Economic and financial feasibility of a diversified market farm in west Michigan

by

Steve Whittington

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Major Professor
Rich Llewelyn

ABSTRACT

Market farming has become a popular style of farming for young and beginning farmers who desire to start their own agribusiness operation. Recent research has shown that market farming can be profitable, but the initial capital requirements and net returns need to be quantified in order to assess financial feasibility. Front Porch Farms is a beginning market farm which is assessing the financial feasibility of beginning a market farming operation in West Michigan.

A capital budget was created listing all required equipment, materials, and infrastructure to begin an operation and produce a marketable product. Enterprise budgets were created for a core group of five popular direct market crops: carrots, greens mixes, head lettuce, sweet peppers, and heirloom tomatoes. Production costs were estimated by analyzing the labor, material, and marketing costs associated with producing each of the crops on a 30'' by 50' bed system.

The net returns with this standardized unit of production were then estimated with both an optimistic and pessimistic year one net return. The optimistic and pessimistic year one return on investment and payback period was calculated. The year one return on investment is 45.19% with a pessimistic analysis of net returns and 126% with optimistic net returns. The payback period for year one with a pessimistic analysis of net returns is 2.21 years and 0.78 years with an optimistic analysis. Through the analysis, the owners determined that with the net return on investment and sufficient payback period, investment of capital into a market farm will be conducted.

TABLE OF CONTENTS

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CHAPTER I: INTRODUCTION

1.1: Background

There is no official definition of a market farm. Market farming is a broad definition of farms characterized by smaller-scale production, usually ranging between fewer than three acres of production to upwards of twelve acres (Byczynski 2006). Market farms are also characterized by farmers who grow specialty products and market those products directly to local customers. Additionally, market farmers have diversified production systems and utilize a mix of hand labor, specialty tools, and forms of mechanization for production (Byczynski 2006).

Market farming has become a popular farming venture for many farmers looking to capitalize on the local demands for specialty products like fruits and vegetables. Direct marketing of farm products through farmers markets continues to be an important sales outlet for producers nationwide (Agriculture, Local Food Research and Publications 2021). The number of farmers' markets in the U.S. has grown steadily with 1,755 markets in 1994 to over 8,268 markets in 2014 (Agriculture, Organic Market Summary and Trends 2021). Consumer demand for local food through direct markets increased with the proliferation of farmers' markets and demonstrates potential for market farmers to capitalize on this demand. This is especially true for market farms that are certified organic. In a USDA survey of market managers, research found that demand for organic products was strong or moderately strong in most of the farmers' markets surveyed across the U.S. (Agriculture, Organic Market Summary and Trends 2021). Additionally, market managers surveyed also reported that more organic farmers were needed to meet consumer demand in the U.S. (Agriculture, Organic Market Summary and Trends 2021). However, 93% of organic sales

take place through conventional and natural food supermarket chains. The Organic Trade Associate (OTA) estimates the remaining 7 percent of U.S. organic food sales occur through farmers' markets, foodservice, and marketing channels other than retail stores (USDA, Organic Market Summary and Trends 2021). The lack of supply of local products, coupled with strong demand from local markets creates an opportunity for market farmers. Market farms are uniquely positioned to capture fresh market demand from regional and local markets because they are able to provide a diverse array of fresh, high-quality products for customers.

The interest in this research originates from the need of this sector of farming to quantify the start-up costs for beginning market growers, the costs associated with this system of farming, and overall profitability of market farms in order to assess feasibility and scale of these operations. The research also serves to support the further development of a business plan for Front Porch Farms.

Front Porch Farms is a start-up farm in West Michigan that will grow specialty produce for local customers through the establishment of a CSA (Community Supported Agriculture) program, direct sales through farmers' markets, and wholesale customers at restaurants. The farm is comprised of the owners, Steve and Abby Whittington, who are the principle decision-makers for the farm and its future operations. The owners have acquired a suitable property to live and farm, and need to analyze the financial feasibility of starting a market farm with their growing family.

1.2 Research Objectives

Front Porch Farms is a beginning market farm that is conducting an economic analysis of the profitability and feasibility of a diversified specialty produce farm. The research will be evaluating the feasibility and financial profitability of establishing a

diversified market farm that produces specialty produce for various local fresh markets in West Michigan. The objectives are defined as:

1. Identify the capital requirements to begin market farming in terms of investments in the means of production including: equipment, infrastructure, materials, and inputs.
2. Analyze the costs associated with the production of each crop in a core group of five specialty crops to determine profitability for two different fresh market options: retail to farmers' markets or wholesale to restaurants.
3. Determine the profitability of each crop based on the total costs of production and estimated yields that contributes to the development of a whole-farm production plan.

The thesis will begin by identifying the initial capital investments for equipment needed for Front Porch Farms to produce specialty crops and meet customer demand. The major capital investments required for this operation will include greenhouse or high-tunnel investments for propagation and growing, propagation equipment, seeding and planting equipment, irrigation and cultivation equipment, harvest tools, wash and packing infrastructure and equipment, post-harvest storage, marketing costs, and transportation costs.

Next, a cost of production analysis will be conducted for each of the five crops to determine the financial feasibility based on direct market retail at farmers' markets and wholesale to restaurants. The objective is to develop a mix of crops that is both profitable for Front Porch Farms and fulfills customer demand in direct retail or wholesale markets to ensure customer satisfaction.

Finally, the profitability of each crop and the mix of crops will be used to develop a whole-farm production plan and profitability assessment to make further economic and financial decisions for the farm.

1.3 Why is this research important?

This research is important to market farmers and beginning farmers because it will help firms understand the economics of small-scale market farming production systems and the role they play in local and regional agriculture markets. According to the USDA in the 2017 Census of Agriculture, the average age of a farmer in the U.S. is 57.5 years and continues to rise each year (USDA 2017). There is a lack of young farmers who can fill various roles on farms, and barriers to entry are very high because of the cost of land and equipment is increasingly expensive. Additionally, over 80% of farm owners and operators have off-farm income to support their farm and family (USDA, A Look at America's Family Farms 2020). The research conducted will analyze the costs of production and financial feasibility for a style of farming that is growing in popularity but is not widely studied. This method of farming can be conducted on smaller acreage and the equipment is less capital intensive, which decreases the barrier to entry for young, beginning farmers.

It is important for Front Porch Farms because as a beginning farm, capital needs to be used efficiently in order to generate adequate cashflow to fund future projects and to grow our production capacity to better serve customers. Front Porch Farms needs to determine what the costs of production are for the planned crops to ensure that the production is profitable to fulfill a larger goal of building a financially viable farming operation.

CHAPTER II: LITERATURE REVIEW

2.1 Economic Feasibility of Small Scale Vegetable Production and Retailing in Rural Communities

The research shows that in urban communities, consumer demand for high quality, locally grown, fresh market products has increased substantially. This is partially driven by increases in household incomes, access to higher levels of education, and the increasing awareness of the numerous health benefits of consuming fresh produce. The research has also shown that the rise in demand for fresh market products is most noticeable in urban communities with numerous fresh produce markets (Biermacher, et al. 2007).

There is, however, limited economic information of the feasibility of producing and retailing vegetables and other fresh market products in rural communities. The prevailing question is whether or not rural customers will have a similar willingness to pay for a differentiated, fresh market retail product as their urban counterparts would. Producers of fresh market products at a small scale must often charge higher prices to cover their cost of production because these systems are labor-focused enterprises and produce highly perishable products. The higher labor costs are reflected in the price of the products and could deter rural customers from purchasing due to a higher price. Additionally, because of the small-scale production indicative of fresh market producers, most producers will at least initially lack the comparative economic advantages seen at larger scale, efficient production systems (Biermacher, et al. 2007).

In an effort to study the economics of small scale, fresh market producers in rural communities, the Noble Foundation (a non-profit agricultural research institution in Oklahoma) established a production farm program in 2006 known as the Noble Produce

Garden and Market. The objectives of this study were to determine the production costs and net returns of selling mixed fruits, vegetables, and cut flowers in the rural community of Ardmore, Oklahoma, and to determine if consumers in this region were willing to pay a differentiated price compared to the price charged in large retail stores (Biermacher, et al. 2007).

The costs of production, both variable and fixed, were analyzed against the gross returns of each crop to determine a break-even point in sales. This was done by dividing the marketable yield of each crop into the total cost of production for each crop. The crops were retailed at the Noble Produce Market Store on-site at the Headquarters Research Farm for 54 days beginning on June 15th through August 11th and to two local supermarkets (Biermacher, et al. 2007).

The researchers noted that during the growing season they experienced extreme weather conditions like high summer temperatures that burned crops staple crops like okra when demand was high. Additionally, the researchers struggled with perishability issues in some of the crops like tomatoes. In some cases, the tomatoes could not be sold and up to 50% of this crop went to waste. (Biermacher, et al. 2007). The effects of extreme weather conditions and high variability in yields can greatly effect the retailing of fresh market products. Overall, these two crops illustrated the variability of marketable yields in a market farm in this research.

The research concluded with an analysis of the break-even costs based on the gross returns of each crop for that season. The cumulative gross sales of the project was $20,457 and the total cumulative net return from the garden project was a negative $41,582 for year one (Biermacher, et al. 2007). In this financial analysis, the researchers noted that of the

total costs, variable costs including an opportunity cost of capital analysis equaled $57,568 which accounted for 93% of the project's total cost. After analyzing the capital budget, the researchers concluded that adjustments could be made to reduce variable costs in production like opting for a cheaper, more efficient irrigation system that would save capital. Despite this adjustment, the project still incurred a negative net return of approximately $31,000 in year 1, a reduction in losses from $41,582 (Biermacher, et al. 2007).

Conclusions from the research show how extreme weather conditions can create financial challenges in market farming; most notably in the variability in marketable yields and increased labor to manage the crops. Additionally, the research demonstrated rural communities were willing to pay differentiated prices for fresher, locally grown produce but sales in year 1 were not enough to cover the costs of production and low marketable yields. Lastly, the researcher made a final conclusion that more work needs to be done to help producers determine the best way to utilize their resources and capital in order to be a successful small-scale market farm.

2.2 Evaluating Marketing Channel Options for Small-Scale Fruit and Vegetable Producers

The research by LeRoux (2010) explores current trends that indicate an increasing demand for local foods which is presenting new marketing opportunities for small-scale producers. The research identified two primary marketing channel options as wholesale and retail for market growers. A direct marketing retail for market growers would be farmers' markets and Community Supported Agrculture (CSA) operations. Wholesale operations would be through wholesalers and supermarkets. The primary decision producers must

make is whether to move larger volumes through wholesale with lower prices per unit or seek higher prices in direct markets with greater labor and other costs in marketing (LeRoux M.N. 2010). In both marketing channels, the greatest cost for both options is labor.

The USDA estimates that total U.S. sales at farmers' markets grew 13% from 2000 to 2005, with the number of farmers' markets nationally increasing from 1,775 in 1994 to 4,700 in 2008. Community Supported Agriculture (CSA) programs increased from 50 in 1990 to over 2,200 in 2009 (LeRoux M.N. 2010). Consumers now have more opportunities to purchase food directly from producers, with 8,268 farmers' markets operating in 2014; a 180 percent increase from 2006 (USDA Economic Research Service, Trends in U.S. Local and Regional Food Systems 2015). In the 2019 National Farmers Market Managers Survey, Market Managers operated 8,140 farmers markets nationally (USDA, National Farmers Market Managers Survey 2020).

In 2012, 7.8 percent of U.S. farms sold food through local food marketing channels, including direct-to-consumer (DTC) marketing channels like farmers' markets, roadside stands, or u-pick (USDA Economic Research Service, Trends in U.S. Local and Regional Food Systems 2015). Direct marketing and retail is advantageous and beneficial for producers whose personality is oriented towards higher amounts of customer interaction. These channels require high levels of customers service, but are also advantageous because they can provide producers valuable feedback on consumer preferences and price sensitivity (LeRoux M.N. 2010). The time-intensive nature of direct markets can also be beneficial because they can lead to brand building, advertising, and discovery of farm products by chefs or wholesalers visiting market. The primary advantage of direct retail

marketing like through farmers' markets or CSAs is the higher price achieved per unit sold (LeRoux M.N. 2010). The risks of this marketing channel occur through higher variable costs because of the perishable nature of the products. Excess waste can occur during a slower market day or leftovers from a farm-stand. Additionally, a considerable amount of labor must be allocated to operate direct market channels with logistical labor costs to travel to market and maintain the stand, and then journey home.

Conversely, wholesale options for market farms achieve a lower price per unit sold, but give the producer more control in this channel because high-volume channels offer increased efficiency in harvest and production processes. Producers can move greater volumes of perishable crops at fewer frequencies throughout the growing season. The research noted that wholesalers were able to purchase approximately 3.4 times more value compared to farmers' market sales even at a lower price per unit. The primary risk associated with wholesale marketing as a market farmer is due to higher levels of product preparation and specifications, contracts, and volume commitments. Distributors can set dictated prices, deadlines, and logistics that increase the stress related with crop failures or low production yields. While crop failure is a concern for all market channels, farmers who operate in wholesale channels tend to feel this stress more due to commitments with wholesale buyers and the contracts that are associated with them (LeRoux M.N. 2010).

The researchers noted that although sales volumes are important, returns relative to the costs associated with the production and marketing of the products are also important for long-term farm viability. Due to the highly perishable nature of fresh market crops, optimizing sales likely requires a combination of both market channels in some capacity (LeRoux M.N. 2010). There needs to be flexibility of combining both types of marketing

channels in order to mitigate risk associated with production of perishable crops like variability in yields or weather incidents.

2.3 Small Farm Economic Viability

The demographics of small farms and the definition of a small farm has changed over time. Small farms are more often quantified based upon the annual gross sales the farm produces than physical size. Generally, small farms are considered to be operations that gross $250,000 or less annually (Reynolds 2015).

Small farms are beneficial to local communities in a multitude of ways. One commonality of smaller farms is diversified production systems. There are many benefits to diversification of production. First, diversification in systems and crops helps growers hedge economic risks by minimizing the effect of crop failures or low yields of a single crop produced on a farm. Ecologically, crop diversification creates biological diversity which can help stabilize farm ecosystems, minimize problematic pests and diseases, and build habitat diversity on a farm. Small farms also act as farmland preservation by mitigating farmland loss. Land in financially successful small farms preserves land from being used for commercial development or for more industrial, monocrop farms. Lastly, small farms can provide significant economic opportunity for local residents, communities, and economies through enhancing rural communities access to food as well as preserving rural and agricultural communities heritage (Reynolds 2015).

