12-12-2012

Cost Accounting Applied to Farming in Southwest Michigan

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ABSTRACT

The purpose of this study is to discuss how cost accounting is applied to the farming process. Specifically, this study evaluates and defines costs incurred within the farming industry where products are produced and sold after being generated from raw materials. Successful farmers must know the costs of raw materials acquired to produce cash corps.

While there are many types of crops farmed in southwest Michigan, this study specializes in cash crops, specifically corn and soybean production. Cost accounting methods applicable to the farming industry are introduced, discussed and applied in this study. A spreadsheet is presented which displays typical costs incurred by farmers. While each farming operation is unique, to become profitable, farmers should breakdown costs, expenses , and revenues for each field farmed. The intended audience for this thesis is assumed to have limited accounting and farming knowledge.

Cost Accounting Applied to Farming in Southwest Michigan

Systems enable managers to make informed decisions. Profitability and effective resource usage is particularly dependent upon cost accounting systems. These systems mandate that the manager understand the cost terms used in their organizations. Cost accounting systems are not identical and are tailored to the needs of individual companies. As a result, several terms are used in practice to describe the same or similar cost concepts, so users need to be aware of the specific terminology used within their company. Managers need to understand how financial statements are commonly prepared since these statements are the primary form in which information is available. The effects of the decisions made by managers will be reflected publicly in the firm's published financial statements (Lanen, Anderson, Maher, 2008, pp.37)

Cost accounting systems provide firms with information to use in the preparation of the financial statements. These statements are usually used for external reporting. However, the cost accounting system records and maintains the use of economic resources by the organization. (Lanen, Anderson, Maher, 2008, pp.38)

Cost vs. Expense

It is important to distinguish between a cost and an expense when classifying resources used within the organization. A cost is a sacrifice of resources. When buying an item, the purchaser gives up the ability to use a resource to buy something else. The price of each item measures the sacrifice that must be made in order to acquire the item. An expense, on the other hand, is a cost that is charged against revenue in an accounting period; that is, expenses are deducted from revenue in that accounting period. (Lanen, Anderson, Maher, 2008, pp.38)

A cost is incurred anytime a resource is sacrificed. These costs can be recorded as assets or as expenses. When recorded as an asset, the cost becomes an expense when the asset has been consumed. The focus of cost accounting is on costs, not expenses. Generally Accepted Accounting Principles (GAAP) and other regulations specify when costs are to be treated as expenses. (Lanen, Anderson, Maher, 2008, pp.38)

Outlay costs and opportunity costs are the two main categories of costs. An outlay cost is a past, present, or future cash outflow while an opportunity cost is the foregone benefit that could have been realized from the best-forgone alternative use of a resource. Consider the cost of college education; the cash outflows for tuition, books, and fees are outlay costs, and the time sacrificed to receive a college education is an opportunity cost. Accounting systems usually record outlay costs but fail to recognize opportunity costs. A well-designed cost accounting system should recognize all relevant information to managers, including opportunity costs that may have otherwise been ignored in decision making. (Lanen, Anderson, Maher, 2008, pp.38-39)

Presentation of Costs in Financial Statements

It is important to remember that cost accounting information is just a means to an end, and the final product is a managerial decision based off information generated by the cost accounting system. The most accurate information is not always sought out nor cost effective, but the best available information is desired. The information being collected and used is for managerial purposes only; therefore, it is assumed that the statements prepared are for internal management use, not external reporting (Lanen, Anderson, Maher, 2008, pp.39).

A basic, generic income statement that is prepared for a manager summarizes the revenues, subtracts the expenses, and results in operating profit. Operating profit is the excess of operating revenues over the operating expenses necessary to generate those revenues. This differs from net income, which is operating profit adjusted for interest, income taxes, extraordinary items, and other adjustments required to comply with GAAP (Lanen, Anderson, Maher, 2008, pp.39).

The income statement will have the same basic form but will vary depending on how the organization acquires the resources used to produce the product. There are usually three types of varying income statements. The first income statement is where the organization sells a service. The second is commonly used by a merchandiser, where the organization sells a product that it acquires from another organization. The last income statement is applicable to a manufacturer; an organization selling a product that it builds, by incurring labor and using raw materials from other organizations (Lanen, Anderson, Maher, 2008, pp.39).

Manufacturing Companies

A manufacturing company's income statement is more complex than a retailer or a merchandiser as it transforms raw materials into finished goods through the use of labor. As a result of manufacturing goods, manufacturers must understand the various costs associated with this production process. It is simply not sufficient to know the price paid for raw materials when manufacturing a finished product (Lanen, Anderson, Maher, 2008, pp.42).

