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Organic Production: An economic and environmental opportunity for conventional crop producers

Macy Krug

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Organic Production: An economic and environmental opportunity for conventional crop producers

by

Macy June Krug

A creative component submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Seed Technology and Business

Program of Study Committee:

Gary Munkvold, Major Professor
Kathleen Delate, Committee Member
Jacquelyn Ulmer, Committee Member

Iowa State University
Ames, Iowa
May 2019

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Finally, thank you to my family for their encouragement and to my significant other for his hours of patience, support, and love.
## Nomenclature

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>CAFO</td>
<td>Confined Animal Feeding Operation</td>
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<tr>
<td>COP</td>
<td>Cost of Production</td>
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<tr>
<td>GE</td>
<td>Genetically Engineered</td>
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<td>GMO</td>
<td>Genetically Modified Organisms</td>
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<td>NOSB</td>
<td>National Organic Standards Board</td>
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<td>NOP</td>
<td>National Organic Program</td>
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<td>OSP</td>
<td>Organic System Plan</td>
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<td>USDA</td>
<td>United States Department of Agriculture</td>
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Introduction

Although this research focuses on organic agriculture, the purpose of this creative component is not to suggest eliminating conventional farming systems. Instead, the purpose of this creative component is to provide conventional producers foundational information to make a transition into organic farming. Many producers may not be aware of the economic and environmental benefits associated with organic production. This report will focus on summarizing current issues in conventional crop production in the Midwest and will provide information on how to transition conventional crop acres into organic and review incentives to do so.

Conventional crop farming is the most practiced farming method in the Midwest. Over 90% of the Midwest’s corn and soybeans are produced conventionally. Conventional farming refers to a farming system which includes the use of synthetic fertilizers, chemical pesticides and genetically modified crop cultivars (Greene, 2016). Throughout the Midwest many conventional row crop operations use a corn followed by a soybean annual crop rotation and sometimes only continuous corn. With the help of seed technology and other agricultural advancements conventional crop farms have been able to become increasingly productive and manage crop pests more effectively each season. Agricultural advancements, specifically those within the conventional farming sector allow producers the ability to produce more efficiently with less effort or cost. As an example, in 1996, U.S. farmers began planting genetically engineered (GE) seed varieties containing traits that would allow crops to tolerate herbicides and resist pests in major field crop production (Greene, 2016). Since 1996 several more seed traits with herbicide and pest resistance have been brought to the market, which allows more flexibility and ways to manage pests in crops effectively. Beyond seed technology conventional farmers use many kinds of synthetic fertilizers to efficiently feed their crops with nutrients. Over time many other tools have been made available and conventional farms have greatly improved their productivity by using them.

Even though great strides have been made in conventional farming for productivity there are still many economic, environmental, and social concerns with the conventional farming model. GE seed varieties and pesticides used on crops have especially gained negative
attention. Due to those concerns there is a significant market demand for products produced by other farming methods. Many of the costs to raise a crop continue to rise while the income side continues to be a challenge. In recent years commodity prices have remained low and farmers are looking for options to boost their profitability. One option that should be considered by conventional farmers is to convert acres into an organic farming system.

**Issues Facing Conventional Production**

For many years now, conventional farmers have been struggling to achieve their break-even point and profitability hasn’t been a reality for all producers. A common process at the end of each harvest for a grain farmer is to evaluate and compare revenues to the cost of production (COP). Producers ask themselves if they are satisfied with their output or should they have done something differently to achieve a larger return. There are several strategies a conventional grain farmer can implement to produce more grain each year. However, not all strategies are cost effective. An example of this would be applying fungicide to corn. There is ample evidence that fungicide applications can help protect or increase corn yields under some conditions, but the cost benefit is difficult to predict. Even though there are many things a producer can do to influence yields, there is very little a producer can do to influence the market. This element of grain production can be very discouraging for producers.

Agriculture input companies continue to bring to market products that help increase or protect crop yield potential for a farmer, but the problem is the added expenses of conventional crop inputs are difficult to offset when the commodity market is depressed. Major input products would include seed technology, weed and pest management chemical products, and synthetic fertilizers. Some products also make grain farming easier for example Roundup Ready™ soybeans which were introduced in 1996. In its time this invention made production of soybeans easier without the need for mechanical weed removal. Roundup Ready™ means that the herbicide Roundup (glyphosate) can be applied directly onto a field planted with Roundup Ready™ soybeans and there will be no impact to the GE soybeans because they have built in resistance to the herbicide. However, any weeds without resistance to glyphosate would be terminated by the chemical. Glyphosate is one example of many pesticides available
in conventional cropping. The general goal of crop input companies is to create value with a product that will secure more bushels for a farmer to sell or reduce time and labor costs.

Over the years, commercial grain producers have steadily increased yields. Many great inventions have helped producers realize such great yields and maintain an upward sloping trendline. The chart below shows the US corn yield from 1988 (United States Department of Agriculture, 2018).

