

Title: Advancing Conservation Innovation among Beginning and Socially Disadvantaged Farmers

Principal Investigator: Chris Brown, Executive Director, Agriculture and Land-Based Training Association (ALBA), Salinas, CA

Timeframe: September 2010 – September 2012

Grant Number: 69-3A75-10-170

Date of Submission: November, 28 2012

Deliverables Identified in Grant Agreement:

- Eight (8) quarterly bilingual newsletters including NRCS program information -- COMPLETED
- Postcard invitations to four (4) workshops featuring high tunnel practices for nutrient/water efficiency and season extension -- COMPLETED
- Full-color bilingual farmers' informational brochure on high tunnel practices, season extension, agronomic observations and conservation benefits (water use, nutrient use, soil organic matter) for distribution to 500+ SDA farmers and NRCS -- COMPLETED
- At least 80 beginning and/or socially disadvantaged farmers will report knowledge gained in four NRCS/EQIP practices (high tunnels) workshops and other events -- COMPLETED
- Establish NRCS partnerships (i.e. EQIP applications) with at least ten (10) of the beginning, socially disadvantaged growers -- COMPLETED

**Contents**

Executive Summary: ..... 1

Introduction..... 2

Background: ..... 3

Review of methods: ..... 4

Discussion of quality assurance:..... 5

Findings: ..... 6

Conclusions and recommendations: ..... 6

Appendices:..... 7

## Executive Summary:

The project helped meet NRCS priority -- *Program Outreach and Technology Transfer to Targeted Groups*. The goal was to introduce and support socially-disadvantaged (SDA) farmers' partnership with NRCS by demonstrating and transferring accessible technologies and practices, in particular the hoop house or high tunnel EQIP initiative in California. The objectives were:

- 1) Conduct targeted program outreach to 500+ SDA farmers in a three-county region, including: a) eight quarterly bilingual newsletters including NRCS program information, and b) postcard invitations to four workshops featuring high tunnel practices for nutrient/water efficiency and season extension.
- 2) Publication of a full-color bilingual farmers' informational brochure on high tunnel practices, season extension, agronomic observations and conservation benefits (water use, nutrient use, soil organic matter) for distribution to 500+ SDA farmers and NRCS.
- 3) At least 80 beginning and/or socially disadvantaged farmers will report knowledge gained in four NRCS/EQIP practices (high tunnels) workshops and other events. ALBA will compile these evaluation results to inform our work strategies and reporting.
- 4) Establish NRCS partnerships (i.e. EQIP applications) with at least ten (10) of the beginning, socially disadvantaged growers to help them learn how to report on priority conservation benefits resulting from the high tunnel practice or other practices.

Among the accomplishments of the project were establishing NRCS partnerships with 10 SDA farmers, 8 of which are currently contracted for the high tunnel practice. In general, both the awareness of and interest in NRCS programs has increased amongst our tenant-farmers during the project period. A total of approximately 75 hours of technical assistance was provided during the project duration to help SDA farmers' access USDA programs.

The goals and the objectives of the project were met and the project was completed on time. Despite this, only two EQIP high tunnels were constructed and approved for cost-share during the project duration and this only happened in the last reporting period. Thus, the ability to report on a multitude of SDA farmers' experiences with high tunnels was somewhat diminished. The main barrier was farmer uncertainty as to what was being asked of them and the inability to capitalize the practice. In some cases the latter was somewhat offset through an advance through Farm Services Agency.

SDA farmers at ALBA and in our tri-county area, NRCS and other governmental staff, ALBA and other non-profit staff all benefited from this grant. Project funds were spent as anticipated.

ALBA was in a unique position to demonstrate the high tunnel practice to its own farmers as well as farmers in our region. Three ALBA farmers had already successfully employed this practice before the project started. Prior to the project start the NRCS initiated a pilot of the high tunnels as an EQIP practice. ALBA offers a peer- and community-based learning network that exists within its Farm Incubator program. Farmers who had adopted the practice were asked to share successes and lessons learned with their peers.

The quantifiable physical results of the project include 2 high tunnels completely constructed and approved for cost-share, 2 high tunnels currently being erected, 4 high tunnels pending construction. Other results include at least 10 acres cover cropped. Eighty-one (81) farmers attended workshops on NRCS EQIP and other USDA programs.

The economic results include ten (10) farmers receiving EQIP contracts for an average \$4600 per farmer cost-share on a range of conservation practices. Two farmers received advances for high tunnel construction through the Farm Service Agency (FSA).

