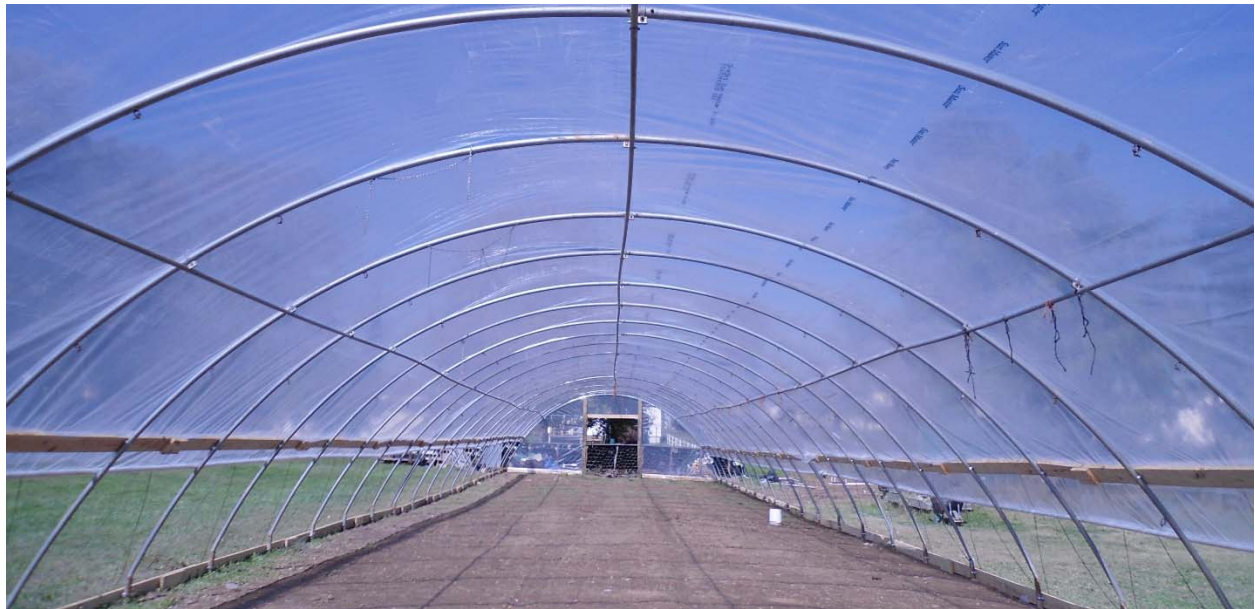


# HIGH TUNNEL GROWING: IS IT RIGHT FOR ME?



HIGH TUNNEL DECISION MAKING REPORT TO ASSIST FARMS  
INCORPORATING HIGH TUNNELS FOR MARKET COMPETITIVENESS IN THE  
MID-OHIO RIVER VALLEY.



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## INTRODUCTION

Although local buying gained momentum in metropolitan areas across the country as early as 2005, local food in West Virginia is just blooming as a trend in eating and economics. Unlimited Future, Inc., a business incubator and resource center for small businesses; seeks to help farmers capitalize on this economic opportunity. With over one billion dollars in yearly food sales in the Mid-Ohio Valley, even a small percentage of dollars redirected to local farmers could make a significant impact.

Farming in the Mid-Ohio Valley is practiced for self-sufficiency, nostalgia and recreation rather than as a primary career path. Demand for consistently available local produce from individual consumers and volume buyers is creating opportunities for self-employment in agriculture. Like many industries, farming is a type of job that is best taught by experience and apprenticeship. Unlimited Future, Inc. has partnered with Coalfield Development to launch a farm enterprise training program called Refresh Appalachia. This on the job training program trains high school graduates and former coal miners how to grow food and manage a farm business. The trainees are hired to work in crews close to where they live and also attend community college for general education credit. Their work for the agriculture enterprises they manage counts toward their associates degree. This program was launched in 2015 and now employs 12 low resource beginner farmers.

The typical West Virginia farm is 150 acres or less and has an average income of \$25,000, with the greatest share of farms reporting less than \$1,000 of income. The median income in West Virginia is \$39,500 annually and 60% farm workers must have an additional income to support their families. Rugged topography limits the productivity of WV farmers but this challenge could be overcome with a more intensive cropping method and the use of high tunnels.

The average age of farm operators in West Virginia is 58 years; this age indicates that many farmers are getting closer to a retirement age. New and younger farmers are needed to meet the demand for local foods. However, aspiring farmers without a family farming legacy have difficulty breaking into agricultural markets. An intensive year round cropping system could also aid new farmers with limited resources to increase new farm profitability through the use of high tunnels.