**Figure 1.** Corn for Grain Yield History

Markets are incredibly challenging for conventional farmers today. Among other reasons, excess production in the United States has contributed to producers experiencing a down market. Another issue with large conventional grain supplies is that exporting becomes more difficult to do as other countries have lengthy processes for approving GE grains. This process happens each time a new GE trait is introduced into the grain supply. For example
some importing countries refuse grain produced containing certain GE traits. This can also lead to a suffering market because US producers are restricted to the domestic grain market, where we are oversupplied. Due to many of these reasons, producers have a need for higher value on grain in order to cash flow their businesses today.

In addition to the economic issues conventional producers are facing there are concerns about environmental stewardship in the conventional farming model from consumer and producer perspectives. Over the past decade especially society has become more concerned with how conventional grain is produced. There has been a rising interest from the general public in GE crops and pesticides that are primary tools used by farmers to produce grain. The genetically modified organisms (GMO) debate is out of scope for this project, but it certainly plays a role. Pollution from agriculture has also gained more attention. A very common fear is that synthetic chemicals and fertilizers used in conventional production inflict negative impacts on the environment. For example, in Iowa, there is a current large effort called the “Nutrient Reduction Strategy” (Iowa Nutrient Reduction Strategy, 2019). The Iowa Nutrient Reduction Strategy is a science and technology-based plan to assess and reduce nutrients from getting into Iowa waters and the Gulf of Mexico. It is designed to direct efforts to reduce nutrients in surface water from both point and nonpoint sources in a scientific, reasonable and economical manner (Iowa Nutrient Reduction Strategy, 2019). There is unintended run-off from fertilizers conventional producers are using for their crops are running off into mainstream water resources, like rivers or creeks. This usually happens from a weather event like a hard rain causing runoff of nutrients from their intended place on a field. Pollution can also occur from over application of inputs. These examples do not suggest that organic production is pollution free.

Worker safety is concern with both conventional and organic farming. The continued use of agricultural pesticides in conventional farming keeps farmers and workers at a serious risk for adverse health effects. Over time conventional agriculturalists have adopted precautionary safety protocols when using pesticides or other synthetic products, but harm to exposed workers continues to be a concern. In in additional to pesticide use safety around farm equipment is also a concern in both farming systems.
From an economic perspective, producers need better commercial grain prices, or they need to consider raising higher value crops. Besides conventional grain producers have other options for generating more revenue with higher value crops. An example might be seed production. Seed companies contract acres with farmers to increase their seed stock or produce hybrid corn, which has a higher value than commercial grain. However, these contracts are limited in scope and are not available to everyone. Organic production is an option available to many and can lead to improved profitability, if the system is managed properly. An organic farming system paired with conventional could be a method to create economic stability. While an organic farming system may not fit all producers’ business models it is an option worth some thought and consideration.

Organic Opportunity

Organic agriculture offers an expanding market opportunity for many farmers. Organic farming systems may help alleviate some of the economic, environmental, and social concerns of conventional farming systems. Due to increased interest by consumers for organic food options, better pricing has been available to organic producers. Consumers worldwide have consistently been willing to pay premium prices for organic products. An organic corn crop can bring as much as two times the price of conventional grain on a per bushel basis (Chase, 2019). The figure below illustrates price per bushel differences between organic and conventional corn over the past decade. It is important to note that while the organic corn prices are significantly higher overall, there are times when the price came closer together, like in 2010, and therefore there was less premium for organic corn during that time. It is surprising that with the current data, which shows an economic benefit, that more farms have not transitioned their operations.

Surveys and other studies indicate that an increasing number of consumers are willing to pay higher prices for organic products because they believe that in doing so, they help to protect the environment, as well as their personal health. Most consumers of organic products believe it is a better option than conventionally produced products. Consuming organic goods has become a social belief and part of everyday life for some consumers. Consequently, grain
processors and food manufacturers have paid farmers premiums for organically produced commodities such as wheat, soybeans, and corn (Welsh, 1999).

**Figure 2.** Organic vs. Conventional Corn Prices

https://www.ers.usda.gov/webdocs/charts/89046/june18_finding_greene_fig01.png?v=571

<table>
<thead>
<tr>
<th>Year</th>
<th>Organic</th>
<th>Conventional</th>
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<tbody>
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<tr>
<td>2008</td>
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<tr>
<td>2018</td>
<td>7.5</td>
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Note: USDA received too few reports to publish organic corn prices in April 2016. Data are expressed in nominal dollars and have not been adjusted for inflation.


**What is Organic Production?**

The United States Department of Agriculture (USDA) defines organic production as

“A production system that is managed in accordance with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical
practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.”

Organic farming emphasizes the use of animal manure and crop rotation to fertilize and manage pests. Organic farming is the oldest method of farming on earth. Today in the Midwest, organic farming is a much less common method of farming than conventional and is often considered to be less productive in terms of bushels per acre (Kuepper and Gegner, 2004). There were five million certified organic acres of farmland in 2016, representing less than 1% total farmland nationwide (Bailik and Walker, 2019).