ALBA was successful in facilitating NRCS partnerships with SDA farmers. However, the participants' understanding of the process has gradually evolved and it has taken repeated interactions for the nature of NRCS and its programs to become clear to our farmers. ALBA recommends that the NRCS continues to leverage its relationships with community-based non-profits to effectively engage SDA groups of farmers.

## Introduction

ALBA is a non-profit 501(c)3 organization whose mission is to advance economic viability, social equity and ecological land management among limited-resource, aspiring farmers. ALBA carries out its mission by operating farmer training and incubator programs at two certified organic farms in Monterey County.

Several key ALBA staff participated in the project:

- Nathan Harkleroad, Agriculture Education Program Manager, has an M.S. in Agriculture, emphasis in Crop Science, from California Polytechnic University, San Luis Obispo. He has nearly a decade of experience working, teaching and doing research in organic agriculture. Nathan speaks fluent Spanish. He managed the project, including organizing workshops, interviewing growers, designing publications, liaising with NRCS and key consultant, consulting farmers on EQIP practices, and helping farmers enroll in EQIP.
- Javier Zamora, Education and Ranch Management Assistant, was hired from April 2012 – October 2012. Javier has worked in agriculture as a Production Manager both in the U.S. and Mexico. He was a key figure on the ground helping farmers understand NRCS programs and constructing tunnels.

As well as the help of one key consultant:

- Michael O’Gorman is the Executive Director of the Farmer Veteran Coalition. He has been a pioneering organic farmer for over forty years. The last twenty years he has been the Production Manager for some of the nation’s largest organic vegetable companies, including TKO Farms, Mission Organics (Natural Selection Foods) and, most recently, Jacobs Farm/DelCabo where he oversaw 1600 acres of tomatoes, basil and mixed vegetables in the Northern half of the Baja Peninsula. Michael taught several workshops, interviewed and provided technical assistance to farmers, and wrote a fact sheet.

The goal was to introduce and support socially-disadvantaged (SDA) farmers’ partnership with NRCS by demonstrating and transferring accessible technologies and practices, in particular the hoop house or high tunnel EQIP initiative in California. The objectives were:

- 1) Conduct targeted program outreach to 500+ SDA farmers in a three-county region, including: a) eight quarterly bilingual newsletters including NRCS program information, and b) postcard invitations to four workshops featuring high tunnel practices for nutrient/water efficiency and season extension.

- 2) Publication of a full-color bilingual farmers' informational brochure on high tunnel practices, season extension, agronomic observations and conservation benefits (water use, nutrient use, soil organic matter) for distribution to 500+ SDA farmers and NRCS.
- 3) At least 80 beginning and/or socially disadvantaged farmers will report knowledge gained in four NRCS/EQIP practices (high tunnels) workshops and other events. ALBA will compile these evaluation results to inform our work strategies and reporting.
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Overall, the scope of the project tasks ranged from meetings with ALBA staff, NRCS, consultants, SDA farmers; workshop planning and execution, including outreach to 500+ SDA farmers; publication design and dissemination; required reporting; and extensive on the ground interviewing and technical assistance to farmers.

ALBA was able to leverage several relationships to execute this project. ALBA farmers that had already constructed high tunnels were able to act as mentors and instructors. One ALBA farmer, in particular, who has nearly one acre of high tunnel space, contributed significantly to the workshop series. In order to develop effective communication piece about the high tunnel practice and other EQIP opportunities most relevant to SDA growers, ALBA integrated SDA farmers' own perspectives on the benefits of the programs they accessed. Furthermore, strengthened relations with the NRCS District Office were instrumental in project completion, including the dedication of the Area Agronomist.

The project was made possible by said grant and in-kind support through produce sales, facility rental, donated consultant time, and other grants.

## **Background:**

The problem that was addressed by the project is that relatively few SDA growers in our region and nationwide engage conservation programs with NRCS. Research shows that beginning, limited-resource and socially disadvantaged farmers operated about 27 percent of all farms in 2006 but held only 12 percent of EQIP contracts. Much of the reason for limited participation is found in the economic structure of agriculture, with limited land tenancy and contract production both pervasive limitations to SDA and/or limited-resource farmers. The high tunnel focus was believed by ALBA, and perhaps also the NRCS, to be an attractive practice that could begin to engage different groups of farmers. Part of the challenge is making NRCS programs relevant to different operations, including small, diverse farms run by SDA farmers.

