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Economic Assessment of Organic, Eco-Friendly, and Conventional Peach Production Methods in Northern Utah

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ECONOMIC ASSESSMENT OF ORGANIC, ECO-FRIENDLY, AND CONVENTIONAL PEACH PRODUCTION METHODS IN NORTHERN UTAH

by

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ABSTRACT

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Peach Production Methods in Northern Utah

by

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Utah State University, 2015

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Fruit producers in Northern Utah face the threat of urbanization, decreased availability of agricultural land, and competition from domestic producers and imports. Hence, small-scale fruit producers are examining alternate forms of production and labeling programs to increase the potential for profitable operations as they compete for land, water, and other resources, and against oftentimes less expensive imported goods. As consumer segments are willing to pay (WTP) a premium for foods differentiated by production methods such as organic, eco-friendly, grass-fed, and local, these methods may assist smaller producers in achieving greater net returns for their products.

Implementing new or additional production practices, however, may also bring on new costs and risks. This study looks into the risks and returns associated with conventional, eco-friendly, and organic peach production in Northern Utah. The risk and returns were analyzed for each of three prospective orchards. Study results show that conventional peach production has the possibility of the highest net returns, but that organic peach production will bring the highest average net returns. It was also found that organic peach production poses the lowest risk to producers and therefore would be preferred to producers of any risk tolerance and could be a profitable option for fruit producers in Northern Utah.

The results of this study may be used to guide producers in making orchard management decisions and in assessing the profitability of alternative peach production methods.

(106 pages)

PUBLIC ABSTRACT

Economic Assessment of Organic, Eco-Friendly, and Conventional

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Fruit producers in Northern Utah face several challenges to their production, urbanization, decreased availability of agricultural land, and competition from domestic producers and imports. As consumers are willing to pay premiums for foods differentiated by production method, such as eco-friendly and organic, conversion to these methods may increase the profitability of fruit growing operations.

This study found that consumers in Northern Utah are willing to pay a premium for peaches grown using organic and eco-friendly production practices over conventionally grown peaches. The study also found that of the three methods of peach production examined (conventional, eco-friendly, and organic), organic had the highest average grower net returns and had the lowest associated risk, while conventional peach production had the potential for the highest net returns. These results may guide producers when making orchard management decisions and in the profitability assessment of alternative production methods.

DEDICATION

I dedicate this thesis to the farmers throughout Utah and other areas that are being encroached upon by the onslaught of continual urbanization; those brave souls who have a great tenacity and resilience to endure hard times in order to bring food to the table of millions of people. Hopefully the results of this study will aid in helping your operations become more profitable so that they may continue to exist into the future. Thank you for your efforts and example. May your fields always be fertile and your yields higher than hoped for.

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I would like to thank Dr. Kynda R. Curtis for allowing me to work on this project and for assisting me throughout my graduate studies. I would also like to thank Dr. Jennifer Reeve and her peach production team at the Kaysville farm for putting up with my incessant emails and inquiries. A thank you must also be extended to Dr. Kim for his help with the analysis and to Dr. Ruby Ward for taking the time to be on my committee. I must also thank my colleagues, Joe Phoenix and Elliott Dennis, for their support and help with the coursework leading up to writing this thesis.

I give special thanks to my wife, Loni Knudsen, and express gratitude for our newborn son, Ramsey Dee Knudsen. I thank Loni, for being my editor, chef, life-coach, and moral support throughout the thesis writing process, and for her continual support and encouragement.

Trevor D. Knudsen

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CHAPTER 1

OVERVIEW OF ISSUES AND PURPOSE OF STUDY

The agricultural acreage in Utah decreased by over 750,000 acres between 2002 and 2012, representing a 6.8% loss (Farmland Information Center, 2014). Increasing market competition, urbanization, and subsequent competition for water makes it more difficult for agricultural producers to succeed (Reeve et al., 2013). Enjie Li (2013) projected that urbanization throughout the Intermountain West is inevitable and that urban areas are predicted to expand at the expense of current farmland. Utah appears to be affected by this urbanization as noted by the decrease in agricultural acreage. Although agricultural lands in Utah have seen an overall decrease, the number of farms in Utah increased by nearly 18% between 2002 and 2012 (Farmland Information Center, 2014), signifying a shrink in average farm size.

Oberholtzer, Dimitri, and Greene (2005) suggested that some farmers have been able to remain profitable on smaller acreage by accessing *niche* markets which demand a higher premium from consumers and can help small producers remain profitable. Small producers have commonly turned to organic certification which has seen rapid increases since official certification began in 2002 (Organic Trade Association, 2011; U.S. Department of Agriculture, Economic Research Service, 2013). Another method for adding premiums to farm products includes eco-friendly production methods, meaning farmers use fewer chemical pesticides and fertilizers than in conventional methods of growing. Studies have shown that both organic and eco-friendly labeling, as well as local marketing could demand a premium for producers in certain markets (Combris et al., 2011; Darby, Batte, Ernst, & Roe, 2008; Lin, Smith, & Huang, 2008; Zehnder, Hope, Hill, Hoyle, & Blake, 2003; Loureiro, McCluskey, & Mittelhammer, 2002). Some farmers may also feel pressure to develop new, more environmentally sound methods of production due to consumer preferences and federal regulations (Loureiro et al., 2002).

The purpose of this study is to determine if it is economically feasible for fruit producers in Utah to employ differentiated methods of production and also to determine if consumers demonstrate a willingness to pay (WTP) for differentiated products. This study will also aid in determining whether fruit producers in Utah are able to make sufficient returns by producing and labeling their products using eco-friendly or organic methods instead of conventional methods, and which method of production has the most favored risk return potential.

Literature Review

There is evidence in extant literature which highlights current consumer demands for organic, eco-friendly and locally-labelled products, and discusses trends and consumer willingness-to-pay (WTP) for each of these products. This literature aids in determining which, if any, of these alternate production or marketing methods could be useful for Utah's fruit producers.

Organic Production

The desire consumers have for organically grown produce, which aims to "preserve the environment and avoid most synthetic materials, such as pesticides and antibiotics" (U.S. Department of Agriculture, Agricultural Marketing Service, 2014a), has increased considerably throughout the United States in the past several years.

According to a report by the Organic Trade Association published in 2011, sales of organic food in the U.S. grew from $1 billion in 1990 to over $26 billion in 2010 (Organic Trade Association, 2011). It is evidently clear from this growth in sales that there is a definite market for organically grown produce. The increase in organic production throughout the U.S. can also be seen by the increase in organically certified farming operations which have increased from 3,587 in 1992 to 12,880 in 2011, and total organically certified acreage in the U.S. which has continued to increase during the same period from 403,400 acres in 1992 up to over 5 million acres in 2011 (U.S. Department of Agriculture, Economic Research Service, 2013). In Utah, where this study is focused, in 2011 there were over 90,000 acres of organic pasture, range, and cropland, which had nearly tripled during the previous decade (U.S. Department of Agriculture, Economic Research Service, 2013).

Organic produce growers have been able to capitalize on this *niche* market, and many small producers have been able to make their farms profitable when they might not have been able to without the organic price premiums (Oberholtzer et al., 2005). Producers are able to label their products as "organic" only after complying with organic methods outlined by the USDA. This certification can take several years to obtain and can cost hundreds or thousands of dollars (U.S. Department of Agriculture, Agricultural Marketing Service, 2014a; R. Overman, personal communication September 3, 2014). However, with this certification, producers are then able to gain a price premium for their products. A review of the Atlanta and San Francisco terminal prices showed that wholesale organic fruits command an average premium of 33% over conventional fruits (U.S. Department of Agriculture, Economic Research Service, 2014a), however evidence shows that organic fruits can be marked up more than 100% over their conventional counterparts (Smith, 2010), making organic production an attractive option for producers.

Granatstein, Kirby, and Willer (2008) recognized the increases in organic production and noted that the expansion in this sector of farming is driven by consumer demand. A number of studies agree with this conclusion and have found that consumer demand for organic products is exhibited by a higher WTP than for conventional products. For instance, in the 2003 study by Zhender et al., it was found that out of 33,779 tomato purchases and 25,927 apple purchases, consumers were willing to pay an average of 22% and 24% more, respectively, for the produce. Lin et al. (2008) determined price premiums for organic produce over conventional produce ranged from 15% to just over 60% when comparing 10 specific fruits and vegetables. Furthermore, those products with high variation in seasonal availability, such as strawberries, demanded a higher organic premium than those that have a longer availability throughout the year.

The literature appears conclusive that there is a demand for organic produce as evidenced by consumer WTP price premiums, however, the amount of those price premiums seem to vary by study, which could largely depend on consumer groups (Lin et al., 2008). These price premiums may be beneficial to producers, however, according to Winter and Davis (2006), organic production costs can increase from 10% to 40% over conventional costs, decreasing the margin that producers will receive for organic production.

Environmentally Friendly Production

Although organic production and labeling is widely recognized, there are other methods of production that consumers also value (Biguzzi et al., 2014; Moser & Raffaelli, 2012). Both national and international surveys have been conducted with regard to WTP for alternate production methods which claim to be more environmentally compatible or sustainable than conventional, but do not comply with organic standards. Such products are specially labelled and therefore can capitalize on other intrinsic values such as environmentally-friendly or eco-friendly, natural, reduced pesticides, or integrated pest management (IPM) systems of production. These labels do not currently have official definitions or certifications[1] regulating producers who use them as a production or marketing tool (Environmental Protection Agency, 2014). However, several U.S. universities have set up IPM programs and have guidelines and training programs on how to implement them. The definition of IPM, as well as the recommendations for implementation, appear to be widely accepted across university systems (University of Illinois Extension, 2007; University of Vermont, 2014; Utah State University Extension, 2014), and include some of the following characteristics:

- Employment of a combination of pest control practices
- Non-chemical tactics for pest control is preferred, but chemical pesticides are not forbidden
- Encouraging the employment of economical and environmentally sound practices
- Long term pest suppression

[1]Because there are no official definitions or certifications for IPM, reduced pesticides, natural, or environmentally friendly forms of production, each of these labels will be used interchangeably throughout the paper, but signify similar characteristics regarding method of production.

Consumer WTP studies for reduced pesticides or environmentally friendly forms of production seem to largely follow the above characteristics when labeling produce as "environmentally-friendly" or "IPM."

In a study conducted by Combris et al. (2011) in France and Portugal, the Becker-DeGroot-Marschak (Becker, DeGroot, & Marschak, 1964) procedure was used to determine WTP. Participants in the surveys exhibited a WTP between 43% and 54% higher for reduced pesticide apples (called integrated protection or PI in the study) than for conventionally grown apples and between 72.5% and 96.4% more for organically labelled apples. The results of this study are reinforced by the Bazoche et al. (2013) study conducted in France, Portugal, Greece, and Holland. The study found that participants in these countries would pay an average of 15% more for IPM apples than for conventional. It was also found in this study that the fewer pesticides used in production, the more participants were willing to pay.

Although these studies give insight into the preference that consumers exhibit for reduced pesticide and organic products, as well as study designs used to gather such information, the information cannot be explicitly transferred to the United States due to differing consumer preferences. In fact it is difficult to compare consumers across different European countries as noted by Combris et al. (2011) where French consumers exhibited a 20-80% higher WTP than Portuguese consumers for similar products in the same study.

There have been some studies conducted in the United States to determine demand and WTP for products exhibiting eco-friendly characteristics. For instance, Zehnder et al. (2003) determined that of consumers who participated in a survey in North

Carolina, over 95% would consider pesticide use when purchasing produce. In the same survey, half of the respondents indicated they would be willing to pay 5-10% more for produce grown using fewer or no pesticides. The surveys were conducted at three South Carolina Department of Agriculture's Plant and Flower Festivals, and the authors suggest that the participants may have had some experience with pesticides, which may have biased the results.

Loureiro et al. (2002) conducted a survey of 285 participants in Portland, Oregon grocery stores. It was found that participants who regularly purchased apples would be willing to pay a 5% premium for "eco-friendly" production and labeling of apples. They mention that this is a "rather small" premium for these apples, and suggests that the particular eco-label they were using for the study may have been ambiguous to consumers who may have chosen organically labelled apples because they recognized the labeling and environmental benefits. Biguzzi et al. (2014) confirmed that consumers were willing to pay more when the label defined the methods of production used for growing the product.

Onken (2010) found a surprising result that seems to contradict other studies in a survey conducted in five Mid-Atlantic States. In this study consumers demonstrated the same (or higher) WTP for "natural" products than for organic products. Although difficult to describe why this preference for natural over organic occurred, it can give producers an insight into what consumers demand from products and may note a small shift in preferences.

At an event held at a major southeastern university in the US, surveys were collected and showed that health was the main concern for paying extra for products produced using eco-friendly practices. However, the authors indicate that their sample size had only three demographic variables, and were taken at an event which was directed at sustainability and environmentalism, therefore results from the study must be used "with caution" (Royne, Levy, & Martinez, 2011).

Moser and Raffaelli, (2012) indicate that oftentimes "average" consumers are not well informed of eco-friendly or IPM practices of production, which may be why participants in Zehnder and colleagues' (2003) study, which was conducted at a Plant and Flower Festival, demonstrated a higher WTP rate (20% of respondents indicated a WTP of 10-15% higher for IPM produce) than participants in Loureiro and colleagues' (2002) study which was conducted at supermarkets. Combris and colleagues' (2011) study in France and Portugal showed that only 42% of survey participants knew what was meant by what they called the "integrated protection" (IPM equivalent) apples that they purchased. Even if the participants in Zehnder and colleagues' (2003) study were more "well-informed" of pesticide use and production practice methods than those of Loureiro and colleagues' (2002) or Combris and colleagues' (2011), there is still a demonstrated WTP that is higher for reduced pesticide production than for conventional production. In Anderson, Hollingsworth, Van Zee, Coli, and Rhodes' (1996) study, they suggested that consumers would be willing to pay even higher prices if they knew more fully the definitions of eco-friendly or IPM practices. It may be concluded that producers could demand a higher price by educating consumers on alternative production practices as seen in the results of the study in France conducted by Biguzzi et al. (2014).

Although there have been studies conducted in the US (Anderson et al.,1996; Loureiro et al., 2002; Zehnder et al., 2003), there appears to be a lack in the literature for further evidence of WTP for reduced pesticide, environmentally friendly, natural or IPM products in the Intermountain West region of the US. There are growing amounts of literature on the practicality of these alternate methods of production (Biddinger, Leslie, & Joshi, 2014; Hirsch & Miller, 2008; Mates, Perfecto & Badgley, 2012), and many state extension services have developed programs and websites to show growers how to implement and conduct methods of production that do not comply with organic standards, but that could be considered more environmentally friendly than conventional methods (Texas A&M Agrilife Extension, n.d.; University of California-Davis, 2014; University of Illinois Extension, 2007; University of Vermont, 2014; Utah State University Extension, 2014), however there is an apparent gap in the literature about consumer demand for eco-friendly products, especially in the Intermountain West.

Locally Sourced Production

Much like eco-friendly, there is currently no official definition of locally-grown food, however, the buy local movement has seen an increase in the United States in recent years (Nganje, Hughner, & Patterson, 2014). This can be seen in the launching of state sponsored agricultural marketing programs such as Jersey Fresh, PA Preferred, or Utah's Own, which, as of early 2010, exist in all 50 states (Onken, 2010) and can be further seen by the fact that the word "locavore[2]" has been added to the Oxford dictionary, and was considered word of the year in 2007 (Oxford University Press, 2007). Consumer demand for local produce can also be seen by the rise in the number of farmers' markets throughout the country which typically vend local produce (Darby et

[2] The Oxford dictionary defines "locavore" as a person whose diet consists only or principally of locally grown or produced food (Locavore, 2014).

al., 2008) and which have increased from 4,685 to 8,268 (a 76% increase) between the years 2004 and 2014 (U.S. Department of Agriculture, Agricultural Marketing Service, 2014b). Wolf, Spittler, and Ahern (2005) found that among the reasons people gave for attending farmers' markets is because the food is more likely to be good for the environment, traceable to the consumers and locally grown. Furthermore, Toler, Briggemen, Lusk, and Adams (2009) found that consumers show an increased willingness to pay for food that is grown by local farmers. The study also shows that consumers attend farmer's markets because they believe locally produced food to be of superior quality than the counterparts found in retail markets.

Yue and Tong (2009) indicated in their non-hypothetical study that consumers demonstrated a WTP of $0.67 per pound for local produce over the $1 per pound conventional price for tomatoes. Interestingly, consumers demonstrated a WTP of the same price premium for organic tomatoes as locally grown tomatoes. Also notable is that when local and organic attributes were combined, consumers were willing to pay $1.06 over the cost of conventional tomatoes, showing a demand for combined attributes in produce.

In a sample of over 800 farmer's market customers in Utah, Curtis, Gumirakiza, and Bosworth (2014) found that consumers in Utah who shopped at farmers' markets preferred produce grown locally (or in-state) by conventional means over organic produce of unknown origin, and they demonstrated an increased WTP of 20-80% depending on the product. Studies such as these may encourage producers to fill the consumer demand for local products and sell in nearby markets rather than changing production practices.

Although there is currently no nationally recognized definition of "local," Darby et al. (2008) attempted to aid in defining "local" in their study in Ohio which surveyed 530 shoppers at 17 locations and determined once again that there is a definite demand and WTP for local produce (strawberries in this instance). This study also found that participants did not distinguish between the characteristics "grown nearby" and "grown in Ohio," suggesting that consumers are willing to accept items grown or produced within their state as being "local."

Production Cost and Return Comparisons

Numerous studies have been undertaken to determine WTP and price premiums for organic and eco-friendly products over conventional products, and also to determine overall yields of different systems (Baldock, Hedtcke, Posner, & Hall, 2014; De Ponti, Rijk, & Ittersum, 2012; Gabriel, Sait, Kunin, & Benton, 2013), but less has been published about the economic differences between the two methods of production. As De Ponti et al. (2012) pointed out, the role of organic agriculture may be largely determined by whether it is economically competitive with conventional agricultural practices, and therefore it is necessary to determine cost and return comparisons between the two methods of agricultural production.

De Ponti et al. (2012) studied the yield differences between the two methods of production. In a survey of 362 sets of organic and conventional yield data from 43 different countries, they found that organic production had an average yield of 80% of that of conventional production. They noted, however, that their yield data did not agree with other studies that have been published that found organic production ranging from

65% to 130% that of conventional production and determine that although difficult to completely explain, some explanation of why there is such a gap may be due to crop varieties, location, and management.

One study in the published literature is Pimentel, Hepperly, Hanson, Douds, and Seidel (2005), who suggested that organic production could require as much as 35% more labor than conventional forms of production. In the 21-year long study, they found out that in order to equalize returns between organic and conventional methods of production, only a 10% premium would need to be demanded in the market for organic products. This study offers an insight into the economic differences between organic and conventional methods of production, however, current organic certification standards were only implemented during the last year of the study (2002), therefore his production methods may now not be considered “organic.”