The cost accounting system used by a manufacturing company should be able to provide information relevant for the external reporting system. For a manufacturing firm, financial reporting separates costs based on when those costs becomes recognized as expenses. All costs

for manufacturers can be classified as product or period costs. Product costs are frequently referred to as manufacturing costs. These costs are assigned specifically to units of production and recognized as an expense when the product is sold. As such, product costs follow the product through inventory and are recorded as an asset in the inventory system. Period costs include all other manufacturing costs. These costs are expensed as they are incurred (Lanen, Anderson, Maher, 2008, pp.42).

Product costs can be further classified as direct or indirect costs. Direct manufacturing costs are product costs that can cost effectively be identified with finished units. Indirect manufacturing costs include all other product costs. Taking a tractor as an example, the metal frame of the tractor is a direct cost of the tractor, but the depreciation of the manufacturing plant producing the tractor is an indirect cost (Lanen, Anderson, Maher, 2008, pp.42).

Any manufacturing company will need materials and employees to produce a finished product. The process followed by a manufacturing firm is to purchase raw materials, hire employees, to alter the raw materials to produce a finished good, and then offering the finished product to consumers. Throughout this process, there are three major categories of product costs: direct materials, direct labor, and manufacturing overhead (Lanen, Anderson, Maher, 2008, pp.43).

Direct materials are materials that are identified directly with the product. Identifying the direct materials with the product should be done at a relatively low cost. These materials are usually referred to as raw materials. The manufacturer will classify not only the raw materials as direct materials but also the transportation costs for acquiring the raw material. Like direct materials, direct labor can be identified directly with the product. This, too, is done

with cost stipulation; it should be done at a reasonable cost (Lanen, Anderson, Maher, 2008, pp.43).

In total, all other costs incurred to transform the materials into a finished product are known as manufacturing overhead. Besides raw materials and direct labor costs, these costs include indirect materials, indirect labor, and other manufacturing costs. Indirect materials are items needed to manufacture the finished product but do not become a part of the finished product. Lubricants for machinery, polishing and cleaning materials, repair parts, and light bulbs are all examples of indirect materials. Indirect labor is the cost for employees that are required for operation, but do not directly work on the product. Supervisors, maintenance workers, and inventory storekeepers are classified as indirect labor because they do not directly work on the product. Other manufacturing costs are expenses incurred to keep the factory operating, such as depreciation of the building and the equipment, taxes on the factory assets, insurance on the factory building and equipment, heating, cooling, and electricity (Lanen, Anderson, Maher, 2008, pp.43).

A manufacturing firm is likely to encounter prime costs and conversion costs. Prime costs are the direct costs, specifically, direct materials and direct labor. Generally, companies will focus on managing prime costs when they have relatively low manufacturing overhead. In other cases, companies will focus on the costs to convert direct materials into the final product, or conversion costs. Usually companies with high direct labor and/or manufacturing overhead tend to be more concerned about conversion costs (Lanen, Anderson, Maher, 2008, pp.43).

Proper cost information is critical when deciding to focus on prime costs or conversion costs. When determining costs to monitor, the magnitude of the cost and the extent to which that cost can be controlled is determined. (Lanen, Anderson, Maher, 2008, pp.43).

Cost Allocation

When products are produced, there are costs involved and usually these costs are incurred in many different departments with shared facilities or services. To assign costs to each finished product, cost allocations must be used. Cost allocations assign the indirect costs to products, services, people, and business units. These products, services, people, and business units are considered cost objects. Indirect costs are assigned a cost pool and then are applied to cost objects. There are many complex cost allocation methods that are available. These methods all have the same fundamental approach of identifying cost objects, determining the cost pools, and selecting the cost allocation rule. Using cost flow diagrams may aid in understanding how a cost system works and the likely impacts on the reported costs of different cost objects from changes in the cost allocation approach (Lanen, Anderson, Maher, 2008, pp.45).

Details of Manufacturing Cost Flows

Materials, labor, and overhead costs are added to a product throughout each stage of the production process. This production process contains three basic steps. First, the manufacturing company will have its direct materials, or raw materials, delivered to the receiving department. After these materials have been inspected, they are placed in the direct materials inventory. When needed for production, those materials are transported to the working environment. The material then goes through the production process and eventually a

finished product emerges. When the material is in production, but not yet complete, it is considered work-in-process and is included in the work in process inventory. When the final product emerges, its cost is included in the finished goods inventory and is ready for immediate sale to customers (Lanen, Anderson, Maher, 2008, pp.46). During the planting season, the seeds are transported to the field, or the working environment, where direct labor and other manufacturing costs are incurred during the growing season. Once the farming process is complete (i.e., the grain is harvested), the grain becomes a finished good that is placed in storage facilities and eventually sold to grain buyers.