Many groups in our area are working to increase engagement of SDA farmers in USDA programs, in general. This includes agriculture-related non-profits as well as local Resource Conservation Districts. This was the first attempt to directly focus on SDA farmer participation in NRCS EQIP with a focus on a specific practice, i.e., high tunnels.

There are many potential benefits from the kind of outreach provided by the project. For example, NRCS partnerships can be forged by SDA farmers that lead to trust in the NRCS and, ultimately, conservation planning and practices. The high tunnel practice, in particular, can help farmers extend their growing season leading to an advantage in the marketplace and increased profitability.

There were many natural resource issues addressed. Farmers who enrolled in EQIP signed up for a suite of practices, including cover cropping and mulching with compost. These two practices, for example, help conserve soil organic matter. In terms of the high tunnel practice, there were lessons to be learned in how to implement the practice without increasing the risk for erosion. This involved helping SDA farmers understand and fulfill specific practice requirements.

SDA farmers should have equal access to the benefits of USDA programs, and there are consequences when this does not happen. For example, cost-share through NRCS EQIP may make a conservation practice economically feasible for an SDA farmer. Without such assistance, the practice might not be implemented. Conserving the resources on which agriculture depends helps ensure the long-term sustainability of a farmer's operation.

## **Review of methods:**

The project was innovative in terms of its targeted promotion and adoption of a new EQIP practice, the peer- and community-based learning network that existed within ALBA's Farm Incubator program, and the ability to provide one-on-one technical assistance to "resident/tenant farmers" within the program. While it is not unusual for cane berry growers to use high tunnels in our region, their use among diverse vegetable crop growers is quite rare – and the pilot practice sought to enhance adoption for broader uses and more diverse impacts.

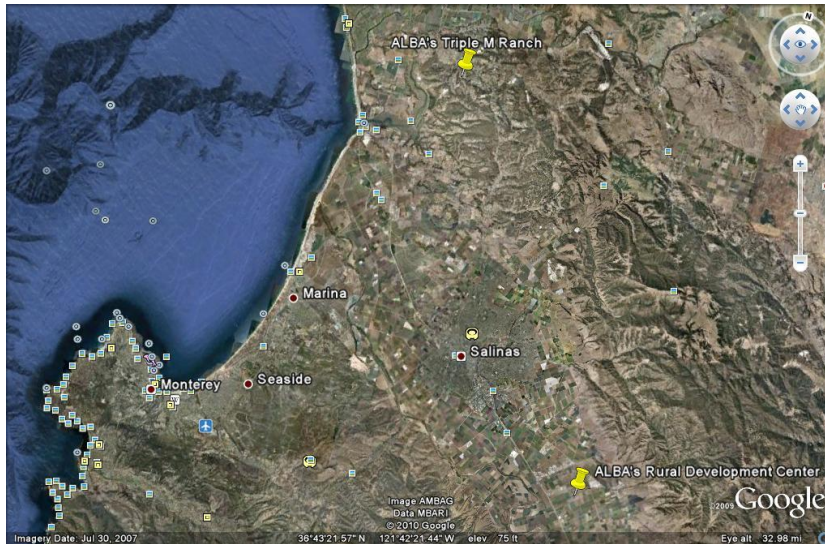
For a full review of high tunnel benefits and challenges, see *High Tunnels for Increasing Yields and Profitability for Small Farmers in California's Salinas Valley* (Appendix A). Based on interviews, the economic input for installing an EQIP high tunnel is around \$1,000 after cost-share. There is additional yearly labor compared to ground that is not in tunnels due to several factors, including increased weeding costs, increased hand labor due to problems with tractor turnaround, and manual ventilation. However, most farmers have agreed that the economic returns are worth it (e.g., up to \$100,000/acre yearly gross income for direct-marketed organic heirloom tomatoes).

The project did not involve marketing an alternative product.

The farmers involved in the project that successfully implemented the tunnel practice had to accommodate the project in several ways, including temporarily taking ground out of production, sourcing appropriate materials from several vendors, organizing labor, and amending the soil.

The two EQIP high tunnels that were constructed and approved during the project period began with EQIP applications submitted in June 2011. Applications were approved and contracts signed in April 2012. Construction of the tunnel began on September and required 60 hours to construct. Other practices implemented through EQIP began as early as November 2011.