In 2012, a group of consumers came together to launch an innovative year round market for farmers. The store located in Downtown Huntington is called The Wild Ramp and appears at first glance to be a small specialty grocery store. However all products found at The Wild Ramp are from growers and value-added food producers within a 250 mile radius of Huntington, WV. This market space has generated a year round direct consumer market for local farmers and returned over \$1.2 million to local farmers. The market now entering its fifth year has seen a steady increase in winter season produce. However market demand still out paces supply and more year-round growers will be important for the markets continued success.

In 2014, Unlimited Future was awarded a Northeast Sustainable research and education grant to investigate the use of high tunnels to address the consistency of local produce available at the Wild Ramp. This report summarizes our research project and integrates basic values based business decision making that is taught through our business startup course, Planning for Profit. Since 2014, Unlimited Future has increased the partnerships and connections with agriculture services providers and internally increased capacity to help farmers grow their businesses. During the project Unlimited Future sent a local accountant to the WVU Extension Small Farm Center for a workshop about farm specific tax benefits and returns. Unlimited Future offered a farmer focused Planning for Profit in two locations in 2016. The course discussed developing a company identity, financial statements, incorporation and tax considerations, and niche market opportunities. Unlimited Future has also gotten involved in projects that create new markets for farmers and address systematic challenges to accessing markets and processing. The Local Food Movement continues to grow in the Mid-Ohio River Valley bolstered by strong partnerships between farmers, service providers, markets, and consumers.

### **How can high tunnels increase supply?**

High tunnels are passively ventilated, solar heated greenhouses that enable farmers to expand the typical growing season by up to four months. The typical growing season is May-October, with high tunnel farmers can capitalize on early planting in February and extend the production of cold crops into December. High tunnels store heat and humidity, raising the average daily temperature by 12 degrees Fahrenheit.

High tunnels are also more affordable to construct and maintain in comparison to a greenhouse, costing only \$2.00 per square foot on average to build. A producer of specialty crops with a 2,000 square foot high tunnel could easily make full return on their investment in one or two growing seasons. Small scale farmers benefit from intensive high tunnel production however many may be unsure about investing in this technology. High tunnels provide a method for intensive and nearly year round production cycle that increases the volume and quality of specialty crops. High tunnels can also help with pest problems because of the controlled environment the farmer has more control over profits. If a farmer adds a high value fruit or vegetable crop, such as salad greens, tomatoes or berries, the farmer could yield \$5,000 of additional income per harvest from a 2,000 square foot tunnel. (Carey, Jett, et.al. 2008)

Simply having a high tunnel is no guarantee of increased business revenue or profit, there are many considerations for high tunnel growing that were discovered during our research project. Each tunnel is its own unique environment. Crop management in the field and under plastic are very different. Ensure that you know what you want to get out of your tunnel and why it will be good for your business before investing in this new growing method on your farm.

## RESEARCH & FINDINGS

The main objective of the research project was to create a model that would incentivize farmers to extend the growing season and even create a growing season in winter. During the course of the project conversations with growers made it clear that a single model was not feasible. Farmers discussed the uniqueness of their high tunnels based on their location, orientation for sunlight, crops selected, moisture, and season and target markets. Farmers also relayed that field and high tunnel growing were very different and that there is a steep learning curve associated with the high tunnel. Even with these new challenges, the benefits were worth the extra effort because high tunnels provide a real advantage for marketing produce. The following section describes the project design and findings.

### Project Design

For the start of the project farmers who targeted different market channels and were currently growing or interested in growing in a high tunnel were selected for the project. Farmers that met the minimum standards were selected from the Wild Ramp producer base and then asked to participate. Two farmers had experience growing in high tunnels and two farmers did not have any prior experience. The Potager, with a focus on direct marketing at farmer's markets and Call Farms with a focus on Farm to School, both had more than two years of experience growing in the high tunnel. Refresh Appalachia, with a focus on small wholesale restaurants and Adelard Produce grew winter produce for the Wild Ramp, both had less than a year of experience. Each farm is described in the Farmer Profile Section.

The primary research questions were:

- How are the available crop yield and planting models affected by variations in environmental conditions and farm infrastructure in the Mid-Ohio Valley?
- What advantages do high tunnels provide in controlling the supply, quality, and consistency of specialty crops?
- Does an extended season high tunnel system generate enough revenue to meet personal earning goals and create self-sustaining employment?