Organic agriculture is a production system which largely excludes the use of synthetic fertilizers, pesticides, and genetically modified organisms (Rodale Institute, 2019). The organic production system relies heavily on crop rotation and tillage for pest control and livestock manure for fertilizer. This describes the ‘old way’ of farming for many conventional farmers today, and many are resistant to go back to those methods. Generally, most synthetic products are not allowed in organic production. However, on the National Organic Program (NOP) website there is a list of allowed synthetic products as well as a list of unapproved non-synthetic products. Approved products should not be mixed with anything containing a non-approved product or substance.

**Why Wouldn’t Everyone Do It?**

Research has shown that if managed properly organic farming systems in the Midwest are more profitable than conventional farms (Delate et al., 2013). Access to high premiums makes organic production seem really attractive, so why aren’t all farms taking advantage of it? The points below are summary points of some hesitations regarding organic transition;

- the 3-year transition period required before organic premium benefits
- general ease of conventional production; highly accessible seeds and chemicals which are readily available coupled with local commercial markets
- lack of information regarding Cost of Production (COP) and Return on Investment (ROI) in an organic system versus conventional production
- uncertainty of future markets and premiums
Despite potentially higher profitability, the adoption of organic production systems for corn and soybeans has been slow. Not every producer is comfortable making a transition because of the barriers it comes with. According to the Economic Research Service of the USDA these barriers include high management costs, risks of shifting to a different production system, limited knowledge of organic production, amplified recordkeeping requirements, and lack of markets and infrastructure to capture marketing premiums (Delbridge et al., 2017). While there are many benefits to organic farming, it is often misunderstood by conventional producers which has contributed to a low adoption of organic systems. This report will uncover and explain those misconceptions.

There is a misconception that organic production excludes all modern conventional farming techniques; however, this is not the case. Organic operations do incorporate modern advancements like new seed varieties, precision agriculture equipment, and other technologies. Seed varieties allowed in organic production do not include genetic modifications for pesticide resistance like commercial seeds do. Organic production is not just the substitution of commercial input materials. It is however the replacement of a treatment approach with a process and systems approach. The primary goal of organic agriculture is to optimize the health and productivity of communities of soil, plants, animals, and consumers (USDA-AMS, 2019). This means that the farm operates as a whole system and each process influences the next. Once organic operations are up and running, they should be fully integrated and revolve around a self-sufficient ecosystem. Unlike a conventional system, organic systems minimize the use of external inputs. External inputs are allowed in organic, however it is much more economical to build fertility as well as pest and disease control within the system itself by using animal manure and crop rotations.

One may argue that organic production systems also has environmental disadvantages. Tillage is the main method of weed control on organic row crop fields. From a soil quality perspective there are compelling reasons to believe that frequent tillage is also not optimal environmental stewardship. Characteristics of soil quality include; bulk density, soil pores, water-holding capacity, infiltration rates, overall tilth, organic matter, and soil organisms. (K. Delate, 2013). Tillage can negatively impact almost every one of those characteristics (Al Kaisi,
Conventional producers also use tillage methods, but primarily for a technique of seedbed preparation and the amount is significantly less than an organic producer would need using tillage for weed control purposes. Over the years conventional farmers have become more knowledgeable on the negative impacts of tillage which have led some producers to adopt minimum tillage and no-till farming practices which are believed to be better for soil health (Delate et al., 2013).

A key question is whether or not higher price premiums and profitability of organic crop production will be sustainable as supplies of organic products become greater. Consumers have proven willingness to pay premiums for organic products due to the environmental and other benefits associated with organic. However, it is uncertain how quickly organic crops will become a commodity like commercial grain. Basic economics would tell us that this depends greatly upon how consumer demand evolves in the future as producers embrace organic production systems.

Differences between Conventional and Organic Costs of Production

Through research I have found that the COP in an organic system can vary greatly between operations. There are endless combinations of crop rotations, methods, and variables that contribute to COP in an organic system. As expected, the economic advantage of organic farming will differ by the crop type raised and how well the system is managed. Many costs are similar between conventional and organic corn and soybean production. I have found information showing organic production being both more expensive and also less expensive than a conventional system. The vast majority of information suggested that the COP for organic is generally slightly higher than conventional (McBride and Greene, 2015). I have focused on key differences between conventional and organic corn and soybeans. The biggest cost differences are crop protection, machinery use, and labor. Below in Figure 3, the presented data displays the major cost categories for crop production and compares the costs in each system (Greene et al., 2017). While most of the costs in the chart illustrate a good comparison, the chemical category seems incorrect. Chemical costs are certainly higher in a conventional system, but they would not be zero in an organic system unless all operations did not use chemicals. As mentioned, the (NOP), who sets the rules and regulations for certified...
organic production, do allow the use of some chemicals which are listed on the national list of approved substances. The second COP chart is from Iowa State University and shows what costs they found on a crop rotation basis (Chase, 2019).