ALBA's farms are located in watersheds draining into the Monterey Bay National Marine Sanctuary. The Triple M Ranch at top-center is in a highly erosion-prone and sensitive riparian zone, while the Rural Development Center is located south of Salinas near the bottom of this map image.

In terms of the high tunnel structure, the practice has performed as expected. Based on feedback from farmers who had already implemented the practice, specific plastic was purchased that wicked the moisture away from the apex of the structure leading to less condensation, and therefore less dripping and pooling of water within the tunnel. Overall, the outreach was very effective and reached its targets.

Farmers may need to consider financing if they are interested in installing a high tunnel with the help of NRCS EQIP. Since the program is based on re-imbursement after the practice has been installed and approved, farmers still need to be able to capitalize the full cost of the practice.

**Discussion of quality assurance:**

The project primarily took place on two farms managed by ALBA, with both tenant-farmers and other SDA farmers in the region as primary audiences engaged. At the ALBA farms, high tunnel practices had already been established by three growers. The acreages operated by the more advanced growers prepared for practice adoption ranged from 2 to 11 acres. They were certified organic mixed vegetable producers, most of whom maintained both direct and wholesale marketing with typical gross production values of \$12K-18K/acre/year. The farmers at ALBA comprise more than 80% SDA farmers, and more than one-third are women-led.

Survey and evaluation responses were both qualitative and quantitative. Evaluations were passed out at the end of each workshop. The project staff used an extensive system of program monitoring and evaluation that includes a case-management database used to track interactions, technical assistance and milestones achieved by farmers involved in the project.

Custody procedures, Calibration and Sample Analysis and Quality were N/A.

Data were recorded and used to inform the project in real-time. We had the ability to provide one-on-one technical assistance to "resident/tenant farmers" within the program and, indeed, record the assistance in a custom client-relationship-management database that tracked progress individually and collectively. Thus, we were able to leverage 3+ years of existing technical assistance records to understand the growers' past inquiries and challenges, key learning needs necessary to become effective NRCS clients, and progress toward adoption of new practices and fulfilling EQIP reporting.

## Findings:

Key findings include the following about the use of high tunnels in the region:

- They can increase gross return for small organic mixed vegetable farms
- They can extend the growing season of high value vegetable crops, but do not work to grow crops out of season
- They can be managed as part of a suite of conservation practices on small organic farms
- They can make NRCS EQIP more attractive to SDA farmers

Also, SDA farmers are increasingly interested in USDA programs but need help understanding how to navigate the system

## Conclusions and recommendations:

Although this project demonstrated that high tunnels can be managed alongside other conservation practices, pesticide use reduced and erosion risks minimized, it is still unclear whether they serve as a conservation practice per se. Nonetheless, it is clear that high tunnels are attractive to SDA farmers and may spur further NRCS partnership.

Specific recommendations include:

- Continue leveraging relationships with community-based non-profits to help SDA farmers become acquainted with NRCS and its programs
- Generally, make documents available bilingually as much as possible in plain, easy-to-follow language
- Seek professional bilingual assistance if NRCS field staff are not proficient in Spanish or engage members of SDA farmer's operation that speak English
- Summarize and provide specific details on FSA advances for NRCS EQIP
- Fund the high tunnel practice such that a larger tunnel can be constructed (i.e., that can span the length of many farm fields for drainage, tractor turnaround, irrigation management)
- Investigate ways specific practice requirements may conflict with real-life farming in an area, and make that information available to interested farmers, before offering them said practice in EQIP contract



## Appendices:

### **High Tunnels: Increasing Yields & Profitability for Small Farmers in Salinas Valley, CA**

High Tunnels are the least expensive form of “Protected Agriculture” – a general term for a wide range of structures built to house vegetables and small fruits to extend the season and increase the yield, pack-out rate and quality of the harvest.

A high tunnel, or hoop house, is a portable structure that is covered in UV resistant polyethylene plastic and has the ability to roll up the sides and open both ends to supply ventilation for both air movement and temperature control.

Heating can be added through the use of space heaters, particularly to protect a crop from frost damage. Extractors can be added at one end of the structure as an alternative method of bringing down the temperature without opening up the structure to incoming insects and other pests.

High tunnels have become popular of late, in part because of the proliferation of beginning and small acreage farmers that are looking for ways to increase revenue and because of support given from the Environmental Quality Incentives Program (EQIP) of the Natural Resource Conservation Service (NRCS) of the USDA.

Both the nature of the high tunnels themselves and the rules of the EQIP program, require the planting of crops directly into soil and the adding of drip irrigation for watering.

