NOVEL TRELLISING AND PLANT MANAGEMENT TECHNIQUES FOR DRAGON FRUIT IN VIETNAM

Le Thi Hoang Truc¹, Nguyen Van Son¹, Nguyen Ngoc Long¹, Nguyen Van Hoa¹, J.M. Campbell² and R.A. Fullerton²

¹Southern Horticultural Research Institute, Tien Giang, Vietnam
²The New Zealand Institute for Plant and Food Research Limited, Auckland, New Zealand
INTRODUCTION

- Dragon fruit or Pitaya (*Hyalocereus undatus*) is one of the most important fruit crops in Vietnam.
- It accounted for approximately 50% of fruit exports reaching over 40 countries worldwide.
- Represents 36.1% of Vietnam’s total fruit and vegetable exports with sales worth US$895.7M in 2016.
- The area in production has expanded from 13,400 ha to 45,500 ha in the past eight years and is continuing to grow.
- Total production is now approaching 1,000,000 tons per year.
INTRODUCTION (CONT.)

Advances in technology in response to the increased volumes being exported and achieving the yields of quality fruit required for the high value export markets.

- postharvest handling
- cool-chain technologies
- production methods

Many challenges are faced in response to the increased volumes being exported and achieving the yields of quality fruit required for the high value export markets.
INTRODUCTION (Cont.)

Significant increases in production efficiency required

• To sustain the current rate of expansion
• To meet increasing demands on available land and labor,

A novel, trellis based production system for dragon fruit is introduced in Vietnam.
CONVENTIONAL PRODUCTION SYSTEM IN VIET NAM

- 4-6 individual plants trained up a concrete post.
- Low establishment costs.
- A number of serious disadvantages
CONVENTIONAL PRODUCTION SYSTEM IN VIET NAM (Cont.)

- New cladodes overlying the older cladodes results in an impenetrable mass of cladodes.
- Only the top 20-30 outer cladodes are productive
- Inner cladodes are redundant for production, reducing nutrient and water use efficiency.
• Over time the plant continues to increase in height.
• Difficult or impossible to remove the old cladodes.
• They cannot be cut back to their bases.
• This region of the canopy is a refuge for pests and diseases.
• Weight eventually breaks support post.
CONVENTIONAL PRODUCTION SYSTEM IN VIET NAM (Cont.)

- Cannot remove canker infected cladode bases,
- Poor spray penetration for fungicides.
- Severe sun burn with large areas of cladode being killed and colonized by fungi
  - Affects plant vigor
  - Fungi in damaged tissue can cause postharvest rots
CONVENTIONAL PRODUCTION SYSTEM IN VIET NAM (Cont.)

- Often on uneven land with ridges or planted on raised mounds
- Sometimes with tree stumps
- Difficult for management operations.
- Cannot use mechanization.
THE T-BAR PRODUCTION SYSTEM

Modern horticultural production principles include:

- High density row planting
- Use of wire trellises to separate and support productive branches
- The mechanization of routine orchard operations

The T-bar system being introduced to Vietnam applies these principles to dragon fruit.
• Rows of concrete posts 5.0m apart and 1.1 to 1.3m high.
• Each post carries a wire at the top
• End assemblies stayed (supported) by screw anchors in soil
• Each post carry two horizontal and parallel steel spreaders

• Support wires (spreader wires) are attached to, each end of the spreaders and tied off at the end posts.

• All trellis wires provide the support structure for the plants.
• Plants 600mm apart in the row.
• Supported by stakes or twine until 600 mm above the top wire.
• The topmost cladode should be from a single, growth flush.
• The cladode is bent over, tied to the top wire and cut off to form a short leader approximately 600mm long.
• All leaders lie in the same direction along the row.
• This is the basic structure of each plant.
• Up to 12 cladodes established and maintained on each head.
• All others are removed as they emerge.
• The selected cladodes are allowed to grow upright until approximately 1.0 m long then slowly brought down on either side of the trellis.
• The cladodes are aligned parallel to each other approximately 100mm apart on each side of the trellis and tied to the spreader wires to hold them securely in place.
• The upper spreader wires carry the shoulder of the canopy and the weight of the plant.
• The lower spreader wires anchor the cladodes to prevent cladode movement and fruit rub.
- This system divides the canopy into a vegetative zone, and a productive zone.
- Fruit which form at the vegetative zone are typically of poor quality.
- The higher quality fruit lower in the productive zone.
THE T-BAR PRODUCTION SYSTEM (Cont.)

Key features

• Continuous production of new healthy cladodes
• The replacement of older spent cladodes by young cladodes
• Constant number of young productive cladodes on each plant
THE T-BAR PRODUCTION SYSTEM (Cont.)

- Only currently productive and replacement cladodes retained on the plant.
- Open canopy
- Easy access for removing spent cladodes
- No build-up of non-productive cladodes on the plants
- Precision of management of canopy not possible with the conventional production system
• All fruits are produced on the outer wall of each canopy providing for easy access for spray treatments or other potential operations such as covering of fruit and fruit harvest and removal from the orchard.

• Available for mechanization such as mechanical sward mowing or, in larger orchards, machine spraying of pesticides.

• Allows for vehicle access for removal of fruit.
Canker –
• The greatest threat to profitable dragon fruit production in the region
• Almost impossible to control in conventional orchards because of diseased cladodes in the canopies.

SOFRI canker control protocol
• Orchard hygiene - removal of all disease symptoms from the canopy
• Application of the recommended fungicides
• Application to the most susceptible parts of the plant – tips of rapidly growing cladodes
The open canopy of the T-bar system is ideally suited for disease control:

- Every part of the canopy is visible and accessible.
- Symptoms can be seen and removed before the pathogen reproduces and spreads.
- All sides of the cladodes are accessible to sprays.
- All sides of the cladode tips can receive sprays.
- It is possible to keep T-bar canopies completely free from canker.
Other advantages:

• Trials (in progress) indicate substantially higher yields per unit of land area

• Yields over a three year period ranged from 1.5 – 2 times greater in the T-bar system.

• The T-bar system is currently undergoing evaluation under commercial production conditions.
CONCLUSION

Although the SOFRI T-bar production system has higher establishment costs than the conventional or single wire trellis systems:

• the costs are quickly recouped by the higher yields, the higher proportion of first quality fruit resulting from less physical damage and less canker damage
• The system allows for faster and easier access to plants for canopy management and disease control
• In larger orchards, potential for mechanization of sward management and spray application for disease control.

The T-bar system introduces to dragon fruit production the concepts of high density planting and precision canopy control, crop management practices that are now a standard feature of all commercially successful horticultural crops worldwide.
Thank you !!!