Two cost comparison studies were conducted with strawberries at the University of California (Bolda, Tourte, Klonsky & DeMoura, 2004, 2006). It was found in these studies that total operating costs per acre were comparable between the two systems with a few input exceptions such as fertilizer, which nearly tripled in the organic system, and pest management, which cost 56% more in the organic system. Although operating costs were similar between the two systems, yields were 32% lower in the organic system, but this decrease in yields was made up for by a 70% markup in price of the organic products.

A study conducted in Washington State compared conventional, IPM and organic production of apples for the first 6 years of growth (Reganold, Glover, Andrews, & Hinman, 2001). This study found that in order for the organic and IPM orchards to have the same breakeven points as the conventional orchard, they would need to demand a 12-14% and 2-6% price premium, respectively.

Studies appear inconclusive with regard to the economics of producing organically versus conventionally. It appears that depending on the crop and the study conducted, the results may either indicate that producers need a price premium to employ organic methods and remain profitable, or that organic systems produce equally to conventional systems and therefore need no premium, or even that organic systems produce more than conventional systems and can be more profitable even without charging a premium (Klonsky & Greene, 2005). It is clear that further studies need to be undertaken in order to determine if organic, conventional or perhaps some other form of production is most profitable, and if needed, the level of price premium required to remain profitable.

Peach Production in Utah

As this study focuses on peach production in Utah, it is necessary to understand the current situation of Utah peach production. Peach producers throughout the United States face several challenges to their production. Primarily, the cost of production in the U.S. is higher than in other countries (Brunke & Chang, 2013) due to recent rises in costs of labor, energy, fertilizers, chemicals, and equipment. For example, the low price of canned peach imports from other countries adds to the competition of domestic peach producers. Although this effect may not be felt as much in Utah, where nearly all peaches produced are sold in the fresh market (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014), Utah peach producers face the challenges of higher input costs, land and water acquisition, as well as loss of land due to increasing urbanization (Li, 2013; Reeve et al., 2013). Producers who are facing urbanization, may be able to capitalize on the growing population. Brunke and Chang (2013) noted that U.S. consumers are showing an increased interest in purchasing produce that has been locally sourced, and have also demonstrated a preference for tree-ripened fruit. This combination of consumer interest may provide peach producers in Utah with opportunities to expand business among local consumers.

Utah peach production has decreased in acreage in recent years, yet has increased in production per acre, as well as in total value. Between 2007 and 2012, the state of Utah saw a reduction of 12% in the number of peach producing acres, decreasing from 1,792 to 1,594 acres (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014). This appears to follow an overall trend for agricultural acreage within the state as more urbanization occurs every year. Although total bearing acres have decreased since 2007, per acre yields have increased from 2.87 tons to 3.53 tons, increasing overall peach production increase from 4,300 tons to 5,300 tons annually. Also notable is the increase in “nonbearing age” peach acres, which increased 18% from 287 acres in 2007 to 341 in 2012, indicating a potential increase in future producing acres in the state (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014). Per ton prices for peaches have also increased and in 2012 were estimated at $1,080 per ton, up 36% from 2007 with a total state peach production value of $5.7 million (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014).

Peach Consumption in Utah

Peach production and value of peaches is increasing in the Utah (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014), however, a challenge that could be associated with peach production in Utah is the apparent decline in demand for fresh peaches (U.S. Department of Agriculture, Economic Research Service, 2014b). Between 1992 and 2012, annual per capita fresh peach consumption decreased by two pounds in the U.S., and for the year 2012 was estimated at 3.7 pounds per person, as seen in Figure 1 (U.S. Department of Agriculture, Economic Research Service, 2014b). The United States Census Bureau (2014) estimated the 2012 Utah population at 2,855,287, which would suggest fresh peach consumption in Utah totaled 10.5 million pounds in 2012. This amount is less than the 2012 estimated Utah production of peaches of 10.6 million pounds (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014), suggesting a possible saturation in the fresh peach market in the state.

As consumers are willing to pay more for fruit grown using alternate production methods, there may be a potential for peach producers to continue to be profitable by employing alternate methods of production and labeling peaches as “organic” or “eco-friendly” and promoting that they are locally grown.

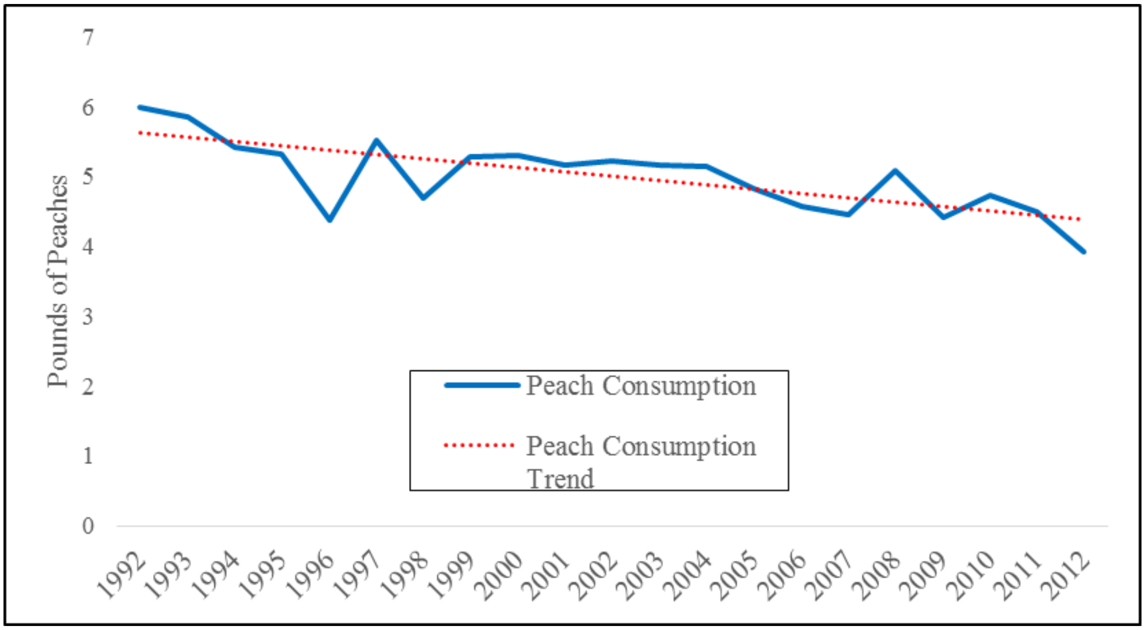

Figure 1. Annual U.S. per capita peach consumption (U.S. Department of Agriculture, Economic Research Service, 2014b; United States Census Bureau, 2014).

Statement of Study Research Goal

A wide range of literature has been published which appears conclusive that consumers have a higher willingness-to-pay (WTP) for the intrinsic values of organic, eco-friendly, IPM, natural, and locally grown produce compared to conventional produce. These studies also delve into why these attributes are important to consumers, and highlight demographic parameters of those who purchase these products. However, there seems to be less published information in the literature with regard to the overall economic benefits of these alternate forms of production for the producer. It is therefore the purpose of this study to determine if these alternate forms of production are economically sustainable for producers in Utah, and whether it makes more economic sense to produce and sell fruit (peaches in this case) under an “eco-friendly” labeling, or if it is worth the extra effort to become certified organic.

This study will use peaches as an agricultural product to attempt to discover which is more economical to establish in Utah; an organic, eco-friendly or conventional orchard. Consumer demographic and WTP information was collected, analyzed and added to that which is already available (Curtis, Gumirakiza et al., 2014) to determine if Utah consumers value the characteristics of these methods of production and if they are willing to pay a premium for such methods. Data were collected through surveys of peach producers in Utah and Colorado to determine costs of production. Local direct market and retail prices were collected in Utah and Colorado to determine potential revenues for each production method. Finally, a risk-return assessment was conducted to aid in determining optimal methods of production for producers in terms of their risk tolerance. The results of this study may be useful for producers in Utah, and may prove beneficial to producers throughout the Intermountain West, when determining optimal methods of production specific to their operations.

CHAPTER 2

Consumer Willingness to Pay for Organic, Eco-Friendly, and Conventional Peaches

As noted in Chapter 1, many studies have been conducted in effort to discover consumers' WTP for the intrinsic values of organic, eco-friendly and conventional goods (Anderson et al., 1996; Combris et al., 2011; Curtis, Gumirakiza et al., 2014; Marette, Messéan & Millet, 2012; Moser & Raffaelli, 2012; Oberholtzer et al., 2005). This information is important for producers so they can adjust production practices to reflect the demand of consumers while producing under the present challenging production circumstances. Very few of the studies to determine WTP for the above-mentioned attributes have been conducted in the focus area of Utah or surrounding areas. Curtis, Gumirakiza et al. (2014) focused on consumers in the Northern Utah area, and the information found is relevant as it regards Utah consumers, but could be supplemented for the purposes of this study. Therefore, during the farmers' market season of 2013, a consumer WTP study was conducted to determine consumer WTP for peaches sold under organic, eco-friendly and conventional labeling (Curtis, Ward, & Reeve, 2014).

Study Design

An experimental economics mechanism was employed to determine Utah consumer's WTP for peaches grown under three differing production practices and labelled accordingly. Specifically, the Becker-DeGroot-Marschak (BDM) mechanism (Becker et al., 1964) was employed in order to define the price ranges that consumers in our target market are willing to pay.

This pricing mechanism has been used in other experimental economic studies of a similar nature (Bazoche et al., 2013; Combris et al., 2011) and is useful in determining not only minimum seller price, but also consumer's maximum buying price (Bohm, Lindén, & Sonnegård, 1998), which is the focus of this study.

Surveys were given to customers at farmers' markets in Park City, Kaysville, Salt Lake City, and Logan, UT during the 2013 market season; each market was visited on three separate occasions. A non-hypothetical study was used, allowing consumers to state their opinion by way of actual purchasing decisions. The survey was given to a total of 676 consumers in order to elicit the reasons for making (or not making) their respective purchases. Peach prices were randomly generated from a range of prices of $2-$6/Lb. gathered from the Salt Lake City and Denver areas in 2012 and 2013 and are shown in Table 1.

Table 1

Consumer Survey Dates, Locations, and Peach Prices (Pound)

Farmers' Market	Date (2013)	Eco-Friendly	Conventional	Certified Organic
Park City	21-Aug	$6.00	$4.00	$5.00
Kaysville	22-Aug	$5.00	$6.00	$3.00
SLC	24-Aug	$4.00	$4.00	$6.00
Logan	24-Aug	$4.00	$2.00	$4.00
Park City	28-Aug	$4.00	$5.00	$6.00
Kaysville	29-Aug	$5.00	$6.00	$3.00
Logan	31-Aug	$3.00	$4.00	$4.00
SLC	31-Aug	$6.00	$3.00	$5.00
Park City	4-Sep	$5.00	$4.00	$3.00
Kaysville	5-Sep	$5.00	$2.00	$3.00
Logan	7-Sep	$3.00	$2.00	$4.00
SLC	7-Sep	$3.00	$3.00	$6.00

The survey that accompanied the sale of peaches included questions asking consumers to list which type of peach they purchased (conventional, eco-friendly or certified organic), or the reason they didn't purchase peaches by indicating one of the following options: price, appearance, quality, variety, color, taste or other (see Appendix A for complete survey). They were also asked to indicate from the following list which peach characteristics they would be willing to pay more for: water wise, reduced pesticide, biodiversity friendly, reduced fertilizer/nitrogen, locally (in-state) produced, organic, or other. They were then asked to indicate whether they purchase peaches "often" (weekly), "sometimes" (once or twice) or "never" when peaches are in season, and the frequency that they purchase produce at the farmers' market: "often" (weekly), "sometimes" (4-6 times per year) or "never." To further determine specific attitude/behavior characteristics, respondents were asked to agree with several statements on a likert scale ranging from strongly disagree (1) to strongly agree (5) (Table 2).

The final portion of the survey asked participants demographic questions regarding age, gender, marital status, household income and education.

The following scripts were used when asked by consumers to define eco-friendly and organic production methods:

Eco-Friendly:

> The peaches have been produced with integrated pest and soil management techniques to reduce chemical applications. Use of mulch, compost and legumes are examples.

Organic:

> Organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic

Table 2

Consumer Survey Attitudes/Lifestyle Questions

Statement	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
I am concerned about the safety of my food	1	2	3	4	5
I have little time to prepare meals	1	2	3	4	5
I am concerned about my health/diet	1	2	3	4	5
I buy products with low environmental impact	1	2	3	4	5
Physical activity is an important part of my routine	1	2	3	4	5
Supporting local farmers is important to me	1	2	3	4	5
Agricultural open space is important to me	1	2	3	4	5
I am concerned about the origin of my food	1	2	3	4	5
I am a vegetarian or vegan	1	2	3	4	5

> meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones. Organic food is produced without using most conventional pesticides; fertilizers made with synthetic ingredients or sewage sludge; bioengineering; or ionizing radiation. Before a product can be labeled ‘organic,’ a Government-approved certifier inspects the farm where the food is grown to make sure the farmer is following all the rules necessary to meet USDA organic standards. Companies that handle or process organic food before it gets to your local supermarket or restaurant must be certified, too.

Although the definitions given to consumers by surveyors may not have been *verbatim,* surveyors were instructed not to provide additional information over that indicated in the above definitions.

All peaches used in the study were locally grown at the Utah State University orchard in Kaysville, UT. All peaches used were the Starfire variety, which are a yellow flesh, freestone peach. The organic peaches were certified by the Utah Department of Agriculture and Food.

Survey Results

Because it was not necessary for people to purchase peaches in order to take the survey, 36.2% of surveys taken were not accompanied by a purchase. Of those who did not purchase peaches, 72.9% of them indicated that the main reason for not purchasing was due to the price of the peaches (see Figure 2). Appearance was the second highest reason for not purchasing (10%), and color was the third reason for not purchasing peaches (7.1%). Taste, quality, and variety were the least frequent reasons for not purchasing at 4.3%, 4.3% and 1.4%, respectively.

The WTP for peaches among those who purchased peaches follows closely the trend that has been seen in other literature, which is that people are willing to pay less for conventionally produced peaches than for eco-friendly, and more for organic than either

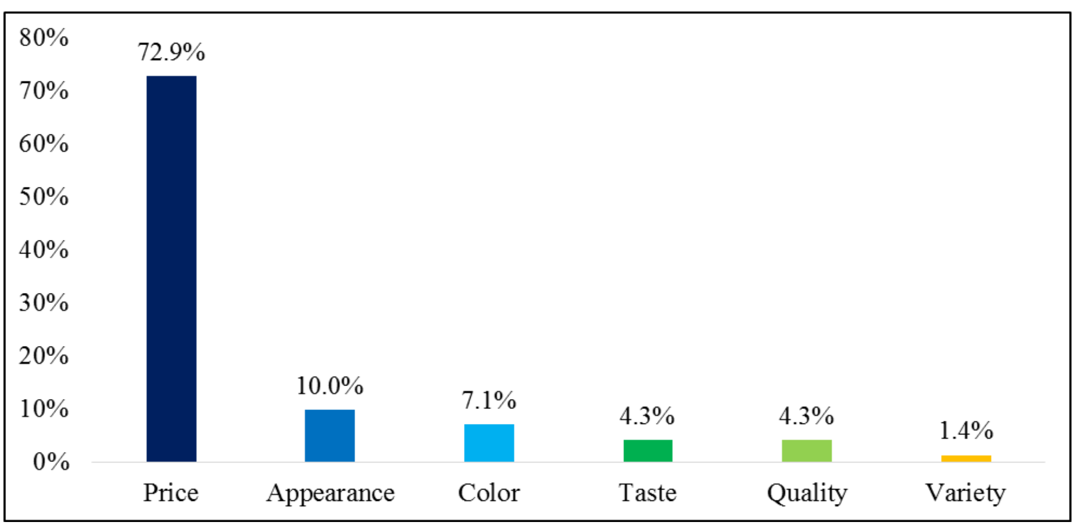

Figure 2. Respondent reasons for not purchasing peaches.

eco-friendly or conventional. The WTP for conventional, eco-friendly, and organic were $4.48/Lb., 5.12/Lb., and 5.42/Lb., respectively. These prices were found to be statistically significant at a 95% confidence level. Although the trend is as to be expected, the actual pricing may be higher than what producers can expect to charge based on the number of respondents who did not purchase peaches due to the price. Even with the higher pricing however, this survey shows a WTP of 14% higher for eco-friendly than conventional, and 21% higher for organic than conventional, demonstrating that consumers in this market have a preference for attributes conveyed by eco-friendly and organically produced peaches. The quantity of peaches purchased reflects the trend of the WTP of consumers who participated with 15% of consumers purchasing conventionally grown peaches, 32% purchasing eco-friendly peaches and 53% purchasing organically certified peaches.

Of those who participated in the survey, 58.7% were female which is higher than Utah's demographic of 49.7% female. The average age of participants was 46 years old. Average annual household income of respondents was $71,700, which is higher than the average annual household income in Utah; $58,100. Furthermore, 83% of respondents had a 4-year degree or higher, whereas the Utah census shows only 29.9% of residents have a 4-year degree or higher (United States Census Bureau, 2014; see Table 3).

Based on the demographic comparison of our respondents compared to the state of Utah's demographic, it is necessary to note that the "average" Utah citizen may respond differently and exhibit an alternative WTP than those who participated in our survey, though it can also be noted that producers who wish to enter new markets based

Table 3

Utah Census vs. Survey Respondent Demographics

	Utah	Survey Respondents
Household Income	$58,100	$71,700
4 Year Degree	29.9%	83.0%
Female	49.7%	58.7%
Married	63.2%	53.0%

Source: United States Census Bureau, 2014

on production methods can utilize this information to direct their marketing efforts toward the appropriate demographic.

When looking further into the results of the study, it is interesting to note the difference in consumers between the three peach labels (see Table 4). For instance, 55% of those who bought conventional peaches were male compared to 47% males who bought eco-friendly peaches, and only 41% males who bought organic peaches, signaling that alternate methods of production may be preferred among women. Also, women who were married purchased organic and eco-friendly peaches more frequently than conventional peaches (52%, 48%, and 42%, respectively).

Those who attended "often," or weekly to the farmers' markets were more likely to purchase organic and eco-friendly peaches than conventional (42%, 38% and 31%, respectively). There also appears to be a small variation, or even a lack of correlation between frequency of in-season peach purchases and the type of production method used for the peaches purchased. This information may suggest that farmers' market attendance increases likelihood of purchasing organic or eco-friendly produce, regardless of product type.

