



Production and Farm Management Report

Colorado
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Department of Agricultural and Resource Economics, Fort Collins, CO 80523-1172

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PRODUCTION RESOURCES AND MANAGEMENT: A COMPARISON OF LOW-SALES, MEDIUM-SALES, AND LARGE FAMILY FARM OPERATIONS IN THE UNITED STATES

Dustin Pendell,¹ Kamina Johnson,² James Pritchett,¹ Dawn Thilmany,¹ and Ann Seitzinger²

Introduction – Questions raised about the challenges facing small and mid-sized farming operations in the United States gave rise to this analysis of data from the 2008 Agricultural Resource Management Survey (ARMS)³ conducted by USDA's Economic Research Service (ERS) and National Agricultural Statistics Service (NASS). This paper⁴ explores marketing and production characteristics of:

- (1) low-sales farms (gross sales <\$100,000);
- (2) medium-sales farms (gross sales between \$100,000 and \$249,999); and
- (3) large family farms (gross sales between \$250,000 and \$499,999)

where operators reported farming as their major occupation. This analysis excludes small family farms with

less than \$250,000 in gross sales whose operators report that they are either retired or have a major occupation other than farming. It also excludes very large family farms with gross sales of \$500,000 or more and nonfamily farms.

Farm sustainability, resilience and performance are closely tied to the effectiveness with which managers use their assets and costs. This fact sheet investigates the cost and asset efficiency of agriculture operations that are categorized according to their sales and ranked by their rate of return on assets.⁵ The size of the operations, input purchases and labor productivity are particular areas of emphasis.

Production Characteristics – Figure 1 shows the average number of acres farmed by the low-sales,

¹ Authors are Assistant Professor, Associate Professor and Professor in the Department of Agricultural and Resource Economics, Colorado State University, Fort Collins, Colorado 80523-1172.

² Authors are Agricultural Economists, USDA:APHIS:Veterinary Services.

³ For 2008, the full Phase III sample from the Agricultural Resource Management Survey (ARMS) was 34,000 farm operations. These operations returned 21,816 usable surveys. Specific information is found at the ARMS Websites: <http://www.ers.usda.gov/Data/ARMS/GlobalDocumentation.htm> and <http://www.ers.usda.gov/DATA/ARMS/FarmsDocumentation.htm>.

⁴ This fact sheet is published as part of a three part series. An Executive Summary (<http://dare.colostate.edu/pubs/PFMR11-01.pdf>) and two additional fact sheets titled *Operator and Operation Characteristics* (<http://dare.colostate.edu/pubs/PFMR11-02.pdf>) and *Profitability Measures and Financial Structure* (<http://dare.colostate.edu/pubs/PFMR11-04.pdf>) and are available at the listed websites.

⁵ Rate of return on assets is defined as net farm income plus interest expenses minus estimated charges for operator labor and management, divided by total assets. This ratio reveals the returns received by the farm operator for both debt and equity capital invested.

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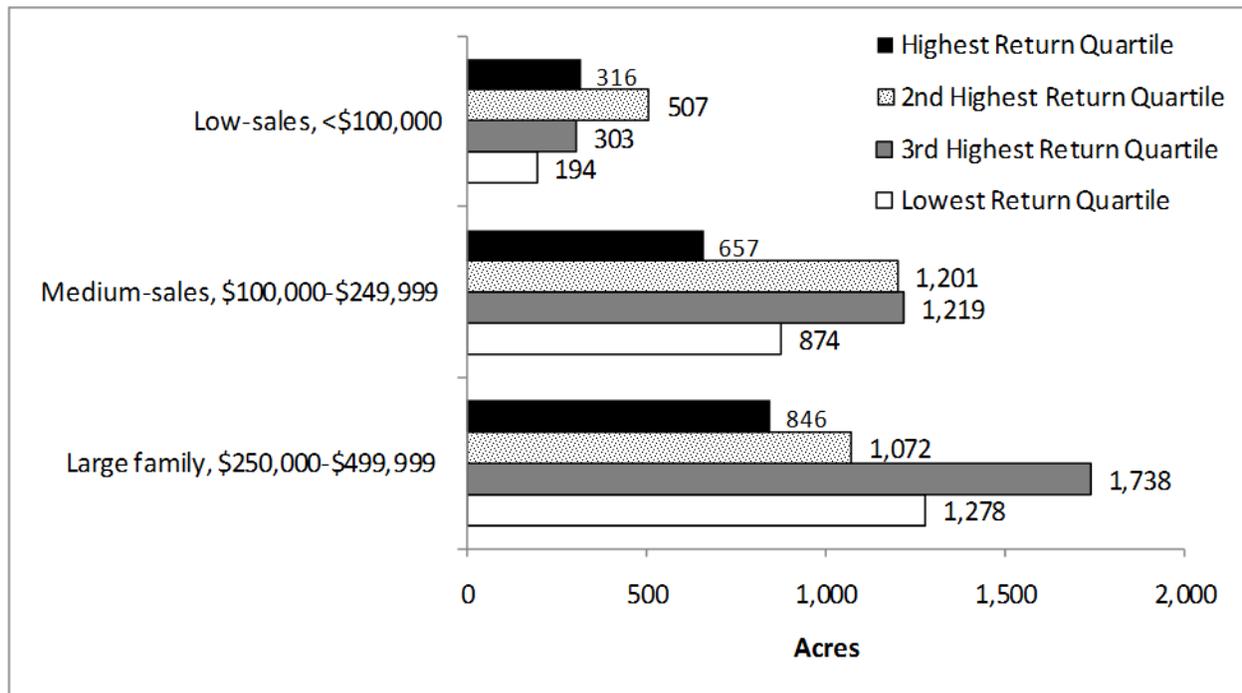


Figure 1. Average Number of Acres Operated, by Farm Sales and Quartile.

medium-sales and large family farms. Within a sales class, farms in the highest performing quartile do not operate the largest number of acres; rather the 2nd and 3rd quartiles tend to operate the most land. Among large family and medium-sales farms, the highest quartile has the lowest number of acres operated with the 3rd highest quartile operating the most the acres. The low-sales farms in the 2nd highest quartile operate the largest number of acres with the lowest profit quartile operating the smallest number of acres. As might be expected, large family farms usually operate the most acres overall.