Total farms in the U.S. peaked at 6.8 million farms in 1935. Since then, the number of U.S. farms fell sharply until the 1970s, where farms continued to decline but at a much slower rate. In the most recent survey, there were 2.02 million U.S. farms in 2020, which is down from 2.20 million farms in 2007. With 897 million acres of land in farms in 2020, the

average farm size is 444 acres (USDA Economic Research Service, The number of U.S. farms continues to decline slowly 2020).

In addition to lost farmland, the consolidation of farms and agricultural land has been a trend in the United States for decades. The consolidation of the agricultural industry and land has impacted the farmers by making access to land more difficult as land prices continue to increase. Despite these facts, small farms still represent 91% of farms in the United States (Reynolds 2015).

There are various ways that economic policies have impacted small farm economic viability. The U.S. agricultural sector policies has effected small farms because policies governing agriculture in the U.S. have shown a trend of favoring large over small farms. The reason for this is thought to be partly because traditional economic models tend to ignore costs and benefits related to environmental or social impact, as these impacts are difficult to quantify (Reynolds 2015). The resulting impression is that small farms are always less economically efficient than their larger farm counterparts.

Larger, more capitalized farms are able to invest in technologically advanced efficient production systems and vertically integrate operations lowering per-unit costs of production. As a result, larger agricultural firms can provide consumers with convenience and consistency with a price of goods lower than what is economically feasible for small-scale producers. Consumers who are accustomed to cheaper, convenient foods may not be willing to pay for qualitative differences in small farm products reflected in higher pricing (Reynolds 2015).

2.4 Market Farming Success

The business of agriculture is not historically a high-paying occupation with many farmers citing reasons beyond money as a reason for farming like lifestyle, appreciating

good food, or working outdoors. However, capital budgeting and quantifying the costs to begin a market farming operation is still something that a producer will need to know when beginning an operation in order to achieve success. Successful farming operations are operations that are making enough money to keep farming, and have achieved a balance between income and expenses with enough money to pay themselves fairly (Byczynski 2006).

The author makes some clear distinctions about how much money a market farmer can make regarding a particular acre size of an operation. A market farm with fewer than three acres that is oriented toward intensive vegetable production of high-dollar crops like heirloom tomatoes and greens mixes can earn $20,000 to $35,000 per acre depending on the management and skill of the grower. The margin on this type of farm consistently runs at about 50 to 60 percent; which is considered a very a good margin (Byczynski 2006).

However, more recent case studies have shown a potential for greater gross incomes on market farms. In the book, "The Market Gardener," by J.M. Fortier, he states that a well-established, smoothly running market garden with good markets can bring in $60,000 to $100,000 per acre annually in diverse vegetable crops. His farm, Les Jardins de la Grelinette in Canada, produces diversified vegetables on 1.5 acres and achieves a gross profit of $150,000 annually with a 40% profit margin (Fortier, The Market Gardener 2014). A good rule of thumb in market farming is that one person working full-time will be able to handle approximately 1 acre.

Market farmers can also produce in the three to twelve acre range. The author states that it is impractical to grow more than three acres of produce using just hand labor, so at this scale farmers choose to invest in labor-saving equipment which leads to higher capital

costs, depreciation, maintenance, and repairs. Selling more than five to six acres of vegetables in retail markets is a feat requiring multiple farmers' markets per week, wholesaling to grocers, retaurants, and institutions, which are all part of the marketing mix at this scale. The amount of revenue generated at this scale varies widely depending on the grower and their own marketing abilities (Byczynski 2006).

Market farms can also exceed twelve acres or more in production. At this scale, mechanization of some sort is essential, with the gross income per acre much lower than on smaller farms. The production at this scale is less intensive due to more space needed for implements to access the bed top. Therefore, the number of plants per acre is lower than an intensively-planted, hand-scale vegetable field. The greater production on larger acerage means the less likelihood a farmer can sell it all directly to consumers at retail prices. Revenue per acre may be as low as $10,000, but with 12 or more acres in production, gross revenue remains high (Byczynski 2006).

The basic premise of market farming is to grow a variety of crops and direct market them. Some crops are more profitable than others, but you may still need to grow less profitable crops to attract or satisfy customers in your market. Achieving a profitable crop mix is a balance of growing high-value profitable crops, staple crops that satisfy customers, identifying profitable markets, and filling gaps in production with other crops for wholesale. High-value crops may include microgreens, heirloom vegetables like tomatoes, baby vegetables like greens or bunched roots like carrots, and specialty salad mixes or other greens. Few growers can make a business out of growing only these crops because they do have a limited market. Therefore, more common fruits and vegetables like tomatoes, lettuce, cucumbers, peppers, and carrots should be included in the crop mix and

can be can be highly profitable when grown efficiently and direct-marketed intelligently. Storage crops should also be considered in a crop offerings because they can be stored and sold over a longer season. Crops like potatoes, garlic, cabbage, brussel sprouts, onions, winter squash, and sweet potatoes are an excellent choice and give the producer more leisure about selling them should weather events turn against you (Byczynski 2006).

Crop enterprise budgets are a useful tool in planning production because they identify the costs of growing a particular crop and the expected returns of the crop given good, average, or low yields (Byczynski 2006). Most of these enterprise budgets from Extension services or books are designed for larger farms, not market farms, with the numbers calculated on a per acre basis. Additionally, budgets calculated on a per acre basis may include assumptions like mechanical cultivation or routine pesticide applications; which variables will be very different on a market farm. A good enterprise budget will give the producer an expectation of production, as well as explain production parameters for the crop (Byczynski 2006).

2.5 Recent Research

The USDA has issued three reports since 2010 through the Economic Research Service on local food systems. The first report shows that trends in U.S. local and regional food systems have shown growth, but in recent years has experienced a plateau. Direct-to-consumer (DTC) sales increased between 2002 and 2007 by 32% with a 17% increase in the number of farms conducting DTC sales. However, DTC sales only increased by 5.5% with sales declining by 1% from 2007 – 2012 (USDA Economic Research Service, Trends in U.S. Local and Regional Food Systems 2015). Two factors may have contributed to the lack of growth in DTC sales since 2007. The demand for local food purchased may have plateaued with more producers competing for the same consumer dollar. This is especially

true for certain markets like on the west coast of the U.S. Additionally, farmers may have been able to increase sales through retailers rather than DTC sales. Local food sourcing of farm products by grocers and other retailers was a common trend in 2012 (USDA Economic Research Service, Trends in U.S. Local and Regional Food Systems 2015).

The next report describes a prevailing sentiment of economic research regarding local food systems that it is difficult to discern the impacts of local food systems compared to mainstream food systems. This is because a relatively small portion of food is produced and consumed in local food markets making it difficult to track and study. This report has identified four potential impacts of local food systems through empirical evidence. The four impact categories are: economic development impacts, health and nutrition benefits, increasing food security, and positive effects on energy use and greenhouse gas emissions (USDA Economic Research Service 2010). The expansion of local food markets implies that consumers in a particular area are purchasing more food from local sources which positively impacts the local community because more money remains within the community. There is a relationship between local foods and healthy food item options like fresh produce. This can lead to health benefits from improved nutrition, obesity prevention, and a reduction of chronic diet-related disease. Local foods also increase food security of communities. Food security means that all people at all times have access to enough food for an active and healthy life. Expanding local food options may increase the availability of healthy food options to food insecure individuals and may encourage an increase in consumption by food insecure individuals. Finally, localizing the food system can have a reduction on fossil fuel energy. Local food systems reduce transport distances for food and reduce fossil fuel energy use (USDA Economic Research Service 2010).

The last report evaluates the characteristics, production, marketing, and financial performance of beginning and experienced farmers with varying levels of direct marketing experience. The first local food survey conducted by the U.S. Department of Agriculture was used to evaluate how local food farmers (which accounts for less than 9% of all farms) of varying levels of experience responded to the increasing demand for local food. The study found that direct-to-consumer sales (DTC) are an important component of local food producers accounting for 76% of their gross agriculture sales. Local food producers with greater experience in DTC marketing showed higher shares of local food sales. However, 83% of first-year farmers earned positive net sales, followed by 73% of inexperienced farmers and 70% of experienced farmers. First year and inexperienced direct marketers had a higher percentage of producers with internet access compared to experienced producers. Positive net sales were associated with internet use to purchase farm inputs and access to price and market information (Park 2021).

2.6 Summary & Conclusion

In the U.S., market farming with a focus on direct marketing to consumers has become an increasingly popular way for beginning farmers to start farming, and consumer demand has shown positive trends for purchasing local food in communities. An increased focus on capital budgeting has been identified as a need by the industry as a whole to quantify costs associated with beginning a market farming venture with a focus on direct-to-consumer marketing. Establishing a capital budget and developing enterprise budgeting for crops produced on market farms can be an effective way to evaluate feasibility of beginning a market farm.

CHAPTER III: THEORY AND METHODS

3.1 Enterprise Budgeting Theory

The purpose of an enterprise budget is to provide the producer with an estimate of potential revenue, expenses, and profit for a single enterprise. Each crop, type of livestock, or unit produced on an farm can be considered an enterprise and a specific budget can be created for each. Enterprise budgets found at local state Cooperative Extension Services are generally developed to represent a typical situation, and may not be accurate for a particular operation (Kay, Edwards and Duffy 2020). Therefore, producers need to adjust their budgets given local situations, particular crops produced, and the type of farm operation.

The benefits of an enterprise budget for managers are numerous in a production farming operation. The budgets can help the producer identify profitable or unprofitable enterprises. Additionally, a producer can utilize the budgets for information and data to make many types of decisions in their farming operation. The process of developing and creating an enterprise budget requires a large amount of data, but once completed, it is a source of data that can be utilized in other types of budgeting decisions (Kay, Edwards and Duffy 2020).

3.1.1 Enterprise Budget Structure and Components

Constructing a budget for an enterprise on a farm operation will be unique to the producer or the types of agriculture products produced on the farm. There are common components to enterprise budgeting that are included on most budgets. Gross revenue from the enterprise is typically shown with the quantity, unit, and price per unit to provide specific information about the enterprise (Kay, Edwards and Duffy 2020).

The next section is the cost section which is generally divided into two parts: variable or operating costs and fixed or ownership costs. Variable costs are costs that will be incurred only if the enterprise is produced. Variable costs can be further divided to meet the specific demands of the enterprise. For example, it may make sense for a producer to further sub-divide variable costs into categories like pre-harvest, post-harvest, or materials cost. The gross income or revenue from a given enterprise measured against variable costs is an intermediate calculation that shows the remaining revenue to be applied to fixed costs. Enterprise revenue shown with the variable costs is often called the gross margin of an enterprise; the value of returns before fixed costs are applied (Kay, Edwards and Duffy 2020).

Fixed costs are any costs that exist from owning assets that would exist even if they were not used specifically for this enterprise. Fixed costs are costs that arise from any ownership costs for machinery, land, or buildings. Fixed expenses are not the result of a particular enterprise, but instead are costs that exist from owning assets and would exist even if they were not used for the enterprise. Fixed costs in an enterprise budget are the most difficult costs to estimate. This is because fixed costs are necessary and appropriate for a farming operation, but are not directly tied to any one enterprise on a farm and are difficult to assign expenses correctly. Fixed costs are often prorated on some basis to all enterprises. Fixed costs may also be quantified on a budget in machinery hours needed for the enterprise, or on the enterprise's share of land on a farm operation (Kay, Edwards and Duffy 2020).

3.1.2 Evaluating Opportunity Cost

Opportunity costs need to be included in an enterprise budget because budgets themselves are tools for economic analysis. In addition to cash expenses and depreciation, there are also opportunity costs that exist when deciding to pursue an enterprise. There are often opportunity costs associated with capital invested in machinery, variable costs, land, and operator labor (Kay, Edwards and Duffy 2020).

The estimated economic profit is found by subtracting the total expenses of the enterprise from estimated gross revenue including opportunity costs. Profit shown on an enterprise budget is an estimate of economic profit when opportunity cost is included, which is different from accounting profit where opportunity costs are not recognized. Managers of an operation need to ensure that opportunity cost for the enterprise has been included in the cost figures. If a charge for management has not been included in the budget itself, the value should be considered the return to management. This is because management is an economic cost, and should be recognized in an economic budget either as a specific expense or as the residual net return or loss to produce the enterprise. If the return to management is a positive figure, this means that the revenue generated by selling the product was sufficient to cover all costs of producing the crop, which includes the opportunity costs of land, labor, and operating capital (Kay, Edwards and Duffy 2020). Conversely, if the enterprise returns are negative, revenues were not sufficient to cover total costs of producing the crop.

3.1.3 Enterprise Budget Analysis and Interpretation

The data and information in an enterprise budget can be utilized to perform different types of economic analysis in a farming operation. Managers of an operation who

understand the estimated costs and returns of their operation can make more informed and calculated farm operation decisions.

Cost of production analysis is a type of analysis that management can use to determine the average cost of producing one unit of a particular commodity or farm product. Cost of production is calculated by taking the total cost over the yield. Cost of production is useful to calculate because costs and yields inevitably will change on a farm due to fluctuating costs and production conditions. Cost of production analysis is also useful from the context of marketing a product. If a product is able to be sold in a market for more than the total costs associated with producing it, a profit is being made (Kay, Edwards and Duffy 2020). If opportunity costs are included in the total cost to produce a unit, the profit would be considered an economic profit as well.

The data in an enterprise budget may also be used to calculate break-even analysis and sensitivity analysis for price and yield. Calculating a break-even yield is accomplished by taking the total costs over the output price. The yield necessary to cover all costs at a given price per unit would result in a break-even yield. Additionally, the break-even price can be calculated as well, which is the output price needed just to cover all costs at a particular output level (Kay, Edwards and Duffy 2020). Calculating a break-even price is done by taking the total costs over the expected yield.

Cost of production and break-even price are different ways to look at the same value. Cost of production and break-even analysis allows a manager to conduct sensitivity analysis. The variability of yield in a farming operation can cause different break-even prices and costs of production. Managers can calculate a range of different possible yields and the subsequent effect on price based on a range of different yields. Therefore, the

calculation of break-even yields and prices is a helpful tool to aid in managerial decisionmaking on farms. For example, managers can study various combinations of break-even prices and yields in order to form their own expectations about the probability of obtaining a price and yield combination that would just cover total cost. A manager could also use variable costs in place of total costs to determine if variable production costs are able to be covered to minimize short-run losses in production. Generally, if a sensitivity analysis is conducted and variable costs are unable to be covered, the economic implications are to not produce the crop that year or at all (Kay, Edwards and Duffy 2020).