Table 4

Differentiated Peach Purchases by Participant Characteristics

Respondent Characteristic	Organic Purchases N=267	Eco-Friendly Purchases N=159	Conventional Purchases N=77
Peach Frequency			
Never	0%	0%	0%
Sometimes	54%	55%	57%
Often	46%	45%	43%
Farmer's Market Frequency			
Never	0%	2%	3%
Sometimes	57%	60%	66%
Often	42%	38%	31%
Gender			
Male	41%	47%	55%
Female	59%	53%	45%
Marital Status			
Single	48%	52%	58%
Married	52%	48%	42%
Education			
High School Diploma	13%	16%	17%
4-Year College Degree	60%	57%	58%
Graduate Degree	27%	27%	25%

Although eco-friendly and organic peaches were purchased more than conventional peaches (159 lbs., 267 lbs. and 77 lbs. respectively), the buying habits of participants did not reflect their survey responses. For instance, of those who bought eco-friendly peaches, only 26% stated they would pay more for “reduced pesticide” and only 17% indicated they would pay more for peaches that are “biodiversity friendly,” two attributes that are associated with eco-friendly production. Of those who purchased organic peaches, only 13% indicated they would pay more for organically grown peaches, even though 53% of the peaches purchased in our study were organic and there was a demonstrated WTP of 21% above the price of conventionally grown peaches.

Table 5 further demonstrates the attributes that participants were willing to pay more for when purchasing peaches.

Because all of the peaches used in this study were locally grown, we could not compare WTP or preference for peaches grown locally to those grown distantly or from an unknown origin. Therefore, attitude questions regarding preference of knowing the origin of food is helpful (see Figure 3). The consumers demonstrated a high preference for "knowing the origin of their food" with 91% of respondents indicating that they

Table 5

Percentage of Consumers Who Indicated They Were Willing to Pay More for Certain Peach Attributes, Separated by Type of Peach Purchased

Peach Type Purchased	Willingness to Pay Attributes (Percentage)[a]					
	Water Wise	Reduced Pesticide	Biodiversity Friendly	Reduced Fertilizer	Locally Produced	Organic Production
Organic	27%	21%	18%	16%	16%	13%
Eco-Friendly	31%	26%	17%	13%	12%	9%
Conventional	13%	10%	4%	3%	3%	1%

[a]Consumers were able to select multiple desired attributes

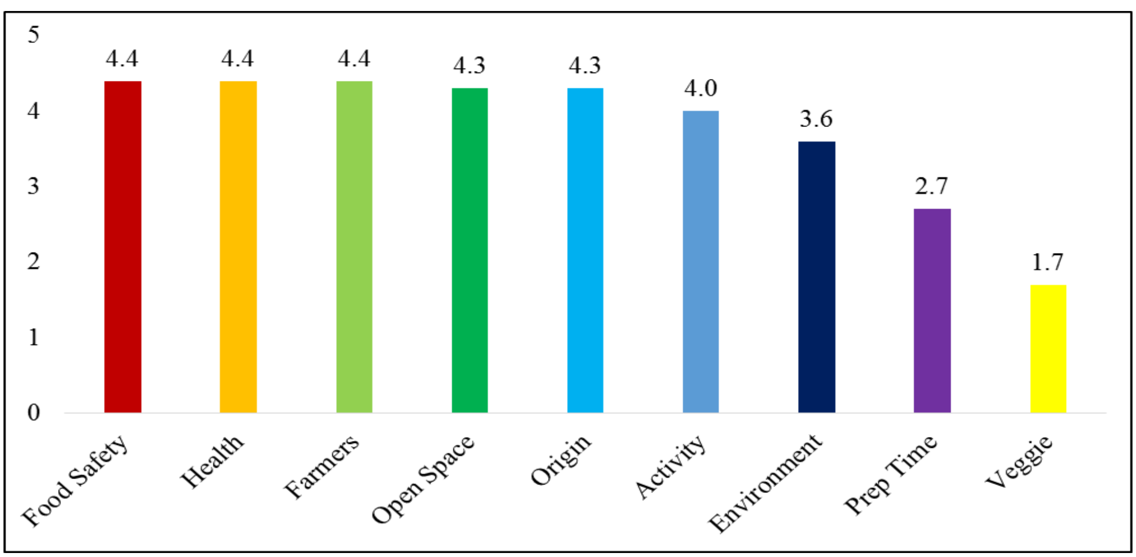

Figure 3. Respondent average attitude/lifestyle likert scale ratings.

“agree” or “strongly agree” that they are concerned with the origin of their food. Three lifestyle question responses (supporting local farmers, concern with health/diet, and concern with food safety) coincide with the reported reasons of consumers from previous studies who purchased food that was grown locally (Toler et al., 2009; Wolf et al., 2005). In our study it was observed that 97% of participants indicated they “agree” or “strongly agree” with supporting local farmers, 96% “agree” or “strongly agree” that they are concerned with their health/diet, and 94% “agree” or “strongly agree” that they are concerned with the safety of their food. This information could be coupled with the information collected by Curtis, Gumirakiza et al. (2014) to extrapolate on the desire consumers have for local food and their estimated WTP for that attribute.

For the purposes of the study at hand, it is most important to note that there is at least a portion of consumers in Utah who demonstrate a higher WTP for eco-friendly and organically produced peaches over conventionally produced peaches. This evidence allows further investigation into the economic feasibility of establishing these separate orchards in Utah.

Current Peach Pricing

During the farmers’ market season of 2014, peach prices were collected at farmers’ markets throughout Northern Utah (Logan, Park City, Murray and Salt Lake City) and Colorado **(**Alamosa, Boulder, Castle Rock, Drake, Golden, Grand Junction, Greeley, Highlands, Longmont, Old Town, Palisade, and South Pearl). Peach prices were also gathered from producer surveys and are included in the Utah and Colorado farmers’ market prices in Table 6. Wholesale prices paid to producers for peaches were also

Table 6

Average Direct and Wholesale Market Peach Prices per Pound in Colorado and Utah (N=227)

	UT Farmers' Market Prices	CO Farmers' Market Prices	Wholesale Prices	WTP Pricing Results
Organic	Unavailable	$3.87	$2.08	$5.42
Eco-Friendly[a]	$2.25	$2.97	Unavailable	$5.12
Conventional	$1.10	$3.36	$1.06	$4.48

[a]Also includes peaches labelled No-Spray, Reduced Pesticides, and other specialty certification pertaining to product's production. Colorado farmers' market prices provided by Colorado State University Extension, 2014

collected from Utah grocery stores such as Associated Foods and Whole Foods. Altogether, 227 peach prices were observed.

Colorado farmers' market prices offer an insight into the direct market for organic peaches as there currently are no organic peach producers in Utah (Associated Foods, personal communication, October 9, 2014; U.S. Department of Agriculture, Economic Research Service, 2013). Interestingly, the eco-friendly peaches at the Colorado farmers' markets were, on average priced lower than conventional peaches, which contradicts pricing in the literature (Anderson et al., 1996; Bazoche et al., 2013; Combris et al., 2011). This may be due to the ambiguity in the definition, reported by Colorado extension[3] for "eco-friendly" peaches, as the labeling may have included other intrinsic values such as local. When consumers do not clearly understand the definitions of labeling, their WTP changes in ways that do not reflect what is generally observed (Moser & Raffaelli, 2012).

[3] Colorado State University Extension (2014) provided the following definitions for reported farmers' market labeling: USDA=USDA Certified Organic; Cert=other specialty certification pertaining to product's production; No cert=product has no specific certification associated with its production.

The percentage difference between the combined average of Utah and Colorado farmers' market prices and the prices demonstrated in the WTP surveys was calculated ((WTP Survey Prices-FM Prices)/FM Prices*100), and it was found that the WTP survey prices were between 40% and 101% greater than actual observed prices (see Table 7). Wholesale price differences were not calculated as they tend to be lower than farmers' market prices (Associated Foods, personal communication October 9, 2014; Colorado State University Extension, 2014; Harmon's Grocery, personal communication, October 7, 2014; Lee's Marketplace, personal communication, October 2, 2014; Smith's Food and Drug, personal communication, October 2, 2014; C. Rowley, personal communication, October 20, 2014; Whole Foods Market, personal communication, October 20, 2014), and since the survey took place at farmers' markets, consumer demographics in a wholesale market may not be comparable to the demographic in this study.

All observed prices and WTP survey prices paid for peaches are higher than prices listed by the USDA. The USDA lists the Utah prices received by producers for peaches in 2014 as $1,080 per ton or $0.54/Lb. (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014), which is 96% lower than even the lowest

Table 7

Percentage Difference between the Combined Farmers' Market Peach Prices and WTP Survey Prices

	Average FM Prices/Lb.	WTP Survey Prices/Lb.	Difference (%)
Organic	$3.87	$5.42	40%
Eco-Friendly	$2.61	$5.12	96%
Conventional	$2.23	$4.48	101%

average observed wholesale price ($1.06/Lb.). Larger scale peach producers may receive lower prices than those observed at farmers' markets as they sell their peaches to fruit packing plants and the packing plants receive the prices reported by local grocery outlets (C. Rowley, personal communication, October 20, 2014). Although future studies may ascertain further consumer WTP information for wholesale outlets, this study focused on consumer WTP for peaches in direct markets.

Peach Pricing Discussion

Consumer's demonstrated WTP for conventional, eco-friendly, and organic peaches in this study were $4.48/Lb., 5.12/Lb., and 5.42/Lb., respectively. Although these prices reflect what was actually paid by consumers during the study, these prices may not necessarily reflect prices that are currently present in the market.

The disparity in actual prices and prices paid during this study is made evident by the 32.6% of survey participants who did not purchase peaches. The main reason for not purchasing (72.9%) was due to price. Although prices paid in the study may not reflect actual prices in the market, price trends in the WTP study follow actual trends with organic, eco-friendly, and conventional peach prices, namely, consumers are willing to pay a premium over conventional peaches for organic and eco-friendly labeling and production practices. This suggests that overall pricing in the markets (except for the anomaly in Colorado farmers' market prices for eco-friendly labeling) reflects the trends that consumers are willing to pay more for certain production practices in peaches.

Table 8 demonstrates the premium comparison between actually observed prices and prices paid in the WTP study for organic and eco-friendly peaches over organic peaches. Observed organic peach prices are 74% above conventional prices, whereas the

Table 8

Premium Paid (%) for Eco-Friendly and Organic Peaches Above Price Paid for Conventional Peaches

	Average FM Prices/lb.	Premium Over Conventional (FM)	WTP Survey Prices/lb.	Premium Over Conventional (WTP)
Organic	$3.87	74%	$5.42	21%
Eco-Friendly	$2.61	17%	$5.12	14%
Conventional	$2.23	0%	$4.48	0%

WTP study price for organic peaches is only 21% above conventional prices. This may be due to the fact that actual farmers' market prices for organic peaches were not available in Utah, and Colorado consumers may be willing to pay more for organic peaches than Utah consumers.

The percentage premium of organic and eco-friendly peaches over conventionally grown peaches gives evidence that consumers in Utah are willing to pay for these alternate forms of production. This information may help producers make educated assumptions about the economic returns that could be attained by switching to alternate production methods. A risk-return assessment will be conducted in Chapter 3, which will further aid producers in assessing if consumer WTP is sufficiently attractive to alter methods of production. This assessment will also be used to determine if current price premiums for eco-friendly and organic peaches are sufficient to cover costs of production, and which method has the potential for greater profits for producers.

CHAPTER 3

RISKS AND RETURNS TO PEACH PRODUCTION

When considering whether to grow under organic, eco-friendly, or conventional management, producers need to understand the risks and returns associated with each method. The following analyses may help provide information to future or current peach producers regarding the risks and returns associated with each production method.

In order to determine costs to establish and maintain an organic, eco-friendly (or Integrated Pest Management), and conventional peach orchard, cost and return studies were prepared. Study data was based on surveys of peach growers in Utah and surrounding states, as well as peach orchard costs and return studies from other states. (Day, Klonsky, & De Moura, 2009; Galinto & Gallardo, 2012; Galinto, Gallardo, & Miles, 2014; Sharp & Cooley, 2004). Unless otherwise indicated, information in the peach orchard costs and returns of this publication are based upon grower surveys and pricing data collected in 2014. The price of peaches received by producers are based on actual observances at farmers' markets in Colorado and Utah, and by a survey of several grocery stores in northern Utah, as outlined in Chapter 2 (see Table 6).

Peach Production Overview

Peach production can vary immensely from orchard to orchard. There are a variety of methods in use and under development to address issues such as pest management, weed management and fertility within an orchard. These methods of production can have an impact on expenses and returns and should be thoroughly researched by producers before implementation. When selecting a method, it may be advisable to test the method on a small portion of the orchard block before applying it to the entire orchard. Cultural management decisions such as variety selection, soil fertility practices, irrigation, pest, and weed control will have an impact on the costs and returns of any peach orchard.

Prices received for peaches harvested are key to profitability**.** Prices in this budget will reflect locally observed prices from 2014. As with most agricultural commodities, several factors determine market prices received during any given year, including variety, total production, fruit quality, marketing strategies and regular volatility in markets. Direct marketing and contracts are options that some producers prefer to use in order to secure higher prices.

The amount paid for equipment, land and other capital expenditures can impact profitability. For example, land prices in Utah vary across regions. Equipment prices also vary depending on whether the equipment is new or used, if the producers leases or if they hire custom services. All of these factors can directly affect the profitability and investment for an orchard, and should be considered in management decisions.

Peach Production Assumptions

Land

The site represented in this budget is established in open land with no improvements (ground levelling, for instance). It is also assumed that the site is in a location with minimal spring frost and winter cold damage.

This representative farm is a 20 acre peach orchard, which is leased at $800/acre (Olsen, Curtis, Wagner, & Knudsen, 2014). Although some producers may grow other crops as well (apples, apricots, cherries) in order to spread the cost of machinery and hedge against unfavorable weather or markets, it is assumed that only peaches are grown in the orchard.

Peach Trees

The cost of purchasing peach trees and planting density can vary significantly. Trees for this budget are priced at $7.75 each (Ty Ty Nusery, 2014) and the planting density is assumed at 400 trees per acre. While organic tree stock can be used in the organic budget, it is not necessary because conventional (non-organically produced) trees can be "sold, labeled, or represented as organically produced" trees when maintained under organic practices for at least one year (National Organic Program, 205 C.F.R §205.204, 2014).

Irrigation

The amount of water needed to properly irrigate a peach orchard will depend on a variety of factors including site location, soil type, annual temperatures, and rainfall. The year of growth also needs to be taken into consideration as younger orchards will require less water than fully producing orchards. The amount of water each orchard receives increases from 1.5 acre feet in year one to 3.5 acre feet in years 6-20 when orchards are in full production (Day et al., 2009).

Although flood irrigation was commonly used in the past for orchard irrigation, drip systems and micro-sprinkler systems have become increasingly popular due to their consistent watering, as well as their efficiency in irrigation. This study assumes a micro sprinkler system priced at $1,500 per acre (Mountain Land Sprinkler, personal communication, November 6, 2014) and annual water cost is $30/acre foot.

Electricity

Electricity to run the irrigation pumps is assumed at $14.22 per acre foot of water (N. Allen, personal communication, November 7, 2014; Rocky Mountain Power, 2014) and electricity to run the cooler is assumed at $15.00 per day during the months of August and September ($900) for a total of $1,895 per acre per year during full production (years 6-20).

Organic Certification

Organic certification applies only to the organic orchard and includes the application fee ($200), annual on-site inspections ($267), evaluation by the organic certification inspector ($84), and additional yearly paperwork and record keeping by the producer ($1,806) for a total of $2406 (R. Overman, personal communication September 3, 2014). Annual gross sales fees are calculated using Table 9 (Utah Department of Agriculture and Food, 2008; R. Overman, personal communication September 3, 2014). The U.S. Department of Agriculture has a “Cost Sharing” program to help offset the cost of organic certification for producers, however, as of 2014, Utah was not participating in this program (U.S. Department of Agriculture, Agricultural Marketing Service, 2014a).

Table 9

Graduated Annual Gross Sales Fee for Organic Products Sold

Gross Sales ($)	Annual Gross Sales Fee ($)
$0.00 - $5,000	$0
$5,001 - $10,000	$100
$10,001 - $15,000	$180
$15,001- $20,000	$240
$20,001 - $25,000	$300
$25,001- $30,000	$360
$30,001 - $35,000	$420
$35,001 - $50,000	$600
$50,001 - $75,000	$900
$75,001 - $100,000	$1,200
$100,001 - $150,000	$1,800
$150,001 - $280,000	$2,240
$280,001 - $375,000	$3,000
$375,001 - $500,000	$4,000
$500,001 - $9,999,999	$5,000

Source: Utah Department of Agriculture and Food, 2008; R. Overman, personal communication, September 3, 2014

Marketing

Yearly marketing fees include packaging at $6 per 23 Lb. box (half bushel), fees and stand costs for four markets ($800), market labor costs ($2,400), and transportation to markets ($1,440).

Market Prices

Producers have found that through direct marketing (roadside stands, farmers' markets, etc.) they have been able to gain higher prices for their peaches, and therefore can cover their costs more effectively. Contracts are also a good way to lock in prices, however, small producers may have difficulty finding buyers willing to contract with them (Utah State University, 2014). "Wholesale" prices assumed in this study reflect prices paid by retail locations such as Associated Foods during 2014. "Direct Market" prices reflect prices received by producers at various farmers' markets in Northern Utah and Colorado during the 2014 market season. Table 10 demonstrates the price per pound for each of the three orchards. After gathering data from grower surveys, it was decided that 20% of production would be sold to wholesale markets and 80% of production would be sold in direct markets. Wholesale markets mainly consist of grocery stores, and direct markets include farmers' markets, community supported agriculture (CSA) programs, and roadside stands.

Table 10

Peach Prices[a] (Per Pound) and Market Allocation

Market	Organic	Eco-Friendly	Conventional	Percentage Sold
Wholesale	$2.08	$1.22	$1.06	20%
Direct Markets	$3.87	$2.61	$2.23	80%

[a] Prices based on surveys of wholesale locations throughout Northern Utah, farmers' markets throughout Northern Utah and Colorado, and grower surveys

Yields

Table 11 provides the assumed quantities of peach production per acre for each time period in the organic peach budget. The possibility of a partial or full crop loss due to frost or other factors is highly likely during the 20-year orchard life. This budget assumes a one-half crop loss every third year. An 80% pack-out rate is assumed and returns are based on the pack-out rate (Table 12).

Cash Overhead

Cash overhead consists of various cash expenses paid during the year. These costs include accounting/legal costs, insurance, and office expenses.