The Farmer partners provided information about their businesses for the grower profiles and tracked their production. Farmer partners were asked to collect data about temperature and yield, as well as make notes about their production. Adelard Produce managed in the model high tunnel from November 2014 thru October 2015 and successfully collected data. This was under the direct supervision of the project manager. The Model High Tunnel was moved to a new location in November 2015 and has been managed by Refresh Appalachia since. However, other farmer participants were only able to provide summarized reports on their sales and information for their business profiles.

Unlimited Future in partnership with The Wild Ramp and WVU Extension hosted two workshops with Lewis Jett, the WVU Extension Horticulture Specialist. Dr. Jett spoke to a crowd of producers about using low tunnels to get started with season extension and also gave a workshop about selecting crop varieties for winter hardiness. Unlimited Future also offered business classes to 35 farmers in the region using the adapted Planning for Profit course. The course covers the basics of creating a company identity, legal incorporation, tax obligations, bookkeeping, financial statements, price setting, marketing, and customer relationships. Finally, Unlimited Future has created a special section of resources for farmers with information about enterprise budgets, articles that profile farmers' market customers, links to price information, links to season extension information, and a business plan template.

## Results

The mild winters in the Mid-Ohio River Valley allow the fall growing season to be expanded, however late snow and overly wet springs have made early marketing opportunities more difficult to capture. Throughout the project it was difficult to collect temperature and climate information that was comparable enough to draw conclusions about the river valley climate. The research questions about the models and relationship to the region's climate were inconclusive without further study. The results do show that winter growing is possible and that even in below freezing conditions the Model High Tunnel maintained above 40 degrees. The Model High Tunnel collected one season of temperature information, shown in the graph below (figure 1). The Model High Tunnel reach over 100 degrees on several days in the in the fall season with lots of variation due to light frost and warm sunny days. Temperatures were typically taken in the late morning when farmer partners arrived to work. During the winter season the trend starts to be more consistent with a gradual decline in the overall temperature.

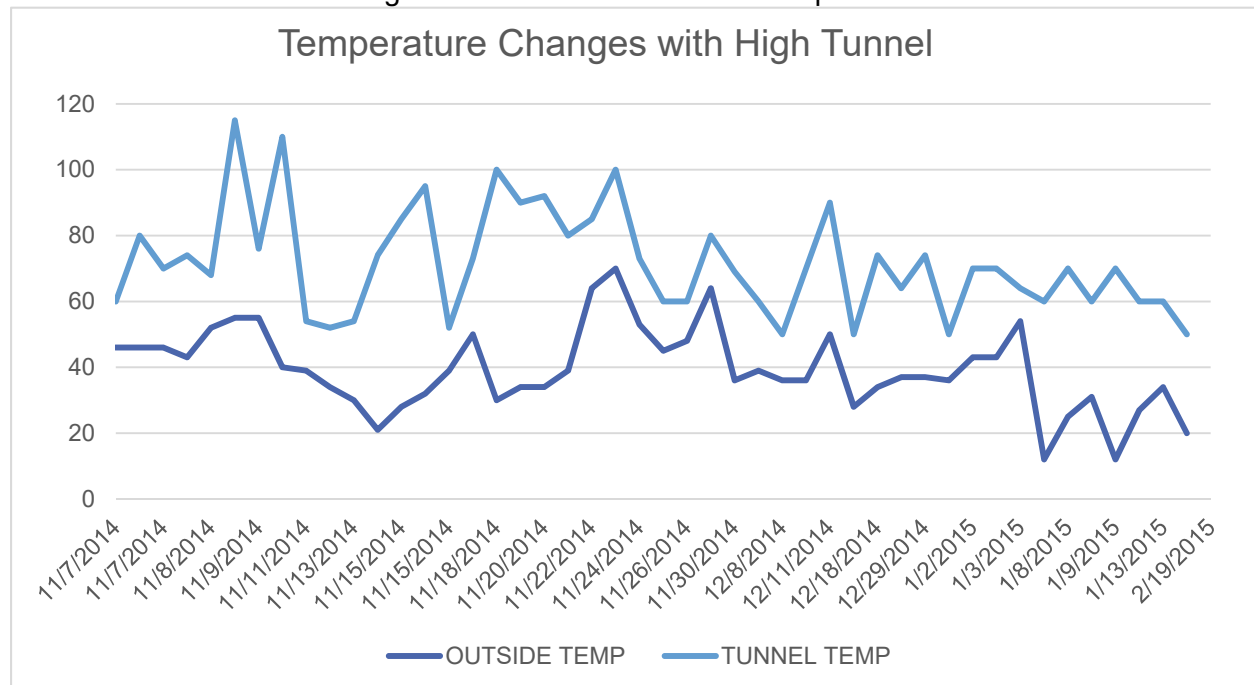


Figure 1: High Tunnel and outside temperatures compared over data collection period.