3.1.4 Enterprise Budget Conclusion

Enterprise budgeting for farm operations has many different advantages. Budgets can help a producer identify profitable enterprises, achieve early identification of enterprises with high variable costs, quantify opportunity costs in production, determine allocation of fixed costs in an operation, and to conduct price and yield sensitivity analysis. Managers can use the budgets to determine which enterprises to be included in a whole-farm profitability plan. A whole-farm profitability plan is comprised of several different enterprise budgets acting as a "building block" of the whole-farm plan. Enterprise budgets are a great start to developing a whole-farm plan and can greatly assist a producer in developing a tactical plan to carry out the planned production on a farm and the resources necessary to complete it (Kay, Edwards and Duffy 2020).

3.2 Introduction to Methods

The method used for the evaluation of the economic opportunities in market farming is budgeting. First, a capital budgeting analysis was conducted by determining the necessary equipment needed for beginning a market farming operation. Next, enterprise budgets were created to estimate costs of production and estimate gross and net returns on

each crop produced in a core group of crops. A capital budget and enterprise budget can be used to calculate an initial cash outlay for beginning the operation, and enterprise budgets can help estimate cashflow of crops produced on the operation.

3.2.1 Capital Budget

The capital budget was constructed by dividing initial capital expenditures necessary for beginning a market farming operation into seven categories. These categories were developed by thinking through the necessary steps to take a vegetable crop from seed to sale at market. The seven categories developed are: greenhouse expenses, propagation, bed preparation and planting, cultivation and irrigation, harvest, post-harvest, and marketing and logistics.

Greenhouse expenses include the materials cost for a 16 foot by 100 foot gothic-style greenhouse and the additional equipment necessary to build and operate a greenhouse like end walls, baseboards, indoor tables, and climate control equipment.

Propagation expenses are any equipment necessary to successfully start seeds for production. Various crops like tomatoes, peppers, cucumbers, and onions will be started from seed at Front Porch Farms. Other crops like carrots, greens, and various herbs will be direct seeded with a hand-held seeder. The costs included in the propagation category are items like soil, trays, hand seeders, and a grow light. In the case of Front Porch Farms, seedlings have been chosen to be propagated indoors for year one because a greenhouse is not yet constructed. When a greenhouse is constructed later in year one, propagation will occur inside the greenhouse in subsequent years.

The bed preparation and planting category includes costs for a walk-behind BCS Tractor and a basic 30’’ tiller implement, hand tools to prepare beds for planting, a hand

seeder, tarps, horticulture netting, t-posts, and assorted supplies necessary to prepare and plant beds of both direct seeded and transplanted crops.

The cultivation and irrigation category is focused on crop maintenance post-planting and before harvest occurs. This category includes items like landscape fabrics, cultivation equipment like hoes, rakes, and flame weeders. Irrigation equipment including hoses, PVC fittings, drip irrigation tubing, overhead irrigation units, row cover, and timers are included here as well.

The harvest equipment category is any equipment used to get the crop out of the field. This includes various knives, harvest bins, a quick-cut greens harvester, bulb crates, and rubber bands.

Post-harvest handling is a category that includes all equipment needed to take a harvested crop and wash and pack the crop into a marketable product that stays fresh for markets. Costs included in this category include capital allocated for stock tanks, stainless steel tables, refrigeration, greens washing station, a root washing station, PVC, conduit, electrical work, scales, bags, and hoses. Costs in this category were found to be more extensive due to the perishable nature of the crops grown and the necessary investment required in post-harvest equipment to keep the crops marketable.

The final category is marketing and logistics. This category includes costs associated with selling a product at market. This includes wax produce boxes for customer CSA pickups, produce bags, transportation costs, tables, tents, farmers' market accessories, and annual market fees.

3.2.2 Enterprise Budgeting for Market Farms

A cost of production analysis and estimated revenues were developed by creating enterprise budgets for a core group of crops that will be grown on the farm. These five

crops included in the research are: carrot, cucumber, greens mixes, head lettuce, sweet peppers, and heirloom tomato. The crops were selected because they represent a diverse and common offering by market farmers to include at market or in a CSA box. The crops were also chosen because they can also be easily transferred to other crops grown on the farm based on similarities that exist in crop type, the cost of production, management, materials, marketing. Carrots, for example, are a bunched root vegetable. The enterprise budget for carrots can be easily transferred to most bunched roots like beets, radish, or parsnip because the costs of production in variable costs are nearly identical. Similarly, a greens mix can include crop offerings like arugula, spicy greens mix, lettuce mix, mizuna, baby kale, or a brassica salad mix. In most cases, the price per pound of each of these greens remains the same at marketplace and the variable costs of production of greens remains similar with the different types of greens.

The enterprise budgets were constructed with the goal of quantifying variable and fixed costs and comparing the total costs with the gross returns of the products sold in West Michigan. The budgets include administrative data like the crop grown, date completed, and size of production unit, which in this case was a 30'' by 50' bed. Each crop was evaluated by creating a process map of every task required to bring the crop from seed to sale at a market. The production tasks were then listed with a estimated labor minutes required for each task in the process map. Machinery hours were also included on the budget to provide flexibility to producers who choose to mechanize more extensively. For example, if a producer choses to mechanize and uses a tractor-mounted power harrow to incorporate soil amendments instead of a bed preparation rake, labor can be included in machinery minutes instead of labor minutes. The total labor hours including any machinery

hours required is the result of all the labor required to produce all units of that crop given the size of production unit. Greens for example are often harvested 2-3 times in a single bed planting. The harvest labor minutes for greens includes multiple harvests in this example.

The per hour labor value was determined by estimating how many employees and managers would be necessary to produce, harvest, and prepare the crops for market given the tasks and time allocation necessary to produce it. The cost of labor will be calculated on a per hour basis and will include two farmhands and one manager for the labor.

Material costs are the next variable cost section included by listing common materials and the costs to produce an individual production unit which is a 30''x 50' bed of crops. Materials costs include seeds or plants, soil mix, soil amendments, compost, landscape fabric, plastic mulch, row cover, drip tape, pesticides or insecticides, boxes, bins, bags, and other general supplies necessary to produce the crop for market.

The researcher chose to divide marketing and transport costs into two separate categories to further evaluate the costs associated with different marketing avenues. For example, retail marketing at farmers' markets is going to incur a higher labor cost per hour to travel to market, sell at market, and travel home. Comparatively, in wholesale marketing these costs do not exist and a different set of costs are incurred. Wholesale costs can include transport fees, delivery fees, contract costs, and labor for delivery.

Fixed costs were calculated by prorating the total farmland occupied by each crop type. This fixed cost is then calculated by taking the current cost per acre of land and dividing the amount by the number of beds per acre. Each bed of production now has a fixed cost that can be applied to the total costs to produce the crop. The total beds per acre

were also divided into the total property taxes paid per year on the property as well as the cost for organic certification. As the farm scales and additional fixed costs like insurance, buildings, and office expenses can be added here as well.

Estimated revenue is calculated in the gross returns section of the budget. The gross returns section is divided into two sub-categories: wholesale gross returns and retail gross returns. The researcher chose to differentiate between wholesale and retail gross returns because there are different costs and prices per unit achieved between wholesale and retail. Typically, wholesale customers will receive a volume discount per unit because more units will be sold at once. Retail prices are typically higher and more competitive per unit but variability exists in amount of units sold based on retail markets. A differentiation is also made because the marketing costs are different between retail and wholesale outlets as well.

Finally, the variable and fixed costs are applied against the gross returns of wholesale and retail markets to achieve a net return of each bed produced. Yields included in the returns are an estimate based on the reasonable amounts of marketable produce that can be sold per bed. Price and yield sensitivity analysis can be conducted to determine a break even yield and price of the crop and to evaluate margins of each crop.

3.2.3 Enterprise Budget Sensitivity Analysis

Each of the crop enterprise budgets created includes sensitivity analysis tools developed by the researcher to assist in making decisions regarding pricing and yields to predict profitability. A price sensitivity button was added to make incremental 0.10 changes in the price per unit sold to quickly see how price per unit sold affects overall net profits of the crop in a wholesale or retail market. This can be a helpful tool when evaluating whether or not to sell to a new customer like a restaurant. In this example,

restaurant buyers will purchase more volume at once but will expect a lower price for all units purchased. The wholesale price sensitivity button can be quickly adjusted to the new price per unit that is being requested by the restaurant buyer. This will allow a producer to quickly see the returns given the new price.

The researcher also included a section with break-even price and yield analysis. This can be a helpful tool to use when a producer wants to evaluate the break-even price or yield on a particular crop. Calculating the break-even yield that needs to be made on a crop to break-even on fixed and variable costs can be done using goal seek in Excel. Using goal seek, the net return is set to zero to calculate how many units must be produced at a given price to break even on costs to produce the crop. This will give the quantity that you must produce in order to recoup the costs to produce the crop. The same methodology can be applied to calculate break-even price. In this example, goal seek is used by setting the net return cell to zero by changing the price with current estimated yield amount. This will give the minimum price to charge given your estimated yield. These calculations are extremely valuable because they give a producer data on how many units they have to sell to recoup costs as well as the minimum price that a producer can sell a particular product.

3.3.1 Market Farming Production Methods

Although each farm and producer approaches production differently, many market farmers choose to establish a standardized bed system for production. This bed system is common with vegetable producers and can translate to a mechanized system or hand-scale system easily. Market farmers who are not heavily mechanized utilize a common bed dimension with a 30 inch bed top width, with 12 to 18 inch pathways between the beds, and with beds that are standardized to 50 foot or 100 foot bed lengths. Front Porch Farms will utilize a 50 foot bed length because we are a beginning farm and it is relatively easy to

scale production from a 50 foot bed length to a 100 foot bed length. The industry has standardized this bed width to accommodate a large array of specialty farm hand tools, tractors, and implements at this scale. Mixed vegetable farmers divide similar sized fields of beds into plots called "field blocks." Standardization is particularly important for mixed vegetable farmers because managing different crops at once throughout the season is very complicated because each crop has different needs and harvest times. Standarization allows a grower to more effectively manage different aspects of production like crop rotations, soil amendments, plantings, and crop yield (Fortier, The Market Gardener 2014).

Market farmers also use a biologically intensive approach to production. A biologically intensive approach on permanent bed systems is a system in which growers focus on maximizing crop yields from a minimum area of land, while seeking to preserve and improve soil quality at the same time (Fortier 2014). When establishing beds, large quantities of compost and amendments are added to create a rich growing area. A new bed or field block could have multiple inches of compost and other amendments applied to the area to boost nutrients and build soil organic matter. Compost and amendments are added regularly after establishment, between crop rotations, and before plantings of crops that are heavy feeders like tomatoes or greens.

Biologically intensive production methods also place importance on minimal soil disturbance minimizing tilling or soil movement when possible to preserve soil health and structure for long-term soil health benefits. Specialty farm tools designed specifically for these systems are often used to accomplish these production techniques. Farm tools like a broadfork, bed preparation rake, tilther, bed roller, flame weeder, and specialty seeders like a Jang Seeder are all tools that are commonly employed on this production system.

A biologically intensive approach to production not only benefits soil, but also increases yields. The intensive management of beds makes it possible to plant crops closer together because the root systems are able to effectively grow downward into the soil of the bed. The heavily amended soil also helps produce higher yields on less space. Crops are spaced so that their leaves touch each other when the plants reach approximately three-quarters of their full size. Spacing plants closer together decreases weed pressure by covering the growing area of the bed preventing weed germination in-row and between rows. This also has an added benefit by keeping the soil more consistently moist, and protects the crops from weather damage (Fortier 2014).

In contrast, a mechanized system with a tractor planting a 42'' bed top, would commonly plant three rows of carrots to leave room for mechanical cultivation as the crop grows. A biologically intensive market farmer could plant carrots five rows on a 30'' bed top, increasing the yield per acre dramatically while preventing weeds, retaining moisture, and offering some protection of the crop from weather events. The added benefit to this system is efficiency, as this process decreases variable production costs like irrigation and cultivation, and can contribute to a more competitive net profit per bed.

3.3.2 Lean Production to Market Farming

Lean production concepts applied to agricultural firms has been an increasingly popular methodology to create more efficient production systems. The basic goal of lean production is to ruthlessly eliminate waste, which is anything that the customer does not value, from your production systems (Hartman 2015).

Recently, lean production techniques commonly adopted by large production firms has been applied to market farms in order to maximize value and minimize waste. Streamlining production environments with lean techniques is called 5S and stands for sort,

set in order, shine, standardize, and sustain. Farms need to be flexible and adapt quickly to changing environments like the changing landscape of food production and customer needs; which a bloated farm filled with inefficiencies will be unable to accomplish (Hartman 2015). Market farming is a labor-intensive style of production and applying lean production methods with the 5S method will set the stage for efficient production so labor costs can remain at a feasible level to maximize profits.

The identification of waste through the 5S method is the first step in the application of lean production. The next step in the application of lean production is to focus on idenfiying what customers value and how to increase it. Precise identification of value is a central component to a lean production enterprise because if you do not know what your customers value, you won't know which activities are creating value or which are creating waste. If you are wrong about what a customer wants, the result is generally waste. Conversely, the more precise you are in identifying value, in the case of what the customer wants, the more customers you will have with high amounts of loyalty to your firm (Hartman 2015).

Business success is often measured by sales volume, but cutting costs is an equally legitimate way to grow a business and profits. A cost decrease in production is an increase in net profits in production with lean methodology. Cutting costs is a component of lean production, but it is not an end in itself. Lean production's focus is about recognizing what customers value and refocusing efforts to best provide that value. This could be changing production processes, eliminating projects, tasks, or tools that do not add value to your products (Hartman 2015). Market farmers who look to maximize value by eliminating

production waste, unnecessary processes, and deliver what customers value will achieve success and a more competitive bottom line on crops produced for market.

CHAPTER IV: RESULTS

4.1 Capital Budgeting

The capital budget was developed by dividing the capital investments into seven cost categories: greenhouse, propagation, bed preparation & planting, cultivation and irrigation, harvest, post-harvest handling, and marketing and logistics.

4.1.1 Greenhouse

The greenhouse is an upgraded 16 foot by 100 foot gothic-style caterpillar tunnel Farmers Friend LLC kit. The kit utilizes 4' bow spacing that is constructed with 14 gauge steel, wind bracing kit, cross bracing, and a 16 inch lift kit to make the structure taller. The total cost for this kit is $4,180. A dutch-door entrance wall kit and a zipper door end wall kit was also budgeted for the caterpillar tunnel at $990 and $310 respectively. This gives a grower the ease of use to enter through a door at the front of the tunnel, and to easily access the back wall with a zipper wall. Various accessories were budgeted like baseboards with added foam board insulation, lumber and hardware for tables, and climate control accessories like a ventless propane heater with propane tank. A greenhouse is a critical investment for northern growers and additional capital has been allocated to make this structure stronger to handle heavy snow and other weather events. This investment in greenhouse infrastructure gives the farm a capability to propagate seeds in the springtime, expands our ability to produce crops in the shoulder seasons, and produces better crops throughout the regular growing season. The total cost for the greenhouse including accessories and upgrades is $6,889. The greenhouse capital budget is found in Appendix A.