Table 11

Peach Yields per Acre/Year (Pounds)[a]

Year	Organic	Eco-Friendly	Convetional
Year 1 (Establishment)	-	-	-
Year 2	-	-	-
Year 3	-	-	-
Year 4	4,290	4,565	5,500
Year 5	10,725	11,412	13,750
Year 6	15,015	15,977	19,250
Year 7	7,507	7,988	9,625
Year 8	15,015	15,977	19,250
Year 9	15,015	15,977	19,250
Year 10	7,507	7,988	9,625
Year 11	15,015	15,977	19,250
Year 12	15,015	15,977	19,250
Year 13	7,507	7,988	9,625
Year 14	15,015	15,977	19,250
Year 15	15,015	15,977	19,250
Year 16	7,507	7,988	9,625
Year 17	15,015	15,977	19,250
Year 18	12,870	13,695	16,500
Year 19	4,290	4,565	5,500
Year 20	8,580	9,130	11,000

[a] Based on Grower Surveys

Table 12

Peach Yields per Acre/Year (Pounds)-80% Pack-out Rate

Year	Organic	Eco-Friendly	Convetional
Year 1 (Establishment)	-	-	-
Year 2	-	-	-
Year 3	-	-	-
Year 4	3,432	3,652	4,400
Year 5	8,580	9,130	11,000
Year 6	12,012	12,782	15,400
Year 7	6,006	6,390	7,700
Year 8	12,012	12,782	15,400
Year 9	12,012	12,782	15,400
Year 10	6,006	6,390	7,700
Year 11	12,012	12,782	15,400
Year 12	12,012	12,782	15,400
Year 13	6,006	6,390	7,700
Year 14	12,012	12,782	15,400
Year 15	12,012	12,782	15,400
Year 16	6,006	6,390	7,700
Year 17	12,012	12,782	15,400
Year 18	10,296	10,956	13,200
Year 19	3,432	3,652	4,400
Year 20	6,864	7,304	8,800

Insurance. Insurance on farm investments vary, depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss at 66.6% of the average asset value and crop insurance provides coverage for crop loss at 75% average yields. Liability insurance covers accidents on the orchard. Crop and liability insurance are estimated at an annual cost of $1000 for the 20 acre orchard (S. Norman, personal communication, September 24, 2014).

Office and Travel. Office and travel costs are estimated at $5,000 for an average year. These expenses include office supplies, telephone service, internet service, and travel expenses to educational seminars.

Accounting and Legal. Annual accounting and legal costs are estimated at $1000 for an average year for the 20 acre orchard.

Equipment

The equipment listed is enough to adequately manage a 20-25 acre orchard. Unless otherwise noted, all equipment listed is new. Equipment prices were collected from producers and equipment dealers (Agrisupply, 2014; B. Chapman, personal communication, October 7, 2014; Commercial Truck Trader, 2014; HOJ Forklifts, personal communication October 7, 2014; Intermountain Farmers Association, Country Stores, personal communication, August 25, 2014; Painter, 2011; Weed Badger, personal communication, October 10, 2014). Producers should consider the costs of buying new equipment versus used, as well as leasing, custom hiring, and group purchasing when establishing a new orchard as these costs will vary and have a large impact on the economic returns of a project.

Fuel and Lube. The fuel and lube for machinery is calculated at 8 percent the average asset value.

Investment Repairs. Annual repairs on all farm investments or capital recovery items that require maintenance are calculated at 2% of the average asset value for buildings and equipment, and at 7% for machinery and vehicles.

Capital Recovery. Capital recovery costs are the annual depreciation (opportunity cost) of all farm investments. Capital recovery costs are calculated using straight line depreciation. All equipment listed is used unless otherwise noted. The price for used machinery is calculated as one-half the new purchase price and useful life is calculated as two-thirds that of new machinery.

Salvage Value. Salvage value is 10% of the purchase price, which is an estimate of the remaining value of an investment at the end of its useful life. The salvage value for land is the purchase price, as land does not normally depreciate.

Labor

The wage rate used is representative of the net cost to the grower and is assumed at $15.00 per hour (Galinato et al., 2014). Owner management and labor is $30,000 per year (Olsen & Curtis, 2012).

Costs and Returns

The initial investment costs for machinery, vehicles, buildings, improvements, and equipment are provided in Tables 13-15. As can be seen, equipment requirements vary by orchard production practices.

Table 13

Initial Investment Requirements[a]-Organic Peach Orchard, 20 Acres

Machinery & Vehicles	Purchase Price	Salvage Value	Useful Life	Annual Capital Recovery	Annual Insurance	Annual Repairs	Annual Fuel & Lube
Tractor 35 hp	$ 25,000	$ 2,500	15	$ 1,500	$ 92	$ 963	$ 1,100
Tractor 65 hp	$ 55,000	$ 5,500	15	$ 3,300	$ 201	$ 2,118	$ 2,420
Pickup 3/4 ton	$ 40,000	$ 4,000	6	$ 6,000	$ 147	$ 1,540	$ 1,760
Refridgerated Truck (used)	$ 22,000	$ 2,200	7	$ 2,829	$ 81	$ 847	$ 968
Forklift	$ 23,000	$ 2,300	10	$ 2,070	$ 84	$ 886	$ 1,012
Wind Machine (x2)	$ 50,000	$ 5,000	15	$ 3,000	$ 183	$ 1,925	$ 2,200
4 Wheeler	$ 10,000	$ 1,000	5	$ 1,800	$ 37	$ 385	$ 440
Sub Total	$ 225,000		NA	$ 20,499	$ 824	$ 8,663	$ 9,900
Buildings, Improvements & Equipment							
Shop (40X40 & Tools)	$ 15,000	$ 1,500	15	$ 900	$ 55	$ 165	-
Temperature Controlled Storage (1500 square feet)	$ 80,000	$ 8,000	15	$ 4,800	$ 293	$ 880	-
Implements	$ 10,000	$ 1,000	10	$ 900	$ 37	$ 110	-
Irrigation System	$ 30,000	$ 3,000	20	$ 1,350	$ 110	$ 330	-
Pneumatic Shears/Compressor	$ 8,000	$ 800	10	$ 720	$ 29	$ 88	-
Tree Sprayer	$ 20,000	$ 2,000	10	$ 1,800	$ 73	$ 220	-
Weed Badger	$ 8,800	$ 880	20	$ 396	$ 32	$ 97	-
Manure/Compost Spreader	$ 23,900	$ 2,390	10	$ 2,151	$ 88	$ 263	-
Tiller	$ 9,000	$ 900	10	$ 810	$ 33	$ 99	-
Flail Mower	$ 3,000	$ 300	10	$ 270	$ 11	$ 33	-
Flatbed Trailer (used)	$ 2,000	$ 200	8	$ 225	$ 7	$ 22	
Sub Total	$ 209,700	$ 20,970	NA	$ 14,322	$ 768	$ 2,307	$ -
Total Initial Investment	**$ 434,700**	**$ 20,970**	**NA**	**$ 34,821**	**$ 1,592**	**$ 10,969**	**$ 9,900**

a Based on grower surveys and local and online suppliers

Table 14

Initial Investment Requirements[a]-Eco-Friendly Peach Orchard, 20 Acres

Machinery & Vehicles	Purchase Price	Salvage Value	Useful Life	Annual Capital Recovery	Annual Insurance	Annual Repairs	Annual Fuel & Lube
Tractor 35 hp	$ 25,000	$ 2,500	15	$ 1,500	$ 92	$ 963	$ 1,100
Tractor 65 hp	$ 55,000	$ 5,500	15	$ 3,300	$ 201	$ 2,118	$ 2,420
Pickup 3/4 ton	$ 40,000	$ 4,000	6	$ 6,000	$ 147	$ 1,540	$ 1,760
Refridgerated Truck (used)	$ 22,000	$ 2,200	7	$ 2,829	$ 81	$ 847	$ 968
Forklift	$ 23,000	$ 2,300	10	$ 2,070	$ 84	$ 886	$ 1,012
Wind Machine (x2)	$ 50,000	$ 5,000	15	$ 3,000	$ 183	$ 1,925	$ 2,200
4 Wheeler	$ 10,000	$ 1,000	5	$ 1,800	$ 37	$ 385	$ 440
Sub Total	$ 225,000		NA	$ 20,499	$ 824	$ 8,663	$ 9,900
Buildings, Improvements and Equipment							
Shop (40X40 & Tools)	$ 15,000	1,500	15	$ 900	$ 55	$ 165	-
Temperature Controlled Storage (1500 square feet)	$ 80,000	8,000	15	$ 4,800	$ 293	$ 880	-
Implements	$ 10,000	$ 1,000	10	$ 900	$ 37	$ 110	-
Irrigation System	$ 30,000	$ 3,000	20	$ 1,350	$ 110	$ 330	-
Pneumatic Shears/Compressor	$ 8,000	$ 800	10	$ 720	$ 29	$ 88	-
Tree Sprayer	$ 20,000	$ 2,000	10	$ 1,800	$ 73	$ 220	-
Weed Badger (new)	$ 8,800	$ 880	20	$ 396	$ 32	$ 97	-
Manure/Compost Spreader	$ 23,900	$ 2,390	10	$ 2,151	$ 88	$ 263	-
Flail Mower	$ 3,000	$ 300	10	$ 270	$ 11	$ 33	-
Flatbed Trailer (used)	$ 2,000	$ 200	8	$ 225	$ 7	$ 22	
Sub Total	$ 200,700	$ 20,070	NA	$ 13,512	$ 735	$ 2,208	$ -
Total Initial Investment	**$ 425,700**	**$ 20,070**	**NA**	**$ 34,011**	**$ 1,559**	**$ 10,870**	**$ 9,900**

a Based on grower surveys and local and online suppliers

Table 15

Initial Investment Requirements[a]-Conventional Peach Orchard, 20 Acres

Machinery & Vehicles	Purchase Price	Salvage Value	Useful Life	Annual Capital Recovery	Annual Insurance	Annual Repairs	Annual Fuel & Lube
Tractor 35 hp	$ 25,000	$ 2,500	15	$ 1,500	$ 92	$ 963	$ 1,100
Tractor 65 hp	$ 55,000	$ 5,500	15	$ 3,300	$ 201	$ 2,118	$ 2,420
Pickup 3/4 ton	$ 40,000	$ 4,000	6	$ 6,000	$ 147	$ 1,540	$ 1,760
Refridgerated Truck (used)	$ 22,000	$ 2,200	7	$ 2,829	$ 81	$ 847	$ 968
Forklift	$ 23,000	$ 2,300	10	$ 2,070	$ 84	$ 886	$ 1,012
Wind Machine (x2)	$ 50,000	$ 5,000	15	$ 3,000	$ 183	$ 1,925	$ 2,200
4 Wheeler	$ 10,000	$ 1,000	5	$ 1,800	$ 37	$ 385	$ 440
Sub Total	$ 225,000		NA	$ 20,499	$ 824	$ 8,663	$ 9,900
Buildings, Improvements & Equipment							
Shop (40X40 & Tools)	$ 15,000	$ 1,500	15	$ 900	$ 55	$ 165	-
Temperature Controlled Storage (1500 square feet)	$ 80,000	$ 8,000	20	$ 3,600	$ 293	$ 880	-
Implements	$ 10,000	$ 1,000	10	$ 900	$ 37	$ 110	-
Irrigation System	$ 30,000	$ 3,000	20	$ 1,350	$ 110	$ 330	-
Pneumatic Shears/Compressor	$ 8,000	$ 800	10	$ 720	$ 29	$ 88	-
Tree Sprayer	$ 20,000	$ 2,000	10	$ 1,800	$ 73	$ 220	-
Flail Mower	$ 3,000	$ 300	10	$ 270	$ 11	$ 33	-
Flatbed Trailer (used)	$ 2,000	$ 200	8	$ 225	$ 7	$ 22	
Sub Total	$ 168,000	$ 16,800	NA	$ 9,765	$ 615	$ 1,848	$ -
Total Initial Investment	**$ 393,000**	**$ 16,800**	**NA**	**$ 30,264**	**$ 1,440**	**$ 10,511**	**$ 9,900**

[a] Based on grower surveys and local and online suppliers

Not only do initial investments for each orchard vary, but so do yearly management and maintenance costs. Appendices B-D provide detailed yearly information about the management, expenses, and returns for the orchards. After the first 5 years of production input and management costs, and yields are assumed to remain constant with the exception of the one half crop loss every three years and declining crop yields of years 18-20 as previously outlined in Table 11. Table 16 gives a side-by side comparison of the per acre net returns and the cumulative net returns for the organic, eco-friendly, and conventional orchards. The net returns are the annual net income after expenses, and the cumulative net returns are the total summation of net returns generated since orchard inception. Also shown in Table 16 is the Net Present Value (NPV), which is a summation of the cumulative net returns over the entire 20 year lifespan of the orchard and

Table 16

Per Acre Net Returns, Cumulative Net Returns, and Net Present Value (NPV) for Organic, Eco-Friendly, and Conventional Peach Orchards

	Annual Net Returns per Acre			Cumulative Net Returns per Acre		
Year	**Organic**	**Eco-Friendly**	**Conventional**	**Organic**	**Eco-Friendly**	**Conventional**
Year 1	($11,380)	($11,083)	($10,264)	($11,380)	($11,083)	($10,264)
Year 2	($8,116)	($7,744)	($6,875)	($19,497)	($18,827)	($17,139)
Year 3	($8,168)	($7,796)	($6,928)	($27,665)	($26,624)	($24,067)
Year 4	$518	($2,630)	($1,705)	($27,147)	($29,253)	($25,772)
Year 5	$15,589	$7,166	$8,124	($11,557)	($22,088)	($17,648)
Year 6	$25,249	$13,216	$14,173	$13,691	($8,871)	($3,475)
Year 7	$4,154	($1,688)	($1,196)	$17,845	($10,560)	($4,671)
Year 8	$25,249	$13,216	$14,173	$43,094	$2,657	$9,502
Year 9	$25,249	$13,216	$14,173	$68,342	$15,873	$23,675
Year 10	$4,154	($1,688)	($1,196)	$72,497	$14,185	$22,478
Year 11	$25,249	$13,216	$14,173	$97,745	$27,401	$36,651
Year 12	$25,249	$13,216	$14,173	$122,994	$40,617	$50,824
Year 13	$4,154	($1,688)	($1,196)	$127,148	$38,929	$49,628
Year 14	$25,249	$13,216	$14,173	$152,396	$52,146	$63,801
Year 15	$25,249	$13,216	$14,173	$177,645	$65,362	$77,974
Year 16	$4,154	($1,688)	($1,196)	$181,799	$63,674	$76,777
Year 17	$25,249	$13,216	$14,173	$207,047	$76,890	$90,950
Year 18	$19,222	$8,959	$9,782	$226,269	$85,849	$100,732
Year 19	($4,884)	($8,074)	($7,783)	$221,385	$77,775	$92,949
Year 20	$7,169	$442	$999	$228,553	$78,218	$93,948
NPV (5%)				**$122,689**	**$37,290**	**$47,204**

discounted at a rate of 5% which allows consideration of the time value of money when analyzing long-term investments (Kay, Edwards, & Duffy 2008). Mathematically, the NPV is calculated:

(1) $$NPV = -C + \frac{\pi_1}{(1+r)^1} + \frac{\pi_2}{(1+r)^2} + \frac{\pi_3}{(1+r)^3} + \cdots + \frac{\pi_{20}}{(1+r)^{20}}$$

where *C* is the initial investment cost, π is the annual net returns per acre in the t^{th} year, and *r* is the discount rate. The NPV allows a more complete comparison of long-term projects because it takes into consideration the time value of money (a dollar today is not worth the same amount as a dollar in 20 years.) For instance, the organic orchard shows a cumulative net return in year 20 of $228,553, when discounted at a rate of 5% to reflect today's value, it is actually worth $122,689.

A break-even analysis is helpful in analyzing potential costs and returns of an investment. A break-even analysis shows a range of yields and prices needed to make a project profitable at a given cost. Tables 17-19, demonstrates break-even analyses for each of the three orchards, and shows varying prices needed (italicized) for the three orchards at and around the assumed pack-out rate yield for a full production year. The median pack-out rate yields (bolded) are the yields assumed in the budgets, rounded to the nearest hundredth. The yields vary by increments of 500 Lbs, to show the prices needed in order for each orchard to become profitable, or "break-even." The analyses use costs from a full production year, and an 80/20 direct and wholesale market distribution is assumed.

Table 17

Break-Even Analysis[a]-Organic Orchard Returns Per Acre at Varying Prices

	Wholesale and Direct Market Prices (Pound)						
Wholesale	*0.75*	*0.80*	*0.85*	*0.90*	*0.95*	*1.00*	*1.05*
DM	*1.40*	*1.49*	*1.58*	*1.67*	*1.77*	*1.86*	*1.95*
Pack-Out Rate Yield							
10500	$ (3,641)	$ (2,755)	$ (1,868)	$ (982)	$ (95)	$ 791	$ 1,678
11000	$ (3,008)	$ (2,079)	$ (1,151)	$ (222)	$ 707	$ 1,635	$ 2,564
11500	$ (2,375)	$ (1,404)	$ (433)	$ 538	$ 1,509	$ 2,480	$ 3,451
12000	$ (1,741)	$ (728)	$ 285	$ 1,298	$ 2,311	$ 3,324	$ 4,337
12500	$ (1,108)	$ (53)	$ 1,002	$ 2,058	$ 3,113	$ 4,168	$ 5,223
13000	$ (475)	$ 622	$ 1,720	$ 2,817	$ 3,915	$ 5,012	$ 6,110
13500	$ 158	$ 1,298	$ 2,437	$ 3,577	$ 4,717	$ 5,857	$ 6,996

[a]Assumes full production year and total annual per acre cost of $16,938

Table 18

Break-Even Analysis[a]-Eco-Friendly Orchard Returns Per Acre at Varying Prices

	Wholesale and Direct Market Prices (Pound)						
Wholesale	*0.55*	*0.60*	*0.65*	*0.70*	*0.75*	*0.80*	*0.85*
DM	*1.18*	*1.28*	*1.39*	*1.50*	*1.60*	*1.71*	*1.82*
Pack-Out Rate Yield							
10500	$(5,551)	$(4,548)	$(3,544)	$(2,541)	$(1,537)	$ (534)	$ 470
11000	$(5,026)	$(3,974)	$(2,923)	$(1,872)	$ (820)	$ 231	$ 1,282
11500	$(4,500)	$(3,401)	$(2,302)	$(1,203)	$ (104)	$ 996	$ 2,095
12500	$(3,449)	$(2,254)	$(1,059)	$ 135	$ 1,330	$ 2,525	$ 3,719
13000	$(2,923)	$(1,680)	$ (438)	$ 804	$ 2,047	$ 3,289	$ 4,532
13500	$(2,397)	$(1,107)	$ 183	$ 1,473	$ 2,764	$ 4,054	$ 5,344
14000	$(1,872)	$ (534)	$ 804	$ 2,142	$ 3,480	$ 4,819	$ 6,157

[a]Assumes full production year and total annual per acre cost of $16,590

Table 19

Break-Even Analysis[a]-Conventional Orchard Returns Per Acre at Varying Prices

	Wholesale and Direct Market Prices (Pound)						
Wholesale	*0.45*	*0.50*	*0.55*	*0.60*	*0.65*	*0.70*	*0.75*
DM	*0.95*	*1.05*	*1.16*	*1.26*	*1.37*	*1.47*	*1.58*
Pack-Out Rate Yield							
14000	$(4,703)	$(3,384)	$(2,066)	$ (748)	$ 570	$ 1,888	$ 3,206
14500	$(4,279)	$(2,914)	$(1,548)	$ (183)	$ 1,182	$ 2,547	$ 3,912
15000	$(3,855)	$(2,443)	$(1,031)	$ 382	$ 1,794	$ 3,206	$ 4,618
15500	$(3,431)	$(1,972)	$ (513)	$ 947	$ 2,406	$ 3,865	$ 5,325
16000	$(3,008)	$(1,501)	$ 5	$ 1,511	$ 3,018	$ 4,524	$ 6,031
16500	$(2,584)	$(1,031)	$ 523	$ 2,076	$ 3,630	$ 5,183	$ 6,737
17000	$(2,160)	$ (560)	$ 1,041	$ 2,641	$ 4,242	$ 5,842	$ 7,443

[a]Assumes full production year and total annual per acre cost of $16,566

Tables 20-22 also show a break-even analysis, but uses the prices assumed in the budgets and changes the pack-out rate yields (italicized) needed at those prices for each orchard to become profitable, or to “break-even.” The median prices (bolded) are the prices used in the budgets, rounded to the nearest tenth. The price difference between wholesale and direct market prices is maintained while adjusting prices.