During this time period a mix of leafy green crops were grown; including spinach, kale, lettuce, swiss chard, beet and turnip greens, and green onion. The beet and turnip greens were harvested to add variety to the product mix and the roots were also harvested in late spring. Carrots and snap peas were harvested in the spring and then the tunnel was turned over with summer squash, cucumbers and tomatoes. The yield of these crops in total pounds over the same period of months is shown in the graph below (figure 2). February was the lowest yielding month over all crops, this is most likely due to the low temperatures and low sunlight from the preceding month. During the coldest months the growers also used row covers to provide an

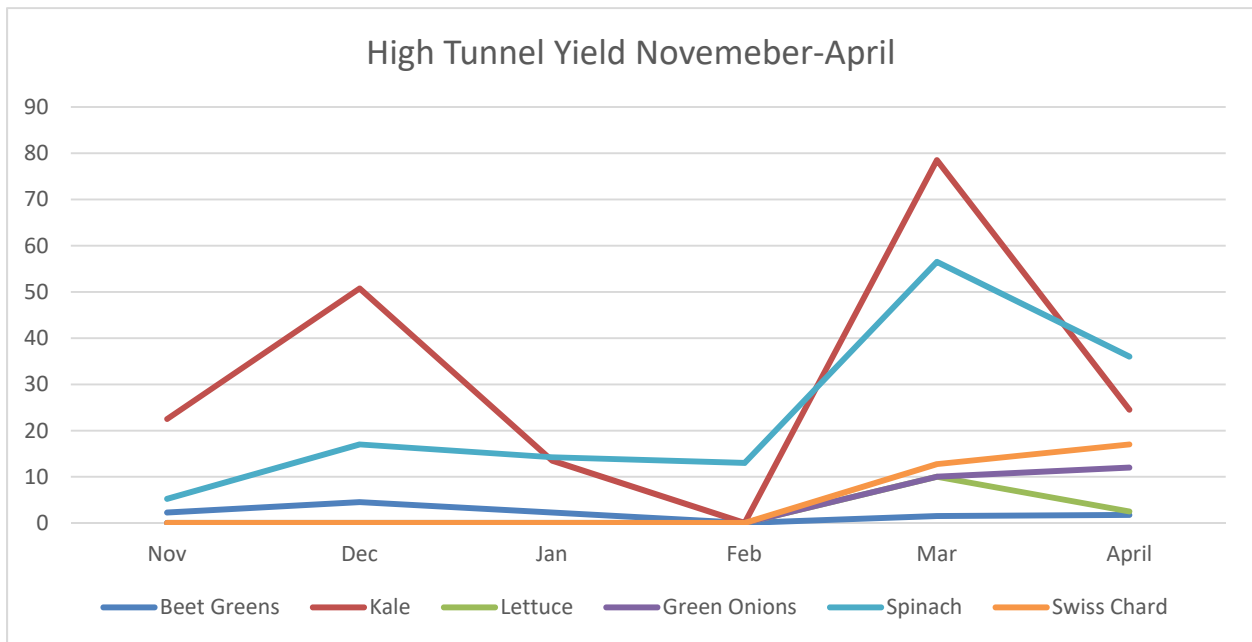


Figure 2: Yield trends in pounds by crop from November thru April in the Model High Tunnel.

added layer of frost protection and heat retention. This practice helped the plants to survive the winter and by March the yields for spinach and kale were the highest recorded during the season. The warmer weather caused a surge in plant growth and by April many plants had bolted and were removed.

Gross Sales for Adelard Produce over the one year period from the model tunnel were \$10,843. Figure 3 shows the winter and early spring crops with sales totaling \$6,966 before June 1<sup>st</sup>. The source of this information is The Wild Ramp's point of sale software and the labels on the crops are slightly different. Spinach and kale were the best sellers especially when picked young and marketed as 'baby'. Spinach overall was the top selling product out of the season with sales exceeding \$2,200. Even when compared to summer crops like tomatoes which sold \$1,800 across a longer season, spinach performed the best. Competition was definitely a factor, Adelard Produce had no competition for its winter and spring crops. For the Wild Ramp market, 2015 was the highest



gross sales earning more than \$400,000 sales across all producers and categories (dairy, meat, value-added, etc.).

With respect for profitability, if it is considered that the average cost to build a high tunnel is \$2.00 per square foot, the farmers would have earned their investment within the year. Adelard Produce worked with about 2,880 square feet of the tunnel space, valued at \$5,760. While there are costs of growing inputs and labor, the sales cover the building cost in the first year of winter sales. Looking at the potential for marketing produce beyond the Wild Ramp, there is even more opportunity to sell to restaurants and institutions during the winter and spring months.