4.1.2 Propagation

The propagation portion of the budget covers any expense required to propagate seeds. This includes expenses for seeding trays, humidity domes, heat mats, hand sowers, seed starting mix, and a small full-spectrum grow light. The year one seed propagation will occur in an indoor setting because the greenhouse has not been purchased. In subsequent years, the front of the greenhouse will be utilized for propagation. The owners have chosen to begin with basic unperforated plastic 1020 trays that hold 50, 72, or 128 cell trays depending on the crops being propagated. Humidity domes were also purchased to help retain moisture and heat required for germination. Investments in propagation systems can be expensive and the owners are still evaluating options for propagation systems and have chosen to begin with a cost effective option of basic plastic trays to get started. The researcher plans to purchase thirty 1020 trays, ten 50 cell trays, 20 72 cell trays, 20 128 cell trays, 10 germination domes, two 20'' by 48'' heat mats, and a Barrina grow light. The total cost for propagation equipment is $1,397. The propagation capital budget is found in Appendix B.

4.1.3 Bed Preparation

The bed preparation categories allocates capital to purchase a BCS walk-behind tractor Model 739 and a tiller implement for $5,035. This tractor is specifically designed for small-scale market farming operations on a 30 inch bed system, and has a vast array of implements that may be purchased to accomplish various farm tasks. Capital allocated to hand tools includes a broadfork for aeration of the soil, a Tilther for mixing in amendments, a 29'' bed preparation rake, and an Earthway seeder. Various other bed preparation equipment purchased includes a 32''x105'' sillage tarp used for bed tarping for weed suppression, trellis netting, steel t-posts, and assorted miscellaneous supplies. Five cubic

yards of compost amendments have also been included here to add a generous amount of compost to the beds to increase soil fertility. The capital budget for bed preparation is looking at the first year for production utilizing a pessimistic cost analysis and will decrease in cost in succeeding years. It is likely that the costs for bed preparation will decrease over time because less soil amendments, materials, and labor will be needed to accomplish bed preparation. The total cost for bed preparation and planting is $6,667. The bed preparation and planting capital budget is found in Appendix C.

4.1.4 Cultivation and Irrigation

The cultivation and irrigation category of the capital budget lists required equipment investments necessary to maintain the crop after planting. Landscape fabric, wire hoops, and floating row cover (Agribond 19) assist in weed maintenance and pest protection throughout the season. Hand tools like stirrup hoes, a tine weeding rake, and a flame weeder are excellent purchases to control weeds. The researcher has decided to invest in drip irrigation and overhead irritation as well because each irrigation system will be used for different crops. For example, summer fruiting crops like tomatoes benefit from root-watering achieved with drip irrigation, whereas greens and bunched roots benefit from overhead irrigation because it cools the plant in the summertime. Four-inch mainline irrigation with valves and emiters, drip line, various commercial grade hoses, nozzles, and fittings have all been budgeted. A dual-outlet electronic timer will assist with the labor required to monitor irrigation amounts daily. The capital budget for cultivation and irrigation does not explicitly include a water cost in the analysis, but water costs may be applicable depending on the location of the market farm and the water source being utilized by the farm. Front Porch Farms will utilize well water with no water cost allocated in the

capital budget. The total cost for cultivation and irrigation is $2,198. The cultivation and irrigation capital budget is found in Appendix D.

4.1.5 Harvest

The harvest category of the capital budget includes a harvest knife, harvest bins from Costco, 9'' black bulb crates, rubber bands, and a Quick-cut greens harvester. The Costco black and yellow bins are cheap, durable, stackable, and are perfect size to move when full of produce like greens. Additionally, they retain moisture which is beneficial for some crops like greens and bunched roots. Drainage holes will be drilled in each bin to prevent excess water from building up in the bin. The 9'' bulb grates are an popular option to store crops like tomatoes, peppers, cucumbers, garlic, and onions. Extra capital was invested in a Quick-cut greens harvester from Farmers Friend, LLC because of its labor savings it provides to harvest greens. The researcher felt this was a necessary purchase because of the large volumes of greens that will be produced and the cost of labor to harvest greens is very high. This piece of equipment is expensive, but it saves hours of harvest time for each bed of greens. The total cost for harvest is $933. The harvest budget is found in Appendix E.

4.1.6 Post-Harvest Handling

Post-harvest handling is a category that is often "bootstrapped" on small-scale farms because the costs to build a professional washing and packing station for vegetables is very expensive. There has been much work developed as of late to assist small farms with creating infrastructure and adopting technologies that accomplish these tasks with smaller amounts of capital required. Much of this information can be found on internet sources for small farms and through various cooperative extension services.

Farms who choose to produce greens must take extra care to wash and pack these products correctly in order to produce a high-quality product and achieve a competitive price point at markets. Building a "greens spinner" out of a refurbished washing mashine is one of those pieces of infrastructure that can be built on modern market farms. A greens spinner is nothing more than a washing machine that has been deconstructed with a switch added to turn the unit on and off of spin cycle. Greens are washed in a stock tank, collected in a perforated plastic basket, set into the washing machine, and spun for approximately one minute. This successfully spins a majority of the excess water and field debris off the greens which helps in the longevity of the bagged greens for customers. Greens can further be dried by laying the recently spun crop onto a drying rack. The drying rack is nothing more than a framed rectangle of 2x4s with ½'' wire mesh on top. An identical shelf above the mesh drying rack holds two standard fans which blow air downward onto the greens further drying them and creating a highly shelf-stable product. With some ingenuity, these systems can be built and help increase the value of your product by increasing cleanliness, longevity, and quality of bagged greens.

A root spray station can be constructed similarly as a greens drying station by constructing a rectangular frame out of 2x4's with ½'' wire mesh stapled on top. This frame can then be set ontop of saw horses to allow a grower to spray off root vegetables with a hose.

A packing station was budgeted by allocating capital for a stainless steel table, digital scale, bag taper, and bags to fit the washed greens. This area is the final prep area for the finished crop before it goes into the cooler.

Small farms must have a refrigerator or cooler to keep the recently washed and packed produce cool and at a steady temperature for markets. Walk-in coolers can be built and a window air conditioning unit can be installed with a CoolBot System attached. A CoolBot is a system that tricks the air conditioning unit into thinking that it is warmer inside the area than it actually is allowing a window air conditioning unit to cool a space down to much cooler temperatures. These systems can keep a room in the upper thirties when the room is properly insulated. The researcher has decided to not build a walk-in cooler due to space constraints. Instead, a used commercial refridgerator will be purchased to store crops. These coolers can be found in second-hand markets like Facebook Marketplace or Craiglist for under $1000 and will hold enough produce that a beginning market farmer can produce. The total cost for an initial wash and pack station for post-harvest handling is $2,881. The post-harvest budget can be found in Appendix F.

4.1.7 Marketing and Logistics

The final category is marketing and logisitics and includes capital allocated for wax boxes, produce bags, and 100 quart coolers with ice packs for market transportation. This category also includes equipment to operate a stand at a farmers' market like tents, foldable tables, table covers, grocery bags, sidewalk chalkboard, a canvas sign with farm logo, markers, cashbox, and various other items. The total cost for marketing and logistics is $1,427. The marketing and logistics budget can be found in Appendix G.

4.2 Enterprise Budget

Enterprise budgets were created for five crops in this analysis to determine estimated profitability after fixed and variable costs are considered. Retail at farmers' markets and wholesale to restaurants were analyzed to estimate returns in these two different markets.

4.2.1 Carrot

Each crop has 15 minutes allocated for bed preparation which includes removal of any old crops, shaping, forming, and marking beds if needed. Carrots are a root vegetable, so broadforking must occur to aerate and loosen the soil for the root crop to grow successfully. Carrots have a notoriously long germination time of 10-14 days which make weed pressure a concern, especially early in the season when weed pressure is highest. Therefore, special emphasis will be placed on weed control with this crop. Pre-plant flame weeding will be conducted to kill any weeds at the soil surface. A generous portion of compost will be added to the bed and will be incorporated with either a tilther or bed preparation rake. Bed preparation is estimated to take approximately 55 minutes.

The crop will then be direct seeded into the bed in five rows. The crop will immediately be irrigated with overhead irrigation until the soil is damp. A sillage tarp will be laid over the recently seeded and irrigated bed if weeds begin to germinate. This will prevent the weeds from establishing while the carrot seed lays dormant waiting to germinate. When carrots begin to germinate the tarp will be removed. This growing process is called a stale seedbed. Forty minutes has been estimated to complete seeding.

Special emphasis has been placed on setting up a weed-free bed with flame weeding and tarping, so cultivation of the beds should be less frequent. One set of in-row hand weeding and between row cultivation has been estimated. Two five minute sessions of pest and disease scouting has been estimated. The crop will be irrigated three times per week and will be managed with a digital timer. Cultivation and irrigation is estimated to take 85 minutes for this crop.

Harvesting the entire bed of carrots is estimated to take 90 minutes. This includes picking the carrots and organizing into bunches of seven and placing a rubber band around

the stems of the crop. Washing and packing is very simple and is accomplished by spraying the roots on the root washing station, placing into a black crate, and storing in the cooler. Harvesting, washing, and packing is estimated to take 140 minutes for the entire bed. The total labor allocated to produce a 50' bed of carrot is 5 hours and 25 minutes. Labor for the farm is calculated at $50 per hour, which includes two employees paid at $15 per hour and a manager at $18 per hour. The total estimated labor cost to produce a bed of carrots is $262.

Management costs for the farm are being calculated as a return to management instead of a per bed cost. The category was created on the enterprise budget if management decides to calculate this cost per bed. Materials costs consist of seeds, compost, rubber bands, and propane for flame weeding for a total estimated cost of $34.

Wholesale marketing costs include one hour for delivery. The farm will not be making deliveries for wholesale if the customer is greater than 30 minutes away. Mileage rates were calculated at the current federal per diem which is $0.58 per mile. Retail marketing is not included for any of the crops. This is because retail costs at farmers' markets are unable to be allocated to just one crop because a diverse offering of crops will be brought to market. Retail marketing costs will be calculated as a per market basis to operate a booth at market and will be subtracted from the total profit received that day at market.

Fixed costs will remain the same for all crops discussed. Land is estimated at $5,000 per acre. There are approximately 237 50' beds possible in an acre of land. Each bed will cost approximately $21 in fixed land costs. The beds per acre are also divided into

the total cost for property taxes and organic certification which is $12 and $5 respectively. Additional fixed costs can be allocated here as the farm grows its operation.

The estimated yield for a bed of carrot is 150 bunches with the price of a bunch of carrots sold in wholesale at $2.50 and at retail for $3.50 in West Michigan markets. The gross returns for wholesale per bed is $375 and retail gross returns are $525. Wholesale total costs are $365 with a net return of $9 and retail total costs are $335 with a net return of $189. The enterprise budget for carrots can be found in Appendix H.

4.2.2 Greens Mixes

Greens mixes on the farm will be directly seeded into the beds after bed maintenance, broadforking, and an application of compost and amendments has occurred. The labor minutes needed to complete these tasks is 70 minutes. Following the direct seeding of the crop in five rows, the crop will immediately be irrigated with overhead irrigation until the soil is damp approximately 1'' sub-surface. Greens tend to germinate faster than carrots so tarping is excluded for this crop. Pre-emergence flame weeding is an option for this crop depending on weed pressure, but is not included in the enterprise budget at this time. Hand cultivation will primarily be used to upkeep the in-row and between row weeds. The crop will be cultivated 3 times for 15 minutes each to maintain weed pressure in the bed. The crop will be irrigated once per week for 15 minutes for four weeks until harvest. Irrigation, cultivation, and scouting for greens is estimated to take 100 minutes. The total estimated labor costs to produce a bed of greens is $283.

Greens mixes can be harvested multiple times per planting. It is typical that for one planting of greens, 3 harvest can take place on that single planting. Yields tend to decrease in the 2nd and 3rd harvest from the bed, but a significant marketable yield is still possible from each of these harvests. A mechanical greens harvester significantly reduces the time

needed to harvest the bed of greens compared to hand-cutting the entire bed. Harvest time has been estimated to take 15 minutes for each harvest for a total of 45 minutes of harvest time per bed. Washing, packing, and storing the crop for market is estimated to take 100 minutes in total for the three harvests.

The materials costs for planting a bed of greens is approximately $10 for seeds, $10 worth of feathermeal fertilizer, $25 for compost, and $10 for bags. The total materials cost for a 50' bed of greens is $53.

It is estimated that the total marketable yield of a bed of greens harvested three times is 150 pounds of greens mix with the price of a pound of greens in wholesale at $6.50 per pound and at retail for $10 per pound. The gross returns for wholesale per bed is $975 and retail gross returns are $1500. Wholesale total costs are $409 with a net return of $565 and retail total costs are $382 with a net return of $1,117. The enterprise budget for carrots can be found in Appendix I.

4.2.3 Head Lettuce

The performance of greens mixes tend to decline in the hot summer months, and heat tolerant head lettuce varieties can be grown in these months successfully to ensure a continual lettuce supply throughout the year. Head lettuce is a versatile crop that can be harvested whole, or cut multiple times to create another type of greens mix. For this enterprise budget analysis, head lettuce profitability will be evaluated on a per head basis instead of a per pound basis like in a greens mix.

Bed maintenance, compost additions, and bed preparation are the same as greens mixes except for broadforking and is estimated to take 55 minutes. The difference with head lettuce production compared to greens is the requirement to start the crop in a greenhouse, the maintenance of that seedling, and the transplant of that seedling instead of

directly seeding into the bed. It is estimated that this will take 70 minutes total to complete the propagation of the crop and transplant it into the bed.

Head lettuce is also unique because this crop can easily be transplanted into a bed with little preparation of the bed itself. The lettuce plant has already germinated, and quickly grows without much hand cultivation or weed pressure. A quick 10 minute cultivation has been estimated to maintain the crop as well as 20 minutes for irrigation set-up. Harvest is also very quick with one cut at the plant's stem, a bed of head lettuce can be harvested in 30 minutes. Wash and pack consists of a submersion in a stock tank of cold water, a scrub of the root where the plant was cut, and storage into a container to maintain freshness. The crop is stored in the cooler until it is time for sale.

