



CRAVO EQUIPMENT LTD.

Redesigning blueberry production facilities in warm climates to financially outperform conventional tunnels

Financial Objectives

1. Achieve an ROI of 3 years or less
2. Increase the profit per harvested kg by 15%-50% compared to the existing tunnel production systems

Major challenges to profitability

- | | |
|--|--|
| 1. Rising input costs | 5. Reduce availability of chemicals |
| 2. Missing peak market prices due to timing, size or quality | 6. Stricter chemical residue regulations |
| 3. Changing weather conditions and extremes | 7. Water shortages |
| 4. Thrips | 8. Labor shortages |
| | 9. Land constraints |

Strategies to achieve the financial results and solve the major challenges

by creating better climate for the plants using automatic roofs

1. Increase total revenues per hectare by:
 - a. increasing total kg harvested per hectare by:
 - i. increasing the number of plants per hectare by 10%-15% by producing more compact plants
 - ii. increasing the kg/ plant by 10%-15% by:
 1. producing more balanced plants (prevent excessive vegetative growth)
 2. reduce losses due to insects like thrips
 3. improving pollination
 4. ensuring that extreme and erratic weather conditions (rain, hail, wind, frost, heat) do not negatively impact yield and quality of the crop or damage the poly covering or structure.



Plant on the left was grown at the end of the tunnel and the plant on the right was grown in the middle of the tunnel. Same genetics, same age, same water same fertilizer, different climate

b. ensuring that the highest prices per kg are achieved by:

- i. increasing the % of jumbo size fruit by approximately 20%
- ii. advancing or delaying the harvest to hit the high price windows
- iii. ensuring fruit is firm with high brix
- iv. achieving the lowest possible chemical residues by reducing the insect and disease pressure and employing more organic protocols

2. Reduce the cost of production per kg

- a. Reduce labor per hectare by:
 - i. reducing frequency of spraying and facilitating machine spraying by up to 65%
 - ii. eliminating the labor to install and remove poly and shade cloth every year
- b. Reduce water requirements per harvested kg by managing excessive heat in minutes

Reduce the number of required applications by approximately 50%-60% and it is easy and efficient to use mechanical sprayers. The roof can be closed or retracted during spraying whichever creates the best environment.



No labor required in the retractable roof to remove or install poly or shade cloth seasonally or to react to extreme weather changes. There is less risk in the retractable roof of plants being knocked over due to a sudden wind since the walls are normally closed and the roof will automatically close once winds pick up.

Tunnels need open walls to help increase ventilation but provides easy entrance for pests and land is wasted by the many wide driveways



Walls can be closed in a retractable cooling house since all the ventilation can be done through the roof



3. Reduce harvest costs per kg by:

- Reducing the frequency per week that fruit needs to be picked from 3-4 times per week to 1-2 times per week since speed of ripening can be slowed down which also helps increase fruit size
- Extending the number of hours per day that the fruit can be harvested by preventing excessive heat
- Preventing worker exhaustion from the oppressive heat in tunnels
- Facilitating the future use of machine harvesting

4. Shrink the size of new facility and redesign it so that it can produce the same total tons as the conventional tunnels on the smaller footprint

- Purchase more expensive retractable roof houses that can automatically manage the climate to achieve the desired increase in revenues per hectare, the reduction in the cost of production and savings in the cost of harvest per kg
- Retractable roof houses can be 10-40 hectares in size which eliminates the need for many large roads at the ends of the tunnel
- Redeploy the savings in land purchase, development or rental to help offset the higher capital cost of the retractable roof structures



Fewer workers to supervise and easier to supervise since the openness of the growing area makes it easier to supervise since everyone is visible. Employees are more comfortable and productive in the retractable cooling house.



Giving managers tools to effectively respond to change in the climate allows them to focus on problem prevention rather than treating the symptoms of problems which allows them to be responsible for more hectares of growing area.



5. Reduce the M3 of water required per harvested kg

- a. Depending on the outdoor climate, the liters of water per harvested kg can be reduced by 20%- 30% in the retractable roof compared to tunnels and 50% compared to outdoor production due to the increase in yield per hectare and increased management of transpiration and evaporation in the retractable roof.

6. Increase the long-term profitability by:

- a. Increasing automation to help production managers proactively prevent the climate challenges that production managers deal with every day instead of incurring expenses to treat the symptoms of their inability to manage the climate such as:
 - i. Installing or removing poly too soon or too late
 - ii. Loss of light, increases in temperature and humidity when poly roofs are installed
 - iii. Excessive plant stress or damage when the poly is removed
 - iv. Rapid re-entry of insects through the open walls in the tunnels
 - v. Variations in the climate and plant development at the ends of the tunnels compared to the middle of the tunnels
 - vi. Small or soft fruit when temperatures are too high
 - vii. Damage to coverings due to strong winds or hail
- e. Weatherproofing your business in anticipation of more extreme weather conditions

There are two primary retractable roof solutions which solve your most significant climate challenge

If rain is a major problem, use Auto-Dry™ motorized rain shelters



If sun radiation and excessive heat is the major problem, use the Retractable Flat Roof cooling house



For more information on these two systems visit:
<https://www.cravo.com/fieldcoveringsystems>

For videos showing blueberries and operational benefits in retractable roof houses, visit our growers resource page for blueberries
<https://www.cravo.com/post/blueberries>