

36 WAYS

RETRACTABLE ROOF GREENHOUSES
can increase

**FRESH FRUIT AND
VEGETABLE PROFIT PER KG**
by **50%-100%**



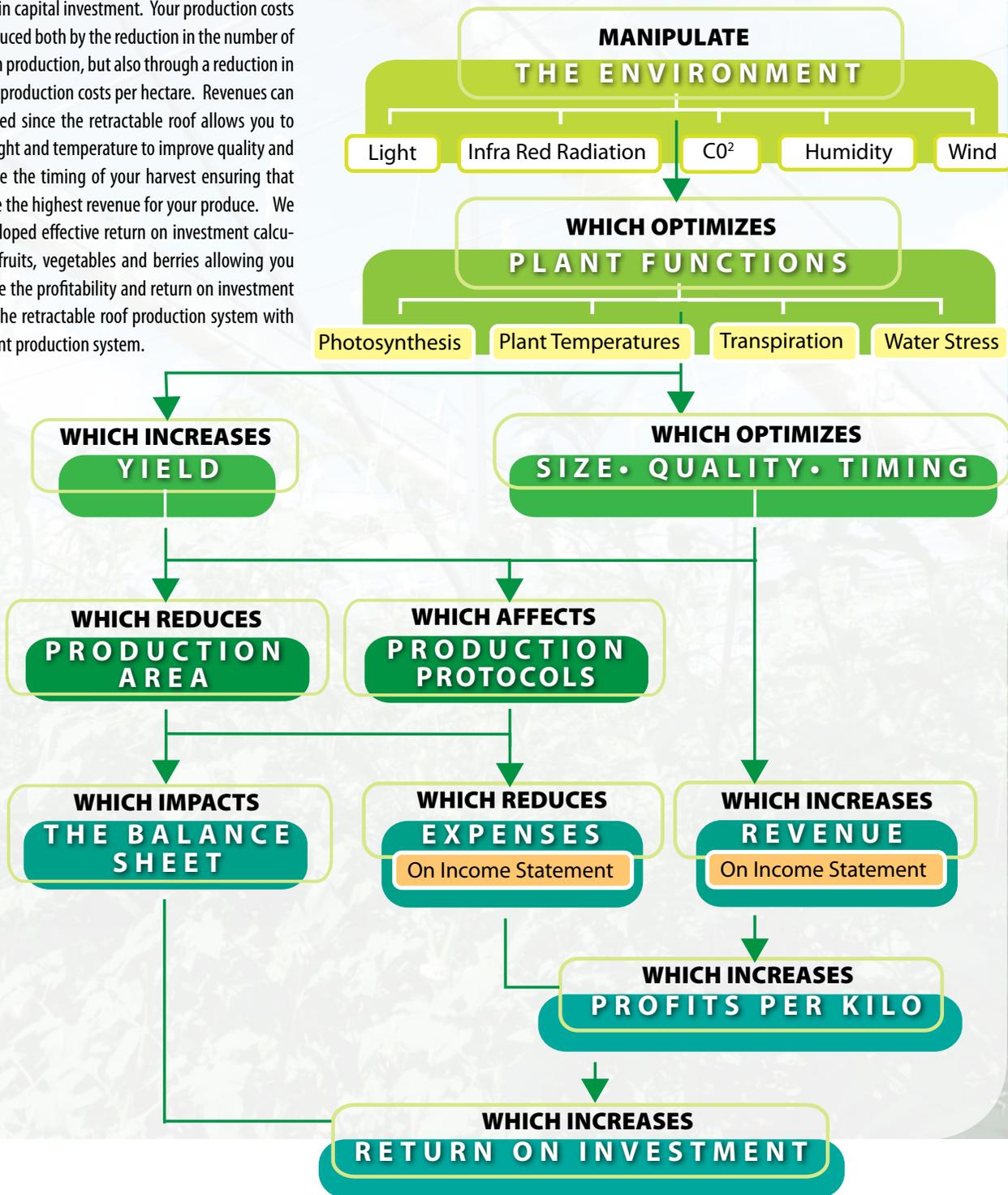
and generate a 2 to 5 year return on investment

Cravo[®]