The estimated yield for a bed of head lettuce is 150 heads with the price of a lettuce head sold in wholesale at $2.50 and at retail for $3.50 in West Michigan markets. The gross returns for wholesale per bed is $375 and retail gross returns are $525. Wholesale total costs are $360 with a net return of $14 and retail total costs are $334 with a net return of $190. The enterprise budget for carrots can be found in Appendix J.

4.2.4 Sweet Peppers

Sweet peppers are a long season crop with only one opportunity for a planting per year in northern climates like Michigan. The crop is often started indoors or in a greenhouse early in the year because it is a warm season crop that prefers warm to hot temperatures. A single plant can produce many peppers throughout a growing season, and a grower can choose whether or not to harvest the pepper based on desired ripeness. Colored or more ripened peppers tend to be more popular at markets; prized for their flavor and exotic colors.

Peppers are classified as a summer fruit on the farm with the majority of the labor cost to produce this crop occurring in the propagation, bed preparation, and harvest stage of the production. Peppers are propagated indoors as early as January or February in Michigan. Seedlings are sowed and "potted-up" throughout the seedling's life cycle prior to planting in the field. This process involves taking the seedling and placing it in a larger cell tray with fresh potting soil medium to feed it a fresh set of nutrients and allow the root system to expand and the plant to grow larger. Greenhouse seeding has been estimated to take 135 minutes of labor.

Bed preparation for this crop is also more extensive. Bed maintenance is conducted like in the other crops, as well as compost and fertilizer applications. There is an additional step to successfully plant this crop which is laying landscape fabric down over the bed with drip irrigation running underneath the fabric. Holes are pre-cut cut into the fabric in which the pepper plants will be planted into. The landscape fabric suppresses weeds for this long season crop, and helps retain consistent moisture by acting as a form of mulch. A simple trellis system is then constructed out of t-posts and baling twine to support the pepper plants as they produce fruit. The total time estimated for these tasks is 190 minutes.

Harvest will take place over 6 weeks for 30 minutes each week for a total estimated harvest time of 180 minutes. Peppers are not washed, but are wiped down with a damp cloth for better presentation at markets if necessary. Peppers are then stored in a refrigerator prior to sale at markets. Post-harvest handling is estimated to take 40 minutes.

The estimated yield for a bed of sweet peppers is approximately 1500 pounds with the price of the peppers sold in wholesale at $0.80 per pound and at retail for $1.25 each in West Michigan markets. The gross returns for wholesale per bed is $1,200 and retail gross

returns are $1,800. Wholesale total costs are $805 with a net return of $394 and retail total costs are $779 with a net return of $1,020. The enterprise budget for peppers can be found in Appendix K.

4.2.5 Heirloom Tomatoes

Production of heirloom tomatoes is similar to the production of sweet peppers with labor costs greater in propagation, bed preparation, and harvest. Tomatoes are propagated at the same time as peppers indoors. The plants are potted-up as the plant grows to allow for size and root expansion of the plant. The estimated labor time to propagate tomatoes is 165 minutes.

Bed preparation is exactly the same as sweet peppers with heavy additions of compost and fertilizer added because the crop is a long season crop and requires additional nutrients to produce for multiple weeks. After the bed is prepared with nutrients, a drip tape emitter to retain moisture and control weeds is added and landscape fabric is laid over the bed. Tomatoes benefit greatly from being grown in a greenhouse compared to field production but are set up similarly in both. Indeterminate and determinate tomatoes will require a trellis system for the tomato to produce successfully over multiple weeks. A field trellis system can be built simply with t-posts and baling twine like in sweet peppers. The difference is tomatoes will require more trellising because they will continue to vine upwards as the season progresses. Tomatoes also benefit from pruning because excess leaves will cause fruit and foliar disease to form which will negatively affect marketable yields. The total time required for bed preparation, planting, trellis set-up, and weekly trellising is 235 minutes for a 50’ bed of tomatoes.

Harvest of heirlooms tomatoes occurs over multiple weeks throughout the season and will be a significant portion of labor cost to produce this crop. The benefit of tomatoes

is there is no washing required, and can be harvested right into trays that go to market. Tomatoes can be polished with a damp cloth to increase marketability, and are stored at room temperature prior to market. The total time estimated to harvest and conduct post-harvest handling is 250 minutes for a 50' bed throughout the production of the crop.

The estimated yield for a bed of heirloom tomatoes is approximately 1250 pounds with the price of the heirloom tomatoes sold in wholesale at $2.00 per pound and at retail for $3.00 in West Michigan markets. The gross returns for wholesale per bed is $2,500 and retail gross returns are $3,750. Wholesale total costs are $845 with a net return of $1,654 and retail total costs are $818 with a net return of $2,913. The enterprise budget for heirloom tomatoes can be found in Appendix L.

4.2.6 Net Margin Comparison: Retail vs. Wholesale

The research showed important implications regarding profitability between the two different marketing options for market farmers. Retail markets have considerably greater opportunities for profitability based on net margins of returns in each of the five crops studied. Net margin is calculated by dividing the net return by the gross return to show the profit margin after costs of production are considered. The net margin in a retail setting for each crop of carrot, greens mixes, head lettuce, sweet pepper, and heirloom tomato are 36.05%, 74.50%, 36.30%, 56.70%, and 78.17% respectively. In contrast, the net margin in a wholesale setting for each crop of carrot, greens mixes, head lettuce, sweet pepper, and heirloom tomato are 2.61%, 58.05%, 3.75%, 32.84%, and 66.20% respectively. Comparivately, net margin analysis demonstrates the greater earning potential in retail markets compared to wholesale markets. However, we also must consider that retail sales require more customer engagement, labor, and sales are not always guaranteed. In contrast,

wholesale options for market farms give the producer more control because high-volume channels offer increased efficiency in harvest, production processes, and sales.

4.2.7 Return on Investment

Analyzing the costs associated with beginning a market farm and the potential annual cash returns of the enterprise can be used to determine the financial feasibility of an operation. There are different ways to approach setting up a market farm and capital expenditures could exceed this capital budget or conversely be less dependent on the producer, infrastructure, and land the producer has available, as well as a myriad of other factors. It is important to note that the capital budgeting portion of the analysis is constructed with the minimum requirements to produce a marketable product based on markets in West Michigan. Additionally, the enterprise budgets were constructed with the initial costs of production to begin a market farm based upon year one costs and conduct a pessimistic analysis on the costs of production. The production methods of market farming are oriented toward a higher initial cost in the beginning stages of production with bed establishment, heavy soil amendments, and higher labor allocated to managed weeds, pests, and diseases. However, it is likely that costs of production will decrease year over year and enterprise budgets can be adjusted and compared as farm ecology and production systems are improved.

The total capital expenditures required in the case study for Front Porch Farms to begin a market farming enterprise is $21,991. This amount is the bare minimum for the farm to begin operations and start selling products through retail or wholesale outlets.

4.2.8 Return on Investment: Retail

Optimisitc and pessimistic return on investment analysis can be conducted to determine returns in year one. There are crops that can be planted and harvested multiple

times per year like carrots, greens, and head lettuce. Additionally, larger successions of these crops can be planted at one time. For example, multiple 50' beds of carrots, greens, and head lettuce can be planted at once for multiple weeks throughout the season depending on market demand. However, the same is not true for crops in the analysis like sweet peppers and heirloom tomatoes with only a few successions possible in northern growing regions. Greens mixes are in high demand to customers at farmers' markets and also yield a higher net return of $1,117. An optimistic analysis of the potential earnings for a bed of greens that can be planted every week in the initial period of the growing season from April through May and again August and September. This gives approximately 16 weeks of greens mixes to offer customers at farmers' markets. The potential earnings for this crop planted each week for 16 weeks where 150 pounds of greens are sold each week is $17,872. This however, is a very audacious goal but the potential for earnings are there if market demand is strong and good systems of production are established. It is likely that this amount will be much more pessimistic, especially in the early years of the farm where systems are still being built and labor saving equipment is being purchased with net returns being reinvested back into the operation. A pessimistic estimate of the potential earnings could be 150 pounds sold per month over the same 16 week period where greens mixes can be produced. The total estimated earnings in a pessimistic view for greens is $4,468.

Greens mixes have a high earning potential, but a crop like carrots has a much less earning potential per bed compared to greens mixes with a retail net return of $189. Additionally, this crop is unable to be planted in as many successions as greens because greens have a much shorter days to maturity usually between 30 and 40 days. Carrots have a much longer days to maturity with 60-70 days, but can be grown throughout the regular

growing season of April through October in Michigan. An optimistic analysis of the potential earnings for carrots in a retail market is calculated by taking the first plant date of April 15th and adding 60 days which is a June 15th harvest date. Successions of carrots are planted each week through August 15th. This gives a producer the potential to sell 150 bunches of carrots over a 16 week period (June 15th through October 15th). The optimistic analysis for potential carrot earnings is $3,024. The pessimistic analysis for carrot earnings is calculated the same as greens with 150 bunches sold per month over the same 4 month period. The total profit for carrot in a pessimistic analysis is $756.

Greens mixes, heirloom tomatoes, and sweet peppers yield a higher net return than carrots and head lettuce. It is likely that an optimal crop mix will be developed where there is sufficient supply of all of these crops at a farmers' market regardless of net returns to the producer because customers enjoy all five crops in the analysis. If one 50' succession of heirloom tomatoes and sweet peppers are grown, and a pessimistic net return is used for greens mixes, carrot, and head lettuce, a year one estimated net return can be calculated. Head lettuce is calculated the same as greens and carrots with a net return of $190 every 4 weeks. Pessimistic returns for the five core crops are carrots at $756, greens at $4,468, sweet peppers at $1,020, heirloom tomato at $2,931, and head lettuce at $762. The total net return for the core group of crops is $9,937.

The potential return on investment in year one with a pessimistic analysis is $9,937 with an initial capital requirement of $21,991. The year one return on investment is 45.19% with a pessimistic analysis of net returns in a retail market setting.

The potential return on investment in year one can be calculated with an optimistic analysis as well. Optimistic returns for the five core crops are carrots at $3,024, greens at

$17,872, head lettuce at $3,048, sweet peppers at $1,020, and heirloom tomatoes at $2,931. The total net return for the core group of crops with an optimistic net return analysis is $27,895. The year one return on investment with an optimistic net return analysis is 126%.

4.2.9 Payback Period

The payback period for the initial capital investment can be calculated by taking the total capital investment required to begin a market farming operation over the pessimistic and optimistic annual net return in year one. A pessimistic payback period for year one is calculated by dividing $9,937 into the capital investment of $21,991 for a payback period of 2.21 years. An optimistic payback period for year one is calculated by dividing $27,895 into the capital investment of $21,991 for a payback period of 0.78 years.

4.2.10 Management Considerations

The results of the return on investment and payback period analysis are constructed considering a strong management skill in this style of production system and a strong production background in fresh-market, diversified vegetables. Management is an extremely important component of the potential earnings of enteprises on a market farm. This is primarily due to the perishable nature of the products grown, and the difficulty of managing the needs of multiple different crops types at once throughout a growing season. Success in production will involve a thorough understanding the crop biology of each crop grown, constructing efficient systems to manage diversified production, and through active management of the crops and market customers.

4.2.11 Literature Review Comparison

In a comparison with recent research about the profitability of market farming, the results showed similarities in estimated returns and the costs of production. In the literature, “Market Farming Success” by Lynn Byzinksi, she discussed a market farm with fewer than

three acres that is oriented on intensive vegetable production of high-dollar crops like heirloom tomatoes and greens mixes can earn $20,000 to $35,000 per acre depending on management and skill of the grower. These two crops were evaluated by the researcher and achieved similar results with greens mixes and heirloom tomatoes as high-dollar crops earning approximately $1,117 and $2,931 respectively. As discussed, it is likely a producer will grow a mix of high-value crops and less profitable crops to satisfy customers at markets.

The capital budget for the research was significantly lower than the research conducted in the Biermacher article. This is likely due to a focus by the researcher on the basic equipment, materials, and labor necessary to produce a marketable product. There are more costly options that could have been included in the capital budget for investments in propagation equipment systems, greenhouse technologies, wash and packing equipment upgrades, specialty seeders, and market transportation. However, it was important to this research that costs were minimized to demonstrate a minimal amount of capital necessary to begin an operation. It is likely that market farms will re-invest earnings back into the business to upgrade equipment, systems, and infrastructure in the first years of production.

CHAPTER V: SUMMARY AND CONCLUSIONS

The owners of Front Porch Farms needed to quantify the beginning capital costs to begin a market farming operation producing fresh market produce and marketing the products directly to consumers in West Michigan.

In order to analyze the required equipment, infrastructure, and materials necessary to produce a marketable product a capital budget was developed. The capital budget was divided into seven categories: greenhouse equipment investment, propagation, bed preparation and planting, cultivation and irrigation, harvest, post-harvest handling, and marketing and logistics. The total minimum capital investment required is $21,991.

Enterprise budgets for a core group of crops were developed to quantify the costs to produce each crop in the selected group of crops and to determine profitability. The crops analyzed are: carrot, greens mixes, head lettuce, sweet peppers, and heirloom tomato. Labor costs, material costs, and marketing costs were analyzed to produce a standard unit of production on the farm which is a bed measuring 30'' by 50'. The gross returns were then calculated by taking the estimated yield per bed for each of the crops and subtracting the costs of labor, materials, and marketing to achieve an estimated net return for retail and wholesale markets.

A pessimistic and optimistic net return was used for each of the five crops to determine a return for year one in production. The estimated pessimistic net return of the five crops in year one is $9,937. The initial capital requirement to begin the operation is $21,991. The year one pessimistic return on investment is 45.19% with a payback period of 2.21 years. The estimated optimistic net return of the five crops in year one is $27,895. The year one optimistic return on investment is 126% with a payback period of 0.78 years.

The profitability analysis has helped the owners determine that investing capital to begin a market farming operation will be conducted. A pessimistic return on investment for year one of 45%, and is a good initial return for starting a business. Additionally, the amount of capital to begin the venture is small compared to other agricultural endeavors and will allow the owners to begin the operation with no debt obligations and overall less risk which are important considerations for the owners.

The implications for farmers, policymakers, researchers, and others involved in agriculture is that beginning farmers have economically sound ways to begin their business and careers as market farmers. Market farms have the ability to scale effectively from very small acerage, and with minimal capital investments allowing a producer to make a decent return in the initial years of beginning an operation. The methods to successfully farm diversified vegetables, fruits, and other crops take time to learn and build systems, but the opportunity to create a financially and economically viable farming operation is possible with less risk than various other agricultural endeavors.