Table 20

Break-Even Analysis[a]-Organic Orchard Returns Per Acre at Varying Yields

	Wholesale and Direct Market Prices (Pound)						
Wholesale	1.95	2.00	2.05	**2.10**	2.15	2.20	2.25
DM	3.63	3.72	3.81	**3.91**	4.00	4.09	4.19
Pack-Out Rate Yield							
3500	$ (5,414)	$ (5,118)	$ (4,823)	$ (4,527)	$ (4,232)	$ (3,936)	$(3,641)
4000	$ (3,768)	$ (3,430)	$ (3,092)	$ (2,755)	$ (2,417)	$ (2,079)	$(1,741)
4500	$ (2,121)	$ (1,741)	$ (1,362)	$ (982)	$ (602)	$ (222)	$ 158
5000	$ (475)	$ (53)	$ 369	$ 791	$ 1,213	$ 1,635	$ 2,058
5500	$ 1,171	$ 1,635	$ 2,100	$ 2,564	$ 3,028	$ 3,493	$ 3,957
6000	$ 2,817	$ 3,324	$ 3,830	$ 4,337	$ 4,844	$ 5,350	$ 5,857
6500	$ 4,464	$ 5,012	$ 5,561	$ 6,110	$ 6,659	$ 7,207	$ 7,756

[a]Assumes full production year and total annual per acre cost of $16,938

Table 21

Break-Even Analysis[a]-Eco-Friendly Orchard Returns Per Acre at Varying Yields

	Wholesale and Direct Market Prices (Pound)						
Wholesale	1.05	1.10	1.15	**1.20**	1.25	1.30	1.35
DM	2.25	2.35	2.46	**2.57**	2.67	2.78	2.89
Pack-Out Rate Yield							
5500	$(5,551)	$(5,026)	$(4,500)	$(3,974)	$(3,449)	$(2,923)	$(2,397)
6000	$(4,548)	$(3,974)	$(3,401)	$(2,827)	$(2,254)	$(1,680)	$(1,107)
6500	$(3,544)	$(2,923)	$(2,302)	$(1,680)	$(1,059)	$ (438)	$ 183
7000	$(2,541)	$(1,872)	$(1,203)	$ (534)	$ 135	$ 804	$ 1,473
7500	$(1,537)	$ (820)	$ (104)	$ 613	$ 1,330	$ 2,047	$ 2,764
8000	$ (534)	$ 231	$ 996	$ 1,760	$ 2,525	$ 3,289	$ 4,054
8500	$ 470	$ 1,282	$ 2,095	$ 2,907	$ 3,719	$ 4,532	$ 5,344

[a]Assumes full production year and total annual per acre cost of $16,590

Table 22

Break-Even Analysis[a]-Conventional Orchard Returns Per Acre at Varying Yields

	Wholesale and Direct Market Prices (Pound)						
Wholesale	0.90	0.95	1.00	**1.05**	1.10	1.15	1.20
DM	1.89	2.00	2.10	**2.21**	2.31	2.42	2.52
Pack-Out Rate Yield							
6500	$ (5,550)	$(4,938)	$(4,326)	$(3,714)	$(3,102)	$(2,490)	$(1,878)
7000	$ (4,703)	$(4,043)	$(3,384)	$(2,725)	$(2,066)	$(1,407)	$ (748)
7500	$ (3,855)	$(3,149)	$(2,443)	$(1,737)	$(1,031)	$ (324)	$ 382
8000	$ (3,008)	$(2,255)	$(1,501)	$ (748)	$ 5	$ 758	$ 1,511
8500	$ (2,160)	$(1,360)	$ (560)	$ 240	$ 1,041	$ 1,841	$ 2,641
9000	$ (1,313)	$ (466)	$ 382	$ 1,229	$ 2,076	$ 2,924	$ 3,771
9500	$ (466)	$ 429	$ 1,323	$ 2,218	$ 3,112	$ 4,006	$ 4,901

[a]Assumes full production year and total annual per acre cost of $16,566

Risk Assessment Overview

Although these cost and return studies reflect actual net return estimated to the three methods of peach productions, they do not necessarily reflect the risk or possible variability that comes along with agricultural production or fluctuation in the markets. In order to better assess the risk and return potential, a stochastic production-based simulation model was run for each of the individual production methods. By running a simulation model of the three methods, an estimation of the distribution of economic returns for the three alternate methods of production can be assessed (Richardson, 2006). A simulation of the intended orchard establishments also allows a variety of situations to be assessed. Rather than calculating a “good,” “average,” and “poor” year of production, simulation with certain stochastic variables allows price, yield, and crop loss risks to change individually (Kim, Curtis, & Yeager, 2014), providing an estimate of likely outcomes (Richardson, 2006). This provides producers a summarized probability of success under each of the given orchard production situations, thus aiding them in deciding which, if any, of the three outlined methods of production are best for them.

Variables and Model Design

In order to run a simulation model that reflects the variability of real life situations, stochastic variables were assigned. Stochastic variables as outlined by Richardson (2006) are those variables which the producer cannot control. Annual net returns, wholesale and direct market prices, pounds of peaches produced, and cumulative net returns are all considered stochastic in this model. Costs of production and percentage of pack-out rate sold to each market can be tracked and anticipated by producers in advance so they are not designated as stochastic. Stochastic variables will be marked by a tilde (~) over the variable and *t* = subscript for time, or the year. The variables used for the model are defined as follows:

$\tilde{\pi}_t$ = annual net returns for the t^{th} year (per acre)

$\tilde{P}_{wt}$ = wholesale prices received per pound of peaches in the t^{th} year

$\tilde{P}_{dt}$ = direct market prices received per pound of peaches in the t^{th} year

$\tilde{Q}_t$ = quantity of peaches produced per acre for the t^{th} year (pounds)

$\tilde{R}_t$ = pack-out rate in the t^{th} year (percentage)

C_t = cost of production per acre for the t^{th} year

W = percentage of peaches sold in wholesale market (i.e. grocery stores)

D = percentage of peaches sold in direct market (i.e. farmers' markets, farm stands, etc.)

$\widetilde{NR}$ = cumulative net returns (per acre)

Stochastic prices $\tilde{P}_{wt}$, and $\tilde{P}_{dt}$ were calculated by using a GRKS distribution[4] based upon the available minimum, maximum, and average prices. The stochastic pack-out rate, $\tilde{R}_t$, was calculated using a normal distribution around a mean of 80% and a standard deviation of 5%. Stochastic quantity (in pounds) of peaches produced, $\tilde{Q}_t$, were calculated using a normal distribution around orchard dependent means with a standard deviation of 5.76%[5], based upon yield variations reported by the U.S. Department of Agriculture (U.S. Department of Agriculture, National Agricultural Statistics Service, 2014). The pack-out quantity is determined by multiplying the quantity of peaches produced, $\tilde{Q}_t$, by the pack-out rate, $\tilde{R}_t$.

The annual per acre net returns function for any given year is calculated by:

(2) $$\tilde{\pi}_t = \{\tilde{P}_{wt}(\tilde{R}_t \tilde{Q}_t)W + \tilde{P}_{dt}(\tilde{R}_t \tilde{Q}_t)D\} - C_t$$

The formula to calculate the cumulative net returns for each 20 acre orchard is:

(3) $$\widetilde{NR} = \sum_{t=1}^{20} \tilde{\pi}_t$$

A separate annual net return function and cumulative net returns function will be calculated for each of the three orchard establishments, and a risk analysis of each will be modeled using Simetar software (Richardson, Schumann, & Feldman, 1997).

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[4] Developed by Gray, Richardson, Klose, and Schumann (Richardson, 2006), the GRKS distribution allows simulation of subjective probability distributions based on minimal input data and can be developed using only a mid-point, minimum, and a maximum.

[5] The standard deviation for organic orchard yields was doubled (11.52%) to reflect the possibly higher insect damage (B. Black & J. Reeve, personal communication, November 24, 2014); however, the risk assessment results were not affected by a higher standard deviation.

Although the aforementioned normal and GRKS distributions may not provide the optimal distributions for yield, price, and pack-out rates, due to lack of more inclusive information, they are the best representation available. Figure 4 shows the assumed yield distribution for year 12 of production, and includes the doubled yield distribution for the organic orchard as recommended by B. Black (personal communication, November 24, 2014).

The goal of this simulation is to have the greatest amount of income with the lowest level of risk possible. This goes beyond a simple ranking of point estimates or sensitivity analysis, but includes the risk levels associated with each level of production. The simulation will not indicate which of the options is optimal, but will assess the risk and return associated with each level of production so a producer will be able to make production decisions based upon the attractiveness of each possibility combined with their own level of risk tolerance (Richardson, 2006).

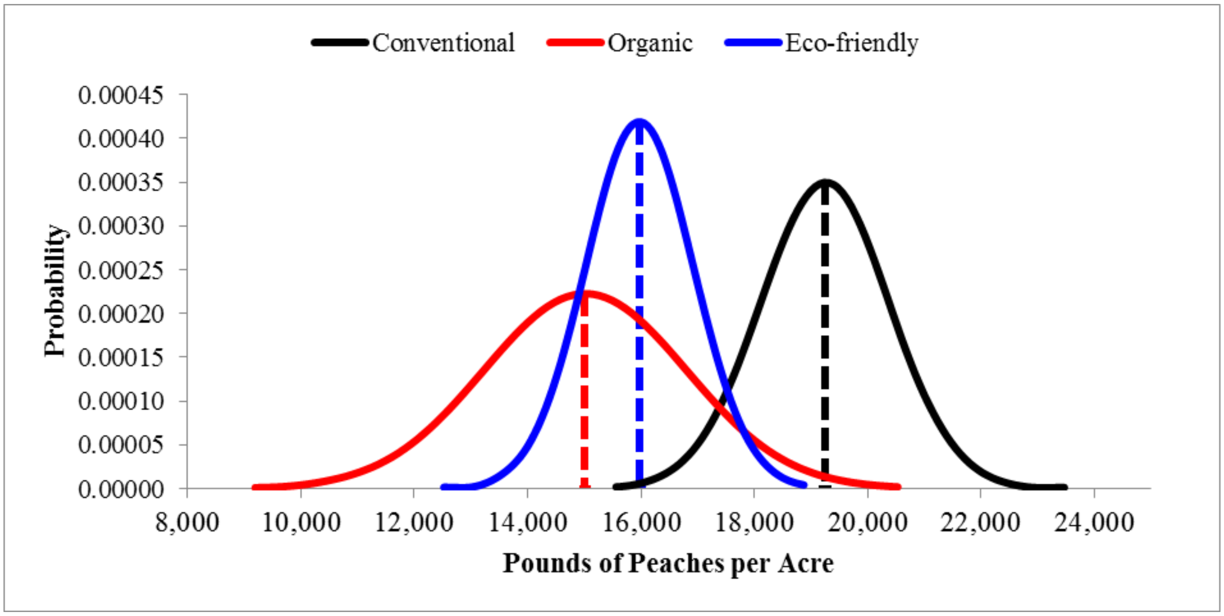

Figure 4. Organic, eco-friendly, and conventional yield distribution, year 12.

Analysis and Results

Simulations based upon the assumed price, pack-out rate and yield distributions were run 1000 times using Simetar software. Various comparisons of the results can be made to determine which of the three options would be optimal for a producer.

Fan graphs comparing returns at varying percentiles within a 95% confidence interval were generated, allowing a comparison of yearly net returns among the three orchards. A simple assessment of Figures 5-7 reveals that eco-friendly and conventional orchards have a greater possibility of yielding negative returns during the entire 20-year period than the organic orchard. Although the conventional orchard contains the highest possibility of negative returns, it also gives the possibility of the highest returns. Looking at only net returns, conventional production appears to be the riskiest possibility, likely due to a relatively wider price range per pound of peaches. Figure 8 shows a comparison of the average yearly return for each orchard, showing the highest, on average return is to be attained with the organic orchard.

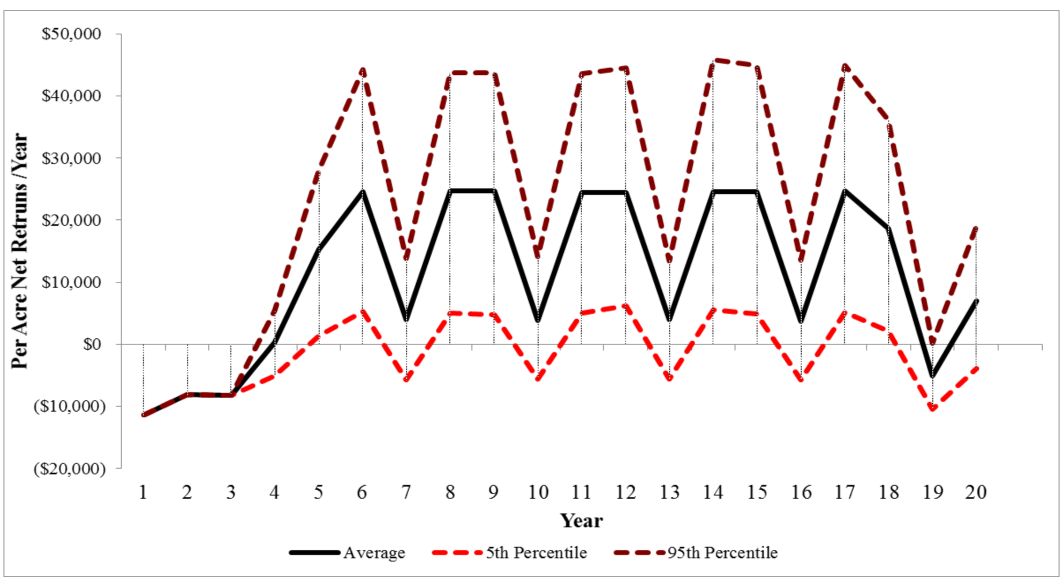

Figure 5. Annual organic returns per acre, 95% confidence interval.

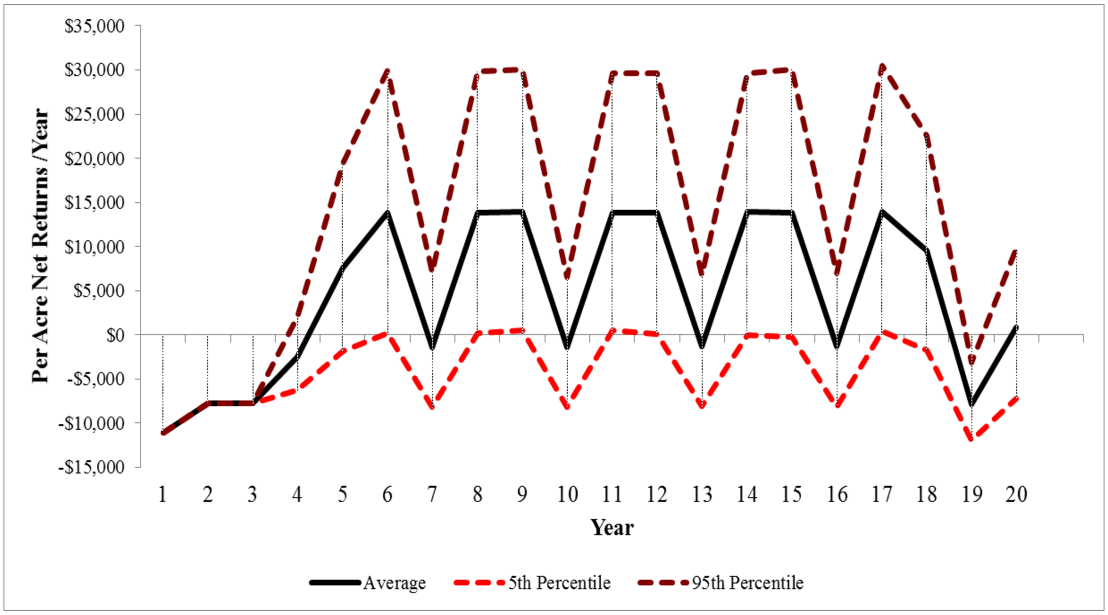

Figure 6. Annual eco-friendly returns per acre, 95% confidence interval.

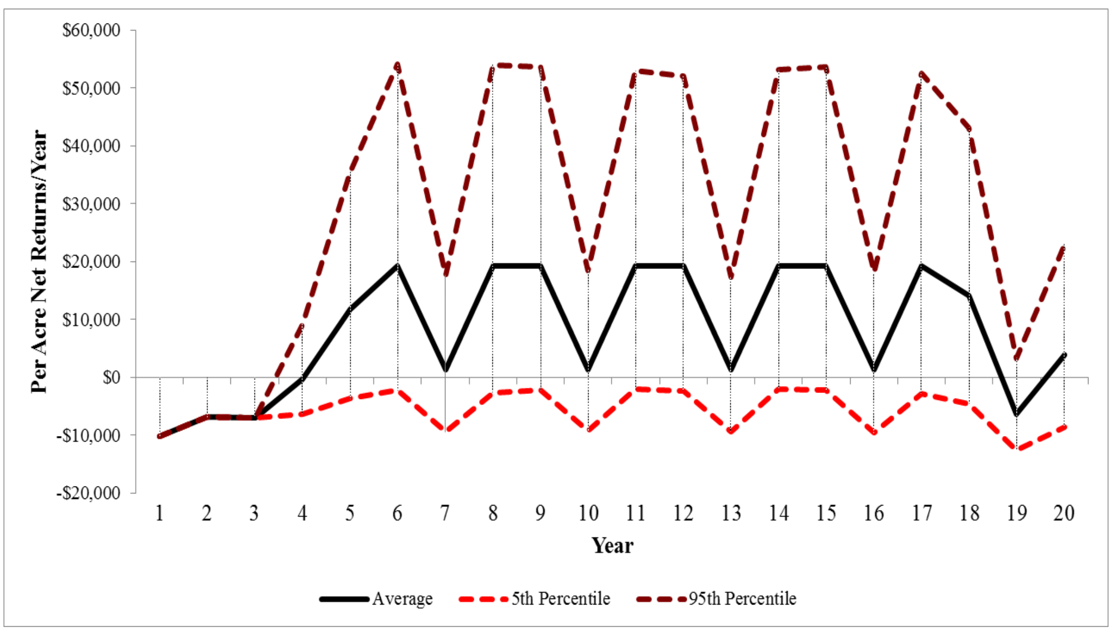

Figure 7. Annual conventional net returns per acre, 95% confidence interval.

