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Contents

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The Economics of On Farm Storage Facilities.

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Many producers across the Midsouth have historically relied on off-farm (commercial) storage. However, a number of factors in recent years have led to a rapid and continued expansion in the amount of on-farm storage. Regardless of why producers construct on-farm storage facilities, doing so generally requires a significant capital investment and thus analyzing the costs and returns associated with this investment is important.

Grain storage costs have both fixed and variable components. Fixed costs are incurred regardless of whether grain actually is stored in storage facilities, whereas variable costs are incurred only when grain is stored. Fixed costs are the cost of owning the storage facilities (i.e., depreciation, interest, repairs, taxes, and insurance). However, when making the investment decision to construct on-farm storage facilities all costs (variable and fixed) should be considered and managers should strive to cover both fixed and variable costs.

Fixed Costs

Grain bin costs vary widely, depending on size and optional equipment. In many cases, a producer will not construct a single grain bin. Rather, an entire storage system will be constructed, which includes multiple bins, aeration equipment, and conveyance equipment. In addition, the location of the storage facilities, as well as future expansion plans, can affect the total investment. Once the total investment is known, annual fixed costs can be estimated.
As mentioned earlier, fixed costs include: depreciation, interest, repairs, and taxes and insurance. Depreciation is an annual, noncash expense which recognizes the amount of value the grain bins lose each year due to use, age, and obsolescence. It is also a way of spreading the cost of the grain bin over its expected useful life. Table 1 shows the expected useful life of grain bins and associated drying equipment.

Table 1. Guidelines for Estimating Grain Storage Fixed Costs

	Grain Bins	**Drying Equipment**
Useful Life	15 – 25 years	10 – 12 years
Depreciation	4 – 7%	8 – 10%
Interest	5 – 8%	5 – 8%
Repairs	1 – 2%	3 – 5%
Taxes, Insurance	1 – 1.5%	.5%
Total	**11 – 18.5%**	**16.5 – 23.5%**

The annual depreciation (as a percent) of a grain bin with an expected useful life of 20 years is 5 percent (100 percent divided by 20 years equals 5 percent per year). For example, a $100,000 grain bin would have annual depreciation of $5,000 (5 percent × $100,000 = $5,000).

The interest rate on intermediate term loans or the rate of return from other fixed investments can be used to estimate the interest costs on a grain storage facility. Interest costs are calculated by multiplying an annual interest rate by the average value of the grain bin over its expected useful life.

Interest cost can be calculated as follows:

$$\textit{Average Value} = \frac{\textit{Cost + Salvage Value}}{2}$$

Interest = average value × interest rate.

For example, annual interest costs are $3,000 for a $100,000 grain bin. This is figured by multiplying one-half of the original investment ($50,000) by an interest rate of 6 percent. The salvage value was assumed to be zero (0) in this example.

As shown in Table 1, estimate annual repair costs using a rate of 1 to 2 percent of the original purchase price of the grain bin(s). For drying and handling equipment, use 3 to 5 percent of the original purchase price.

Taxes can be figured by multiplying the local property tax rate times the assessed building value. If that is not available, a general guideline is to use 1 percent of the original purchase price. Insurance (not flood insurance) costs can be estimated at 0.5 percent of the original purchase price.

An example of estimating the annual ownership costs of a grain storage facility is shown in Table 2.

Table 2. Estimated Annual Grain Storage Fixed Costs

(43,500 bushel annual grain volume – Initial Cost $100,000)		
	Percent	**Cost**
Depreciation		
• Bins ($70,000)	5%	$3,500
• Equipment ($30,000)	9%	$2,700
Interest	6%	$3,000
Repairs		
• Bin	1%	$700
• Equipment	3%	$900
Taxes (bin only)	1%	$700
Insurance	0.5%	$500
Total Cost		**$12,000**
Annual Cost Per Bushel		**.28**

Variable Costs

Table 3 shows a breakdown of the typical variable costs associated with storing grain. As the name implies, variable costs are just that. The costs provided in Table 3 are simply estimates and can vary due to individual management and environmental conditions. Though included in Table 3, no expense is assigned to drying. Drying costs for all wet grain whether stored on-farm or at commercial facilities will be incurred. For that reason, drying costs have been ignored in this example.

Table 3. Estimated Grain Storage Variable Costs

Utilities (electricity)	
• Conveyance	$.019
• Drying	$.000
• Aeration	$.013
Insecticide [1]	$.025
Interest [2]	$.105
Shrinkage [3]	$.062
Total Variable Costs per bu.	**$.224**

1 includes bin wall spray, protectant, and fumigant

2 based on storing corn for 6 months and price of $3.50/bu.