**Figure 3.** Organic vs. Conventional Costs by Input Type in 2011

Through my research I have found that the methods used in organic production have much more cost variability than conventional production costs do. According to an organic farm I spoke with, they believe that weed control costs in an organic system are misrepresented mostly due to the variability of weed control methods (Fitzgerald, 2019). Commercial production costs seem to have some more consistency year over year. An exception would be crop inputs, commercial fertilizer which tends to be the most variable expense. In general, I found organic seed costs to be higher. In organic production, organic seeds must be planted, if they are able to be sourced.
Again, conventional producers rely on the use of pesticides for crop protection whereas organic rely more heavily on mechanical weed removal, therefore organic systems typically incur larger labor and fuel costs in a season than conventional would. According to Iowa State University Ag Decision Maker, the 2019 crop protection costs in a corn and soybean rotation were estimated to be up to $48.36 for pesticides per acre in Iowa, this number would not include the cost of labor or machinery (Plastina, 2019).

Crop protection costs for organic producers include other variables compared to conventional production. Organic producers use machines for mechanical weed removal, and also walking soybeans to remove weeds that machines cannot get to without also injuring soybeans. It is normal for this cost to be variable. Organic producers will use cultivators or other types of machines several times per growing season. Another method used in organic is to flame weeds. Flamers are designed to heat plant cells in weeds to kill them between the rows of an organic crop. On average, cultivating is performed once or twice preplant and at most up to four or five times in season. The amount of cultivating can really vary depending upon weed pressure and field conditions. The fuel cost to cultivate is higher than a one or two pass herbicide program with a sprayer for conventional producers would be. In a study by the Practical Farmers of Iowa, cultivating in an conventional corn system averages $13 per acre and, in organic, is cost averaged at $26 per growing season (Bower, 2019). When walking is required the labor, usually crews are hired to walk the fields and perform this work. Organic producers have reported that walking rule of thumb is to have one person per one hundred acres for weeding (Fitzgerald, 2019). Organic producers can spray some NOP approved insecticides, for example, Fitzgerald’s Organic in Minnesota stated that this past year they spent $30 to $50 per acre to have Pyganic insecticide custom applied to their soybean fields (Fitzgerald, 2019).

Due to the variability nature of organic production, it’s been difficult to bring all the costs together to summarize a fair comparison of each system. However, there are several comparisons of budgets posted on Practical Farmers of Iowa and Iowa State University Agriculture Decision Maker. These tools allow producers to enter and evaluate some of their own data. File A1-26 from Iowa State University,
(http://www.extension.iastate.edu/agdm/crops/xls/a1-26organictransition.xls) is a decision tool to help producers analyze the transition process from a budgeting perspective. There is a spreadsheet version of the file which can be editable and allows individuals to enter their own prices for their budget. Within the file there are starting point budgets for conventional crops as well as organic crops. The summary page illustrates the returns on investment during transition for each crop investment.

Figure 5. ISU Ag. Decision Maker File A1-26 Transition Production Plan and Budget
http://www.extension.iastate.edu/agdm/crops/xls/a1-26organictransition.xls (Chase, 2016)

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<td>Field 3</td>
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<td>Field 4</td>
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Conv=conventional; Trans=transitional; Sb=soybean.

<table>
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<th>Table 2. Transitional organic economic returns.</th>
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<td>Returns to LM</td>
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The Transition Process

Converting a farming system from conventional to organic is not a quick process. Transitioning into an organic production system is a big decision and requires a long-term commitment. To make the transition and become organically certified takes three years. This means that for three years of transition crop production practices must comply with organic standards. During the first two years of transition crops raised are still marketed conventionally...
without any organic premiums. At the end of the third year producers can products as certified organic. This time period can be stressful for producers and one of the biggest barriers of transition (Delbridge et al., 2017). Organic premiums are not available until the three-year period is met and fields become organically certified (Pratt, 2016). Producers should expect lower yields during organic transition than they did under conventional management. While this may not always be the case, it is important to plan for less and be surprised by more during the organic transition years. Organic certification requires that crops do not receive any synthetic fertilizers or pesticides for a minimum of three years prior to harvest of the first organic crop (Delate, 2003). This report will focus on the transition process for a conventional corn and soybean farming system to convert to an organic farming system.

Organic transition is the term used for converting into an organic farming system. Transitioning from conventional production system to an organic production system in the United States is a regulated process. Only naturally occurring materials are allowed for use in organic production. In order for a producer to market a crop as “organic” the crop must have been raised on cropland which has not received synthetic fertilizer or pesticides for the previous three years leading up to the harvest of the first certified organic crop (Kuepper and Gengner, 2004). The crop must also have been raised from non-genetically modified seeds and be planted from organic seeds, if possible.

It is important to know that mixed conventional and organic farming methods within a single farming operation are permitted during the organic transition process and anytime (Chase et al., 2015). A producer is not required to transition their whole farming operation into organic, and whole farm transitions at one time are usually discouraged. Field-by-field organic transitions are far easier to manage. Smaller acreage transitions have proved to be more successful due to the intensive management requirements and learning curves of organic.