Further research can be conducted on market demand for products, product pricing, estimated yield per bed, market segmentation of urban versus rural buyers, and feasibility of scale of these operations with mechanization. Perishability, or shrinkage, will effect the costs of production and overall profitability. The impact of perishability should be included as a perishability factor in future enterprise budget systems. In addition, considerations of water or pumping costs could be allocated to budgets as well depending on the particular area of production. Front Porch Farms will be conducting further research utilizing the enterprise budget system as the building blocks to create a whole-farm profitability plan. The basic premise of the whole-farm profitability plan is to determine annual profitability

based on the amount of beds planted of each crop grown at the farm. For example, if multiple beds are planted of a crop at once, and multiple successions of that crop are grown throughout the year, the farm can then determine an estimated total profit for that production year considering crop grown. The whole-farm plan will be a summary of the total production to be carried out and the required resources to do so. The development of a whole-farm plan will result in a farm that will increase profits and is more positioned to accomplish other goals of the firm through effective economic and financial planning and management.

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APPENDIX A

Greenhouse Capital Budget

Propagation House Budget					
Unit	**Cost/Unit**	**Units**	**Total**	**Source**	**Description**
Propagation & Production House - 100' Option					
100' Gothic Pro	$ 4,180.00	1	$4,180.00		100' Gothic Pro, 4' spacing, 14ga steel, wind bracing, lift kit, cross-bracing.
Dutch-Door End Wall Kit	$ 990.00	1	$ 990.00	https://www.farmersfriend.c	Polycarbonate doors, aluminum tubing, 48" wide for BCS, All metal, fits all caterpillar tunnels.
Zipper Door End Wall	$ 310.00	1	$ 310.00	https://www.farmersfriend.com/zipper-door-end-wall-kit	
	Subtotal:		$5,480.00		
Additional House Construction					
Baseboards	$ 12.00	20	$ 240.00	https://www.menards.com/m	2x10' baseboards (10 on each side of house)
Baseboard Foam Board Insullation	$ 14.88	10	$ 148.80	https://www.menards.com/m	Foam Board Insullation for the inside of the baseboard
	Subtotal:		$ 388.80		
Propagation Tables					
Lumber to Build Tables (Est)	$ 250.00	1	$ 250.00		2x4x8 with cylinder blocks or wood legs.
Hardware to Build Tables (Screws etc)	$ 50.00	1	$ 50.00		
Cylinder Blocks for Table Legs	$ 1.50	12	$ 18.00		
	Subtotal:		$ 318.00		
Climate Control					
30,000 Btu Vent Free Radiant Propane Heater	$ 271.18	1	$ 271.18	https://www.mrheater.com/3	Free standing or wall-mountable heater powered by propane or natural gas. Optional Blower.
Heater Optional Blower	$ 32.58	1	$ 32.58	https://www.amazon.com/Mr-Heater-Vent-Free-Accessory-2016-present/dp/B01DGWAUA8	
AcuRite Temperature and Humidity Station with	$ 69.99	1	$ 69.99	https://www.cabelas.com/sh	Sensor and Alarm to monitor heating for shoulder seasons.
Steel 100lb Propane Tank	$ 179.00	1	$ 179.00	https://www.menards.com/m	100lb tank to supply heat to heater element.
Propane for Tank ($1.50/ga)	$ 1.50	100	$ 150.00		
	Subtotal:		$ 702.75		
Propagation House Total:			$6,889.55		

APPENDIX B

Propagation Capital Budget

Propagation					
Unit	**Cost/Unit**	**Amount**	**Total**	**Source**	**Description**
Seed Starting Equipment					
1020 Tray	$ 1.49	30	$ 44.70	Local Store	1 Tray each
50 - Cell Seed Starting Tray	$ 1.99	10	$ 19.90	Local Store	1 Tray each
72 - Cell Seed Starting Tray	$ 2.49	20	$ 49.80	Local Store	1 Tray each
128 - Cell Seed Starting Tray	$ 1.99	20	$ 39.80	Local Store	1 Tray each
1020 Germination Dome	$ 2.29	10	$ 22.90	Local Store	1 Tray each
Seed Hand Sower	$ 4.65	1	$ 4.65	https://www.johnnyseeds.com/tools-su	Hand Sower
Seed Starting Heat Mat 20x48	$ 65.99	2	$ 131.98	https://www.amazon.com/VIVOSUN-x	Heat Mat
Grow Light	$ 140.00	1	$ 140.00	https://www.amazon.com/dp/B08VJ4X	Barrina 2000 LED Grow Light Full Spectrum
		Subtotal:	$ 453.73		
Initial Seed Costs					
Garlic Seed	$ 325.00	1	$ 325.00		Garlic Seed Stock Order
Vegetable Seed	$ 398.82	1	$ 398.82		Initial Seed Order
Potato Order	$ 131.18	1	$ 131.18		Potato Order
					Est. Seed Costs for remainder of 2022
	Subtotal:		$ 855.00		
Soil and Amendments for Propagation					
2 cu bag of seed starting soil	$ 16.99	5	$ 84.95		Fox Farms Potting Mix
	Subtotal:		$ 84.95		
Propagation Total:			$ 1,397.00		

APPENDIX C

Bed Preparation and Planting Capital Budget

Bed Preparation						
Unit	**Cost/Unit**	**Amount**	**Total**	**Purhased**	**Source**	**Description**
Mechanized Equipment						
BCS Tractor	$ 4,198.50	1	$ 4,198.50	No	https://www.bcsamerica.com/build-your-bcs	Model 739. Honda 11HP Engine expands to almost all BCS attachments.
30" Rear-Tine Tiller Implement	$ 837.00	1	$ 837.00	No	https://www.bcsamerica.com/build-your-bcs	
	Subtotal:		$ 5,035.50			
Hand Tools						
Gulland Forge Broadfork	$ 235.00	1	$ 235.00	Yes	https://www.gullandforge.com/shopping_cart.html	Gulland Forge Bertha Broadfork
Bed Preparation Rake	$ 98.24	1	$ 98.24	Yes	https://www.johnnyseeds.com/tools-supplies/bed-pr	Creates perfect seedbeds for successful precision planting
Earthway Seeder	$ 132.99	1	$ 132.99	Yes	https://www.earthway.com/shop/1001-b-precision-garden-seeder/	
Tilther	$ 649.00	1	$ 649.00	No	https://www.johnnyseeds.com/tools-supplies/bed-pr	Incorporates compost and other amendmments into bed
	Subtotal:		$ 466.23			
Other Growing Equipment						
Sillage Tarp - 32' x 105'	$ 295.00	1	$ 295.00	No	https://www.farmersfriend.com/products/weed-man	Sized to fit a 16' or 30' greenhouse + 100' long
Hortonova Trellis Netting 59"x 328"	$ 79.99	1	$ 79.99	No	https://hosstools.com/product/hortonova-trellis-netting-59-x-328/	
T-Posts - 6'	$ 4.79	12	$ 57.48	No	https://www.tractorsupply.com/tsc/product/studded-t-post-6-ft-125-lb-per-foot	
Assorted Misc. Supplies	$ 250.00	1	$ 250.00	No		
	Subtotal:		$ 682.47			
Compost						
Morgan's Compost 5cu yd	$ 483.00	1	$ 483.00	Yes		5 cu yards delivered
	Subtotal:		$ 483.00			
Bed Preparation Total:			$ 6,667.20			

APPENDIX D

Cultivation and Irrigation Capital Budget

Cultivation & Irrigation						
Unit	**Cost/Unit**	**Amount**	**Total**	**Purhased**	**Source**	**Description**
	Cultivation					
Landscape Fabric 4' x 300'	$ 123.00	1	$ 123.00	No	https://www.farmersfriend.com/products/weed-management/ground-cover/buy	
3.5" Stirrup Hoe	$ 58.00	1	$ 58.00	No	https://www.johnnyseeds.com/tools-supplies/weed-control/3%C2%BC%22-stirrup-hoe-9489.html?cgid=weed-control#star	
5" Stirrup Hoe	$ 60.50	1	$ 60.50	No	https://www.johnnyseeds.com/tools-supplies/weed-control/5%22-stirrup-hoe-9500.html?cgid=weed-control#start=1	
Tine Weeding Rake - 21"	$ 43.20	1	$ 43.20	No	https://www.johnnyseeds.com/tools-supplies/weed-control/tine-weeding-rake-21%22-7407.html?cgid=weed-control#start=	
Flame Weeder	$ 780.00	1	$ 780.00	No	https://www.farmersfriend.com/products/weed-management/pyroweeder-flame-weeder	
	Subtotal:		$ 1,064.70			
	Irrigation					
3"x50' lay flat hose	$ 62.99	1	$ 62.99	No	https://www.agrisupply.com/pvc-discharge-hose/p/48554/?utm_source=bing&utm_medium=cpc&utm_campaign=NB_PLA	
Drip Irrigation Tubing - 250'	$ 77.99	1	$ 77.99	No	https://www.agrisupply.com/gator-drip-kit/p/82863/	
Overhead Irrigation Unit	$ 40.00	4	$ 160.00	No	Trickel-eez	
Commercial Garden Hose - 3/4x75'	$ 60.00	4	$ 240.00	No	https://gilmour.com/products/hoses/professional-grade-hoses/professional-farm-ranch-hose-2990	
Assorted PVC fittings, nozzles, etc	$ 150.00	1	$ 150.00	No	Hardware store	
Dual Outlet Electronic Water Timer	$ 38.49	1	$ 38.49	No	https://www.amazon.com/Gilmour-804014-1001-400GTD-Outlet-Electronic/dp/B00IJG4EPO?ref_=ast_sto_dp&th=1&psc	
	Subtotal:		$ 729.47			
	Other					
Floating Row Cover (Agribond 19) 8	$ 16.95	5	$ 84.75	No	https://www.johnnyseeds.com/tools-supplies/r	Insect & Frost Protection
76" Wire Support Hoops (100 ct)	$ 135.00	1	$ 135.00	No	https://www.johnnyseeds.com/tools-supplies/r	Used to create floating row covers
Row Cover Hand Peg (250 ct)	$ 185.00	1	$ 185.00	No	https://www.johnnyseeds.com/tools-supplies/r	Anchor pin for row covers
	Subtotal:		$ 404.75			
	Total:		$ 2,198.92			

APPENDIX E

Harvest

Harvest						
Unit	**Cost/Unit**	**Amount**	**Total**	**Purhased**	**Source**	**Description**
	Cultivation					
Harvest Knife	$ 9.00	1	$ 9.00	Yes	https://www.johnnyseeds.com/tools-supplies/harvesting-tools/harvest-knives/victorinox-serrated-knife-9634.html	
Harvest Bins	$ 6.99	20	$ 139.80	Yes	https://www.costcobusinessdelivery.com/Plastic-Storage-Bin-with-Lid%2c-27-Gallon%2c-Black-and-Yellow.product.1	
Quick-cut Greens Harvester	$ 560.00	1	$ 560.00	No	https://www.farmersfriend.com/quick-cut-greens-harvester	
9" Bulb Crates	$ 6.00	30	$ 180.00	No	https://www.fedcoseeds.com/ogs/9-bulb-crate-with-full-sides-9362	
Rubber Bands	$ 15.00	3	$ 45.00	No	https://www.fedcoseeds.com/ogs/rubber-bands-9334	1# bag. 425/#
	Subtotal:		$ 933.80			
	Total:		$ 933.80			

APPENDIX F

Post-Harvest Handling

Post Harvest Handling & Washpack						
Unit	**Cost/Unit**	**Amount**	**Total**	**Purhased**	**Source**	**Description**
Greens Tank						
100 gal. Rubbermaid Stock Tank	$ 92.99	1	$ 92.99	No	https://www.tractorsupply.com/tsc/product/rubberm	Greens Bubbler/Dunk Tank
Hudson Valve for Stock Tank	$ 27.95	1	$ 27.95	No	https://www.amazon.com/Hudson-Valve-Tank-Liv	Auto-stop for filling
Jacuzzi motor (Greens Bubbler)	$ 172.32	1	$ 172.32	No	https://www.amazon.com/Air-Supply-Silencer-Portable-Horsepower/dp/B0037TOTQM	
Misc. PVC	$ 100.00	1	$ 100.00			
	Subtotal:		$ 393.26			
Greens Spinner						
Whirlpool Washing Mashine (Greens	$ 598.00	1	$ 598.00	No	https://www.homedepot.com/p/Whirlpool-4-3-cu-f	Spins greens after greens washing
Greens Spinner Timer	$ 17.48	1	$ 17.48	No	https://www.lowes.com/pd/TORK-Timers-Mechanical-Countdown-Lighting-Timer/1000341259	
Wetatherproof Electric Box	$ 4.38	1	$ 4.38	No	https://www.lowes.com/pd/Sigma-Electric-1-Gang-Weatherproof-Box-1-Gang-Gray-Metal-Weatherproof-	
Compression Connector	$ 3.28	1	$ 3.28	No	https://www.lowes.com/pd/Sigma-Electric-ProConnex-1-2-in-Compression-Connector-Electrical-Metal-Tu	
Entrance Connector	$ 0.49	1	$ 0.49	No	https://www.lowes.com/pd/Sigma-Electric-ProConnex-3-8-in-Clamp-on-Type-Service-Entrance-Connector	
Metal EMT Conduit	$ 6.20	1	$ 6.20	No	https://www.lowes.com/pd/Common-1-2-in-Actual-50-In-Metallic-Emt-10-ft-Conduit/3129551	
Conduit Clamps	$ 1.58	8	$ 12.64	No	https://www.lowes.com/pd/Sigma-Electric-ProConnex-1-2-in-Two-hole-Strap-Electrical-Metal-Tubing-Cor	
Dry wire connectors	$ 3.18	4	$ 12.72	No	https://www.lowes.com/pd/DryConn-Aqua-Red-5-Pack-Aqua-Wire-Connectors/3377350	
Greens Spinner Baskets	$ 14.50	3	$ 43.50	No		
	Subtotal:		$ 698.69			
Greens Drying Rack						
2x4 Cost Est.	$ 125.00	1	$ 125.00	No		Estimated Cost
Hardware Est.	$ 50.00	1	$ 50.00	No		Estimated Cost
1/2 wire mesh Est.	$ 50.00	1	$ 50.00	No		Estimated Cost
Fans	$ 25.00	2	$ 50.00	No		Estimated Cost
	Subtotal:		$ 225.00			
Roots Spray Station						
2x4 Cost Est.	$ 60.00	1	$ 60.00	No		Estimated Cost
Hardware Est.	$ 25.00	1	$ 25.00	No		Estimated Cost
1/2 wire mesh Est.	$ 50.00	1	$ 50.00	No		Estimated Cost
	Subtotal:		$ 135.00			
Packing						
Stainless Steel Scale	$ 22.49	1	$ 22.49	No	https://www.amazon.com/Taylor-Stainless-Analog-Kitchen-Capacity/dp/B002SXV8G2/ref=dp_fod_1?pd_	
Stainless Steel Table for Packaging	$ 169.00	1	$ 169.00	No	https://www.amazon.com/Rockpoint-Stainless-Steel-Commercial-Backsplash-Adjustable/dp/B07L8F4XLN	
Bags for Greens	$ 66.00	1	$ 66.00	No	https://www.uline.com/Product/Detail/S-1255/Gus	500 per carton
Bag Taper	$ 20.00	1	$ 20.00	No	https://www.uline.com/Product/Detail/H-167/Tape	Taping bagged greens
	Subtotal:		$ 277.49			
Cooler						
Commercial 2-door Refrigerator	$ 750.00	1	$ 750.00	No		Cooler for storage on farm
	Subtotal:		$ 750.00			
Other Washpack Items						
Double Utility Sink	$ 180.79	1	$ 180.79	No	https://www.lowes.com/pd/Mustee-40-in-x-24-in-	For spraying vegetables or smaller batches of harvested
Estimated PVC Hardware Cost	$ 300.00	1	$ 300.00	No		Estimated cost for PVC plumbing washpack
Estimated Rubber Hose Cost	$ 75.00	1	$ 75.00	No		Estimated cost for assorted rubber hoses for wash/pack
	Subtotal:		$ 480.79			
	Total:		$ 2,881.82			