#### ***What Is Protected Agriculture?***

Protected agriculture is any investment in structures that bring production of (mainly) vegetable and berries, under cover to create a more controlled and supportive environment and thus reduce unwanted loss to weather, wind, rain, insects, and disease carried by vectoring insects.

The technology for protected agriculture has mostly come from three countries, each for a different reason. In Israel it was the scarcity of water that led to the need to increase yields on smaller parcels of irrigated land. In Holland, it was an agricultural industry built around the quality of produce and flowers that could ship competitively across the Atlantic and bring in enough premium prices to cover the expense. In Spain, it was its position in the southernmost and warmest part of the large and lucrative European market.

In our hemisphere, it has been Mexico, driven by a shrinking availability of land and water, support from the Mexican government, increased demand from the US market and the proliferation of technical support from (primarily) Israel, but also the Dutch and the Spanish.

There are two primary types of structures used in protected agriculture in Mexico, each considerably more expensive than the high-tunnels that are now becoming commonplace with beginning and small growers in the United States.

What is called the ‘*malla contra insect*’ or ‘*malla contra aphido*’ is an unheated but permanently built structure, usually big enough to drive a small tractor inside. The ‘*malla*’, or netting is made of polypropylene netting woven tightly enough to keep out aphids and all larger disease vectoring insects. The notable exception, because of its small size, is the thrip. It is held up by steel framing that is cemented into the ground and contains a separate structure inside that supports parallel rows of wire placed directly above each row of crops so that the vegetables, most commonly tomatoes or cucumbers, can be suspended and trained to grow vertically.

It is the combination of adding an entire third dimension (height) to the length and quality of the harvest that has made this investment hugely profitable to grower/shippers. The structure does not, however, protect against either too cold of temperatures in the winter, or the more common problem, too hot of temperatures in the summer.

These additional protections come with the building of a greenhouse, which in technical agricultural terms means a near perfectly controlled environment. This addition of heating and cooling, and coverings that can be automatically removed or utilized to keep out rain or reduce direct sunlight, have created the most favorable conditions for producing the highest, most consistent yields over the longest possible harvest. Tomato harvests of nine months, with high yields and pack-out rates in excess of 96% number one export quality fruit are common.

There are also 'hybrid' versions of these two structures, usually involving of a removable plastic covering that keeps out unwanted rainfall or the adding of ventilation or heat extraction.

### *Advantages and limitations of high tunnels*

High tunnels do not do everything these more expensive structures do, but the benefits they offer make them an affordable and valuable addition to a small farm. The equation that makes any farm profitable (or not) is yield times price minus cost. In vegetable and berry production, the most labor reliant parts of our agricultural economy, productivity-the amount of labor it takes to produce one unit of marketable product - becomes the farmer's most significant factor in cost. High tunnels contribute most to the yield side of the equation, but they can also help create higher prices and increase productivity as well. Some of the benefits of high tunnels include:

1. **Keeping off unwanted rains.** Lost in all the discussion of support for more locally grown food is why high valued vegetable and berry production had moved to California over the years: the almost non-existence of rainfall during the 180 warmest and longest growing days of the season coupled with the availability of irrigation. Rain on plants can cause and spread a whole host of plant diseases. Epidemics of late blight in tomatoes and potatoes on the east coast this year were an unfortunate and serious example of disease preventable by protection against rain. The proliferation of high tunnels designed specifically for raspberry production has created an historic increase in the economic value of raspberries to the California Central Coast these last few years. That is because the tunnels can not only keep rain, but dew, and smaller amounts of moisture off water sensitive crops. High value crops sensitive to even minor amounts of unwanted rainfall include tomatoes, basil, and most cut-flowers.
2. **Reduction, not elimination, of unwanted pests.** Because a high tunnel uses requires opening of both sides and ends for cooling and ventilation, pests will not be kept out, and those that do get in may find it to their interest to stay and multiply. A fair number of migratory insects can be reduced, however, and with the use of anti-aphid netting on the ends and the sides of the houses, their presence can be reduced much further. Careful monitoring of insect presence, the use of sticky tapes and the timely release of the correct beneficial insects can create further control. Beneficial's, like harmful insects, will also find it more difficult to leave and will populate quickly if they have insects to live on.
3. **Dust Reduction.** Dust is a vector of spider mites, a major problem in tomato production. It also reduces the availability of the plant to absorb chlorophyll, essential to all photosynthesis. Dust is also a carrier of unwanted pathogens, many of which are hard to wash off of plants such as basil.