The organic transition years can be costly and there is a fair amount of uncertainty during this time period. As previously discussed, during the transitional period producers are running operations to comply with organic standards while not receiving any organic premium incentives. However, there is a possibility to market transition grain for a non-GMO premium if one is available, but that isn’t always the case. Producing corn and soybean crops during
transition commonly may result in higher production costs and lower yields (Delbridge et al., 2017). In addition, the learning curve may also have a price attached to it. Adjusting to a different production system will likely include learning challenges and certain mistakes that happen during that learning process can sometimes be costly. Due to some of these issues raising lower-input type of crops during the transitional timeframe has been a better option to balance COP with income. An example of a lower input crop would be oats. Starting off an organic transition with an oats crop can have an advantage from both a weed suppression and budgeting perspective.

The first step in transitioning to organic is deciding how to establish the crop rotation, as this is the most important management tool in an organic system. Crop rotation is the practice of strategically selecting a sequence of crops grown on a certain field. Successful crop rotations can supply fertility, improve soil quality, suppress weeds, and help reduce pests and diseases (Kuepper and Gegner, 2004). Organic systems use lengthier and more diverse crop rotations than most conventional farms do. Rotation of crops is also a requirement for organic certification. The biggest challenges will be weeds and nitrogen fertility. It is important to balance those constraints while maintaining value. An example would be managing weeds below an economical threshold. Newly organic producers should not expect their fields to look like a ‘show plot’ as many conventional crop farms have the ability of achieving due the use of herbicides. Managing weeds and fertility in an organic production system will require a different way of thinking and patience. Organic producers in the Midwest have found that starting transition with a small grain in the first year makes weed control more manageable than starting transition with corn or soybeans. Having a well thought out crop rotation plan in place is crucial to the success of any organic transition.

A four to six-year crop rotation is common in organic farming systems compared to a two-year rotation used in most conventional corn-soybean systems. In addition to corn and soybeans, organic systems use other legume crops like alfalfa in their rotations. Using a legume crop can help with nitrogen fixation for subsequent non-legume crops. The longer rotations used in organic production help breakup, and reduce pathogen and insect life cycles, especially rootworms that can be very detrimental to corn. The table below outlines a typical crop
rotation used by organic producers in the Midwest Corn Belt. Each farm operation will use its own combination of methods to create a working organic production system. There is no one size fits all or standardized crop rotation or system. The table below is an example of an organic transition timeline on a field by field basis.

**Figure 6.** Organic Field Crop Rotation (Kuepper and Gegner, 2004).

Access to livestock manure is essential to organic crop production. Livestock manures are the most commonly used organic fertilizers (Kuepper and Gegner, 2004). Livestock manures primarily provide nitrogen for crops, as well as other nutrients in smaller quantities. Conventional systems also utilize manure for nitrogen fertilizer when it’s available, but another highly utilized product is anhydrous ammonia (NH3), which is not permitted in organic production. Ideally livestock enterprises would be integrated into a whole farm system and manuring is part of a closed system of nutrient recycling. Sometimes though, crop and livestock production does not occur within the same operation and manure must be sourced off the farm. Another issue might be producing enough manure to support the crop production also leading to off-farm manure purchases. In organic production, manuring coupled with crop
rotation provides an abundant supply of essential nutrients for crop production. Organic production can still be achieved without the presence of livestock manures; however, the costs will be much greater. The manure used in certified organic crop systems are not required to be sourced from organically fed sources.

The use of livestock manures has created some concerns and controversy within the organic community (Kuepper and Gegner, 2004). A large amount of manures in the Midwest are generated by large agricultural feeding operations also known as Confined Animal Feeding Operations (CAFOs). Some within the organic community consider CAFOs to be part of the conventional system and are in conflict with some of the environmental and social values represented by organic production. On the other side of the concerns many organic producers believe that an organic farm cannot achieve its full potential or balance without the use of livestock manure. At the present time there are no rules against using livestock manures from CAFOs.

One of the more significant investments producers in transition need to make is equipment investments. Producers transitioning into organic need to evaluate their current machinery set and determine what else they need to purchase or lease for an organic production system. If they choose to use a mixed conventional and organic system there is likely an opportunity for the current machinery set to be utilized in each production system. Organic would require tillage and weed control implements such as rotary hoes, tine weeder, and cultivators likely different from their current machinery. Producers would need to decide how they would obtain access to those additional tools and how that would fit the budget.

