- The use of green manure crops to improve or maintain soil structure;
- Improved soil cultivation and the use of more appropriate implements to reduce soil structural damage and prevent the formation of hard pans;
- The use of lime, dolomite and gypsum to improve pH and supply calcium;
- The use of plastic mulch to develop a wetting pattern to ensure adequate root growth;
- The use of drip irrigation in association with tensiometers and fertiliser injection;
- The effective use of fertilisers to supply the nutrient needs of plants especially base fertiliser and phosphorus;
- The precise management of irrigation and fertiliser inputs to gain maximum benefit from the improved growing system.

Progress Report
A green manure crop of Jumbo forage sorghum was sown on the virgin block in December 1997 and although there were drainage problems, which affected growth, the crop was cut and incorporated into the soil using DPIF implements. The demonstration area was ripped, re-cultivated and beds with plastic mulch were laid down in April 1998. An area of 0.25 ha was finally sown half to snake bean and half to bitter melon in July after a series of delays.

An irrigation manifold with a venturi set up was designed for fertiliser injection of specially developed fertiliser mixtures for snake beans and bitter gourd. Soil moisture tensiometers were installed for the grower and their use demonstrated.

Results
Unfortunately, both crops eventually failed. The bitter melon had excellent early growth rates but the unseasonal hot conditions during July, August and September resulted in severe plant stress. Temperatures under the black plastic reached 47°C but were reduced to 34°C after white paint was sprayed over the plastic. Eventually the market price fell and the crop was abandoned. The local selection of bitter melon was considered to be a poor performer.

The snake beans sustained a severe attack from bean fly early in growth and then two-spotted mite at a later date decimated the first planting. Due to predatory mite release on the IPM project to control the two-spotted mite, pesticides could not be used effectively to control these pests of snake bean. The second snake bean planting went well with no mite problems but due to irrigation scheduling problems this crop was also abandoned.

The grower gained a great deal of experience from the preliminary project although he lost the two crops. He was able to make valid comparisons with his own farming methods and lack of farming experience. Lack of adequate machinery, poor communication and real extension problems will have to be addressed in the continuation of this project.

5.1.8 POST-HARVEST HANDLING OF ASIAN VEGETABLES

Vegetable Cool Chain

M Gosbee

The Vegetable Cool Chain project, funded by HRDC and also involving SARDI and Agriculture Victoria, includes temperature and microbial monitoring as part of the work. Temperature logging of Asian Vegetables was mainly from Darwin to Melbourne, and found

that inadequate pre-cooling prior to packing was the most common cause of problems later in the handling chain. Ms Janine Jaeger, of Agriculture Victoria, visited in September 1998 and baseline data of naturally occurring microbial populations of snake beans and bitter melon were evaluated. Data suggested a high level of variability in separate samples but within the normal ranges for vegetables.

Changes in microbial populations due to temperature are being studied in conjunction with temperature logging this year. Several information kits about cool room use, post harvest handling and transport of vegetables have been produced as part of this project. Many thanks to Territory Produce Freight Management and growers who have been involved in this project.

5.1.9 EFFECT OF TEMPERATURE AND PACKAGING ON THE SHELF LIFE OF BITTER MELON AND OKRA

M Gosbee and S Marte

These experiments were performed to examine the effects of four types of packaging on the shelf life of bitter melon and okra when they were stored at different temperatures. This continues previous work on other Asian vegetables. The vegetables were packed in boxes with either a plastic bag, perforated plastic bag, peak-fresh bag or just with newspaper lining, and stored at 5, 10, 15 and 20°C and 95% RH. Weight loss and quality scores were recorded twice weekly to determine shelf life. Other parameters also noted included chilling damage, rots, ripening and colour changes.

Bitter melon had the best storage life of 23 days when stored at 5°C. However it developed chilling injury at this temperature. Okra had the best storage life at 10°C.

Table 1. Optimum storage conditions for bitter melon and okra

	Bitter Melon	Okra
Packaging	Perforated bags	Plastic bags
Temperature	10°C	10°C
Storage Life	14 days	24 days

As expected, the rate of water loss was strongly affected by packaging. Produce packed in newspaper lost the most water, and would not be recommended particularly in low humidity cool rooms. While plastic bags reduce water loss, they keep in the heat. Perforated bags are the best option. No advantage was gained from the peak-fresh bags. Thanks to Territory Produce Freight Management and Amcor for supporting this work.

5.1.10 BITTER MELON HARVEST MATURITY

M Gosbee and S Marte

Aim
To develop harvest maturity stages that optimise post-harvest storage life, minimise ripening in transit and maximise final eating quality to the consumer.