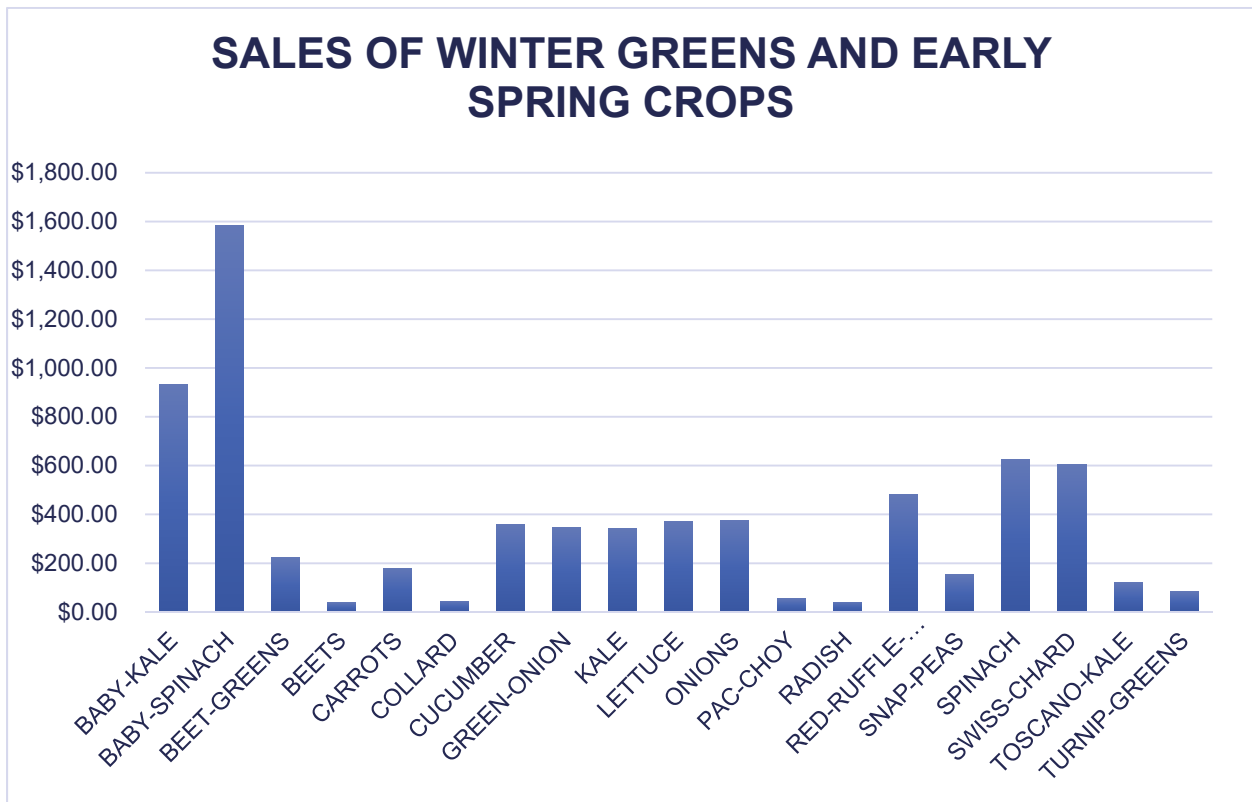


Figure 3: Sales by crop for winter and spring crops

## VALUE-BASED BUSINESS DECISION MAKING

Farm owners and managers must consider the alignment of business goals and personal goals. Each person must ask, “How much can I, as a single person, realistically expect to do?” For instance if you can only work twenty hours each week then business goals should be planned around the time constraints.

*Why is this important?* You are the best asset for your business. Giving up personal and family time is not good for business in the long run. Finding a way to create a balance of family and farm time is essential. Over extending your time will affect the profitability of your business and so will your state of mind. If you don't have a clear vision of why you are in business, you may make decisions that do not meet your personal goals.

### The 4 C's: Creativity, Challenge, Control, and Cash

Some businesses fail because the owners or managers are uncertain what they really want to achieve or because they did not structure the company and their responsibilities in ways that satisfy their personal needs and ambitions. Consider the 4C's to describe your motivation. Keep in mind that there are sometimes trade-offs between personal goals.

**Creativity:** If you are motivated by creativity, your business is likely a platform to make a contribution to society and represents your personal mission. You enjoy putting a personal stamp on your products and customer relationships. Your motivation comes from within, but be careful not to over personalize because this will lead to feeling burned out.