36 WAYS TO PROFIT

There are at least 36 ways that Cravo Retractable roof greenhouses and the “Retractable Roof Production System” (RRPS)[™] can positively impact on your balance sheet and almost every line on your income statement. The retractable roof will allow you to manipulate the growing environment resulting in an increase in yield compared to those growing in the open field, or in tunnels, rain shelters or low tech greenhouses. The increased yield per hectare or acre will allow you to reduce the size of your production area resulting in a reduction in capital investment. Your production costs will be reduced both by the reduction in the number of hectares in production, but also through a reduction in your fixed production costs per hectare. Revenues can be increased since the retractable roof allows you to manage light and temperature to improve quality and manipulate the timing of your harvest ensuring that you realize the highest revenue for your produce. We have developed effective return on investment calculators for fruits, vegetables and berries allowing you to compare the profitability and return on investment between the retractable roof production system with your current production system.

Retractable Roof Greenhouses



IMPROVING THE BALANCE SHEET

The ability of retractable roof greenhouses to increase yields by optimizing the growing environment and protect crops from excessive cold, heat, rain, hail, wind and snow allows grower to modify:

- Where they grow.
- How large of a production facility they need to meet their customer demands.

This provides growers the option to improve their balance sheet by lowering their overall investment by:

- Lowering land acquisition costs.
- Reduce the overall investment on the greenhouse.
- Eliminate the purchase and installation of other equipment that is normally required in conventional greenhouses.

REDUCE THE COST OF USABLE LAND AND LAND PREPARATION



1. Reduce the overall size of the production area

The higher yields in a retractable roof greenhouse allows growers to build few hectares of houses while still maintaining the same overall yield.

2. Build where land costs are lower

Retractable roof greenhouses can be built in warmer climates where land costs could be cheaper since cooling is no longer a limiting factor.

3. Increase land utilization

Land utilization can be maximized since large retractable roof greenhouse ranges can be built without the need to break the greenhouse up into smaller greenhouses to ensure sufficient cooling.

4. Reduce the number of growing locations

For growers wanting to supply year round, the retractable roof greenhouses can frequently reduce the number of farm locations that would be required to ensure a constant supply year round.

5. Reduce or eliminate costs to control fertilizer runoff

The retractable roof greenhouse could cause a reduction in the investment required to comply with regulations concerning emission of leachates since the retractable roof can help reduce both the usage of water usage and fertilizer due to the ability to manage transpiration rates, nutrient uptake and leaching due to rain.

6. Reduce cost of land preparation

Costs to grade the land could be reduced since certain retractable roof greenhouse designs allow the greenhouse to follow gentle changes in the slope of the land. Grading costs can also be reduced if the crops are going to be grown in the ground since grades are not as critical compared to crops grown hydroponically.

7. Reduce or eliminate costs for water runoff studies

The expense of storm water studies and the investment in water drainage and retention ponds could possibly be avoided if a flat retractable roof greenhouse using a water porous covering is built since the rain is not collected by a gutter system.

8. Reduce or eliminate costs of building permits

Building permits may not be necessary if building a flat roof greenhouse since local authorities may treat it as a shadehouse.

9. Reduce the total covered area to compensate for the higher yield

10. Construct larger retractable roof house ranges

The excellent cooling capabilities of the retractable roof houses allow growers to build larger greenhouse ranges which reduces the investment in sidewall coverings and doors.

REDUCE THE INVESTMENT IN SUPPLEMENTAL GREENHOUSE EQUIPMENT

11. Choose the lowest cost retractable roof greenhouse design which meets your needs

Build a lower cost retractable flat roof greenhouse for crops which require protection from excessive cold and heat, but do not need to be protected from the volume of rain.



12. Reduce the investment for electrical supply

Costs for power supply, backup power generation and electrical hook up of motors can be minimized since few motors are required to power the roofs. (One motor can power up to .5 hectare of A frame style and 1 hectare of flat roof)

REDUCE THE INVESTMENT IN SUPPLEMENTAL GREENHOUSE EQUIPMENT

13. Reduce or eliminate the investment in a heating system

The retractable roofs allow you to build in warmer climate where heating systems will not be required.

14. Eliminate the need to purchase horizontal airflow fans

It may not be necessary to install horizontal airflow fans to circulate the air since opening the walls and roofs allows the wind to circulate the air more effectively and economically than horizontal airflow fans. However, if the greenhouse roof is closed for long periods of time during the winter, then horizontal airflow fans may still be beneficial.