Each of the inventory accounts in the production process typically will have a beginning inventory amount, additions and deductions during the period, and an ending inventory amount. By assigning costs to the physical flow of goods, cost flows through the inventory accounts and the use of resources in the production process can be represented (Lanen, Anderson, Maher, 2008, pp.45).

Cost Behavior

Managers make decisions that lead to the activities a firm will undertake. These decisions can create or sometimes, destroy the value in an organization. Financial statements presented to the managers will show what is happening financially, but they do not explain the whys. In order for a manager to analyze costs and arrive at a decision, they must understand basic cost behaviors within the organization (Lanen, Anderson, Maher, 2008, pp.51).

Cost behavior deals with the way a cost responds to changes in activity levels. Managers will need to know how the costs behave in order to make important decisions about the product, to plan, and to evaluate performance. The behavior of these costs is usually

categorized as one of the following: fixed costs, variable costs, semi-variable costs, or step costs (Lanen, Anderson, Maher, 2008, pp.51).

Not all costs are strictly fixed or variable, but usually categorizing the cost as a fixed or a variable cost is an important first step. Fixed costs are costs that remain the same even when the volume changes within the relevant range of activity. Variable costs are costs that change in direct proportion to a change in volume within the relevant range of activity. The relevant range is the range within which the total fixed costs and unit variable costs do not change and in which the company normally operates (Lanen, Anderson, Maher, 2008, pp.52).

When deciding to classify a cost as fixed or variable, there are four aspects of cost behavior that come into play. The first aspect is realizing that not all costs are purely fixed or variable. Some costs will have both fixed and variable components. These costs are semi-variable costs. Another possible cost is a step cost. A step cost is a cost that will increase with the volume in steps. Once the cost behavior is understood, those costs are classified depending on the measure of activity used (Lanen, Anderson, Maher, 2008, pp.52).

Making Cost Information More Useful for Managers

With knowledge of the fixed costs and variable costs, the manger should use this information, along with the financial statements, to aid in the decision making process. The traditional income statement is primarily used for external reporting. The value approach or the contribution margin income statement is more useful for internal decision making (Lanen, Anderson, Maher, 2008, pp.52).

The contribution margin income statement uses variable costing to calculate the contribution margin and then calculates the operating profit after considering the fixed costs.

Revenue is reduced by the variable costs to produce the contribution margin. The contribution margin is then reduced by the fixed costs to compute the operating profit (Lanen, Anderson, Maher, 2008, pp.52).

Although the contribution margin income statement is helpful in decision making, the value income statement offers more insight for the manager. This statement classifies costs into value-added or nonvalue-added activities. It follows the same outline as a contribution margin income statement, but with the categorized activities, the manager is able to reduce or eliminate nonvalue-added costs to reduce costs for the product being created (Lanen, Anderson, Maher, 2008, pp.52).

Activity-Based Costing

An activity is any discrete task that an organization undertakes to make or deliver products or services. Products or services consume activities and activities consume resources. Activity-based costing (ABC) is a two-stage product costing method that assigns costs first to activities and then to the products based on each product's use of activities. There are four steps involved in activity-based costing (Lanen, Anderson, Maher, 2008, pp.319).

First, the activities that consume resources are identified and costs are assigned to them. Identifying the activities that consume resources can sometimes be challenging and interesting. In identifying these activities, activities can be classified into value added and nonvalue added. When following the production process all the way through, managers often uncover many nonvalue added activities that can be eliminated from this first step. Second, cost drivers associated with each activity are identified. Third, a cost rate per cost driver is computed. A predetermined rate is equal to the estimated indirect cost divided by the

estimated volume of allocation base. Fourth, costs are assigned to products by multiplying the cost driver rate by the volume of cost driver units consumed by the product (Lanen, Anderson, Maher, 2008, pp.320-321).

Activity-based costing uses more data than conventional costing but provides more informed estimates of product costs. Having better cost information enables managers to make decisions about pricing. Activity-based management focuses on managing activities to reduce costs (Lanen, Anderson, Maher, 2008, pp.321).