**Challenge:** If you are motivated by challenge, you like to solve problems, take risks, multi-task, and always start on new projects. Challenge hungry entrepreneurs can be very successful, but they can also be their own worst enemies, losing focus before completing a project or reaching a goal.

**Control:** If you are motivated by Control, business ownership is a way to have control your own life and be your own boss. However, you make every decision in your business and you must decide when to delegate tasks to others so you can stay on track. Will you be planting and harvesting and marketing online and going to the farmers market? You have to decide what is feasible and where you may want some help. Creating procedures, structures, and expectations for workers and helpers will keep operations going even when you cannot be there to oversee each step.

**Cash:** If you are motivated by cash, then you want to make money! All businesses aim to make a profit, but you have to decide how much you need. The enterprises you choose to operate must generate enough personal income to support your family. The amount of income you need will greatly impact how you operate your business. Cash also refers to money in hand needed to buy growing inputs or hire extra labor. If you have less cash, you may have to take out a loan or find a business partner and make sacrifices in other areas of your personal goals.



## What is your goal?

Your business and personal goals must align in order to be successful and satisfy your motivation for starting a business. There are many questions to answer when starting your business and having a goal in mind will enable you to set priorities and stay focused. The goal of your business will represent your motivation and your values, while making a statement about what you want to achieve. Ultimately, your business plan will more focused and operations more efficient. The SMART goals framework will with writing goals for your business plan.



Remember that a goal is not a contract and you can create new goals or adjust existing goals at any time. Life happens, priorities change, and abilities change over the years. Set aside some time to reevaluate your goals every few months or every year.

## What are your business values?

Values are your principles or standards, they will drive how you do business and define how to interact with your farm helpers, customers, the environment, and your community. Your values will help you make your goals realistic and achievable. Ask yourself, what is important to me in my life? When tough decision about balancing farm work, goals, and family life arise; always return to your values. Decision making based on values will ensure that you are doing the work for the right reasons and ultimately be more satisfying when you reach the goal.

Value can be summarized in a value statement and this is the foundation for you marketing materials and interactions with your customers. For example, My farm grows the highest quality produce for the farmers' market by using organic methods to improve the health of my community and natural environment.

**GET IT ON PAPER! USE THE SELF-ASSESSMENT WORKSHEET TO GET YOUR GOALS AND VALUES WRITTEN DOWN.**

## GROWER PROFILE: THE POTAGER-PUTNAM COUNTY, WV

Julie Schaer is the owner of The Potager, a 1.5 acre USDA Certified Organic farm located Putnam County. She has grown with certified organic methods since 2006, growing high quality heirloom vegetables and cut flowers for direct markets. Julie manages a 26X70 foot high tunnel growing directly in the ground using plastic mulch and drip irrigation to manage weeds. During severe cold, she uses light row covers to keep crops from freezing. Julie worked with the NRCS cost share program to build the high tunnel in 2012.

### MAIN GOAL: GROWING HIGH QUALITY FOOD FOR DIRECT MARKETS.

**Favorite Crops:** Early Zucchini; Kale; Turnips; Arugula; Collard Greens; Radishes and Fennel (experimental); Southern Peas (ground cover)

**Markets Opportunities:** Farmers Market; Partnering with other Farms who operate Community Supported Agriculture programs

**Target Customers:** Customer base is foodie crowd that is looking for unique, fancy variety veggies and organic foods



### What is Success?

Early zucchini: Julie starts seeing fruit in the beginning of June, rather than the end of July. Picking the zucchini small and early allows her to be one of the first market growers and easily sell at twice the price before the high season. Typical yield is approximately 100 lbs. per row from half of tunnel.

There are many ways to view success, did customers like the crop? Was the crop profitable? Did you learn something about the process of growing it?

Last year, Julie experimented with growing and selling fennel at the farmers' market. Even though she only had 12 plants it was profitable and her target market loved the fresh unique ingredient. She emphasizes that success can be small and builds slowly over many years.



*"Sometimes success is not getting a large crop yield, but figuring out the problem"*

### What has not worked?

For Julie, tomatoes have not been worth the extra effort to grow in the high tunnel. Julie starts all of her tomatoes from seeds and uses most heirloom varieties. Even with an early start, field tomatoes and tunnel tomatoes started bearing fruit about the same time. She has decided not to start tomatoes in the tunnel this year based on her experience.