15. Eliminate the need to purchase stationary or retractable shade for

summer cooling

If growing in a warm or hot climate, choose a white retractable roof covering which can frequently eliminate the need to purchase an additional interior curtain system or black shade cloth for additional cooling.

16. Eliminate the need to purchase a hydroponic system

A hydroponic or NFT system can frequently improve production yields and quality in a conventional greenhouse since they can help manage water stress and eliminate the side effects of increased salinity levels which tend to build up in the soil media over several years.

In a retractable roof greenhouse, simple drip irrigation systems can frequently be used instead of a hydroponic system since the retractable roof helps manage the water stress and plant balance by exposing plants to higher transpiration rates than those possible in a conventional greenhouse. Salt build up in the soil can also be reduced in the retractable roof since the roof can be retracted at certain times to allow the rain to come into the house and help leach accumulated salts.

IMPROVING THE INCOME STATEMENT

The income statement can be improved using retractable roof greenhouses both by increasing revenues and reducing operating expenses.

INCREASING REVENUES

Retractable roof greenhouses can be used to increase your revenues by increasing the quality, quantity and timing of the harvest since they allow growers to create better conditions than those in:

- The **open field** since growers can now close the roof to help time their harvest to come in before and/ or after those in the open field. They can also eliminate production losses due to extreme cold, heat, rain or hail.
- **Conventional greenhouses**, shadehouses or tunnels since growers can now cool the greenhouse more effectively during hot conditions and can totally retract the roof when outdoor conditions are optimal to expose plants to higher light and lower humidity levels. Growers using retractable roof greenhouses have a greater range of environments that they can utilize to manipulate crop development to increase revenues by increasing quantity of fruits harvested, improving the quality and time the harvest windows to ensure that

maximum production occurs when prices are highest. In addition, growers can explore using varieties that generate higher prices but do not perform well in the open field, or in conventional greenhouses, tunnels or shadehouses.

17. Increasing the quantity of produce sold

Retractable roof greenhouse can:

- Allow growers to increase plant density due to the higher light levels and better control over humidity. Also, plant density can be frequently increased by around 12% in the retractable roof compared to a tunnel due to the greater head clearance and distance between post lines.
- Increase the yield per plant due to the improved growing environment
- Extend the growing season since crops can be protected from the winter cold and the summer heat
- Potentially allow growers to increase the number of plantings to target the shoulder seasons

18. Improve fruit quality so that a higher price can be charged

Fruit quality can be improved compared to those



grown in the open field or a conventional greenhouse or shadehouse since the roof can be closed during adverse conditions to prevent the blemishes which occur in the open field. Retracting the roof during ideal outdoor conditions help produce fruit that is larger, has a higher brix and is firmer than that grown under a stationary roof covering. Tomatoes grown in a retractable roof to have proven to have a longer shelf life and have the appearance of a greenhouse tomato but are easily sliceable like a field tomato.

19. Produce fruits or vegetables organically

Retractable roofs are very effective for organic production in warm or hot climates for 4 key reasons.

Plants grown in a retractable roof greenhouse:

1. Develop strong natural defense mechanisms helping to prevent damage from insects and foliar disease.
2. Can be protected from rain and be exposed to the sun to prevent leaves from staying wet over long periods of time helping to prevent foliar diseases.
3. Insect reproduction is generally low in a retractable roof.
4. Transpiration rates are high enough in a retractable roof to make it easy for the plants to absorb and distribute the organic fertilizer.

20. Supply produce when the prices are highest

The ability to open and close the roof provides growers with the ability to speed up or slow down production to allow the managers to time their peak production to the window when they can realize the highest prices. The best prices could be during the winter, being the first to market in the spring, being able to supply good quality through the heat of summer, or being able to supply product in the fall after the cold weather has limited the field production. It all depends on your crop and the market that you are competing in.

21. Grow more profitable varieties

When new varieties come out that appear to meet a customer demand, growers do trials to determine if it can be profitably grown. Many varieties that met customer expectations did not perform well when tried in a traditional greenhouse or in the open field. These varieties may do well in a retractable roof greenhouse since most of the challenges of growing in a traditional greenhouse and the open field can be prevented.