3 based on (1.18% shrink + additional 0.1% x 6 months of storage) x price of $3.50/bu.

A rough estimate of gas use for drying is 0.02 gallons of LP per bushel per percentage point of moisture removed. When five percentage points of moisture are removed (for example from 20 percent moisture down to 15 percent moisture, wet basis), you could expect to use 0.1 gallons of LP per bushel (5 points x 0.02 gal per bushel per point). If LP gas costs $1.30 per gal, the gas cost would be about $0.13 per bushel. For dryers that use natural gas, the equivalent number would be about 1840 cubic feet of gas per bushel for each moisture percentage point removed.

The continued weakness in the SRW basis follows a much smaller U.S. crop in 2009. Production is estimated to be about 412 million bushels, 202 million bushels (33 percent) smaller than the 2008 harvest.

The harvest in Arkansas was estimated at 19.7 million bushels, 36.1 million (65 percent) smaller than the 2008 harvest. Given these fundamentals, some improvement in basis would normally be expected. However, the potential benefit of the smaller 2009 production has been offset by very slow SRW wheat exports. The USDA-FAS reported as of September 10, 2009, 14 weeks into the 2009-10 marketing year, only 33.5 million bushels of SRW wheat had been exported. That compares to cumulative exports of 89 million bushels at the same time a year earlier.

Break-Even Prices:

The figure below provides estimates of returns over variable costs under different wheat prices and yields. The 2010 variable costs of $183 and $173 per acre for wheat shown in Figure 1 do not include land charges. Figure 2 illustrates the impact of a 75/25 share rent arrangement on break-even yields and prices.

For instance, if a producer owns a farm and sells his wheat for a net price of $4.00 per bushel, his yield can drop as low as 42 bushels per acre and still cover his variable costs. Conversely, if the same producer believes his average yield will be 42 bushels, then his net selling price will need to be $4.00 per bushel to break even.

The Economic Contribution of Agriculture to the Arkansas Economy in 2007

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*This article is based on the forthcoming research report number 987 *"Economic Contribution of the Agricultural Sector to the Arkansas Economy in 2007 and Revised Estimates for 2006"* by Kemper, Popp and Miller, which will be available online at http://division.uaex.edu/.

Arkansas' Agriculture and Food Sector, made up of agricultural production, processing and retail industries, as a percentage of total Arkansas Gross Domestic Product (GDP) has exceeded those of surounding states since at least 1969 when the Bureau of Economic Analysis (BEA) began publishing regional GDP information. In 2007, the Agriculture and Food Sector accounted for nearly 12 percent of Arkansas' GDP (Table 1). Arkansas' Agriculture and Food Sector as a percentage of its GDP was about double that of most other Southern region states. It was more than double that of the United States' (US) agricultural production, processing and retail sectors as a percentage of national GDP in 2007.

Agriculture has historically been one of Arkansas's most important economic sectors and the diversity of Arkansas' Agriculture and Food Sector is the foundation of its strength. While agriculture contributes to the economy through direct agricultural production and value-added processing, it also plays an important role through its interactions with other sectors. The use of non-agricultural goods and services as inputs for agricultural production and the purchase of goods and services by Agriculture Sector workers promotes diversified growth in Arkansas' economy, thereby allowing agriculture to remain a vital part of the Arkansas state economy. A study was recently undertaken to analyze the economic contribution of the Agriculture Sector, made up of agricultural *production and processing* in the state, for the year 2007.

Methods

For the economic contribution analysis, the entire measure of economic activity in the industries that make up the Agriculture Sector (such as Crop, Livestock and Forestry production and processing industries) is more than just the direct production and processing and agriculture support industry contributions.The indirect and induced contributions of agriculture must be taken into consideration as well. Indirect contributions occur when the Agriculture Sector purchases goods and services from local businesses, such as when the poultry and egg production sector purchases concrete and steel and secures financing to build new poultry houses. Agriculture's induced contributions are measured by increases in economic activity to satisfy the personal consumption by employees of the Agriculture Sector or by employees of firms that provide inputs to the Agriculture Sector. The sum of these direct, indirect, and induced contributions provides a measure of the total economic contribution of agriculture.