4. **Reduction in wind.** Wind is a major problem throughout the Salinas Valley. High tunnels cannot only reduce damage to wind sensitive crops but when strategically placed the structures themselves can become wind-breaks for the other crops on the farm.
5. **Extension of the harvest season.** This is the most touted and, indeed, the most economically important reason to use high tunnels. While extension of a harvest season is a key component to an increased yield on a given piece of land – and thus a direct and important contributor to potential profitability it also has important secondary effects. The amount of time a farmer is able to bring a crop to market adds value to any wholesale buyer or direct buyer of consistent volume, such as a restaurant. Even a two week extension on either (or both) sides of the season often bring the additional advantage of higher prices and the coveted first-to-market position.
6. **Increased speed of growth.** While most of the attention on the value of a high tunnel comes from the ability to plant earlier and harvest later, it also shortens the period from planting to harvest all throughout that period. A shortened growth cycle allows for the possibility of fitting more crops within a normal season, another important and often overlooked component in increasing yields. All crops have something that is called their growing threshold – a temperature under which the plant does not grow, and over which it grows in relation to the amount of degrees above the threshold multiplied by the amount of time over that threshold. An unheated high-tunnel in Salinas Valley will add very few degrees during the coldest hours before daylight, but will greatly increase how quickly the air temperature rises once sunlight hits the structure and has the ability to retain more of that heat going into the evening. This leads to an important reduction in the amount of time between planting and harvest, especially early in the season. Less time to grow a crop creates less opportunity for disease or other crop loss.
7. **A place to work during rainy weather.** An overlooked consequence of hiring farm labor is the expense of maintaining them during inclement weather. It is not only directly advantageous to the farmer and his/her paid personnel to be able to stay productive the entire time they are ‘on the clock’ but guaranteeing steady employment is essential to a small grower’s ability to obtain and maintain dependable help. Likewise, the more a grower expands the amount of acreage into indoor production the possibility of a more highly trained and productive workforce is created. And a lengthened growing season means a lengthened work season for employees.
8. **Reduction of input costs.** Reduced evaporation rates reduce the need for irrigation. In the Salinas Valley, water itself is not expensive, but the cost of pumping it is. This also saves water that may be limited by concession or other availability, for outside crops. Similarly, a slowed evaporation rate is beneficial to the effectiveness of organic sprays, which rely on contact and increase in effectiveness in relation to how slowly they dry. Both the costs of water and pest control will be directly reduced. Fertilization costs will be reduced on a per unit basis as the yields of market grade product should increase.
9. **Environmental benefits.** This is one of the principal objectives of the NRCS’s investment in this program. While much of their focus is on the environmental benefits of improving the amount of produce that can be sold with less transportation miles there are other benefits. As water usage is reduced so is the addition of salts, chlorine and other harmful elements to the soil. For an organic grower in the Salinas Valley, with its high winds, sometimes low cloud cover and predominance of conventional growers, a high tunnel can be protection from chemical drift.

10. **Adding a third dimension to space.** The biggest contribution that protected agriculture has to the '**Yield times Price minus Cost**' equation – is the possibility of growing crops that benefit from trellising and take full advantage of the space invested in protecting. This does require the investment in labor and materials in trellising but, ultimately, will offer the crops that will bring the highest return on investment for growing indoors. These include indeterminate tomatoes, cucumbers and, as mentioned, brambles, particularly raspberries, but also thorn less blackberries.
11. **Reduce culling.** Trellised cucumbers are no comparison in value to even the best attempt to grow them on the ground; they grow straight (simply from gravity) have no unsightly yellow belly from touching the ground, and will make investment in more expensive but far superior seed affordable. Likewise the pack-out rate of tomatoes grown indoors and trellised as opposed to on the ground is remarkable. In Baja California, where tomato diseases were a serious problem, indoor tomato production has increased the average of tomatoes graded for export from 40% to 96% or above.
12. **Farming in dirt.** Unlike some modern techniques using hydroponics that save tremendously on water use and create other potential for added value and yield, high tunnels are still farming in soil. That not only makes them affordable, but does not require a farming system different from that on the rest of the farm and can lead to the training and experience that can eventually justify transferring of more acreage to soil based indoor farming.

All these specific advantages add up to one – the ability to significantly increase revenue for a grower with limited acreage.