REDUCING EXPENSES

Retractable roof houses can potentially reduce almost every production expense on an income statement. The amount to which the cost reductions you can achieve will vary by crop, geographic location and your current production practices. Your Cravo representative can provide you more specific information to factor into the return on investment calculations.

22. Reduce or eliminate chemical fungicides, pesticides and growth regulators

The frequency of chemical usage can be significantly reduced when growing in a retractable roof greenhouse due to the improved growing conditions, increased plant health and reduced insect reproduction making it easier to utilize IPM protocols. If chemicals are required, the volume of chemicals applied in a retractable roof can be reduced compared to that in the open field by closing the roof and walls during the application to prevent wind drift. **Growers using retractable roof greenhouses have experienced a:**

- 50%- 100% reduction in fungicide usage.
- 50%- 100% reduction in growth regulator usage.
- 10% - 100% reduction in pesticide usage.
- 50%-100% reductions in herbicide usage.

When calculating the total savings in reducing chemical usage, one must consider that in the retractable roof:

- Soap and garlic is frequently used for insect control.
- There is a reduced cost to purchase and apply the chemicals.
- There is a potential reduction in labor downtime due to re entry regulations.
- There is an increased life of the roof coverings since many chemicals used in greenhouses are harmful to polyethylene film coverings.

23. Choose from a wider range of spray application methods

Growers who normally grow in the open field can use electrostatic sprayers rather than conventional sprayers to take advantage of the lower cost to operate because growers can now close the greenhouse roof to block the wind which helps improves the uniformity of the fine mist spray.

24. Reduce fertilizer usage

Reductions in fertilizer usage or improvements in fertilizer usage should be achieved regardless of whether your crops are normally grown outside or in a greenhouse.

Fertilizer usage on outdoor crops can be improved since the roof can be closed





during rainfall to prevent leaching of fertilizers. When compared to crops grown in traditional greenhouses, fertilizer application rates in retractable roofs can occasionally be lowered since retracting the roof increases transpiration levels to normal levels allowing plants to more easily absorb and distribute the nutrients that are available to the root system.

25. Reduce water usage

Growers of outdoor plants have experienced up to 50% reductions in water usage during the summer simply by closing the greenhouse roof 85% during hot conditions. When factoring in the increased yields, the water usage per kilo of crops harvested can be up to 85% less than that of the open field. In addition, water usage can be further reduced by retracting the roof during rainfall to naturally irrigate your crops using rain that is free and has a low PH and salinity. The rain can also be used to clean off the leaves and help leach salt out of the soil media.

26. Reduce heating costs

Retractable roof greenhouses can help reduce the cost of fuel for heating systems by:

- Building the greenhouse in a location where average temperatures are warmer.
- Accumulating heat in the soil during the daytime by retracting the roof to allow the sunlight to heat up the soil directly instead of heating up the air.
- Preventing the need to turn on the heating system in the morning to dry off the plants for disease control by retracting the roof as soon as outside conditions permit.
- Building larger houses that are more efficient to heat than many smaller ones.
- Installing shading/cooling and heat retention curtains. Growers can now choose a closed curtain fabric that offers maximum heat retention without compromising on the cooling and ventilation capacity.

In traditionally ventilated greenhouses, growers sometimes had to choose a porous curtain fabric to get sufficient cooling and then missed out on the potential heat savings.

27. Reduce electrical costs

Electrical costs can be reduced in a retractable roof since:

- Fans are not required for ventilation.
- The motors that power the roofs only run intermittently. It takes only minutes for one motor to close or retract anywhere from 4,000 sq m (45,000 sq ft) to 10,000 sq m (108,000 sq ft)

depending on the roof design.

- Horizontal airflow fans are frequently not required and do not need to operate unless outside conditions are cold for extended periods of time.

28. Allow production managers to manage larger areas

Growers that have retractable roofs can manage larger production areas because they can now effectively prevent most of the problems that they had in their conventional production systems by using the retractable roof to eliminate the problems in:

- The open field by closing the roof during adverse weather conditions.
- Their tunnels, rain shelters, shadehouses or low tech greenhouses by retracting the roof when outdoor conditions are optimal.

The overall crop management strategy becomes more proactive instead of reactive. It is always easier and cheaper to prevent a problem than solve a problem after it has occurred.