Identifying users of ABC is not always easy for a variety of reasons. First, ABC means different things to different observers. Second, ABC can be used in some parts of an organization but not in every part of an organization. Lastly, organizations usually announce the adoption of ABC but do not necessarily announce its discontinuance (Lanen, Anderson, Maher, 2008, pp.330-331).

A wide range of organizations have adopted ABC, ranging from manufacturing to government agencies. The sizes of these organizations also vary significantly. Some organizations using ABC are small regional users while others are large multinational users (Lanen, Anderson, Maher, 2008, pp.330). One type of organization in particular that can benefit from the use of ABC is a farming organization. Farmers can use ABC because they are able to follow the process of relating costs to an activity all the way through to the finished product.

Agriculture in Michigan

Michigan has a rich history in the automotive industry and has been titled the nation's automotive capital. In addition, in 2004, Michigan produced more than half of the office furniture systems in the United States. Michigan has been ranked fourth in the nation for

plastics shipments, and also manufactures a wide variety of other products, including fabricated metals, machinery, food products, and chemicals (Department, 2003).

In addition, agriculture plays a big role in Michigan's economy. In 2007, Michigan had 56,014 farms totaling roughly 10 million acres of land (Corrin, 2009). The state was ranked first nationally in 2007 for the production of dry beans, blueberries, tart cherries, pickling cucumbers, and more. The top five agriculture commodities for Michigan in 2011 were dairy products, corn, soybeans, floriculture and nursery, and cattle and calves (Parker, 2012). Grains, oilseeds, and dry beans account for 30% of sales, milk and dairy products account for 22% of sales, and floriculture and nursery account for 11% of sales (Corrin, 2009).

The average size of a farm in Michigan is 179 acres. In percentages of total farms for 2007, 65.4% of farms averaged 1 to 99 acres, 26.5% of farms averaged 100 to 499 acres, 4.7% of farms averaged 500 to 999 acres, 2.5% of farms averaged between 1,000 to 1,999 acres, and 1.0% of farms averaged 2,000 or more acres (Parker, 2012). Of these farms, roughly one-half of farm operators are at least 55 years old and 56% of farm operators have another occupation. Farm employment from these various farms totaled 86,000 with a total payroll of $607 million (Corrin, 2009).

According to the 2007 census, "Corn continued to lead all crops in value sold, accounting for nearly 28 percent of all U.S. crop sales and more than 13 percent of all agricultural products sold." Focusing on grain, oilseed, and dry bean farms, the five largest expense items are fertilizer, cash rent, seed, chemicals, and gasoline and fuel. In 2007 throughout the U.S., these farms spent $53.1 billion on these five expenses, an increase of $20.5 billion from 2002. The largest net increase in expenses was from gasoline and fuel and

fertilizer. Gasoline and fuel increased by 124% and fertilizer increased by 122% (2007 Census, 2012).

Agriculture in Southwest Michigan

In 2007, the top five counties farming grains, oilseeds, and dry beans in Michigan, based on sales, were Allegan, Ottawa, Huron, Sanilac, and Ionia (Corrin, 2009). Of the top five counties, Allegan, Ottawa, and Ionia are the counties that are located in southwest Michigan. Van Buren is another county in southwest Michigan that produces large amounts of grains, oilseeds, and dry beans. These southwestern counties have farms that incur the same large expenses that U.S. farms spend billions of dollars on each year. Boerson Farms, Barry Brook Farms, Groholski Farms, B & G Crop Farms, Blonde Farms, and Stamp Farms, LLC. are some of the local farms and farmers within the southwest region of Michigan that would incur these five main expenses yearly.

Each of these local farms and farmers must account for their fertilizer, cash rent, seed, chemicals, and gasoline and fuel in a certain way. Most farmers will use a form of accounting to assign these expenses to the grain being produced. In a general sense, accounting for farming operations is an information system that provides reports to stakeholders about the economic activities and condition of a farm. There are expenses incurred throughout the entire farming process (Warren, Reeve, Duchac, 2007, pp.7).

The Farming Process

To fully understand how cost allocations are achieved in a farming operation, the farming process must be understood. The farming process is different for each crop. For purposes of this paper, cash crops, specifically corn and soybean production, will be used to explaining the

farming process. These crops are grown and maintained in a very similar manner.

A crop year. Once harvest is complete, anything done to a field thereafter is considered to be for the next year's crop production. Therefore, applying lime and tilling the land after harvest is considered to be preparation for the following year's crops. A crop year is thus determined and based on the year that the crop will be harvested, not necessarily on the year that the inputs go into the ground to prepare for the crop.