### *Challenges and problems of growing in high tunnels in the Salinas Valley*

While most of my observations of the advantages of protected agriculture come from personal experience in Mexico; observations over the last season with two incubator farmers at ALBA's Salinas ranch, each of whom had purchased and built hoop houses with NRCS /EQIP cost share grants, as well as the production in the larger, but older fiberglass structure that was managed by Martin Bournhonesque, offered me insight to many of the challenges that exist to successfully farming under cover in the Salinas Valley. While these growers had a range of success and failures I was able to observe the following challenges:

1. **Effective use of space.** Limited to a certain size structure because of the NRCS grant, both growers built a hoop house that was around half the length of the rows in their field. Whatever gains they made in utilization of space in the area protected was lost in the land underutilized behind their structure. I would definitely recommend the assuming the additional cost of building a structure the complete distance of whatever length one is working with. Additionally it is important to make sure the land is fully utilized up the each side of the structure.
2. **Field preparation and cultivation.** Larger structures I am accustomed to have the advantage of being designed for the entry and use of specialty small width tractors. There needs to be a way to design the opening of both ends of the hoop house to get a tractor to run through it when necessary for adequate bed preparation or needed cultivation. This could be helped through the rotation of the house location and the preparation of beds prior to the enclosure of the structure, but something needs to be built into the production engineering so that any gains in yields are not surpassed by losses in labor productivity.

3. **Pollination.** One of the unintended consequences of keeping out insects is that both bees and insect pollinators can also be kept out. Even plants that rely on the use of wind to assist in their pollination can suffer. This was most noted in a well-tended, but under pollinated crop of hanging cucumbers. With cucumbers this can be easily corrected with the use of self-pollinating seed. Bumble bees are commonly used in the pollination of tomato plants, as they do not require nectar and they are relatively docile for workers to be around.
4. **Irrigation management.** Later in the season I observed the same grower with an extremely nice crop of tomatoes growing alongside his hoop house while the tomatoes inside were much larger, but visibly water stressed. This went against every theory that the indoor tomato would require less water, but made sense that the considerably larger plant with an already significant fruit set was several weeks in real life development ahead of the outside plant, and needed to be set up to a different water schedule.
5. **Condensation.** Condensation on the inside of the greenhouse roof is the result of water vapor, from high humidity in the greenhouse, condensing on the cooler greenhouse roof. Condensation builds on the interior of the plastic covering of the hoop house and finds its least resistant place to collect and then drop onto the plants. This is usually along the length of the metal roof structures. Larger greenhouses are built so that this moisture drops, if at all, in the areas designed not to have plants. Ventilation aids greatly. Both of these techniques are significantly more challenging in a small house. Managing water, to reduce the relative humidity inside the hoop house going into the evening will help, but it is impossible to eliminate or control the temperature outside. The unwanted dripping from condensation onto tomato plants of one of the growers was causing ideal situation for growth of bacteria and fungus. Working closely with the manufacturer of a given structure is important, both to design the location of the condensation dripping to fall between the rows of the plants, and to involve them in any other structural solutions to this problem.

### ***Strategies for making hoop houses profitable in Salinas Valley***

It is challenging to be a small and beginning farmer in the midst of the most productive and valuable farming region on earth. How does one benefit from the enormous cost saving that growers on the east coast are receiving right now, when Salinas companies are paying nearly \$8.00 to send a box of broccoli to their markets. That price savings along with a growing segment of the population's willingness to pay a premium for product that has not only traveled less miles but is a full five days fresher, has made the economics of returning high value crops back to parts of the country that have long abandoned them.

Finding a competitive edge in an industry where so much of profit is determined by yield and productivity is difficult anywhere. Doing so in the region where a relatively small number of crops are grown to maximum yields and with some of the most efficient farm labor management in the world is extremely challenging. Add to that, that the most difficult years for a farmer's success – his/her survival – are the same years that they are most lacking in experience, most likely to make mistakes and least likely to have mastered the most important components of the equation – yield and productivity

The good news is can be done and the lack of diversity of cropping in the valley at this moment, along with a grower demand that will still reward a small farmer, and support from the ALBA Organics marketing team all make it possible.