29. Reduce the cost for general labor

Retractable roof greenhouses can reduce labor costs by:

- Ensuring the work environment is more comfortable making workers more productive.
- Making employee supervision easier in the large greenhouses.
- Eliminate the labor for extensive pruning of crops like tomatoes since plants in the retractable roof tend to naturally have an optimal leaf to fruit ratio.
- Allowing larger, more efficient equipment to be used inside compared to those used in tunnels.
- Making harvesting more efficient in the larger greenhouses.
- Reducing labor for spraying of chemicals.
- Allowing for a faster reentry of workers after spraying by creating an outdoor environment.

30. Reduce maintenance costs

Maintenance costs with a retractable roof greenhouse can be reduced by reducing or eliminating the need to:

- Spray on and scrub off whitewash, since the retractable roofs typically are never whitewashed.
- Seasonally install and remove poly or shade cloth.
- Repair damage to the roof covering from the wind since the reinforced retractable roof coverings are very resistant to wind. (Retractable roofs have survived 7 hurricanes.... And not even one retractable roof covering has blown off in the last 30 years.)
- Change the roof covering. Reinforced poly roofs typically last 8 – 12 years instead of 1 to 4 years for regular



greenhouse film. The extension in the life of the roof covering also reduces the negative impact on the environment because there is less waste going to the landfill.

- Clean the roofs. Retractable roof coverings are frequently not cleaned in warm climates since retracting the roof allows plants to receive more light than plants in a glass greenhouse.
- Repair hail damage, since reinforced retractable roof coverings are very resistant to hail.
- Maintain ventilation fans or cooling pads since they are not required with a retractable roof.
- Maintain roof vent motors since fewer motors are used than in a conventional roof vent.

31. Make it easier to plan production and rotate crops

Retractable roofs can help the production planning process since:

- A wide variety of crops can be grown in retractable roof greenhouses making it easy to alternate crops from season to season.
- It is easier to transplant during the hot or cold season making it easier to hit the shoulder seasons.
- It is relatively easy to speed up or slow down the speed of growth in order to target production when prices are the best.
- Erratic or unseasonable weather conditions which threaten crops can be managed in minutes.



32. Simplify training of workers

Training of growers, maintenance personnel and general workers is simplified for operations with one or multiple locations since retractable roof greenhouses can frequently be used for the entire growing process, from propagation to production. Having one style of house simplifies training since employees do not have to learn the subtle and not so subtle differences between growing in different types of traditional greenhouses.

For growers with multiple locations, the retractable roof greenhouses can frequently be utilized at all locations since they can easily be used to manage the differences in temperature, humidity, wind and rain from one location to another. This allows standard crop production protocols to be developed which can be implemented at each of the different locations, allowing for easier training of workers. In addition, production staff as well as construction and maintenance staff will be familiar with the retractable

roof houses allowing for easy transfer of people and knowledge from one farm to another.

Training of production workers is also positively impacted since employee turnover is typically lower when workers are in a comfortable work environment. The reduced worker turnover reduces the cost of training and can reduce the losses due to mistakes made by new employees.

33. Reduce the risk of catastrophic loss

Retractable roof greenhouses can reduce the risk of catastrophic loss to the owner due to:

- Crop loss due to a major disease outbreak since plants grown in a retractable roof tend to be naturally healthier and conditions inside are generally not conducive to insect and disease reproduction.
- Crop loss resulting from losing a roof due to the wind since Cravo retractable roofs have never blown off even during 7 hurricanes with wind speeds up to 200kph (130mph).
- Structural damage during extreme hurricanes or typhoons since the roof and walls can be automatically retracted in minutes.
- Fire since the greenhouse roofs can be retracted during a fire which will limit the spread of fire.

34. Reduce the cost of insurance (or make it easier to get insurance)

Insurance costs may be reduced or insurance companies may be willing to provide insurance since retractable roofs can reduce the risk of loss due to fire, hurricanes, or crop failures.

35. Resale value

The resale value of a greenhouse is can be highest if the greenhouses have a retractable roof since virtually every crop can be profitably grown inside it, making it more attractive to buyers.

36. Make your greenhouse expansion easier to finance

Banks should be more interested in financing retractable roof greenhouses since:

- The improved profitability should make loan repayments easier.
- There should be a reduced risk of a catastrophic loss due to extreme weather or crop failure.
- The greenhouse should have a higher resale value since virtually any crop can be grown inside.



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