Fertilizing, tilling, and discing. Fertilizer is a growth supplement. It will be applied to the ground after the prior year's harvest. The typical fertilizer used in Southwest Michigan is lime. Lime can be purchased for approximately $14 per straight ton and is considered to be one of the more cost effective fertilizer options.

The process of spreading lime will depend on how many acres need tended. There are two ways to apply fertilizer to a field. Fertilizer is applied either by a pull behind spreader tender or by a large self-propelled floater tender. The application of the fertilizer can occur before or after tilling the ground, but it must take place before planting the crop. Typically in southwest Michigan, the farmer will choose to apply fertilizer in the fall after harvest is complete.

In order to maximize yields (i.e., the amount of crop produced per acre), a third party professional can provide valuable assistance. An agronomist or another third party company is qualified to determine how best to treat the soil in each particular field. They will make suggestions as to what type of fertilizer should be used, how much fertilizer should be used, and when to apply the fertilizer. These suggestions are used by the farmers at their own discretion.

If the field is fertilized after harvest and ready for the spring, or if the field is fertilized in the spring to prepare for the season, the following step is tillage, also referred to as tilling the land. Typically tilling is done immediately following the harvesting of the crops and the application of the lime. The fertilizer is then turned through the tillage tool that allows the lime to be placed into the ground. By tilling the land after applying the fertilizer, the farmer is mixing the input with the ground to prepare the ground for the crops.

After the land is tilled, the next process is to disc or what some might call "fit" the field. This process is used to break up the large lumps of ground that resulted from tilling. Discing the field leaves it with a nice layer of fresh dirt across the top of the field. The results of fertilizing, tilling, and discing leave the field looking smooth and beautiful. It creates a firm seedbed that allows for an even emergence of crops once they have been planted.

Scouting. In early spring, before planting, scouts will head out to the fields. Scouts are employees that will inspect the fields for any weeds that have sprouted over the winter months. They will spray any weeds with a burn down herbicide.

Planting. Although fertilizing, tilling, discing, scouting are important processes, planting the crops is the vital process. Planting the crops occurs at different times depending on what crop is being planted. In this case, planting corn and soybeans will usually take place in April. Planting is done by using large machinery called "planters." These planters carry the seed and plant numerous rows at a time. Farmers can decide how many rows to plant in each pass. There are different size planters available for purchase: six row planters, twelve row planters, twenty-four row planters, and so forth.

The seed used in the planting process usually is purchased from a seed dealer. The farmer

meets with a seed dealer and picks which variety of seed will be planted and carried by the planters. After placing the seed in the ground, nitrogen and water are applied to aid in the growth of the crop.

Applicating. In the early summer months, nitrogen is applied to the fields. Farmers usually call this process applicating or application. Application is done with a machine that allows the nitrogen to be inserted beneath the soil. The fields usually require only a single pass of nitrogen per season. After the nitrogen is applied, water is needed.

Water can be supplied to a field both by man and by nature. If the field is irrigated it will have a pivot in place as the main water supply. Irrigated ground usually has a well and a generator to power the pivot and supply the water. These pivots circle around the field in a determined pattern. Irrigated ground usually produces higher yields and stronger crops than non-irrigated fields. A non-irrigated field is a field that solely depends on Mother Nature's rainfall for its main water supply.

Whether the field is irrigated or non-irrigated, the water is still necessary. The soil absorbs the water and the water is then mixed with the nitrogen that was applied to the field. This mixture is supplied to the plant and aids in growth.

Spraying. Farmers need to protect their crops and can do so by spraying fields. This is necessary to keep the bugs and weeds from stunting the growth of crops. The fields must be scouted once again and the scouts will make sure there are no bugs or weeds that are damaging crops. In order to prevent any bugs from harvesting their eggs, the fields are sprayed with pesticides. These pesticides are recommended by an agronomist and they are field specific based on findings from the scouts.

Harvesting. The final process of farming is to harvest the crops. The harvest process happens after all of the moisture is out of the crop. During this process, combines are used to harvest the corn or soybeans. There is a small area for the combine to hold the grain being harvested. Once this area is near full, an attached auger is used. This auger releases the grain from the combine and is dropped into a grain cart that also has a limited amount of storage for the crops. Once the grain cart is near full, its auger is used to drop the grain into a semi trailer. Semis then haul the grain into a local elevator or offsite storage facilities.