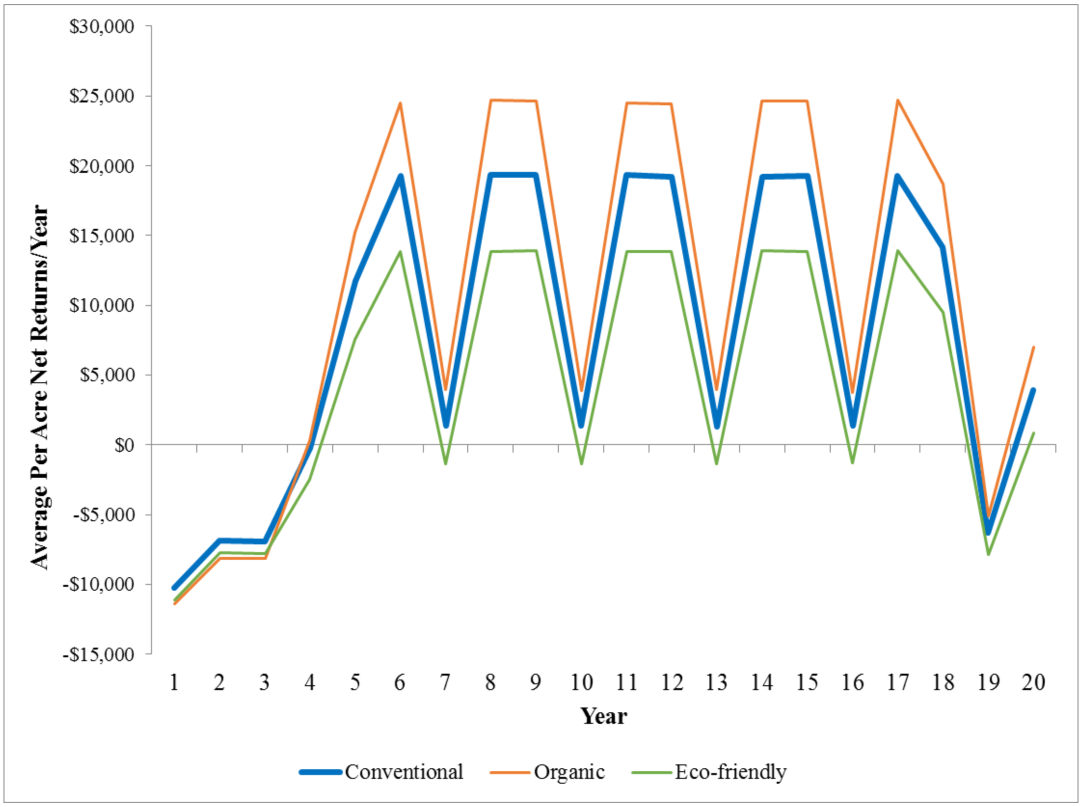

Figure 8. Average annual net returns per acre for organic, eco-friendly, and conventional orchards.

Table 23 compares simulated minimum, maximum, and mean cumulative net returns for each of the three orchards, as well as the coefficient of variation and the standard deviation. The highlighted fields indicate the alternative that is optimal depending on which field the producer wishes to compare.

For instance, a producer could look at the minimums and determine which alternative has the smallest chance for a loss, or rather, which alternative has the possibility to lose the least amount of money. In this case, the eco-friendly orchard shows the least chance for loss. If a producer wanted to choose production strategies based upon the highest possible return then the clear choice would be conventional orchard. A

Table 23

Comparison of Minimum, Mean, Maximum, Standard Deviation, and Coefficient of Variation by Orchard Type

	Organic	Eco-Friendly	Conventional
Min	-$294,214	**-$224,985**	-$329,108
Mean	**$221,560**	$85,719	$158,224
Max	$672,679	$496,166	**$1,018,937**
Std Dev	$141,102	**$113,281**	$216,653
CV	**64**	132	137

producer wanting to receive the highest average return would decide to go with organic orchard production.

A producer solely concerned about the amount of risk involved while disregarding income generated, may base their decisions on the standard deviation. Standard Deviation (or variance) measures the associated risk with a given decision (Richardson, 2006). A producer wanting the least risky option, disregarding potential income will chose the option with the lowest standard deviation, which in this case is the eco-friendly orchard.

The coefficient of variation (CV) aids in ranking risky alternatives by taking the absolute ratio of the standard deviation and the mean, or rather, the relative risk associated with a given scenario (Richardson, 2006). Mathematically,

(4) $$CV = \frac{SD}{M}$$

where *CV* is the coefficient of variation, *SD* is the standard deviation, and *M* is the mean cumulative net returns of the simulation. The higher the CV, the higher the variation in possible net returns. A lower CV means less variation in possible net returns and a less risky option for the producer, which would make the organic option most appealing. This simple comparison allows producers to make production decisions based upon individual criteria, but lacks the complexity needed for making decisions necessary for a 20 year investment.

Figure 9 reveals the cumulative distribution function (CDF) that each production method will yield the shown cumulative net returns. This adds another level of complexity to Table 23, showing the probability that each level of production will yield the highest positive cumulative net returns. The vertical axis of Figure 9 shows the probability of receiving the cumulative net returns shown on the horizontal axis. Figure 9 suggests that roughly 80% of the time, the organic orchard would have the highest returns of the three orchards, and that 80% of the time per acre cumulative net returns in the organic orchard would be less than or equal to $350,000.

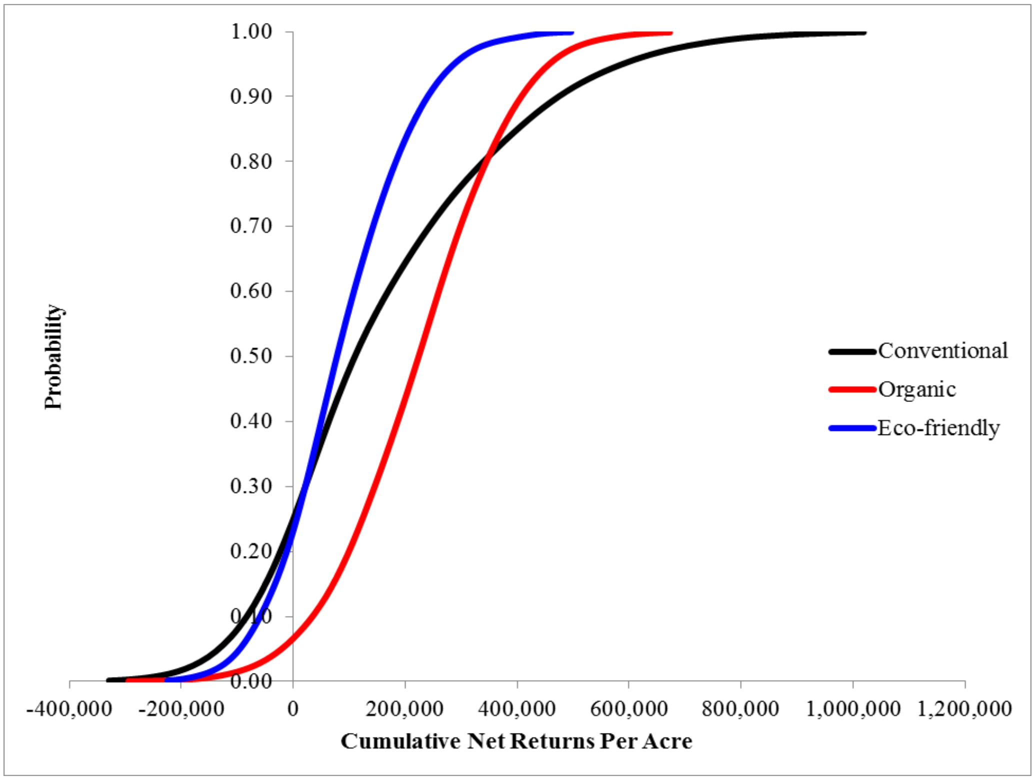

Figure 9. Cumulative distribution function (CDF) approximations for organic, eco-friendly, and conventional orchards.

Figure 10 shows the combined probability distribution function (PDF), representing the relative skewness of each method of production with their mean cumulative net returns. Figure 10 provides a different representation of information already presented in Figure 9 and Table 23.

To further analyze the risk associated with each level of production, a Stochastic Efficiency with Respect to a Function (*SERF*) graph was generated. *SERF* simultaneously ranks risky alternatives in terms of certainty equivalents (*CE*s) over a range of risk aversions, and is a preferred when compared to other methods of ranking (Hardaker, Huirne, Anderson, & Lien, 2004, p. 153). *CE*s assume a specified range of risk aversion coefficients using a predetermined utility function based upon the following rules:

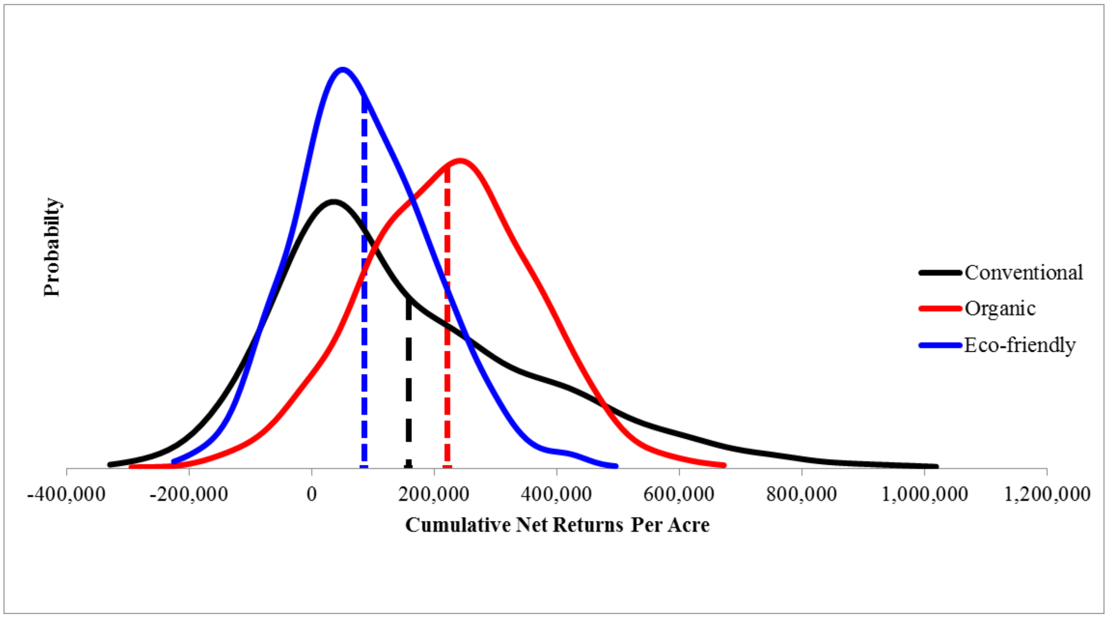

Figure 10. Probability distribution function (PDF) of organic, eco-friendly, and conventional orchard cumulative net returns.

$$F(\pi) \text{ preferred to } G(\pi) \text{ at } ARAC \text{ if } CE_F > CE_G$$

(5) $$F(\pi) \text{ indifferent to } G(\pi) \text{ at } ARAC \text{ if } CE_F = CE_G, \text{ or}$$

$$G(\pi) \text{ preferred to } F(\pi) \text{ at } ARAC \text{ if } CE_F < CE_G,$$

where $F(\pi)$ and $G(\pi)$ are cumulative distribution functions (*CDF*) as seen in Figure 9, *CE* is the certainty equivalences, and *ARAC* signifies the *absolute risk aversion coefficient* and assumes a negative exponential utility function.[6]

ARAC is defined mathematically by Hardaker, Huirne et al. (2004, p. 102) as:

[6] Negative exponential utility function is given mathematically by, $U(\pi) = 1 - \exp(-ARAC * \pi)$, where *ARAC*>0 (Hardaker, Huirne et al., 2004, p. 103). Negative exponential utility function exhibits CARA or *constant absolute risk aversion,* given here by *ARAC.* Hardaker, Huirne et al. (2004, p. 103) note that this function can be estimated from a single CE and has been used extensively in decision analysis.

(6) $$r_a(w) = -U^{(2)}(w)/U^{(1)}(w)$$

where $U^{(2)}$ and $U^{(1)}$ are, respectively the second and first derivatives of the individual's utility function, and *w* is the individuals wealth. The underlying theory is that as wealth, *w*, increases, the *ARAC*, $r_a(w)$, will decrease because people will take greater risks as they get richer.

The *CE* used for ranking in *SERF* is defined by Hardaker, Richardson, Lien, & Schumman (2004, p. 257) as the "sure sum with the same utility as the expected utility of the prospect. In other words, for a given utility function, it is the point at which a decision maker is indifferent between the value and the risky outcome." The *CE* depends on the type of utility function used. The *CE* for the negative exponential utility function used in the *SERF* graph below (Figure 11) is mathematically defined as (Hardaker, Richardson et al. 2004, p. 257):

(7) $$CE(\pi, ARAC) = \ln[(\frac{1}{\mathrm{n}}\sum exp\,(-ARAC * \pi_i))^{\frac{1}{ARAC}}]$$

Figure 11 represents the ranking of the CEs for each of the three orchards on a SERF graph. The CEs along the vertical axis of Figure 11 represents the amount of money a producer would be willing to accept instead of taking a chance on a higher, although more uncertain cumulative net return (Varian, 1992). When *ARAC* = 0, it signifies the producer is risk neutral, or, has a high tolerance to risk and they will chose to produce organic peaches. When following the horizontal axis of Figure 11, it is surprising to see that the more risk averse producer would also choose producing organic

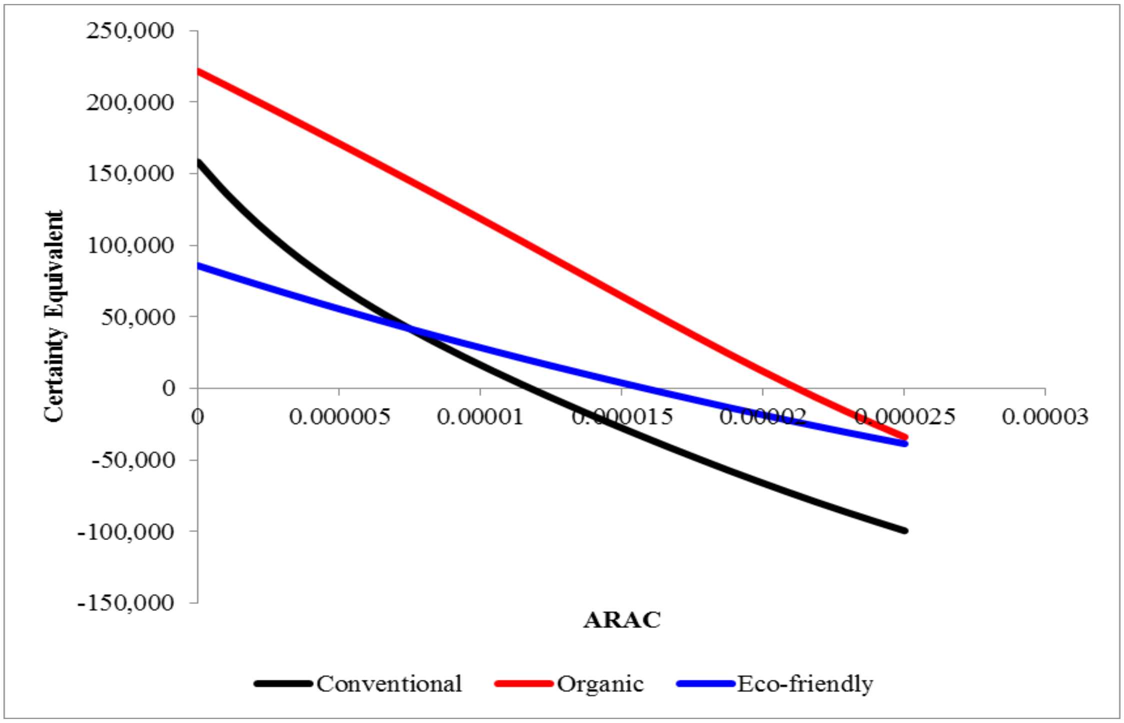

Figure 11. Stochastic efficiency with respect to a function (SERF) for organic, eco-friendly and conventional orchards, assuming a negative exponential utility function.

peaches over the alternatives. The risk preference for eco-friendly and conventional production switch places, but opposite than expected. It would be anticipated that the more risk neutral producer would choose alternate forms of production, and that the more risk averse producer would choose forms of production closely related to conventional production. The result of having absolute preference for growing organic peaches regardless of the producers risk tolerance, is likely due to the higher prices and subsequent higher net returns received for organic peaches, even though the cost to establish and maintain is higher and lower yields are produced. The results of producers with higher risk tolerance choosing conventional production over eco-friendly production is likely due to the wide range of possible prices received for conventional peaches when compared with organic or eco-friendly peaches.

Running sensitivity analysis on the organic peach data revealed that unless the mean price for wholesale and direct market peaches were at or below $1.85 and $3.43, respectively, then producers would choose to produce organic peaches regardless of their risk tolerance.

To continue the sensitivity analysis, a simulation was run with an organic yield distribution between 50% and 94% of conventional yields, per the findings by De Ponti et al. (2012). The results of this simulation showed the same risk assessments results as the initial simulation with only a slight movement along the vertical axis and surprisingly suggested again that organic peach production would be preferred for peach producers of all risk tolerances.