## Words of Wisdom

*There is a very steep learning curve to high tunnel growing, that is often undersold. While I am grateful for the NRCS cost share program, there was no technical support for the production after the tunnel was built. I would recommend, finding an experienced farmer who is growing crops you want to grow in order to understand the full potential of your high tunnel.*

*Get plants in and out when their time has come, I have lost harvest yield thinking I can wait until next week to pick. One warmer fall or winter day and products can really start to die quickly.*



### Motivation: Challenge and Creativity

Julie enjoys the challenge of growing in her high tunnel, a different environment from the open field. Variations in temperature and moisture can invite new pests and support the growth of weeds not found outside in the field. As a certified organic producer, Julie manages these challenges uses practices rather than products often going beyond the burden prescribed by organic standards. Each year she reserves a space in the tunnel to try something new. The greatest accomplishment is mastering the crop by understanding the environment and designing creative solutions.

## GROWER PROFILE: REFRESH APPALACHIA- LINCOLN COUNTY, WV

Crystal Snyder and Colt Brogan are on the Lincoln County Crew of Refresh Appalachia, a social enterprise of the Coalfield Development Corporation. Refresh Appalachia is a regional economic and workforce development initiative to establish a sustainable training and development program to increase the success of beginning farmers and ranchers in West Virginia, the Mid-Ohio Valley Region, and eastern Kentucky. Crystal and Colt manage two 30X50ft high tunnels outfitted with raised beds and located at Lincoln County High School in Hamlin, WV. The pair started with Refresh Appalachia in 2015, one of their first tasks were to build high tunnels that they now manage. When Crystal and Cody graduate from the training program, they have big plans to implement what they have learned!

### MAIN GOAL: GROWING FOOD FOR OUR COMMUNITY AND LEARNING FOR THE FUTURE.

**Crops:** Lettuce Mix, Spinach, Chard, Collards, Tatsoi, Pac Choy, Green Onion, and Carrots.

**Market Opportunities:** Restaurants, Workplace CSA

**Target Customers:** Restaurants interested in sourcing ingredients from their community and members of the community that may not have access to fresh veggies



### What are some of the advantages?

*Crystal: We get a higher yield throughout the season by using space more efficiently and extending the season. We can also sell more by using row covers to grow during the winter months, when other growers are not producing. So far we have been able to easily control weeds in the raised beds and have had few pest problems.*

*Colt: The high tunnel is also deer proof, which is a problem for many outside growers in our area. You also have some control over the weather inside the tunnel by watering and increasing ventilation when needed. This is the way of the future and growing sustainably.*

## What are the challenges?

Crystal: *Finding organic inputs is a challenge and we have not been able to find a solution to the moles finding their way into the tunnel.*

Colt: *Developing markets that can buy the products have been a challenge and we did not have enough markets in our first year. Also, having cold storage and transport so that the product stays fresh on its way to the buyer.*

## Words of Wisdom and Future Goals



Colt: *Growing in the high tunnel, it's not easy, it will take a lot of time and attention, and is not as simple as throwing seeds in the ground. Build a strong network because you cannot do it alone. It takes extra hand to build the tunnel and knowledge to grow.*

*For my future farm, I am going to think about the resources that are available and markets that are most accessible. The people that I have met through this experience will be my greatest asset for developing my farm.*

Crystal: *Don't be afraid to try it. We have learned how to build a \$1,000 high tunnel, where you can buy most of the materials from the local hardware store. We have also hosted a workshop to bring people in and share this knowledge, plus a free set of extra hands. I am interested in growing mushrooms on my future farm and I would love to have a high tunnel someday.*

### Motivation: Cash and Creativity

Colt enjoys the gratitude that he sees in people that are enjoying the produce and values working outside. His motivation is to learn to make a living income and believes that his knowledge of building high tunnels could be an extra stream of income in the future. He wants to make a difference in his hometown and give others at Lincoln County High School a chance to learn about agriculture.

Crystal has discovered a passion for growing mushrooms and wants to share this with her community. She has helped to design and host two workshops to teach others how to prepare and inoculate logs for growing mushrooms.



## GROWER PROFILE: ADLEARD PRODUCE- CABELL COUNTY, WV

Adelard Produce was a unique partnership between Sammy Torres, an avid home gardener, and Paul Carbonau, an experienced market farmer. Neither had experience growing in a high tunnel before working in the Model High Tunnel for one season. Sammy had built raised beds and low tunnels in his backyard and had the time to tend to the plants since he recently retired from running his own business. Paul had been interested in the opportunity and had a clear idea of how to manage the project. The pair teamed up to grow winter produce from November until April and summer produce until the following November in the Model High Tunnel. The tunnel measured 30x96 feet and low tunnels were used for added warmth. They grew in the ground using plastic mulch to help control weeds and keep the plants cleaner. They tried not to waste any space by using grow bags to plant onions between the rows. They planted almost everything you can plant in a high tunnel. After the experience, Paul decided to build a high tunnel on his own property and Sammy is still trying to convince the city and his neighbors to build one in his backyard.