Using Cost Accounting in the Farming Process

The farming process has many costs involved. There are some constant expenses that are considered to be direct costs. It is determined that these costs will be present as long as the farming process is in occurrence. The process itself also creates indirect costs. In order to properly account for these costs, an accounting system must be used.

There are many different uses and applications of accounting throughout the industry. Although there are many different fields of accounting in practice, cost accounting is a field of accounting that measures, records, and reports information about costs and the one that is most applicable to a farming operation. Cost accounting allows farmers to see their farm as more than “x” amount of acres that costs “x” amount of dollars to produce “x” amount of bushels. Cost accounting allows the farmer to see the farming operation broken into incomes and expenses based on acres and yield units. This is possible because these grain farmers have a unit of production, grain. Being able to break the income and expenses down per acre gives the farmer a basis for comparing performance of different fields, determining why one field may be producing more than another, analyzing optimal use of land, experimenting with

agricultural practices to improve yields, and reducing expenses (Managing, 2011).

Some of the farming process will incur the same costs, and other processes will incur process-specific costs. Iowa State University Extension and Outreach has a valuable spreadsheet that calculates the costs incurred all the way through the net proceeds for individual farms. The spreadsheet is formatted for others to edit and personalize for their own inputs and costs. The costs throughout the farming process are included within this spreadsheet (Duffy, 2012).

Most farmers till more than one field. Many local farmers in southwest Michigan have fields in more than one county. In this case, they will want to determine profitability per field. The inputs for each field will differ depending on many variables. Some variables include: the type of that ground present, the acreage that is being covered in a particular field, the distance from the field to the farm's "home base" location, and if the field is an irrigated or a non-irrigated field.

Iowa State University Extension and Outreach Spreadsheet: Template of Costs Incurred per Field

Field Name			Expected Yield		bu./acre
			Acres		
		Cost per Acre			Total Cost
Preharvest machinery		Fixed	Variable	Total	All Acres
Chisel plow				$0.00	$0
Tandem disk				$0.00	$0
Apply nitrogen				$0.00	$0
Field cultivate				$0.00	$0
Plant				$0.00	$0
Spray				$0.00	$0
Custom hire				$0.00	$0
Other				$0.00	$0
Other				$0.00	$0
Total per acre		$0.00	$0.00	**$0.00**	**$0**
Total all acres		$0	$0	**$0**	----
Seed, chemicals, etc.					
Seed		----	$0.00	$0.00	$0
cost per 1000 kernels					
kernels per acre					
Nitrogen		----	$0.00	$0.00	$0
price per pound					
pounds per acre					
Phosphate		----	$0.00	$0.00	$0
price per pound					
pounds per acre					
Potash		----	$0.00	$0.00	$0
price per pound					
pounds per acre					
Lime (annual cost)		----		$0.00	$0
Herbicide		----		$0.00	$0
Insecticide		----		$0.00	$0
Crop insurance		----		$0.00	$0
Miscellaneous		----		$0.00	$0
Interest on preharvest variable costs		----	$0.00	$0.00	$0
length of period (months)					
interest rate					
Total		----	$0.00	**$0.00**	**$0**
Harvest machinery					
Combine				$0.00	$0
Grain Cart				$0.00	$0
Haul		$0.00	$0.00	$0.00	$0
Fixed- price per bushel					
Variable- price per bushel					
Drying		$0.00	$0.00	$0.00	$0
Fixed- price per bushel					
Variable- price per bushel					
Handling		$0.00	$0.00	$0.00	$0
Fixed- price per bushel					
Variable- price per bushel					
Custom hire				$0.00	$0
Total per acre		$0.00	$0.00	**$0.00**	**$0**
Total all acres		$0	$0	**$0**	----
Labor					
Operator		$0.00	----	$0.00	$0
Hours					
Rate per hour					
Hired		----	$0.00	$0.00	$0
Hours					
Rate per hour					
Total		$0.00	$0.00	**$0.00**	**$0**
Land					
Cash rent equivalent			----	$0.00	$0
Total fixed, variable and all costs					
Per acre		$0.00	$0.00	**$0.00**	**$0**
Per bushel		$0.00	$0.00	$0.00	----
All acres		$0	$0	**$0**	----
			Return per Acre Over		Return
			Variable Costs	All Costs	All Acres
Gross returns					
Expected selling price	*$0.00*		----	$0.00	$0
Government payments					
Direct payment			----	$0.00	$0
Counter Cyclical pymt.			----	$0.00	$0
Expected LDP rate	*$0.00*		----	$0.00	$0
Total returns			----	**$0.00**	**$0**
Net returns			$0.00	**$0.00**	**$0**

