears. Removing old ferns will help to reduce the level of this disease.

Three new diseases have recently been recorded on asparagus in Australia. Asparagus stem blight (*Phomopsis asparagi*) has been found in Queensland and Victoria. Stem blight causes defoliation and loss of production and is a very difficult disease to manage. Asparagus rust (*Puccinia asparagi*) has only been found in Queensland. The rust weakens plants and reduces marketable yield. Anthracnose (*Colletotrichum gloeosporioides*) can be a devastating disease and has been found in Queensland and the Northern Territory. Anthracnose produces large lesions on the fern stems.

HARVESTING

The harvest season for asparagus extends from August in warmer districts through to December in cooler districts. Harvesting has been extended using crop manipulation techniques such as 'mother fern culture'. In this system, one spear is permitted to proceed to fern, while other spears in the crown continue to be harvested. The 'mother fern' provides some supplementary nutrition, slightly prolonging the harvest. This method of extending the harvest, however, may affect crown longevity and, thus, the total productive potential of the asparagus stand.

Harvesting is performed during the early morning when it is cool. Spears are cut just below the ground when 200mm or greater of the spear is protruding above the soil surface. Spears are later trimmed to 180mm. Spears are then collected and kept in the shade until removed from the field.

POST-HARVEST MANAGEMENT

Asparagus spears deteriorate rapidly and must be cooled as soon as possible after harvest. Once in the packing shed, field heat should be removed. This should occur immediately if the spears are not being graded and packed straight away.



Bio-dynamic asparagus packaged for market.

Hydro-cooling is the usual method used to pre-cool spears to remove field heat. This involves spraying, flooding or immersing the spears in chilled water (3°C-5°C). The spears are then placed directly into a cool room. Length of time to leave the spears in the hydro-cooler depends on the temperature and flow rate of the cooling water, the initial temperature of the spears and whether the spears are loose or packaged.

Hydro-cooling usually involves recirculation of water and this may cause an accumulation of micro-organisms. In conventional production systems active chlorine at a rate of 200 – 400 mg.l⁻¹ is usually added to the holding tank. However, organic standards do not permit the use of chlorine above 5ppm. Hydrogen peroxide (H₂O₂), another effective disinfectant, is permitted in organic standards. Research has shown that 5% H₂O₂ is a reasonably effective anti-microbial agent. However, further research is necessary to determine the usefulness of H₂O₂ treatment.

If spears are dirty they should be washed, preferably with chilled water, prior to packing. Spears will need to be trimmed, graded and bundled according to the requirements of your markets. Conventionally, it is common practice to dip the butts immediately after cutting and bundling into a solution of calcium hypochlorite to prevent bacterial soft rot, but this is not permitted in organic production systems. The use of hydrogen peroxide should be investigated as an organically acceptable alternative to calcium hypochlorite.

Bundled spears should be packed in fully waxed, paper-lined cartons. If already pre-cooled, spears should be packed as quickly as possible and cartons placed into a coolroom set at 2°C.

Refrigerated transport should be used to ship asparagus to market. Transport operators should be made aware that your produce is organic to avoid the possibility of contamination.

MARKETING

The market possibilities for asparagus producers include fresh or processed, local or export, white or green, spears or tips. Quality and continuity of supply are the keys to success.

Fresh asparagus is most likely to fall victim to oversupply. While the harvest period can be extended or manipulated through various cutting strategies, the only other opportunity to avoid peak supply times arises if your particular climate favours slightly out-of-season production.

Check with wholesalers to determine when periods of under-supply and oversupply occur. New Zealand organic asparagus is available from October through to January.

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FURTHER READING

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