The transition years can be costly to a producer, cost-share and other types of assistance are available to aid in a smooth transition. A change in farming methods is often coupled with new expenses like equipment purchases or modifications, increased cost of management, and certification fees to name a few. Depending upon the size of the operation this could be a significant upfront cost. Producers may need to adopt new tactics to overcome transition challenges, such as managing pests and stimulating soil health, and must also ensure organic products do not come in contact with any prohibited substances, and or commingled with non-organic products. Many USDA agencies and non-profit organizations provide technical
and educational resources, as well as financial assistance to support organic producers. Additional information on specific programs can be found online at https://www.ams.usda.gov/sites/default/files/media/Technical%20and%20Financial%20Assistance%20factsheet.pdf

Certification

Organic certification is largely about assuring buyers that they are receiving what they are paying for. Organic certification is an evaluation system used to validate the authenticity of products labeled and sold as organic (USDA-AMS, 2019). In the United States organic production is regulated at a federal level. The National Organic Program (NOP) was established in 2001 by Congress and they develop and enforce regulations for production, handling and, labeling of organic products.

The NOP defines “certified” as:

“a determination made by a certifying agent that a production or handling operation is in compliance with the Act and the regulations in this part, which is documented by a certificate of organic operation.” (Code of Federal Regulations, 2019)

In simpler words – this means producers are following the organic protocols and have been inspected and approved by a USDA-accredited certifying agent. The NOP enforces uniform national standards for organically produced agriculture products sold within the United States. The NOP accredits third party agencies and trains inspectors who then certify that farms are meeting the national organic standards. Only agencies accredited by the USDA can grant organic certification. The figure below illustrates each role within the NOP. There is also a National Organic Standards Board (NOSB), which is a Federal Advisory Board which is comprised of 15 public volunteers who are involved with the organic rulemaking process and advise the NOP.
It is important to start working with an organic certifier early during the transition process. Establishing a relationship with an organic certifier early on will help ensure that the transition goes smoothly, and the future organic production system is set up for success. Certifiers can serve as a consultant to organic transitions as well as ensure producers maintain compliant with organic regulations. Producers should select a certifier that best suits the needs of their operation. When choosing a certifier, it is also important that producers consider where they will market organic products once they have fully transitioned. A list of USDA approved certifiers can be found online at https://www.ams.usda.gov/services/organic-certification/certifying-agents (Accredited Certifying Agency, 2019). Organic buyers may have a
preference on certifying agencies they work with, especially if producers plan to sell organic products internationally. There could be additional regulations if producers intend to sell to a specific market. The number of USDA accredited agencies has been sufficient too meet producers’ needs within the US organic market (USDA-AMS, 2019).

Certified organic producers must have an Organic System Plan (OSP). An OSP is a plan of management of an organic production or handling operation that has been agreed to by the producer or handler and the certifying agent and that includes written plans regarding all aspects of agricultural production or handling. The OSP exhibits how an operation fulfills or intends to comply with organic certification requirements (Baier, 2005). By the time an operation has fully transitioned the OSP should be mostly developed.

Organic record keeping is a new aspect compared to the requirements of conventional production. As discussed earlier, the intensity of organic record keeping can be a barrier that conventional producers sometimes struggle with when making the transition into organic. A component of organic certification is establishing a strong audit trail. The NOP defines audit trail as:

“documentation that is sufficient to determine the source, transfer of ownership, and transfer of any agricultural product labeled as “organic”” (Code of Federal Regulations, 2019)

The integrity and value of organic crops depends upon record keeping and proof of production. An audit trail is a recordkeeping system that provides traceability of field activities and crop inputs and associates the information to a specific output of organic products. At the time of inspection, the organic certifier will review the audit trail for clearly documented field activities, crop inputs, practices, and products are in compliance with NOP standards. (Baier, 2005). There are different options for organic recordkeeping systems. An organic certifier may have a preference or suggestion on what software or method producers use for recordkeeping, but the decision is ultimately up to the producer on what they would like to use as long as it retains all of the proper information.

The components of an audit trail begin with field maps. Field maps must show the transitional or organic acreage as well as any nearby conventional acres. All geographical
information like roads, creeks, and drainage ditches must also be included on the field maps. Unlike conventional fields, certified organic fields must have a recognized isolation around the sides of the fields that are in close contact to conventional fields or areas having potential sources of contamination. There are several methods for creating an organic field buffer. These may include; a natural grass strip or existing grove of trees, an unsprayed ditch, field road or waterway, or a portion of the organic field itself used for conventional sale (Kuepper and Gegner, 2004). An option in organic corn is to delay planting the crop by a minimum of two weeks behind nearby corn crops. Delayed planting would protect an organic corn field from cross-pollination from GMO crops as the corn crops would be in different stages of development. Delayed planting can be costly due to the fact that the crop isn’t being planted at the optimal time to achieve yield potential (Pratt, 2016). The buffer method and requirements will largely depend upon the organic crop being raised on the field.

Another component of the audit trail includes an activity log in which a detailed description of any field practice being conducted must be recorded. In addition, a crop input record must be kept for organic certification. A crop input record can be incorporated with a field activity record as the two usually occur simultaneously. Next, harvest and storage records containing date of harvest, field identification, yield, and final storage location must be retained, assuming there is on-site storage. At the time of sale, a sales record must document the date of sale, product sold, quantity, organic certificate number, purchaser, sales invoice number, transition certificate number, bill of lading, and scale ticket number if sold by weight. Depending upon specific transportation methods used by producers, additional shipping and cleanout records could be required.