APPENDIX G

Marketing and Logistics

Marketing and Logistics						
Unit	**Cost/Unit**	**Amount**	**Total**	**Purhased**	**Source**	**Description**
Marketing & Transportation Costs - CSA (On-farm pickup)						
Wax Boxes for Pickup	$ 2.80	30	$ 84.00	No	https://www.uline.com/Product/Detail/S-17644/Food-Containers/Wax-Produce-Boxes-1-2-Bushel	
Produce Bags	$ 66.00	1	$ 66.00	No	https://www.uline.com/Product/Detail/S-1255/Gusseted-Poly-Bags/10-x-8-x-2	500 per carton
Folding Tables	$ 45.00	3	$ 135.00	No	https://www.amazon.com/Lifetime-4428-Adjustable-Folding-Utility/dp/B003YJPC2A/ref=sr_1_6?crid=S57MB6SS1S	
	Subtotal:		$ 285.00			
Transport to Market						
Coleman 100 Qt Cooler	$ 100.00	3	$ 300.00	No	https://www.amazon.com/Igloo-Gray-Polar-120Qt-cooler/dp/B08GV7DXC1/	Keeping produce cold for transport
Cooler Ice Packs (3 pk)	$ 49.95	3	$ 149.85	No	https://www.amazon.com/gp/product/B07TN7S93J?ie=UTF8&linkCode=sl1&tag=joshsattin-20&linkId=53fb134c5a6a	
	Subtotal:		$ 449.85			
Marketing & Transportation Costs - Farmers' Market						
Gas - .58c/mile	$ 0.58	50	$ 29.00			Per Diem to and from market
Tent	$ 104.00	2	$ 208.00	No	https://www.amazon.com/dp/B003A81WJM?tag=campingworld20-20&linkCode=ogi&th=1&psc=1	
Foldable Plastic Tables	$ 129.99	3	$ 389.97	No	https://www.amazon.com/Best-Choice-Products-Folding-Portable/dp/B017E17J9M/ref=sxin_14?asc_contentid=amzn1.	
Grocery Bags (Pack of 300)	$ 14.82	1	$ 14.82	No	https://www.amazon.com/Concession-Essentials-Disposable-Reusable-T-Shirt/dp/B093TLNBSG/ref=sr_1_5?keywords	
Market Fees	$ 150.00	1	$ 150.00	No		Annual Fee for Vendor
Sidewalk Chalkboard	$ 69.99	1	$ 69.99	No	https://www.amazon.com/Magnetic-Chalkboard-Standing-Sidewalk-Sandwich/dp/B01NBG3QDF/ref=sr_1_6?keyword	
Produce Bags	$ 66.00	1	$ 66.00	No	https://www.uline.com/Product/Detail/S-1255/Gusseted-Poly-Bags/10-x-8-x-2	500 per carton
Canvas Sign with Farm Logo	$ 250.00	1	$ 250.00	No	Local custom	
Misc: tablecloth, markers, bags, etc.	$ 250.00	1	$ 250.00	No		
	Subtotal:		$ 1,427.78			
	Total:		$ 1,427.78			

APPENDIX H

Carrot Enterprise Budget

Vegetable Enterprise Budget

Crop: Carrot ***Date: 1/20/22*** ***Unit:*** ***30"x50' Bed***

Variable Production Costs

Task	Details	Labor Minutes	Machinery Minutes
Bed Preparation			
Bed Maint. (mark, shape, form, cover etc)	Remove Old Crop	15	
Broadfork	Aeration	15	
BCS Rotovate			
BCS Harrow			
Flame Weed	pre-plant	10	
Other:			
Pre-plant Amendments Applications			
Apply Fertilizer			
Apply Compost + Incorporate with rake		15	
Other:			
Pre-plant preparation			
Tarping	Lay Tarp Post-seeding	5	
Lay plastic/drip tape			
Other:			
Seeding & Transplanting			
Greenhouse seeding			
Harden-off			
Water			
Transplant	.		
Direct Seed		15	
Post-plant irrigation & setup		20	
Other:			
Cultivation			
Hand cultivation	In-row weeding x1	30	
Mechanical Cultivation	Between row weeding x2	10	
Other:			
Pest Management			
Scouting	2x @ 5 min ea	10	
Insecticide/Herbicide Application			
Other:			
Irrigation			
Drip			
Overhead	3x/week.	30	
Harvest			
Pick + bunch		90	
Delivery to pack house		5	
Post-harvest handling			
Wash		30	
Pack		15	
Store			
Sort			
Other:			
Field Clean-up			
Equipment removal			
Incorporate residues			
Other:			
Total Production Hours Required:		5.25	0
****Est. Cost of Labor/Machinery Per Hour:***		$ 50.00	$ 75.00
Total Cost of Labor/Machine Labor:		**$ 262.50**	**$ -**

Labor Value Determination	$50/hr for labor
This task can be performed by 2 employees	
at $15/hr + 1 manager for supervision at	
$18/hr. I will be the manager. ~$48/hr	
rounded to $50/hr	

WS Proxy:	25
RT Proxy :	35

Wholesale Price Sensitivity

Retail Price Sensitivity

Variable Production Costs

Management Costs	Amount	Quantity	Total
Organization and Supervision			$ -
Opportunity Cost for Equipment			$ -
Opportunity Cost for Labor			$ -
Opportunity Cost for Infrastructure			$ -
Other:			$ -
Total Management Cost:			$ -
Materials Cost	**Amount**	**Quantity**	**Total**
Seeds or plants**	$ 0.00336	600	$ 2.02
Potting Mix Per Tray (128)	$ 1.25		$ -
Compost	$ 25.00	1	$ 25.00
Plastic mulch			$ -
Row Cover			$ -
Plastic mulch/Drip Tape			$ -
Pesticides			$ -
Boxes, Bins, Bags, Bands	$ 2.50	1	$ 2.50
Fuel	$ 5.00	1	$ 5.00
Other:			$ -
Total Materials Cost:			$ 34.52
Wholesale Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Labor for Delivery (hourly)	$ 15.00	1	$ 15.00
Transportation (.58/mile)	$ 0.58	25	$ 14.50
Other:			
Total Wholesale Marketing Costs:			$ 29.50
Retail Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Display Setup/Take-down	$ 12.00	0	$ -
Market Fees per Market (per market)	$ 20.00	0	$ -
Advertising (Social Media Ad)	$ 2.50	0	$ -
Labor at Market (hourly)	$ 15.00	0	$ -
Transportation to Market (.58/mile)	$ 0.58	0	$ -
Other:			
Total Retail Marketing Costs:			$ -
Total Variable Wholesale Production Costs:			$ 326.52
Total Variable Retail Production Costs:			$ 297.02

***Fixed Costs (Prorated to total farmland occupied by crop)**

Item	Amount	Quantity	Total
Land (per ac of production)	$ 5,000.00	$ 21.03	$ 21.03
Buildings (per year)			$ -
Insurance (per year)			$ -
Office Expenses (per year)			$ -
Property Taxes (per year)	$ 3,000.00	$ 12.62	$ 12.62
Utilities (per year)			$ -
Organic Certification	$ 1,200.00	$ 5.05	$ 5.05
Other:			
Total Fixed Cost:			**$ 38.70**
Total Wholesale Costs (Fixed & Variable):			**$ 365.22**
Total Retail Costs (Fixed & Variable):			**$ 335.72**

Gross Returns

Wholesale

Units by Bunch	$ per unit		Total
150	$ 2.50		$ 375.00

Retail

Units by Bunch	$ per unit		Total
150	$ 3.50		$ 525.00

Current Net Returns

Wholesale Net Returns

Net Return	Price	Quantity	Total Costs
$ 9.78	$ 2.50	150	$ 365.22

Retail Net Returns

Net Return	Price	Quantity	Total Costs
$ 189.28	$ 3.50	150	$ 335.72

"Enterprise Crop Budgeting System for Small-Scale Diversified Farming Operations"

APPENDIX I

Greens Mix Enterprise Budget

Vegetable Enterprise Budget

Crop: Greens Mix DS (Spring/Fall) ***Date: 1/20/22*** ***Unit:*** ***30"x 50' Bed***

Variable Production Costs

Task	Details	Labor Minutes	Machinery Minutes
Bed Preparation			
Bed Maint. (mark, shape, form, cover etc)		15	
Broadfork		15	
BCS Rotovate			
BCS Harrow			
Flame Weed		10	
Other:			
Pre-plant Amendments Applications			
Apply Fertilizer			
Apply Compost + Rake		15	
Other:			
Pre-plant preparation			
Tarping			
Lay plastic/drip tape			
Other:			
Seeding & Transplanting			
Greenhouse seeding			
Harden-off			
Water			
Transplant			
Direct Seed		15	
Post-plant irrigation & setup		20	
Other:			
Cultivation			
Hand cultivation	3x @ 15 min.	45	
Mechanical Cultivation			
Other:			
Pest Management			
Scouting	: @ 5 min. each	15	
Insecticide/Herbicide Application			
Other:			
Irrigation Set-Up			
Drip			
Overhead	ıtes for 4 weeks	20	
Harvest		45	
Pick			
Delivery to pack house			
Post-harvest handling			
Wash		45	
Pack	Bag	45	
Store		10	
Sort			
Other:			
Field Clean-up			
Clear out old crop		15	
Incorporate residues		10	
Other:			
Total Production Hours Required:		5.67	0
****Est. Cost of Labor/Machinery Per Hour:***		$ 50.00	$ 75.00
Total Cost of Labor/Machine Labor:		**$ 283.33**	**$ -**
Labor Value Determination	$50/hr for labor	WS Proxy:	65
This task can be performed by 2 employees		RT Proxy :	100
at $15/hr + 1 manager for supervision at			
$18/hr. I will be the manager. ~$48/hr			
rounded to $50/hr			

Wholesale Price Sensitivity

Retail Price Sensitivity

Variable Production Costs

Management Costs	Amount	Quantity	Total
Organization and Supervision	$ 30.00	0.10	$ 3.00
Opportunity Cost for Equipment	$ 30.00	0.05	$ 1.50
Opportunity Cost for Labor	$ 30.00	0.10	$ 3.00
Opportunity Cost for Infrastructure	$ 30.00	0.00	$ -
Other:	$ 30.00	0.00	$ -
Total Management Cost:			$ 7.50
Materials Cost	**Amount**	**Quantity**	**Total**
Seeds or plants**	$ 10.00	1	$ 10.00
Potting Mix Per Tray (128)			$ -
Fertilizer (Feathermeal)	$ 10.00	1	$ 10.00
Compost	$ 25.00	1	$ 25.00
Row Cover			$ -
Plastic mulch/Drip Tape			$ -
Pesticides			$ -
Bags	$ 8.00	1	$ 8.00
Boxes			$ -
Other:			$ -
Total Materials Cost:			$ 53.00
Wholesale Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Labor for Delivery (hourly)	$ 12.00	1	$ 12.00
Transportation (.58/mile)	$ 0.58	25	$ 14.50
Other:			
Total Wholesale Marketing Costs:			$ 26.50
Retail Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Display Setup/Take-down	$ 12.00		$ -
Market Fees per Market (per market)	$ 20.00		$ -
Advertising (Social Media Ad)	$ 2.50		$ -
Labor at Market (hourly)	$ 12.00		$ -
Transportation to Market (.58/mile)	$ 0.58		$ -
Other:			
Total Retail Marketing Costs:			$ -
Total Variable Wholesale Production Costs:			$ 370.33
Total Variable Retail Production Costs:			$ 343.83

***Fixed Costs (Prorated to total farmland occupied by crop)**

Item	Amount	Quantity	Total
Land (per ac of production)	$ 5,000.00	$ 21.03	$ 21.03
Buildings (per year)			$ -
Insurance (per year)			$ -
Office Expenses (per year)			$ -
Property Taxes (per year)	$ 3,000.00	$ 12.62	$ 12.62
Utilities (per year)			$ -
Organic Certification	$ 1,200.00	$ 5.05	$ 5.05
Other:			$ -
Total Fixed Cost:			**$ 38.70**
Total Wholesale Costs (Fixed & Variable):			**$ 409.04**
Total Retail Costs (Fixed & Variable):			**$ 382.54**

Gross Returns

Wholesale

Units by Pound	$ per unit		Total
150	$ 6.50		$ 975.00

Retail

Units by Pound	$ per unit		Total
150	$ 10.00		$ 1,500.00

Current Net Returns

Wholesale Net Returns

Net Return	Price	Quantity	Total Costs
$ 565.96	$ 6.50	150	$ 409.04

Retail Net Returns

Net Return	Price	Quantity	Total Costs
$ 1,117.46	$ 10.00	150	$ 382.54

"Enterprise Crop Budgeting System for Small-Scale Diversified Farming Operations"