Iowa State University Extension and Outreach Spreadsheet: Example of Costs Incurred per Field

Field Name			Expected Yield	185	bu./acre
Fisher-Dewey East			Acres	650	
			Cost per Acre		Total Cost
Preharvest machinery		Fixed	Variable	Total	All Acres
Chisel plow		$3.95	$4.90	$8.85	$5,753
Tandem disk		$3.55	$3.25	$6.80	$4,420
Apply nitrogen		$4.60	$5.50	$10.10	$6,565
Field cultivate		$2.80	$3.20	$6.00	$3,900
Plant		$6.20	$5.10	$11.30	$7,345
Spray		$2.10	$1.80	$3.90	$2,535
Custom hire		$0.00	$0.00	$0.00	$0
Other		$0.00	$0.00	$0.00	$0
Other		$0.00	$0.00	$0.00	$0
Total per acre		$23.20	$23.75	**$46.95**	**$30,518**
Total all acres		$15,080	$15,438	**$30,518**	----
Seed, chemicals, etc.					
Seed		----	$99.00	$99.00	$64,350
cost per 1000 kernels	*$3.30*				
kernels per acre	*30,000*				
Nitrogen		----	$117.00	$117.00	$76,050
price per pound	*$0.65*				
pounds per acre	*180*				
Phosphate		----	$46.50	$46.50	$30,225
price per pound	*$0.75*				
pounds per acre	*62*				
Potash		----	$30.00	$30.00	$19,500
price per pound	*$0.60*				
pounds per acre	*50*				
Lime (annual cost)		----	$9.72	$9.72	$6,318
Herbicide		----	$21.00	$21.00	$13,650
Insecticide		----	$18.70	$18.70	$12,155
Crop insurance		----	$23.40	$23.40	$15,210
Miscellaneous		----	$8.75	$8.75	$5,688
Interest on preharvest variable costs		----	$14.32	$14.32	$9,309
length of period (months)	*8*				
interest rate	*5.4%*				
Total		----	$388.39	**$388.39**	**$252,454**
Harvest machinery					
Combine		$19.45	$10.60	$30.05	$19,533
Grain Cart		$5.90	$3.50	$9.40	$6,110
Haul		$7.40	$7.40	$14.80	$9,620
Fixed- price per bushel	*$0.04*				
Variable- price per bushel	*$0.04*				
Drying		$9.25	$35.52	$44.77	$29,101
Fixed- price per bushel	*$0.05*				
Variable- price per bushel	*$0.19*				
Handling		$3.15	$4.63	$7.77	$5,051
Fixed- price per bushel	*$0.02*				
Variable- price per bushel	*$0.03*				
Custom hire		$0.00	$0.00	$0.00	$0
Total per acre		$45.15	$61.65	**$106.79**	**$69,414**
Total all acres		$29,344	$40,069	**$69,414**	----
Labor					
Operator		$64.13	----	$64.13	$41,681
Hours	*2.85*				
Rate per hour	*$22.50*				
Hired		----	$39.90	$39.90	$25,935
Hours	*2.85*				
Rate per hour	*$14.00*				
Total		$64.13	$39.90	**$104.03**	**$67,616**
Land					
Cash rent equivalent		$190.00	----	$190.00	$123,500
Total fixed, variable and all costs					
Per acre		$322.47	$513.69	**$836.16**	**$543,502**
Per bushel		$1.74	$2.78	$4.52	----
All acres		$209,606	$333,896	**$543,502**	----
			Return per Acre Over		Return
			Variable Costs	All Costs	All Acres
Gross returns					
Expected selling price	*$5.75*		----	$1,063.75	$691,438
Government payments					
Direct payment			----	$0.00	$0
Counter Cyclical pymt.			----	$0.00	$0
Expected LDP rate	*$0.00*		----	$0.00	$0
Total returns			----	**$1,063.75**	**$691,438**
Net returns			$550.06	**$227.59**	**$147,936**

Costs Incurred per Field Spreadsheet

The highlighted cells are input cells. The farmer should create a spreadsheet for each field farmed. The expected yield and acres farmed are typically different for each field.

Preharvest machinery and harvest machinery are broken into fixed costs and variable costs. Fixed machinery costs include depreciation, return on investment in machinery, insurance, and storage of the machinery. Variable machinery costs include fuel, oil, and repairs and maintenance. Some typical fixed and variable costs associated with a farming operation are discussed below:

1. The fixed costs remain the same even when the acres being farmed increases. The variable costs change in proportion to the amount of acres farmed. Having the ability to track and break down variable costs gives farmers field specific knowledge on the cost per acre.