The surprising results for preference of organic peach production over conventional and eco-friendly peach production is likely due to the relatively higher prices per pound of organic peaches, and the lower price spread of organic peaches compared to conventional peaches. The observed direct market price spread for organic peaches was between $1.50/Lb and $6.00/Lb (a $4.50 price range), whereas direct market conventional peaches ranged from $0.65 to $6.00/Lb (a price range of $5.35). With a lower relative range of prices to be gained, the risk is decreased for the producer, making that option more attractive to producers of any risk tolerance.

CHAPTER 4

DISCUSSION AND CONCLUSION

Cost and return studies were completed representing organic, eco-friendly, and conventional peach orchard production. According to the cost and returns studies, higher net returns were apparent for the eco-friendly and organic peach orchards, which may help add to the inconclusive literature discussed in Chapter 1 (Klonsky & Greene, 2005; Reganold et al., 2001). The costs and returns studies were then analyzed to determine if the price premiums suggested by the WTP study and available pricing data were sufficient to cover the varying costs of production, and to determine the risk associated with each form of production.

It was found that organic peach production yielded the highest returns on average. Organic production also showed the lowest relative risk associated with its production. Conventional production showed the possibility for the highest returns and also the greatest losses. Eco-friendly showed the lowest variance, or lowest absolute risk. Although each form of production could show positive net returns, the organic production showed the highest average positive returns with the lowest associated risk, meaning organic production is the least risky of the three options at any level of risk tolerance. This is surprising as organic produce tends to have lower yields (Bolda et al., 2004, 2006; De Ponti et al., 2012), and would therefore assume greater risk. The lower risk associated with organic production may be due to the higher pricing of organic peaches without the same relative increase in production costs. A greater quantity of information regarding yield variance and yield distribution of organic production could be of great benefit to this analysis and may convey different results.

Future price changes in peaches (organic, eco-friendly, or conventional) may limit the usefulness of the results in this study. If the prices paid for organic peaches substantially decreased, for instance, then the overall profitability of organic peaches may decrease. Beyond the impact on profitability, if prices for organic peaches were to change from the assumptions in the study, the risk may be affected and change how desirable each form of peach production may be at varying levels of risk tolerance. Input costs may also change the profitability of peach production. If, for instance, organic fertilizers and pesticides were to increase in price or quantity needed, it would leave smaller margins for producers than those used in this study. Also, if consumption of organic produce were to lose its appeal, prices may be adversely affected. With infinite possible scenarios, it is difficult to definitively state that organic peach production is the best option now or in the future, but rather, under the given assumptions, organic peach production currently appears to be the most profitable form of production with the least inherent associated risk.

Another limitation to the outcome of this study, is the amount of peaches consumed in Utah. As mentioned in Chapter 1, Utahns consumed approximately 10.5 million pounds of peaches in 2012. This suggests that according to the assumptions outlined, Utah could support 44 of the 20-acre organic peach orchards, 41 of the 20-acre eco-friendly peach orchards, or 34 of the 20-acre conventional peach orchards during a full production year. Utah’s ability to support this quantity of 20-acre peach orchards also assumes that Utahns only consume peaches produced in Utah and that all producers grow their peaches using the same production method. Although Utah could potentially support 44 20-acre organic peach orchards, a survey by the Organic Trade Association shows that only about 10% of the produce purchased throughout the United States in 2013 was organically produced (Burfield, 2014). If that holds true in Utah, then Utah could only support between four and five 20-acre organic peach orchards, and all other orchards would need to use either eco-friendly or conventional production methods in order to reflect the consumer pretense.

This study assumes an 80% direct market share, and assumes that all product will be sold. Future studies may look in to the feasibility of selling this quantity of peaches in direct markets in Northern Utah. Other studies may investigate more fully the yield variation and yield distribution of organic, conventional, and eco-friendly peaches to give better insight into these forms of production.

As organic food production continues to increase in the United States, producers may want to look into altering production methods to reflect the demands of consumers, and to reflect what is best for their own bottom line. The results from this study may give encouragement to peach producers in Utah and the Intermountain West seeking to increase farm profitability.

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APPENDICES

Appendix A: Consumer Willngness to Pay Survey

Peaches Comment Card

Today, I purchased the following peaches at this booth:

- Conventional Price $_________ Quantity ________(lbs)
- Certified Organic Price $_________ Quantity ________(lbs)
- Eco-friendly Price $_________ Quantity ________(lbs)

I didn't purchase peaches today due to (please choose one):

- Price
- Appearance
- Quality
- Variety
- Color
- Taste
- Other _____________
- Other _____________

When purchasing peaches the following are important to me, or I would be willing to pay more for peaches with this attribute (please choose all that apply):

- Water wise
- Reduced pesticide
- Biodiversity friendly
- Reduced fertilizer/nitrogen
- Locally (in-state) produced
- Organic production
- Other ____________

I purchase peaches when in season:

- Often (weekly)
- Sometimes (once or twice)
- Never

I purchase fresh produce and fruit at farmers' markets:

- Often (weekly)
- Sometimes (4-6 times/year)
- Never

Please specify if you agree or disagree with each of the following statements.

Statement	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
I am concerned about the safety of my food	1	2	3	4	5
I have little time to prepare meals	1	2	3	4	5
I am concerned about my health/diet	1	2	3	4	5
I buy products with low environmental impact	1	2	3	4	5
Physical activity is an important part of my routine	1	2	3	4	5
Supporting local farmers is important to me	1	2	3	4	5
Agricultural open space is important to me	1	2	3	4	5
I am concerned about the origin of my food	1	2	3	4	5
I am a vegetarian or vegan	1	2	3	4	5

In what year were you born? _____________

What is your gender?

- Male
- Female

What is your marital status?

- Single
- Married

What was your 2012 annual household income? _______________ (dollars)

Which of the following best represents your completed level of education?

- High school diploma
- 4-year college degree
- Graduate degree

Thank you for your time!

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COOPERATIVE EXTENSION

Appendix B: Organic Peach Orchard Yearly Budgets

Table 24

Organic Peach Orchard Establishment/Year 1 Expenses

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Clearing	Hrs	15	30	450	________
Discing (Custom)	Acre	20	1	20	________
Soil Finishing (Custom)	Acre	20	1	20	________
Fertilizing	Hrs	15	2	30	________
Trees	Trees	7.75	400	3100	________
Planting	Hrs	15	40	600	________
Training	Hrs	15	3	45	________
Irrigating	Hrs	15	15	225	________
Irrigation Setup	Acre	100	1	100	________
Spraying	Hrs	15	5	75	________
Soil Testing	Test	30	1	30	________
Fertility					
Feathermeal	Lbs	0.77	225	173	________
Compost	Tons	80	5	400	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Irrigation					
Water	Acre Feet	30	1.5	45	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	________
Organic Certification					
Certification	Fee	2,406	0.05	120	________
Annual Gross Sales Fee	Fee	-	0.05	0	________
Weeds					
Straw Mulch	Tons	250	1.5	375	________
Electricity					
Irrigation Pump	Annual	427	0.05	21	________
Cooler	Annual	-	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9,900	0.05	495	________
Repairs	Annual	10,969	0.05	548	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1,000	0.05	50	________
Liability/Crop Insurance	Annual	1,000	0.05	50	________
Office/Travel	Annual	5,000	0.05	250	________
Annual Investment Insurance	Annual	1,592	0.05	80	________
Owner Management/Labor	Annual	30,000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20,499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	14,322	0.05	716	
Total Establishment Expense Per Acre				**$11,380**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 1 (Per Acre)				**$ (11,380.23)**	
Cumulative Net Returns (Per Acre)				**$ (11,380.23)**	

Table 25

Organic Peach Orchard Production Expenses-Year 2

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Tilling	Hrs	15	5	75	________
Thinning	Hrs	15	0	0	________
Fertilizing	Hrs	15	2	30	________
Irrigation	Hrs	15	30	450	________
Picking	Hrs	15	0	0	________
Irrigation					
Water	Acre Feet	30	2	60	________
Fertility					
Compost	Tons	80	5	400	________
Feathermeal	Lbs	0.77	225	173	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.5	375	________
Electricity					
Irrigation Pump	Annual	569	0.05	28	________
Cooler	Annual	0	0.05	0	________
Organic Certification					
Certification Fee	Fee	2,406	0.05	120	________
Annual Gross Sales Fee	Fee	-	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9,900	0.05	495	________
Repairs	Annual	10,969	0.05	548	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1,000	0.05	50	________
Liability/Crop Insurance	Annual	1,000	0.05	50	________
Office/Travel	Annual	5,000	0.05	250	________
Annual Investment Insurance	Annual	1,592	0.05	80	________
Owner Management/Labor	Annual	30,000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20,499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	14,322	0.05	716	
Total Yearly Expense Per Acre				**$8,116**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 2 (Per Acre)				**$ (8,116.34)**	
Cumulative Net Returns (Per Acre)				**$ (19,496.58)**	

Table 26

Organic Peach Orchard Production Expenses-Year 3

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Tilling	Hrs	15	5	75	________
Thinning	Hrs	15	2	30	________
Fertilizing	Hrs	15	2	30	________
Irrigation	Hrs	15	30	450	________
Picking	Hrs	15	0	0	________
Irrigation					
Water	Acre Feet	30	2.5	75	________
Fertility					
Compost	Tons	80	5	400	________
Feathermeal	Lbs	0.77	225	173	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.5	375	________
Electricity					
Irrigation Pump	Annual	711	0.05	36	________
Cooler	Annual	-	0.05	0	________
Organic Certification					
Certification Fee	Fee	2,406	0.05	120	________
Annual Gross Sales Fee	Fee	-	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9,900	0.05	495	________
Repairs	Annual	10,969	0.05	548	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1,000	0.05	50	________
Liability/Crop Insurance	Annual	1,000	0.05	50	________
Office/Travel	Annual	5,000	0.05	250	________
Annual Investment Insurance	Annual	1,592	0.05	80	________
Owner Management/Labor	Annual	30,000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20,499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	14,322	0.05	716	
Total Yearly Expense per Acre				**$8,168**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 3 (Per Acre)				**$ (8,168.45)**	
Cumulative Net Returns (Per Acre)				**$ (27,665.03)**	

Table 27

Organic Peach Orchard Production Expenses-Year 4

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	42	630	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Tilling	Hrs	15	5	75	________
Thinning	Hrs	15	50	750	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	60	900	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3	90	________
Fertility					
Compost	Tons	80	5	400	________
Feathermeal	Lbs	0.77	225	173	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	100	90	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.5	375	________
Electricity					
Irrigation Pump	Annual	853	0.05	43	________
Cooler	Annual	900	0.05	45	________
Organic Certification					
Certification Fee	Fee	2,406	0.05	120	________
Annual Gross Sales Fee	Fee	2,240	0.05	112	________
Marketing					
Packaging	Box	6	187	1119	________
Marketing fees	Annual	800	0.05	40	________
Transportation	Hrs	15	4.8	72	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9,900	0.05	495	________
Repairs	Annual	10,969	0.05	548	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1,000	0.05	50	________
Liability/Crop Insurance	Annual	1,000	0.05	50	________
Office/Travel	Annual	5,000	0.05	250	________
Annual Investment Insurance	Annual	1,592	0.05	80	________
Owner Management/Labor	Annual	30,000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20,499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	14,322	0.05	716	
Total Yearly Expense Per Acre				**$11,535**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 2.08	686	**$ 1,427.71**	
Direct Market Sales (80%)	Lbs	$ 3.87	2,746	**$ 10,625.47**	
Net Returns-Year 4 (Per Acre)				**$ 518.49**	
Cumulative Net Returns (Per Acre)				**$ (27,146.54)**	

Table 28

Organic Peach Orchard Production Expenses-Year 5

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	50	750	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Tilling	Hrs	15	5	75	________
Thinning	Hrs	15	100	1500	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	80	1200	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3.5	105	________
Fertility					
Compost	Tons	80	5	400	________
Feathermeal	Lbs	0.77	225	173	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	100	90	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.5	375	________
Electricity					
Irrigation Pump	Annual	995	0.05	50	________
Cooler	Annual	900	0.05	45	________
Organic Certification					
Certification Fee	Fee	2,406	0.05	120	________
Annual Gross Sales Fee	Fee	5,000	0.05	250	________
Marketing					
Packaging	Box	6	466	2798	________
Marketing fees	Fee	800	0.05	40	________
Transportation	Hrs	15	4.8	72	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9,900	0.05	495	________
Repairs	Annual	10,969	0.05	548	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1,000	0.05	50	________
Liability/Crop Insurance	Annual	1,000	0.05	50	________
Office/Travel	Annual	5,000	0.05	250	________
Annual Investment Insurance	Annual	1,592	0.05	80	________
Owner Management/Labor	Annual	30,000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20,499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	14,322	0.05	716	
Total Yearly Expense Per Acre				**$14,543**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 2.08	1,716	**$ 3,569.28**	
Direct Market Sales (80%)	Lbs	$ 3.87	6,864	**$ 26,563.68**	
Net Returns-Year 5 (Per Acre)				**$ 15,589.46**	
Cumulative Net Returns (Per Acre)				**$ (11,557.08)**	

Table 29

Organic Peach Orchard Production Expenses-Years 6-20

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	45	675	______
Spraying	Hrs	15	5	75	______
Mowing	Hrs	15	5	75	______
Tilling	Hrs	15	5	75	______
Thinning	Hrs	15	150	2250	______
Fertilizing	Hrs	15	2	30	______
Irrigating	Hrs	15	30	450	______
Picking	Hrs	15	120	1800	______
Marketing	Hrs	15	6.4	96	______
Irrigation					
Water	Acre Feet	30	3.5	105	______
Fertility					
Compost	Tons	80	5	400	______
Feathermeal	Lbs	1	225	173	______
Metalosate Multi Mineral	Lbs	13	1.3	16	______
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	______
Isomate PTB	Acres	80	1	80	______
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	______
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	1	100	90	______
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	______
Weeds					
Straw Mulch	Tons	250	1.5	375	______
Electricity					
Irrigation Pump	Annual	995	0.05	50	______
Cooler	Annual	900	0.05	45	______
Organic Certification					______
Certification Fee	Fee	2406	0.05	120	
Annual Gross Sales Fee	Fee	5000	0.05	250	______
Marketing					
Packaging	Box	6	653	3917	______
Marketing fees	Fee	800	0.05	40	______
Transportation	Hrs	15	4.8	72	______
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	______
Repairs	Annual	10969	0.05	548	______
Cash Overhead					
Land Rental	Acre	800	1	800	______
Accounting/Legal	Annual	1000	0.05	50	______
Liability/Crop Insurance	Annual	1000	0.05	50	______
Office/Travel	Annual	5000	0.05	250	______
Annual Investment Insurance	Annual	1592	0.05	80	______
Owner Management/Labor	Annual	30000	0.05	1500	______
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	______
Buildings, Improvements & Equipment	Annual	14322	0.05	716	
Total Yearly Expense Per Acre				**$16,938**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 2.08	2,402	**$ 4,996.99**	
Direct Market Sales (80%)	Lbs	$ 3.87	9,610	**$ 37,189.15**	
Net Returns-Year 6 (Per Acre)				**$ 25,248.51**	
Cumulative Net Returns (Per Acre)				**$ 13,691.43**	

Table 29 Continued

Cumulative Net Returns (Per Acre)		
Year 6	$	13,691
Year 7	$	17,845
Year 8	$	43,094
Year 9	$	68,342
Year 10	$	72,497
Year 11	$	97,745
Year 12	$	122,994
Year 13	$	127,148
Year 14	$	152,396
Year 15	$	177,645
Year 16	$	181,799
Year 17	$	207,047
Year 18	$	226,269
Year 19	$	221,385
Year 20	$	228,553

Table 30

Summary of Organic Costs, Revenues, Returns, and Cumulative Net Returns (Per Acre)

Year	Total Cost per Acre	Total Revenue Per Acre	Returns per Acre	Cumulative Net Returns per Acre
Year 1	$11,380	$0	($11,380)	($11,380)
Year 2	$8,116	$0	($8,116)	($19,497)
Year 3	$8,168	$0	($8,168)	($27,665)
Year 4	$11,535	$12,053	$518	($27,147)
Year 5	$14,543	$30,133	$15,589	($11,557)
Year 6	$16,938	$42,186	$25,249	$13,691
Year 7	$16,938	$21,092	$4,154	$17,845
Year 8	$16,938	$42,186	$25,249	$43,094
Year 9	$16,938	$42,186	$25,249	$68,342
Year 10	$16,938	$21,092	$4,154	$72,497
Year 11	$16,938	$42,186	$25,249	$97,745
Year 12	$16,938	$42,186	$25,249	$122,994
Year 13	$16,938	$21,092	$4,154	$127,148
Year 14	$16,938	$42,186	$25,249	$152,396
Year 15	$16,938	$42,186	$25,249	$177,645
Year 16	$16,938	$21,092	$4,154	$181,799
Year 17	$16,938	$42,186	$25,249	$207,047
Year 18	$16,938	$36,160	$19,222	$226,269
Year 19	$16,938	$12,053	($4,884)	$221,385
Year 20	$16,938	$24,106	$7,169	$228,553

Appendix C. Eco-Friendly Peach Orchard Yearly Budgets

Table 31

Eco-Friendly Peach Orchard Establishment/Year 1 Expenses

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Clearing	Hrs	15	30	450	________
Discing (Custom)	Acre	20	1	20	________
Soil Finishing (Custom)	Acre	20	1	20	________
Fertilizing	Hrs	15	2	30	________
Trees	Trees	7.75	400	3100	________
Planting	Hrs	15	40	600	________
Training	Hrs	15	3	45	________
Irrigating	Hrs	15	15	225	________
Irrigation Setup	Acre	100	1	100	________
Spraying	Hrs	15	5	75	________
Soil Testing	Test	30	1	30	________
Fertilization					
Ammonium Sulfate	Lbs	2.83	75	212	________
Compost	Tons	80	5	400	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Irrigation					
Water	Acre Feet	30	1.5	45	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	________
Weeds					
Straw Mulch	Tons	250	1.0	250	________
Roundup	Gal	13	0.50	6.25	________
Electricity					
Irrigation Pump	Annual	427	0.05	21	________
Cooler	Annual	0	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10870	0.05	544	________
Cash Overhead					
Land Rental	Acre	500	1	500	________
Accounting/Legal	Annual	6000	0.05	300	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1559	0.05	78	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Establishment Expense Per Acre				**$ 11,083**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 1				**$ (11,083.09)**	
Cumulative Net Returns (Per Acre)				**$ (11,083.09)**	