**Organic Transition Model**

In our current operation we produce commercial corn and soybeans, seed corn for multiple seed companies, as well as produce hogs on a large scale. The commercial corn crop we raise is primarily used for feed to be fed into the hog operation, and any surplus corn is sold on the grain market. Feeding our own corn to the hog operation benefits both enterprises. The hog operation finishes roughly 50,000 hogs annually and these are fed out in nine locations around our cropland. The crop side operates on roughly 9,000 acres. Of that land base about
one-third of the acres are owned, and two-thirds are rented land. We are paying between average to high rents and our area is very competitive, which tends to drive the rent prices up. The large number of acres has allowed us to participate in some quantity discounts for crop inputs. On the revenue side we also sometimes receive better pricing incentives for our grain because we are able to sell large quantities at once. Even with those benefits the current business still struggles with many of the scenarios explained in an earlier section of this report. Low commodity prices have made it difficult for us to be profitable at a level we consider to be successful. We are always looking for ways to improve and be more efficient with our resources; including but not limited to land, labor, and finances.

In addition to improving farm economics, we are also committed to improving stewardship as it is one of our core values on the farm (Our Core Values, 2019). Over the years we have felt the pressure from society and also the agriculture community to farm more sustainably. We have implemented practices like minimum till, cover crops, and use nitrogen inhibitors to help with some of the environmental concerns. Some of these practices are more expensive and we wonder if an organic system would prove to us to be more affordable than our current model. There is a younger generation who would like the opportunity to farm this same land in the future. It is important to us to farm the land sustainably so that there is a farming opportunity for the next generation.

**Beck Site: Current State**

The hog facilities we utilize have been built on land near or around our secured crop land. This is a very common model in the Midwest for operations who integrate both crop and hog production. Having the hog sites near our cropped land has allowed us access to manure, which has been a very affordable nitrogen source. We purchase anhydrous ammonia for nitrogen to apply onto our crop acres that are not near hog facilities. For us, the Beck site which is comprised of 570.2 acres of tillable land is an ideal candidate for organic transition due to its location and access to hog manure. The Beck site is currently in a conventional corn-soybean rotation, with continuous corn at times rotated in.

In addition to our hog operation, we have other systems in place that are synergistic to organic agriculture. Our farm is highly organized with record keeping of field applications and
crop inputs. We also have experience with seed corn production and having to isolate from neighboring corn fields to protect from cross pollination. Being a highly detailed operation already and familiar with some of the procedures followed by non-commercial crop types, like seed production will help us to more naturally adopt into organic practices. We also have a robust equipment set that would be very adaptable to using in organic production. Our labor force on the farm is at times is in an overabundance, especially during the growing season. However, it is important to us to keep that staff around for the more demanding times of the year. Therefore, we could utilize our surplus labor on the organic acres.

**Beck Site: Organic Transition Plan**

At the Beck site we produce hogs and farm 570.2 row crop acres that we will start transitioning into organic production starting in 2020. With the current crop rotation, the hog manure is used on roughly half of the acres ahead of corn each crop year. The 570.2 acres are all included in a manure management plan in place for the hog building which adequately provides nitrogen fertilizer for the 570.2 acres. The Beck hog facility produces an estimated 43,000 units of nitrogen annually. With the correct rotations this is enough manure to also supply a 570.2 organic production system with nitrogen fertilizer without having to purchase nitrogen off farm. It is possible that the hog buildings will produce more than enough manure for the organic system here, but we have adequate manure storage and options for using the manure elsewhere. In our planned organic rotation, there is always corn being grown each year, at a minimum the manure would always be spread onto acres going into corn production.

The table below shows our intended crop rotations and transition plans for each field. As previously discussed, in organic the crop rotation is more complex and lengthier when compared to a two-crop commercial corn and soybean rotation. The crop rotation is a working document, we are uncertain which crops will work well in our system and which pests we might encounter throughout the seasons. Therefore, our crop rotation plan in the figure below is only a starting point and will always be open to modifications.

During the transition years, we are going to raise corn, oats, and alfalfa in varying combinations. Among the five fields in the plan, four will be in some type of transition crop in 2020, only field 49 will remain in conventional production. We believe in starting off with a
combination of fields and crop types so we can quickly learn about raising multiple crop types we are less familiar with. It is a priority for us to get the learning curve out of the way. A lot of the literature suggests starting transition with a low input crop that suppresses weeds, like a small grain. We will raise oats to start transition on fields 47 and 50. In the fall of 2019, the plan is to pump the hog manure out onto fields 17 and 49, both going into corn production in 2020. Field 48 will be seeded into alfalfa.

Alfalfa will be raised on fields 48 and 49 in alternating years. Each of those fields are about the same size and would produce similar amounts of alfalfa. Our plan is to sell the transition alfalfa crops to a neighboring dairy operation. We have already had talks with the dairy and they are onboard with purchasing the alfalfa from us. The dairy would normally produce their own alfalfa, but this would allow them to raise seed corn in those years, which is a more valuable crop for them, and we would have someone to market our alfalfa crop to. The other two transition crops corn and oats can be fed through our hog operation. We would not receive any premium on the transition crops.