I recommend the following techniques to accelerate the return on investment in hoop houses:

1. **Prepare for fertility and weed control before the beginning of any construction.** Once a house is built leveling the ground, deep tillage, incorporation of cover crops or effective use of tillage between rains and following pre-irrigation for weed control are all but impossible. All this needs to be done ahead of time.
2. **Designing and buying the right size structure for your space.** This not only means one that is the full length of the row of the field it will be in, but has the ability to manage the watering independently from what is grown outside.
3. **Select high value crops.** Crops for Salinas Valley that come to mind are raspberries, heirloom or specialty tomatoes, mid-sized varietal lettuces for the high end restaurant or caterer, mid-sized blanched frisée, fresh cut basil, and any number of cut flowers.
4. **Grow one thing at a time in a single house.** I know everyone talks about bio-diversity these days; that can be achieved by the planting of a mixture of plants that attract beneficial insects on the outside edges of the house or any other unusable space. Efficiency is key here. The entire house has to be able to be planted at once, watered uniformly and be ready to come out and be replanted as quickly and entirely as possible.
5. **Be strategic about when you plant.** What is the advantage of investing in a structure to give you a two week jump on tomato production in Salinas, when you can drive to an open field twenty miles north in Hollister and beat yourself to market growing outdoors? On the other hand, planning a tomato planting that starts in the summer and is protected when the first rains of early November/late October destroy everything outdoors from Hollister to King City will give you access to the lucrative market preceding Thanksgiving and beyond. Likewise varietal lettuces can be scheduled for transplant the morning Monterey County's annual lettuce moratorium is ended. In 3 weeks you can have indoor grown lettuce to market a full six weeks before larger direct seeded and outdoor grown lettuce. It is all in the timing.
6. **Get two crops (at least) a year and be ready to switch from one to the other.** The advantage of mid-summer tomatoes following lettuces are that there will be little or no plant residue to incorporate or cause down-time during the peak summer growing days. Use transplants to further exploit your maximum yields in the minimum times. And be ready for the quick change-over. Ideally the row spacing of each crop is planned accordingly so no deep tillage is needed between the two and the second is planted into low weed pressure. If both ends of the greenhouses were able to be dismantled to bring an implement through for adding of additional fertility and shallow rebuilding of the beds, that would be ideal.
7. **Control your weeds.** There is no such thing as constant weed pressure. It is either getting worse or it is getting better. Anything less than total weed control and it is most likely getting worse. That is why my suggestions of preparing the ground ahead of the construction of the house is important and why I suggest short season crops that are transplanted and outgrow any weed's ability to grow to seed on the front end of the season and the more challenging crops planted into conditions already made difficult for further weed emergence. One remaining issue is temperature induced weed germination, such as grasses going into dropping fall temperatures. This can be mitigated by the timing of the tomato plants that they will have already provided shade-induced competition or through the use of the proper seasonal plastic mulch.
8. **Farm well.** Ultimately it all comes down to this. The high tunnel is an opportunity to greatly increase the amount and value of your crop – an essential equation to your survival as a farmer on limited acreage. Do it well. Ask for help and advice. Do not buy a structure from a company that is not willing to offer you help. Find out who in the local Extension Service is



willing to mentor throughout the season. And consider selling the crop, though a buyer/broker such as ALBA Organics or to another company that may be looking for a supply of one harder to produce, but lower volume item for their product line. Avoid the type of sales that take you off the farm during this critical learning part of your farming career.

***Michael O’Gorman - a short biography.***

I began my farming career in 1970. In 1990 I was hired to manage production for the first certified organic farm in Salinas and spent the next seven years at the crest of the growth of both large scale organic vegetable production and the development of the volume production of baby lettuces, spinach, mustard greens and full sized chicories that is now a mainstay of economic importance to the Salinas Valley.

In 1999 and 2000 I was first able to study and learn from Dr. Leon Gallegos, one of Mexico’s leading agronomists, and partner with him in some of the first indoor organic vegetable production in Mexico. In 2006 and 2007 I was able to train under the guidance of partner and peer David Rifinback, who grew for the company I managed, *Agroproductos Del Cabo*. David and his partners at the time were growing about five acres of indoor production in Maneadero, Baja California, near the Pacific coast and protected by its temperate climate. David had spent several years growing at Houwelling Tomatoes in Ojai, California and had studied under in Holland as well. David was able to successfully produce organic crops for the wholesale market valuing as high as \$250,000 per acre. In 2006 I oversaw the construction of 25 acres of ‘*malla contra-aphidos*’ in Vizcaino, Baja California Sur and several successful crops of spring and fall tomatoes and cucumbers. I have been volunteering time to help the small and beginning farmers at ALBA since 2008.