VEGETABLE GROWING SYSTEMS: IMPACTS ON THE ENVIRONMENT

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Intensive agricultural activities, such as vegetable farming, involve a high risk of harming aquatic ecosystems through sedimentation, nutrient enrichment and the introduction of toxins. They can also result in soil degradation that reduces productive capability and further increases the threat of off-farm damage. A vegetable-production systems experiment which monitors productivity and environmental impact of five contrasting systems has been running for three years at Somersby, NSW, approximately 60 km north of Sydney. The vegetable-production treatments are whole systems in which a range of management technologies and practices are combined.

METHODS

Five vegetable production systems (Table 1) are replicated four times on plots of 0.1 ha. One replication of each treatment is instrumented to measure and collect samples of runoff water. Crop productivity, soil effects and runoff pollution loads (N, P, sediment) are being monitored.

Table 1. Characteristics of vegetable production systems.

Treatments (Systems)	Characteristics
District Practice (DP)	Heavy use of fertilisers, pesticides, frequent cultivation, spray irrigation, no beneficial rotations
Agfact (Ag)	Uses Department of Agriculture advice, soil analysis, trickle irrigation, informed pest management, limited rotations, frequent cultivation
Objective (Obj)	Permanent beds, plastic mulch, fertigation, irrigation scheduling, objective pest management
Organic (Org)	Adheres to organic standards, excludes use of most synthetic fertilisers and pesticides, reduced tillage, cover crops, rotations, mulches, compost
Evolving (Ev)	Mixed technologies - permanent beds, objective pest control, rotations, cover crops, slow release fertiliser and organic mulches

RESULTS AND DISCUSSION

The productivity of *DP* and *Ag* has been consistently higher than the other treatments: the fresh weight yields from a recent cabbage crop were 23, 20, 14, 11 and 5 t/ha for *Ag*, *DP*, *Ev*, *Obj* and *Org* respectively. However, productivity differences are likely to decrease as the soil fertility of *Org* increases and the exploitive practices on *DP* and *Ag* reduce soil health. DP and Ag have also been the worst polluters by producing higher volumes of runoff which has had higher loads of N, P and sediment. Between April and June 1995, 5.9% and 5.4% of rainfall became runoff on *DP* and *Ag* whereas on *Obj* and *Org* it was only 0.4% and 0.1%. During a storm that occurred when all plots were bare following a cucumber crop in 1994, the N concentration in runoff water was 13.2, 8.5, 1.3 and 0.5 mg/L for *DP*, *Ag*,

Obj and *Org* respectively, P concentrations were 2.2, 2.2, 0.2 and 0.1 ?g/L and sediment loads were 0.5, 0.2, 0.2 and 0.02 g/L. Preliminary results from studies of soil structure suggest that DP and Ag soils have less macro-pores than the other treatments.

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