The economic contribution of the Arkansas' Agricultural Sector was modeled using the Impact Analysis for Planning (or IMPLAN) System. IMPLAN is an input-output model which uses a computerized database to create regional economic multipliers. There are 440 industries in IMPLAN - 96 agricultural industries and 344 non-agricultural industries. The Agriculture Sector can be categorized by three broader industries; agricultural production, agricultural processing and agricultural-related. Once the contribution analysis is complete, contribution results for the 440 IMPLAN sectors are aggregated into 20 2-digit NAICS industries to simplify presentation of results. Arkansas data for 2007 from the Minnesota IMPLAN Group, Inc., the most recent data available, were used to calculate all contributions. Total jobs, income and value added contributions were estimated for all sectors and labor income and value added figures are reported in 2007 dollars, unless otherwise noted.

Results

Direct, Indirect and Induced Contributions

Table 2 shows that in 2007, the Agriculture Sector made large contributions to the economy in terms of jobs, income and value added. The Agriculture Sector provided 268,617 jobs, or 17 percent of state employment. That is, one in six Arkansas jobs can be attributed to agriculture. Agriculture, either directly or indirectly, contributed $9.2B or 15 percent of total Arkansas labor income and contributed $15.2B or 16 percent of state value-added. That is, about $1 out of every $6 in Arkansas value added can be attributed to agriculture.

The Agriculture Sector's direct contribution to the state economy is measured by the sum of the contributions of farm production, the processing of farm products and agriculture related sectors (such as cotton ginning and custom harvesting services). There were 161,140 workers employed directly by the agricultural production, processing and agriculture related sectors. The crops industries employed more than one out of every three (40%) of these workers, while the animal agriculture industries employed 38% and the forestry industries 22%. The owners, operators and workers of these farms and businesses received nearly $5.2B in labor income. 72% of the labor income went to workers and business owners in agricultural processing industries. Crops, animal agriculture, and forestry industries contributed direct added value of $8.2B to the Arkansas economy, nearly sixty percent of which came from processing industries.

Indirect contributions result when agricultural firms purchase raw materials and services from other Arkansas businesses to produce their products. In 2007, there were 54,553 workers employed by industries supplying goods and services to the farm production and processing industries. These workers and the owners of those establishments received \$2.4B in labor income and these industries added value of over \$4B to the state economy.

Induced contributions result when employees of agricultural firms and employees of the raw material and service firms spend a portion of their income on local purchases. There were 52,923 workers employed by businesses providing goods and services to the employees in agriculture and its supplying industries. These employees and the proprietors of these businesses received over \$1.6B in labor income and added value of roughly \$2.9B to the Arkansas economy.

Where Jobs, Labor Income and Value Added are Generated

Agriculture generates employment in all 20 of the 2-digit NAICS aggregated industries (or sectors). Three-quarters, or almost 75%, of all agriculture-generated jobs are in five industries (Table 3). The Poultry Sector (comprised of Poultry Processing and Poultry and Eggs) alone provides 40,707 jobs or just over 25% of all agricultural generated jobs in Arkansas. *Poultry Processing* employed 30,226 of these workers. The remaining 10,481 workers are employed in *Poultry and Egg Production*.

The far-reaching contributions of agriculture are seen in the distribution of agriculture-generated value added throughout the economy. Table 4 shows the five industries that benefit most from value added generated by agriculture. Note that three of those industries (Real Estate and Rental, Wholesale Trade, and Transportation and Warehousing) reside outside of the Agriculture Sector as defined here. While almost half (48%) of all agriculture-generated value added accrues outside agricultural Sectors, these industries are closely tied to agriculture. For instance, the Wholesale Trade industry contains businesses such as grain and livestock wholesalers as well as farm supply wholesalers. Within the Agriculture Sector, *Poultry Processing, Grain Farming, Poultry and Egg Production, Logging, and Oilseed Farming* add the largest amount of value in the economy. About 19% (\$2.8B) of value added by Agriculture accrues in Crops, 15% (\$2.3B) in Animal Agriculture, and 19% (\$2.8B) in Forestry.

As with value added, much of the income attributable to agricultural activity is generated outside of agricultural sectors. Table 5 shows the five industries that benefit most from income generated by agriculture. In 2007, \$4.3B, or 46.8% of all labor income, went to workers in non-agricultural sectors. Within the agricultural sectors, *Poultry Processing, Grain Farming, Poultry and Egg Production, Support Activities for Agriculture and Forestry, and Paper Mills* received \$2.2B, or 24.4% of all labor income generated.

Discussion and Conclusions

This research suggests that the Agriculture Sector plays a significant role in generating jobs, income and value added throughout the economy of Arkansas. Seventeen percent of all jobs, 15 percent of income and 16 percent of value added in the state are contributed due to agriculture. The Agriculture Sector generates economic activity in all of the 20 2-digit NAICS industries, indicating that the contributions of agriculture are experienced not only in the direct agricultural industries but in non-agricultural sectors as well.