2. A fixed cost is determined for each of the farming processes. Custom hire is not always a part of the farming process, therefore, was not discussed as part of the farming process. Custom hire is the process of hiring a third party company to custom plant, applicate, spray, and harvest crops. This process has unique accounting concerns that are beyond the scope of this paper.

3. Seed, chemicals, and fertilizers are variable costs. They will change in proportion to the acres farmed. Common sense suggests the more acres farmed, the greater are these variable costs.

4. Labor is also broken into fixed costs and variable costs. In farming, an operator is considered to be the supervisor. For each farming activity, there is usually an operator assigned to each crew. An operator will have many job titles. He or she might work on paperwork, report field conditions to the owner, or even drive a piece of farming machinery. Regardless of the job being done, an operator's labor is considered to be manufacturing overhead and will be treated as a fixed cost.

5. Hired labor is an hourly paid employee. Hired labor works directly with the production of the crops and their labor will be a variable cost. This cost will change in proportion to the amount of hours these employees work, which should vary by the acres farmed.

6. Land rent will be a fixed cost for each field rented. This is fixed because the cash paid for rent will not change until a new negotiation is agreed upon between the farmer and the landowner.

Once the variable costs have been calculated, they are multiplied by the number of acres being farmed. Fixed costs are added to that total to arrive at total costs. To compute a net return, those total costs are then deducted from the calculated total returns.

The expected selling price can be found on the Chicago Board of Trade website. This selling price will be the most up-to-date price that farmers can anticipate their grain. The selling price is first multiplied by the expected bushels per acre, and then it is multiplied by the number of acres farmed.

Government payments are also considered when calculating the total returns. The expected LDP rate is a number found from the USDA that is a subcategory of government payments. The expected LDP is determined by the state and county in which the farmer is located.

A positive net return represents a profit for farming that field. A negative net return represents a loss for farming that field. By using this spreadsheet, farmers can determine what costs are value-added and what costs are nonvalue-added costs. Farmers, not satisfied with the profitability amount, can identify costs to minimize to enhance profits.

If a spreadsheet is completed for each field that is farmed, the sheets can then be consolidated to determine overall profitability. Consolidating these sheets is important because some fields will always be more profitable than others will. If the fields combined result in a combined profit, the farmer does not need to worry quite as much about small losses. Moreover, even if a plot of land has a negative profit, it may be worth farming. That is, fixed

costs assigned to that plot of land will be incurred regardless if it is farmed or not (assuming the land is kept). As long as the marginal revenue exceeds the marginal cost (variable costs) of that plot of land, in the short-run, it is advantageous for the farmer to till that land. A long-run decision would have to consider the fixed costs to determine if the plot of land can return to a positive profitability status.

For the first couple of years being farmed, some fields will produce a loss. Inputs may be required to build up the ground. For poor land, the farmer should negotiate a lower rent amount.

Conclusion

In tough economic times, farmers must be aware of all costs, which fields are profitable, and which fields are producing a loss. Sadly, not all farmers make use of a software system that may help assign their costs to fields. In fact, many farmers are not fully aware of what costs are being incurred, the behavior of these costs, what yields are being produced on each plot of land, and the profitability of those plots of land. Given the amount of corn and soybeans harvested, however, farmers do understand how to farm their land and are perfecting the farming process. What frequently is lacking is an understanding of the profitability of each plot of land. A total profitability analysis is rather performed, which may not maximize profits, as specific lot inefficiencies are not identified.

By using cost accounting that measures, which records, and reports information about costs, farmers can establish a relationship between costs and the stages of the farming process. Farmers would also be able to distinguish a cost from an expense, an outlay cost from an

opportunity cost, and a direct cost from an indirect cost. The ability to categorize these costs essential to the farmer's long-term financial success.

Farmers should ultimately categorize costs as fixed costs and variable costs. Having the ability to use a spreadsheet as displayed and discussed in this paper, farmers are able to break their costs into fixed costs and variable costs per plot of land. Using this process, farmers may be able to associate costs to specific fields being farmed to determine the profitability of those fields.

With this ability, farmers could determine their value-added and nonvalue-added inputs. In addition, farmers are able to determine the relative importance of each input and assign a spending limit for each activity. By using a spreadsheet presented, or one of similar nature, a farmer may be able to input data to predict outcomes of many different cost scenarios.

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