### MAIN GOAL: SUPPLY WINTER AND EARLY PRODUCE TO THE WILD RAMP MARKET.



**Crops:** Lettuce Mix, Spinach, Chard, Kale, Green Onion.

**Market Opportunities:** The Wild Ramp and partnering with other farms that operate CSA programs

**Target Customers:** Individual consumers that value locally grown produce and year-round availability

### What are some of the advantages?

*Sammy: Well, we were the only people growing produce for the Wild Ramp during the winter, so that was a huge advantage. We were also able to succession plant and harvest so that there were very few weeks that we did not have any produce to sell. The use of the low tunnels inside the high tunnel we were able to keep the temperature above 40, even with snow outside.*

### What are the challenges?



*Sammy: When the weather started to warm up in the spring, we started having more greens that we could sell in a short time period. We were not prepared with secondary markets, but were able to sell some larger volumes to a few restaurants and help other farmers with their CSA programs.*

Motivation: Challenge

Sammy and Paul wanted to take on a new project to grow winter produce for the Wild Ramp. They were able to achieve a lot in a short time horizon because they had a clear goal in mind. Along the way they had to solve many problems to keep plants growing through fluctuating fall temperatures and snow during the winter.

## GROWER PROFILE: CALL FARMS- CABELL & MASON COUNTY, WV

Zachary Call grew up farming with his parents and grandparents on a 100 acre farm located in Mason County. While his parents raised mostly livestock, he has always enjoyed growing vegetables. As a high school student in 2013, Zachary began to supply the schools with lettuce and received assistance from NRCS to build an 88 X 24 foot high tunnel. Zachary has since graduated from high school and decided to pursue raising produce and managing the farm as his full-time career. He now has two high tunnels and rents several acres of land for sweet corn, which he processes into cobbets. Zachary mainly sells his products to the Cabell County Board of Education and the Wild Ramp. He chooses his crops based on what he knows he can sell to the schools and has learned how to meet their needs as a buyer. Zachary was recognized as the top FFA seller in Cabell County in 2015 and supply the schools with over \$1,000 worth of product each month. In his high tunnels he grows directly in the ground and uses plastic mulch to control weeds.



### MAIN GOAL: SUPPLY CABELL COUNTY SCHOOL FOOD SERVICE WITH FRESH PRODUCE.

**Crops:** Romaine Lettuce, Cucumbers, Tomatoes.

**Market Opportunities:** Farm-to-School and The Wild Ramp

**Target Customers:** Food Service Director at Cabell County Schools and individual consumers at the farmers market.

### What are some of the advantages?

Zachary uses his high tunnels to meet the needs of his primary target customer, Cabell County Schools. The span of the school year from late-august until May, misses the main season for farm grown vegetables in our area. Zachary can use the tunnel to schedule crops so that they are available when school is in session.



#### Motivation: Cash and Control

Zachary enjoys the freedom that farming for a living income offers. He is ambitious and works hard to meet the needs of his Farm-to-School Buyers. Zachary only grows what he knows he can sell, a smart choice for a young farmer. He works well with his family, delegating deliveries when he can't make the trip.

## SELF-ASSESSMENT WORKSHEET

### Quiz: Determining your values

What are your motivations for starting a business? Remember the 4 C's!

What kind of work will satisfy your motivations?

What are your ethical principles?

What are your connections to the community? List non-profit service organization or civic organizations:

Do you want to work alongside your family and friends? What work will you be able to delegate to them?

If you may want to hire employees, what kind of relationship to you want to create or work environment?

What do you want to have on the natural environment?

### Summarize your values in a value statement:

My business provides what, to whom, when and/or how.



## What are your Goals?

**MAIN GOAL:**

**SHORT-TERM GOALS:**

## Is a high tunnel right for you?

What are your target markets? When are the highest periods of demand?

What demand is not currently being met? Will building a high tunnel help with unmet demand?

Does the potential growing capacity of the high tunnel complement the other enterprises on your farm? How does it affect your production plan overall?

How much time can you dedicate to the high tunnel each week?

What educational resources are available to you? (e.g. Extension or farmer mentor)

How will you finance the building costs of the high tunnel?

Need more help with developing your business? Contact Unlimited Future.

Visit [www.unlimitedfuture.org](http://www.unlimitedfuture.org) or call 304-697-3007

We have business start-up classes and business plan development assistance available.