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Table 1. The Agriculture and Food Sector as a Percentage of GDP, 2007[a]

State / Region	Percent of GDP by state
Arkansas	12.03
Louisiana	4.55
Mississippi	9.19
Missouri	7.09
Oklahoma	5.46
Tennessee	6.68
Texas	4.28
Southeast [b]	6.94
U.S.[c]	5.50

Source: USDC, BEA (2009b)

[a] Current 2007 dollars

[b] The BEA includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia in the Southeast region

[c] Agriculture and food is measured as a percent of GDP for the U.S.

Table 2. The Aggregate Agriculture Sector's Contribution to Arkansas' Economy, 2007

	Employment [a]			Labor Income [b]			Value-Added [c]		
	Number of Jobs	% Total Contribution	% Total Arkans as Jobs	Million $ [d]	% Total Contribution	% Total Arkansas Labor Income	Million $	% Total Contribution	% Total Arkansas Value Added
Production [e]	67,491	25.1	4.3	1,374	15.0	2.3	3,342	22.0	3.6
Processing [f]	82,691	30.8	5.2	3,496	38.2	5.9	4,597	30.3	4.9
Ag-Related [g]	10,958	4.1	0.7	296	3.2	0.5	268	1.8	0.3
Direct Contribution	**161,140**	**60.0**	**10.2**	**5,166**	**56.4**	**8.7**	**8,208**	**54.0**	**8.8**
Indirect Effects	54,553	20.3	3.5	2,403	26.2	4.0	4,097	27.0	4.4
Direct + Indirect Contribution	**215,694**	**80.3**	**13.7**	**7,569**	**82.7**	**12.7**	**12,304**	**81.0**	**13.2**
Induced Effects	52,923	19.7	3.4	1,588	17.3	2.7	2,881	19.0	3.1
Total Contribution	**268,617**	**100.0**	**17.0**	**9,157**	**100.0**	**15.4**	**15,186**	**100.0**	**16.3**

Source: Computed using the 2007 Arkansas database from MIG (2009)

[a] Equivalent to full- and part-time jobs (MIG, 2009)

[b] Labor income represents all forms of employment income; it is the sum of employee compensation and proprietor income (MIG, 2009)

[c] Value-added is the sum of employee compensation, proprietary income, and indirect business taxes

[d] Current dollars

[e] Appendix A, Table 3 lists sectors of direct agricultural production in terms of IMPLAN sectors

[f] Appendix A, Table 3 lists sectors of direct agricultural processing in terms of IMPLAN sectors

[g] Ag-related sectors include agricultural sectors not categorized as agricultural production or processing. These sectors are: Fishing, Hunting and Trapping, Agriculture

and Forestry Support Activities, and New Farm Housing Units and Additions and Alterations

Table 3. Employment Generated by Agriculture Sector, 2007

Top Five NAICS industries[a]
Manufacturing 86,577 jobs (96% of the jobs are in agricultural processing)
Agriculture, Forestry, Fishing and Hunting 78,449 jobs (86% of the jobs are in agricultural production)
Retail Trade 12,806 jobs
Health and Social Services 11,951 jobs
Transportation and Warehousing 10,206 jobs
Top Five Total 199,989 jobs (74% of all jobs generated by Agriculture)

[a] Based on 2-Digit NAICS aggregation (USCB, 2006)

Table 5. Labor Income Generated by Agriculture, 2007[a]

Top Five NAICS Industries[b]
Manufacturing $3.70B (94% of labor income is in agricultural processing)
Agriculture, Forestry, Fishing and Hunting $1.67B (82% of labor income is in agricultural production)
Wholesale Trade $585.60M
Transportation and Warehousing $471.93M
Health and Social Services $470.04M
Top Five Total $6.90B (75 % of all labor income generated by Agriculture)

[a] Current dollars

[b] Based on 2-Digit NAICS aggregation (USCB, 2006)

Table 4. Value Added Generated by Agriculture, 2007[a]

Box 3. Top Five NAICS Industries[b]
Manufacturing $4.95B (93% of the value added is in agricultural processing)
Agriculture, Forestry, Fishing and Hunting $3.61B (93% of the value added is in agricultural production)
Real Estate and Rental $1.01B
Wholesale Trade $991.62M
Transportation and Warehousing $679.30M
Top Five Total $11.24B (74% of all value added generated by Agriculture)

[a] Current dollars

[b] Based on 2-Digit NAICS aggregation (USCB, 2006)

We hope you find our newsletter useful. If you have any comments or questions regarding these articles, or would like to make suggestions for future articles, contact the editor.

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