APPENDIX J

Head Lettuce Enterprise Budget

Vegetable Enterprise Budget

Crop: Head Lettuce (Summer) ***Date: 5/1/2020*** ***Unit:*** ***30"x50' Bed***

Variable Production Costs

Task	Details	Labor Minutes	Machinery Minutes
Bed Preparation			
Bed Maint. (mark, shape, form, cover etc)		15	
Broadfork			
BCS Rotovate			
BCS Harrow			
Flame Weed			
Other:			
Pre-plant Amendments Applications			
Apply Fertilizer			
Apply Compost + Rake		20	
Other:			
Pre-plant preparation			
Tarping		20	
Lay plastic/drip tape			
Other:			
Seeding & Transplanting			
Greenhouse seeding		15	
Harden-off		5	
Water		5	
Transplant		45	
Direct Seed			
Post-plant irrigation & setup		20	
Other:			
Cultivation			
Hand cultivation			
Mechanical Cultivation			
Other:			
Pest Management			
Scouting			
Insecticide/Herbicide Application			
Other:			
Irrigation Set-Up			
Drip			
Overhead			
Harvest		30	
Pick			
Delivery to pack house		5	
Post-harvest handling			
Wash		60	
Pack		30	
Store		5	
Sort			
Other:			
Field Clean-up			
Equipment removal		10	
Incorporate residues		10	
Other:			
Total Production Hours Required:		4.92	0
****Est. Cost of Labor/Machinery Per Hour:***		$ 50.00	$ 75.00
Total Cost of Labor/Machine Labor:		**$ 245.83**	**$ -**

Labor Value Determination	$50/hr for labor	WS Proxy:	25
This task can be performed by 2 employees		RT Proxy :	35
at $15/hr + 1 manager for supervision at			
$18/hr. I will be the manager. ~$48/hr			
rounded to $50/hr		**Wholesale Price Sensitivity**	
		▲	
		▼	
		Retail Price Sensitivity	
		▲	
		▼	

Variable Production Costs

Management Costs	Amount	Quantity	Total
Organization and Supervision	$ 30.00	0.10	$ 3.00
Opportunity Cost for Equipment	$ 30.00	0.05	$ 1.50
Opportunity Cost for Labor	$ 30.00	0.10	$ 3.00
Opportunity Cost for Infrastructure	$ 30.00	0.00	$ -
Other:	$ 30.00	0.00	$ -
Total Management Cost:			$ 7.50
Materials Cost	**Amount**	**Quantity**	**Total**
Seeds or plants**	$ 0.037	200	$ 7.40
Potting Mix Per Tray (72)	$ 1.25	8	$ 10.00
Fertilizer (Feathermeal)	$ 0.87		$ -
Plastic mulch			$ -
Row Cover	$ 25.00	1	$ 25.00
Plastic mulch/Drip Tape			$ -
Pesticides			$ -
Boxes, Bins, Bags			$ -
General Supplies			$ -
Other:			$ -
Total Materials Cost:			$ 42.40
Wholesale Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Labor for Delivery (hourly)	$ 12.00	1	$ 12.00
Transportation (.58/mile)	$ 0.58	25	$ 14.50
Other:			
Total Wholesale Marketing Costs:			$ 26.50
Retail Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Display Setup/Take-down	$ 12.00		$ -
Market Fees per Market (per market)	$ 20.00		$ -
Advertising (Social Media Ad)	$ 2.50		$ -
Labor at Market (hourly)	$ 12.00		$ -
Transportation to Market (.58/mile)	$ 0.58		$ -
Other:			
Total Retail Marketing Costs:			$ -
Total Variable Wholesale Production Costs:			$ 322.23
Total Variable Retail Production Costs:			$ 295.73

***Fixed Costs (Prorated to total farmland occupied by crop)**

Item	Amount	Quantity	Total
Land (per ac of production)	$ 5,000.00	$ 21.03	$ 21.03
Buildings (per year)			$ -
Insurance (per year)			$ -
Office Expenses (per year)			$ -
Property Taxes (per year)	$ 3,000.00	$ 12.62	$ 12.62
Utilities (per year)			$ -
Organic Certification	$ 1,200.00	$ 5.05	$ 5.05
Other:			$ -
Total Fixed Cost:			**$ 38.70**
Total Wholesale Costs (Fixed & Variable):			**$ 360.94**
Total Retail Costs (Fixed & Variable):			**$ 334.44**

Gross Returns

Wholesale

Units	$ per unit		Total
150	$ 2.50		$ 375.00

Retail

Units	$ per unit		Total
150	$ 3.50		$ 525.00

Current Net Returns

Wholesale Net Returns

Net Return	Price	Quantity	Total Costs
$ 14.06	$ 2.50	150	$ 360.94

Retail Net Returns

Net Return	Price	Quantity	Total Costs
$ 190.56	$ 3.50	150	$ 334.44

"Enterprise Crop Budgeting System for Small-Scale Diversified Farming Operations"

APPENDIX K

Sweet Pepper Enterprise Budget

Vegetable Enterprise Budget

Crop: Peppers ***Date: 5/1/2020*** ***Unit:*** ***30"x 50' Bed***

Variable Production Costs

Task	Details	Labor Minutes	Machinery Minutes
Bed Preparation			
Bed Maint. (mark, shape, form, cover etc)		15	
Broadfork			
BCS Rotovate			
BCS Harrow			
Flame Weed			
Other:			
Pre-plant Amendments Applications			
Apply Fertilizer			
Apply Compost + Rake		15	
Other:			
Pre-plant preparation			
Tarping			
Lay landscape fabric/drip tape		30	
Other: T-Post set up	1 every 4'	30	
Seeding & Transplanting			
Greenhouse seeding	10 row liney + p	15	
Pot-Up to 50 cell tray		30	
Water	daily 5 min. eac	60	
Harden-Off	1 week prior to '	30	
Direct Seed			
Post-plant irrigation & setup		10	
Plant		30	
Cultivation			
Hand cultivation			
Mechanical Cultivation			
Other: Trellis	1x per week: 30	90	
Pest Management			
Scouting	3x @ 10 min. ea	30	
Insecticide/Herbicide Application			
Other:			
Irrigation Set-Up			
Drip			
Overhead			
Harvest			
Pick	30 min./week fo	180	
Delivery to pack house		10	
Post-harvest handling			
Wash			
Pack		20	
Store		10	
Sort		10	
Other:			
Field Clean-up			
Equipment removal		45	
Incorporate residues		20	
Other:			
Total Production Hours Required:		11.33	0
****Est. Cost of Labor/Machinery Per Hour:***		$ 50.00	$ 75.00
Total Cost of Labor/Machine Labor:		**$ 566.67**	**$ -**
Labor Value Determination	$50/hr for labor	WS Proxy:	8
This task can be performed by 2 employees		RT Proxy :	12
at $15/hr + 1 manager for supervision at			
$18/hr. I will be the manager. ~$48/hr			
rounded to $50/hr			

Wholesale Price Sensitivity

Retail Price Sensitivity

Variable Production Costs

Management Costs	Amount	Quantity	Total
Organization and Supervision	$ 30.00	0.10	$ 3.00
Opportunity Cost for Equipment	$ 30.00	0.05	$ 1.50
Opportunity Cost for Labor	$ 30.00	0.10	$ 3.00
Opportunity Cost for Infrastructure	$ 30.00	0.00	$ -
Other:	$ 30.00	0.00	$ -
Total Management Cost:			$ 7.50
Materials Cost	**Amount**	**Quantity**	**Total**
Seeds or plants	$ 0.20	33	$ 6.60
Potting Mix Per Tray (128)	$ 1.25	8	$ 10.00
Fertilizer (Feathermeal)	$ 0.87		$ -
Plastic mulch			$ -
Row Cover	$ 25.00	1	$ 25.00
Plastic mulch/Drip Tape	$ 25.00	1	$ 25.00
Pesticides			$ -
Boxes, Bins, Bags			$ -
General Supplies	$ 100.00	1	$ 100.00
Other:			$ -
Total Materials Cost:			$ 166.60
Wholesale Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Labor for Delivery (hourly)	$ 12.00	1	$ 12.00
Transportation (.58/mile)	$ 0.58	25	$ 14.50
Other:			
Total Wholesale Marketing Costs:			$ 26.50
Retail Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Display Setup/Take-down	$ 12.00		$ -
Market Fees per Market (per market)	$ 20.00		$ -
Advertising (Social Media Ad)	$ 2.50		$ -
Labor at Market (hourly)	$ 12.00		$ -
Transportation to Market (.58/mile)	$ 0.58		$ -
Other:			
Total Retail Marketing Costs:			$ -
Total Variable Wholesale Production Costs:			$ 767.27
Total Variable Retail Production Costs:			$ 740.77

***Fixed Costs (Prorated to total farmland occupied by crop)**

Item	Amount	Quantity	Total
Land (per ac of production)	$ 5,000.00	$ 21.03	$ 21.03
Buildings (per year)			$ -
Insurance (per year)			$ -
Office Expenses (per year)			$ -
Property Taxes (per year)	$ 3,000.00	$ 12.62	$ 12.62
Utilities (per year)			$ -
Organic Certification	$ 1,200.00	$ 5.05	$ 5.05
Other:			$ -
Total Fixed Cost:			**$ 38.70**
Total Wholesale Costs (Fixed & Variable):			**$ 805.97**
Total Retail Costs (Fixed & Variable):			**$ 779.47**

Gross Returns

Wholesale

Units by Pound	$ per unit		Total
1500	$ 1.25		$ 1,875.00

Units by Pound	$ per unit		Total
1500	$ 2.00		$ 3,000.00

Current Net Returns

Wholesale Net Returns

Net Return	Price	Quantity	Total Costs
$ 394.03	$ 0.80	1500	$ 805.97

Retail Net Returns

Net Return	Price	Quantity	Total Costs
$ 1,020.53	$ 1.20	1500	$ 779.47

"Enterprise Crop Budgeting System for Small-Scale Diversified Farming Operations"

APPENDIX L

Heirloom Tomato Enterprise Budget

Vegetable Enterprise Budget

Crop: Heirloom Tomato - Outdoor ***Date: 5/1/2020*** ***Unit:*** ***30"x 50' Bed***

Variable Production Costs

Task	Details	Labor Minutes	Machinery Minutes
Bed Preparation			
Bed Maint. (mark, shape, form, cover etc)		15	
Broadfork		15	
BCS Rotovate			
BCS Harrow			
Flame Weed			
Other:			
Pre-plant Amendments Applications			
Apply Fertilizer			
Apply Compost + Rake		15	
Other:		15	
Pre-plant preparation		15	
Tarping			
Lay landscape fabric/drip tape			
Other: T-Post set up	1 every 4'		
Seeding & Transplanting			
Greenhouse seeding	10 row liney + p	15	
Pot-Up to 50 cell tray		30	
Water	daily 5 min. eac	60	
Harden-Off	1 week prior to '	30	
Plant		30	
Post-plant irrigation & setup		10	
Other:			
Cultivation			
Hand cultivation			
Mechanical Cultivation			
Other: Trellis	4x @ 30 min ea	120	
Pest Management			
Scouting	3x @ 10 min. ea	30	
Insecticide/Herbicide Application			
Other:			
Irrigation Set-Up			
Drip			
Overhead			
Harvest			
Pick	30 min./week fo	180	
Delivery to pack house	5 min./week for	30	
Post-harvest handling			
Wash			
Pack		20	
Store		10	
Sort		10	
Other:			
Field Clean-up			
Equipment removal		45	
Incorporate residues		20	
Other:			
Total Production Hours Required:		11.92	0
****Est. Cost of Labor/Machinery Per Hour:***		$ 50.00	$ 75.00
Total Cost of Labor/Machine Labor:		**$ 595.83**	**$ -**
Labor Value Determination	$50/hr for labor	WS Proxy:	20
This task can be performed by 2 employees		RT Proxy :	30
at $15/hr + 1 manager for supervision at			
$18/hr. I will be the manager. ~$48/hr			
rounded to $50/hr			

Wholesale Price Sensitivity

Retail Price Sensitivity

Variable Production Costs

Management Costs	Amount	Quantity	Total
Organization and Supervision	$ 30.00	0.10	$ 3.00
Opportunity Cost for Equipment	$ 30.00	0.05	$ 1.50
Opportunity Cost for Labor	$ 30.00	0.10	$ 3.00
Opportunity Cost for Infrastructure	$ 30.00	0.00	$ -
Other:	$ 30.00	0.00	$ -
Total Management Cost:			$ 7.50
Materials Cost	**Amount**	**Quantity**	**Total**
Seeds or plants	$ 0.50	33	$ 16.50
Potting Mix Per Tray (128)	$ 1.25	8	$ 10.00
Fertilizer (Feathermeal)	$ 0.87		$ -
Plastic mulch			$ -
Row Cover	$ 25.00	1	$ 25.00
Plastic mulch/Drip Tape	$ 25.00	1	$ 25.00
Pesticides			$ -
Boxes, Bins, Bags			$ -
General Supplies	$ 100.00	1	$ 100.00
Other:			$ -
Total Materials Cost:			$ 176.50
Wholesale Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Labor for Delivery (hourly)	$ 12.00	1	$ 12.00
Transportation (.58/mile)	$ 0.58	25	$ 14.50
Other:			
Total Wholesale Marketing Costs:			$ 26.50
Retail Marketing/Transport Costs	**Amount**	**Quantity**	**Total**
Display Setup/Take-down	$ 12.00		$ -
Market Fees per Market (per market)	$ 20.00		$ -
Advertising (Social Media Ad)	$ 2.50		$ -
Labor at Market (hourly)	$ 12.00		$ -
Transportation to Market (.58/mile)	$ 0.58		$ -
Other:			
Total Retail Marketing Costs:			$ -
Total Variable Wholesale Production Costs:			$ 806.33
Total Variable Retail Production Costs:			$ 779.83

***Fixed Costs (Prorated to total farmland occupied by crop)**

Item	Amount	Quantity	Total
Land (per ac of production)	$ 5,000.00	$ 21.03	$ 21.03
Buildings (per year)			$ -
Insurance (per year)			$ -
Office Expenses (per year)			$ -
Property Taxes (per year)	$ 3,000.00	$ 12.62	$ 12.62
Utilities (per year)			$ -
Organic Certification	$ 1,200.00	$ 5.05	$ 5.05
Other:			$ -
Total Fixed Cost:			**$ 38.70**
Total Wholesale Costs (Fixed & Variable):			**$ 845.04**
Total Retail Costs (Fixed & Variable):			**$ 818.54**

Gross Returns

Wholesale

Units by Pound	$ per unit		Total
1250	$ 2.30		$ 2,875.00

Units by Pound	$ per unit		Total
1250	$ 3.00		$ 3,750.00

Current Net Returns

Wholesale Net Returns

Net Return	Price	Quantity	Total Costs
$ 1,654.96	$ 2.00	1250	$ 845.04

Retail Net Returns

Net Return	Price	Quantity	Total Costs
$ 2,931.46	$ 3.00	1250	$ 818.54

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