After transition we are planning to raise the same crops as certified organic and also add organic soybeans to the rotation. At this time, we do not know who and where our organic markets will be, but that will be fully discovered as we move forward in the transition process and work with our certifier. We are confident that we will be able to sell our crops, but we are in still in the process of determining our buyers. If we find ourselves to be successful transitioning our Beck site into organic, we will begin transitioning another hog facility in the near future.
### Figure 8. Beck Site Rotation Plan

<table>
<thead>
<tr>
<th>Field #</th>
<th>17</th>
<th>47</th>
<th>48</th>
<th>49</th>
<th>50</th>
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<tr>
<td>Acres</td>
<td>149.2</td>
<td>77.5</td>
<td>136.8</td>
<td>140.2</td>
<td>66.5</td>
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<tr>
<td>2019</td>
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<td>Soybeans</td>
<td>Corn/Com</td>
<td>Corn</td>
<td>Com</td>
</tr>
<tr>
<td>2020</td>
<td>Trans Corn</td>
<td>Trans Oats</td>
<td>T-Alfalfa</td>
<td>Corn/Com</td>
<td>Trans Oats</td>
</tr>
<tr>
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<td>Trans Corn</td>
<td>Trans Corn</td>
<td>T-Alfalfa</td>
<td>Trans Oats</td>
</tr>
<tr>
<td>2022</td>
<td>Org Corn</td>
<td>O-Oats/Alfalfa</td>
<td>Org SB</td>
<td>Trans Corn</td>
<td>O-Oats/Alfalfa</td>
</tr>
<tr>
<td>2023</td>
<td>O-Oats/Alfalfa</td>
<td>Org Com</td>
<td>Org Oats</td>
<td>Org SB</td>
<td>Org Com</td>
</tr>
<tr>
<td>2024</td>
<td>Org Com</td>
<td>Org SB</td>
<td>O-Oats/Alfalfa</td>
<td>Org Corn</td>
<td>Org SB</td>
</tr>
<tr>
<td>2025</td>
<td>Org SB</td>
<td>Org Com</td>
<td>Org Com</td>
<td>O-Oats/Alfalfa</td>
<td>Org Com</td>
</tr>
<tr>
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<td>Org SB</td>
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<td>Org Com</td>
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<td>Org Oats</td>
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</tr>
<tr>
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<td>Org Com</td>
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<tr>
<td>2031</td>
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<td>Org Com</td>
<td>Org Com</td>
<td>Org SB</td>
<td>Org Com</td>
</tr>
</tbody>
</table>

### Figure 9. Beck Site Map
**Organic Transition Resources**

During my research process I have found many great resources available to help farmers learn about organic production systems. There are also many organic consulting firms available to producers who prefer additional guidance throughout organic transition. I have found the organic community to be very welcoming and have a desire to help educate those who want to learn more about organic production.

**Organic Consulting Group**

http://www.fitzgeraldorganics.net

**AgriSecure**

http://www.agrisecure.com

**MOSES**

http://www.mosesorganic.org

**Practical Farmers of Iowa**

https://practicalfarmers.org/programs/field-crops/

**Iowa State University**

http://extension.agron.iastate.edu/organicag

**United States Department of Agriculture**

https://www.usda.gov/media/blog/2016/04/21/transitioning-organic-certification

**Conclusion**

This creative component discusses both conventional and organic crop agriculture. In short, organic somewhat describes what crop farming used to be prior to seed technology and commercial fertilizers. Seed technology and commercial fertilizers have allowed farmers to achieve great yields. From a production and efficiency perspective conventional agriculture has made great strides. However, many conventional crop producers are not feeling the same success from an economic and environmental perspective. This is where organic agriculture may play a role for producers who are still looking to find economic and environmental stability within their operations. There is a demand for both conventional and certified organic grain. In cases, like the model presented, certified organic can coexist with a conventional farm system.
Due to the demand from consumers for more organic products, a shift in acres to organic may create a better balance for each farming model and their markets.

While strong economics are a compelling reason for conventional farmers to consider organic production, improving environmental quality and consumer concerns about food safety are also important matters to consider. Organic production systems provide a unique opportunity to conventional crop producers, especially those who might be struggling in their current system. A full or partial transition may provide more stability for conventional operations. An obvious incentive is the validation of organic products that offers entrance to niche markets and premium prices. Another perk to the organic production systems is that producers believe by in doing so they are committing to the sustainability of the environment.

If producers do not find value in converting their acres into organic production, I think there are still methods conventional producers can implement to be more environmentally friendly and aware of consumer concerns. Hopefully this creative component provides conventional producers a foundational understanding of how an organic transition works and the incentives to do so. Farmers like having options and certified organic crop production is an option worth consideration.
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