Table 32

Eco-Friendly Peach Orchard Production Expenses-Year 2

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	___________
Spraying	Hrs	15	5	75	___________
Mowing	Hrs	15	5	75	___________
Thinning	Hrs	15	0	0	___________
Fertilizing	Hrs	15	2	30	___________
Irrigation	Hrs	15	30	450	___________
Picking	Hrs	15	0	0	___________
Irrigation					
Water	Acre Feet	30	2	60	___________
Fertility					
Compost	Tons	80	5	400	___________
Ammonium Sulfate	Lbs	2.83	75	212	___________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	___________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	___________
Isomate PTB	Acres	80	1	80	___________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	___________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	___________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	___________
Weeds					
Straw Mulch	Tons	250	1.0	250	___________
Roundup	Gal	12.5	0.50	6.25	___________
Electricity					
Irrigation Pump	Annual	569	0.05	28	___________
Cooler	Annual	0	0.05	0	___________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	___________
Repairs	Annual	10870	0.05	544	___________
Cash Overhead					
Land Rental	Acre	500	1	500	___________
Accounting/Legal	Annual	6000	0.05	300	___________
Liability/Crop Insurance	Annual	1000	0.05	50	___________
Office/Travel	Annual	5000	0.05	250	___________
Annual Investment Insurance	Annual	1559	0.05	78	___________
Owner Management/Labor	Annual	30000	0.05	1500	___________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	___________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Yearly Expense Per Acre				**$ 7,744**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 2				**$ (7,744.20)**	
Cumulative Net Returns (Per Acre)				**$ (18,827.28)**	

Table 33

Eco-Friendly Peach Orchard Production Expenses-Year 3

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	2	30	________
Fertilizing	Hrs	15	2	30	________
Irrigation	Hrs	15	30	450	________
Picking	Hrs	15	0	0	________
Irrigation					
Water	Acre Feet	30	2.5	75	________
Fertility					
Compost	Tons	80	5	400	________
Ammonium Sulfate	Lbs	2.83	75	212	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	0	0	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.0	250	________
Roundup	Gal	12.5	0.50	6.25	________
Electricity					
Irrigation Pump	Annual	711	0.05	36	________
Cooler	Annual	0	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10870	0.05	544	________
Cash Overhead					
Land Rental	Acre	500	1	500	________
Accounting/Legal	Annual	6000	0.05	300	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1559	0.05	78	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Yearly Expense per Acre				**$ 7,796**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 3				**$ (7,796.31)**	
Cumulative Net Returns (Per Acre)				**$ (26,623.59)**	

Table 34

Eco-Friendly Peach Orchard Production Expenses-Year 4

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	42	630	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	50	750	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	60	900	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3	90	________
Fertility					
Compost	Tons	80	5	400	________
Ammonium Sulfate	Lbs	2.83	75	212	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	100	90	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1.0	250	________
Roundup	Gal	12.5	0.50	6.25	________
Electricity					
Irrigation Pump	Annual	853	0.05	43	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	198	1191	________
Marketing fees	Fee	800	0.05	40	________
Transportation	Hrs	15	6.4	96	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10870	0.05	544	________
Cash Overhead					
Land Rental	Acre	500	1	500	________
Accounting/Legal	Annual	6000	0.05	300	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1559	0.05	78	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Yearly Expense Per Acre				**$ 11,146**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.22	730	**$ 891.09**	
Direct Market Sales (80%)	Lbs	$ 2.61	2,922	**$ 7,625.38**	
Net Returns-Year 4				**$ (2,629.82)**	
Cumulative Net Returns (Per Acre)				**$ (29,253.41)**	

Table 35

Eco-Friendly Peach Orchard Production Expenses-Year 5

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	50	750	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	100	1500	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	80	1200	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3.5	105	________
Fertility					
Compost	Tons	80	5	400	________
Ammonium Sulfate	Lbs	2.83	75	212	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	100	90	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1	250	________
Roundup	Gal	12.5	0.50	6.25	________
Electricity					
Irrigation Pump	Annual	995	0.05	50	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	496	2977	________
Marketing fees	Fee	800	0.05	40	________
Transportation	Hrs	15	6.4	96	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10870	0.05	544	________
Cash Overhead					
Land Rental	Acre	500	1	500	________
Accounting/Legal	Annual	6000	0.05	300	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1559	0.05	78	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Yearly Expense Per Acre				**$ 14,125**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.22	1,826	**$ 2,227.62**	
Direct Market Sales (80%)	Lbs	$ 2.61	7,304	**$ 19,062.60**	
Net Returns-Year 5				**$ 7,165.66**	
Cumulative Net Returns (Per Acre)				**$ (22,087.75)**	

Table 36

Eco-Friendly Peach Orchard Production Expenses-Years 6-20

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	45	675	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	150	2250	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	120	1800	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3.5	105	________
Fertility					
Compost	Tons	80	5	400	________
Ammonium Sulfate	Lbs	2.83	75	212	________
Metalosate Multi Mineral	Lbs	12.5	1.3	16	________
Twig Borer					
Dipel DF Pro	Lbs	20	1	20	________
Isomate PTB	Acres	80	1	80	________
Coryneum Blight					
Nordox 75WG	Lbs	8	13	104	________
Powdery Mildew					
Sulphur Tiger 90CR	Lbs	0.9	100	90	________
Green Peach Aphids					
Stylet Oil	Gal	20	2	40	________
Weeds					
Straw Mulch	Tons	250	1	250	________
Roundup	Gal	12.5	0.50	6.25	________
Electricity					
Irrigation Pump	Annual	995	0.05	50	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	695	4168	________
Marketing fees	Fee	800	0.05	40	________
Transportation	Hrs	15	6.4	96	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10870	0.05	544	________
Cash Overhead					
Land Rental	Acre	500	1	500	________
Accounting/Legal	Annual	6000	0.05	300	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1559	0.05	78	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	13512	0.05	676	
Total Yearly Expense (Per Acre)				**$ 16,590**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.22	2,556	**$ 3,118.71**	
Direct Market Sales (80%)	Lbs	$ 2.61	10,225	**$ 26,687.98**	
Net Returns-Year 6 (Per Acre)				**$ 13,216.25**	
Cumulative Net Returns (Per Acre)				**$ (8,871.50)**	

Table 36 Continued

Cumulative Net Returns (Per Acre)		
Year 6	$	(8,871)
Year 7	$	(10,560)
Year 8	$	2,657
Year 9	$	15,873
Year 10	$	14,185
Year 11	$	27,401
Year 12	$	40,617
Year 13	$	38,929
Year 14	$	52,146
Year 15	$	65,362
Year 16	$	63,674
Year 17	$	76,890
Year 18	$	85,849
Year 19	$	77,775
Year 20	$	78,218

Table 37

Summary of Eco-Friendly Costs, Revenues, Returns, and Cumulative Net Returns (Per Acre)

Year	Total Cost per Acre	Total Revenue Per Acre	Returns per Acre	Cumulative Net Returns per Acre
Year 1	$11,083	$0	($11,083)	($11,083)
Year 2	$7,744	$0	($7,744)	($18,827)
Year 3	$7,796	$0	($7,796)	($26,624)
Year 4	$11,146	$8,516	($2,630)	($29,253)
Year 5	$14,125	$21,290	$7,166	($22,088)
Year 6	$16,590	$29,807	$13,216	($8,871)
Year 7	$16,590	$14,902	($1,688)	($10,560)
Year 8	$16,590	$29,807	$13,216	$2,657
Year 9	$16,590	$29,807	$13,216	$15,873
Year 10	$16,590	$14,902	($1,688)	$14,185
Year 11	$16,590	$29,807	$13,216	$27,401
Year 12	$16,590	$29,807	$13,216	$40,617
Year 13	$16,590	$14,902	($1,688)	$38,929
Year 14	$16,590	$29,807	$13,216	$52,146
Year 15	$16,590	$29,807	$13,216	$65,362
Year 16	$16,590	$14,902	($1,688)	$63,674
Year 17	$16,590	$29,807	$13,216	$76,890
Year 18	$16,590	$25,549	$8,959	$85,849
Year 19	$16,590	$8,516	($8,074)	$77,775
Year 20	$16,590	$17,033	$442	$78,218

Appendix D. Conventional Peach Orchard Yearly Budgets

Table 38

Conventional Peach Orchard Establishment/Year 1 Expenses

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Clearing	Hrs	15	30	450	
Discing (Custom)	Acre	20	1	20	
Soil Finishing (Custom)	Acre	20	1	20	
Fertilizing	Hrs	15	2	30	
Trees	Trees	7.75	400	3100	
Planting	Hrs	15	40	600	
Training	Hrs	15	3	45	
Irrigating	Hrs	15	15	225	
Irrigation Setup	Acre	100	1	100	
Soil Testing	Test	30	1	30	
Fertility					
Ammonium Sulfate	Lbs	3	100	300	
Metalosate Multi Mineral	Gal	36	0.25	9	
Irrigation					
Water	Acre Feet	30	1.5	45	
Twig Borer					
Asana XL	Gal	65	0.1	7	
Powdery Mildew					
Sulphur Granules	Lbs	0.4	0	0	
Weeds					
Roundup	Gal	12.5	0.5	6	
Electricity					
Irrigation Pump	Annual	427	0.05	21	
Cooler	Annual	0	0.05	0	
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	
Repairs	Annual	10511	0.05	526	
Cash Overhead					
Land Rental	Acre	800	1	800	
Accounting/Legal	Annual	1000	0.05	50	
Liability/Crop Insurance	Annual	1000	0.05	50	
Office/Travel	Annual	5000	0.05	250	
Annual Investment Insurance	Annual	1440	0.05	72	
Owner Management/Labor	Annual	30000	0.05	1500	
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Establishment Expense Per Acre				**$10,264**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 1 (Per Acre)				**$ (10,263.78)**	
Cumulative Net Returns (Per Acre)				**$ (10,263.78)**	

Table 39

Conventional Peach Orchard Production Expenses-Year 2

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	0	0	________
Fertilizing	Hrs	15	2	30	________
Irrigation	Hrs	15	30	450	________
Picking	Hrs	15	0	0	________
Irrigation					
Water	Acre Feet	30	2	60	________
Fertility					
Ammonium Sulfate	Lbs	2.83	100	283	________
Metalosate Multi Mineral	Gal	36	1	36	________
Twig Borer					
Imidan 70WP	Lbs	10.65	4	43	________
Coryneum Blight					
Captan 70 WP	Lbs	3.5	8	28	________
Powdery Mildew					
Sulphur Granules	Lbs	0.4	0	0	________
Green Peach Aphids					
Dormant Oil Spray	Gal	8.5	3	26	________
Weeds					
Roundup	Gal	12.5	0.5	6.25	________
Electricity					
Irrigation Pump	Annual	569	0.05	28	________
Cooler	Annual	0	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10511	0.05	526	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1000	0.05	50	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1440	0.05	72	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Yearly Expense Per Acre				**$6,875**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 2 (Per Acre)				**$ (6,875.48)**	
Cumulative Net Returns (Per Acre)				**$ (17,139.26)**	

Table 40

Conventional Peach Orchard Production Expenses-Year 3

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	32	480	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	2	30	________
Fertilizing	Hrs	15	2	30	________
Irrigation	Hrs	15	30	450	________
Picking	Hrs	15	0	0	________
Irrigation					
Water	Acre Feet	30	2.5	75	________
Fertility					
Ammonium Sulfate	Lbs	2.83	100	283	________
Metalosate Multi Mineral	Gal	36	1	36	________
Twig Borer					
Imidan 70WP	Lbs	10.65	4	43	________
Coryneum Blight					
Captan 50 WP	Lbs	3.5	8	28	________
Powdery Mildew					
Sulphur Granules	Lbs	0.4	0	0	________
Green Peach Aphids					
Dormant Oil Spray	Gal	8.5	3	26	________
Weeds					
Roundup	Gal	12.5	0.5	6.25	________
Electricity					
Irrigation Pump	Annual	711	0.05	36	________
Cooler	Annual	0	0.05	0	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10511	0.05	526	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1000	0.05	50	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1440	0.05	72	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Yearly Expense per Acre				**$6,928**	
Cash Inflows From Sales				**$ -**	
Net Returns-Year 3 (Per Acre)				**$ (6,927.58)**	
Cumulative Net Returns (Per Acre)				**$ (24,066.84)**	

Table 41

Conventional Peach Orchard Production Expenses-Year 4

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	42	630	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	50	750	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	60	900	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3	90	________
Fertility					
Ammonium Sulfate	Lbs	2.83	100	283	________
Metalosate Multi Mineral	Gal	36	1	36	________
Twig Borer					
Imidan 70WP	Lbs	10.65	4	43	________
Coryneum Blight					
Captan 50 WP	Lbs	3.5	8	28	________
Powdery Mildew					
Sulphur Granules	Lbs	0.4	200	80	________
Green Peach Aphids					
Dormant Oil Spray	Gal	8.5	3	26	________
Weeds					
Roundup	Gal	12.5	0.5	6.25	________
Electricity					
Irrigation Pump	Annual	853	0.05	43	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	239	1435	________
Marketing fees	Annual	800	0.05	40	________
Transportation	Hrs	15	4.8	72	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10511	0.05	526	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1000	0.05	50	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1440	0.05	72	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Yearly Expense Per Acre				**$10,487**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.06	880	**$ 933**	
Direct Market Sales (80%)	Lbs	$ 2.23	3,520	**$ 7,850**	
Net Returns-Year 4 (Per Acre)				**$ (1,705.06)**	
Cumulative Net Returns (Per Acre)				**$ (25,771.91)**	

Table 42

Conventional Peach Orchard Production Expenses-Year 5

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	50	750	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	100	1500	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	80	1200	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3.5	105	________
Fertility					
Ammonium Sulfate	Lbs	2.83	100	283	________
Metalosate Multi Mineral	Gal	36	1	36	________
Twig Borer					
Imidan 70WP	Lbs	10.65	4	43	________
Coryneum Blight					
Captan 50 WP	Lbs	3.5	8	28	________
Powdery Mildew					
Sulphur Granules	Lbs	0.4	200	80	________
Green Peach Aphids					
Dormant Oil Spray	Gal	8.5	3	26	________
Weeds					
Roundup	Gal	12.5	0.5	6.25	________
Electricity					
Irrigation Pump	Annual	995	0.05	50	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	598	3587	________
Marketing fees	Annual	800	0.05	40	________
Transportation	Hrs	15	4.8	72	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10511	0.05	526	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1000	0.05	50	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1440	0.05	72	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Yearly Expense Per Acre				**$13,832**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.06	2,200	**$ 2,332**	
Direct Market Sales (80%)	Lbs	$ 2.23	8,800	**$ 19,624**	
Net Returns-Year 5 (Per Acre)				**$ 8,124.26**	
Cumulative Net Returns (Per Acre)				**$ (17,647.65)**	

Table 43

Conventional Peach Orchard Production Expenses-Years 6-20

Operation	Units	Unit Cost ($)	Units Per Acre	Cost Per Acre ($)	Your Estimate
Labor					
Pruning	Hrs	15	45	675	________
Spraying	Hrs	15	5	75	________
Mowing	Hrs	15	5	75	________
Thinning	Hrs	15	150	2250	________
Fertilizing	Hrs	15	2	30	________
Irrigating	Hrs	15	30	450	________
Picking	Hrs	15	120	1800	________
Marketing	Hrs	15	6.4	96	________
Irrigation					
Water	Acre Feet	30	3.5	105	________
Fertility					
Ammonium Sulfate	Lbs	2.83	100	283	________
Metalosate Multi Mineral	Gal	36	1	36	________
Twig Borer					
Imidan 70WP	Lbs	10.65	4	43	________
Coryneum Blight					
Captan 50 WP	Lbs	3.5	8	28	________
Powdery Mildew					
Sulphur Granules	Lbs	0.4	200	80	________
Green Peach Aphids					
Dormant Oil Spray	Gal	8.5	3	26	________
Weeds					
Roundup	Gal	12.5	0.5	6.25	________
Electricity					
Irrigation Pump	Annual	995	0.05	50	________
Cooler	Annual	900	0.05	45	________
Marketing					
Packaging	Box	6	837	5022	________
Marketing fees	Annual	800	0.05	40	________
Transportation	Hrs	15	6.4	96	________
Machinery/Vehicles/Equipment					
Fuel & Lube	Annual	9900	0.05	495	________
Repairs	Annual	10511	0.05	526	________
Cash Overhead					
Land Rental	Acre	800	1	800	________
Accounting/Legal	Annual	1000	0.05	50	________
Liability/Crop Insurance	Annual	1000	0.05	50	________
Office/Travel	Annual	5000	0.05	250	________
Annual Investment Insurance	Annual	1440	0.05	72	________
Owner Management/Labor	Annual	30000	0.05	1500	________
Non Cash Overhead (Capital Recovery)					
Machinery & Vehicles	Annual	20499	0.05	1025	________
Buildings, Improvements & Equipment	Annual	9765	0.05	488	
Total Yearly Expense Per Acre				**$16,566**	
Cash Inflows From Sales					
Wholesale Market Sales (20%)	Lbs	$ 1.06	3,080	**$ 3,265**	
Direct Market Sales (80%)	Lbs	$ 2.23	12,320	**$ 27,474**	
Net Returns-Year 6 (Per Acre)				**$ 14,172.88**	
Cumulative Net Returns (Per Acre)				**$ (3,474.77)**	

Table 43 Continued

Cumulative Net Returns (Per Acre)		
Year 6	$	(3,475)
Year 7	$	(4,671)
Year 8	$	9,502
Year 9	$	23,675
Year 10	$	22,478
Year 11	$	36,651
Year 12	$	50,824
Year 13	$	49,628
Year 14	$	63,801
Year 15	$	77,974
Year 16	$	76,777
Year 17	$	90,950
Year 18	$	100,732
Year 19	$	92,949
Year 20	$	93,948

Table 44

Summary of Conventional Costs, Revenues, Returns, and Cumulative Net Returns (Per Acre)

Year	**Total Cost per Acre**	**Total Revenue Per Acre**	**Returns per Acre**	**Cumulative Net Returns per Acre**
Year 1	$10,264	$0	($10,264)	($10,264)
Year 2	$6,875	$0	($6,875)	($17,139)
Year 3	$6,928	$0	($6,928)	($24,067)
Year 4	$10,487	$8,782	($1,705)	($25,772)
Year 5	$13,832	$21,956	$8,124	($17,648)
Year 6	$16,566	$30,738	$14,173	($3,475)
Year 7	$16,566	$15,369	($1,196)	($4,671)
Year 8	$16,566	$30,738	$14,173	$9,502
Year 9	$16,566	$30,738	$14,173	$23,675
Year 10	$16,566	$15,369	($1,196)	$22,478
Year 11	$16,566	$30,738	$14,173	$36,651
Year 12	$16,566	$30,738	$14,173	$50,824
Year 13	$16,566	$15,369	($1,196)	$49,628
Year 14	$16,566	$30,738	$14,173	$63,801
Year 15	$16,566	$30,738	$14,173	$77,974
Year 16	$16,566	$15,369	($1,196)	$76,777
Year 17	$16,566	$30,738	$14,173	$90,950
Year 18	$16,566	$26,347	$9,782	$100,732
Year 19	$16,566	$8,782	($7,783)	$92,949
Year 20	$16,566	$17,565	$999	$93,948