Ownership of beef cows is not associated with high ranking quartiles. As seen in Figure 2, operations in the highest profit quartile for all three farm sales classes own the fewest number of beef cows. Low-sales and medium-sales farms in the 3rd and 2nd highest quartiles have the most beef cows.

The two previous figures illustrate the relationship between farm performance and physical size of the operation, while the next figure and table indicates the diversity and specialization of the operations. In Figure 3, the number of commodities produced on average is reported in each sales class. Evidence suggests that more specialized operations (less than 2 commodities) perform better when compared to operations that

have a greater scope of production. As gross sales increase, the average number of commodities produced increases slightly. The low-sales farms achieving the highest returns produce 1.5 commodities on average, while large family farms garnered the highest returns with 3 commodities produced. This could be a result of the large family farms operating a higher number of acres (as seen in Figure 1). Of interest is the risk mitigating benefits of producing more crops, but this is not represented in the figure.

Using the value of sales to define production specialties, the highest and lowest ROA quartile averages are found in Table 1. The low-sales farms show a greater variety of production specialties compared to medium-sales and large family farms. The highest return quartile for low-sales farms shows beef cattle, other crops, and grains and oilseeds as the top production specialties. The highest return quartile of the medium-sales and large family farms are dominated by grains and oilseeds with 52.8 percent and 68.3 percent of these farms, respectively, claiming this production specialty. For low-sales farms, specializing in beef cattle is more prevalent in the lowest return quartile. For medium-sales and large family farms, specializing in grains and oilseeds and dairy is more prevalent in the lowest return quartile, although at a markedly lower percentage than for the highest return quartile.

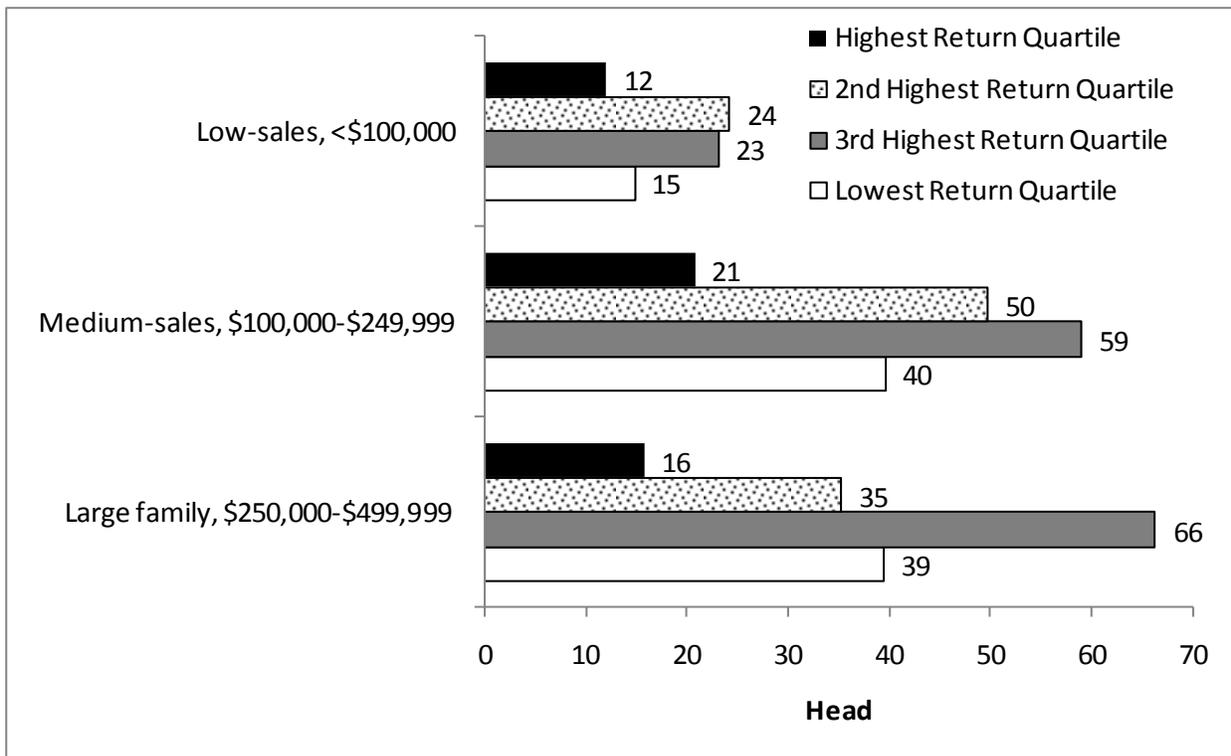


Figure 2. Average Number of Beef Cows Owned, by Farm Sales and Quartile.

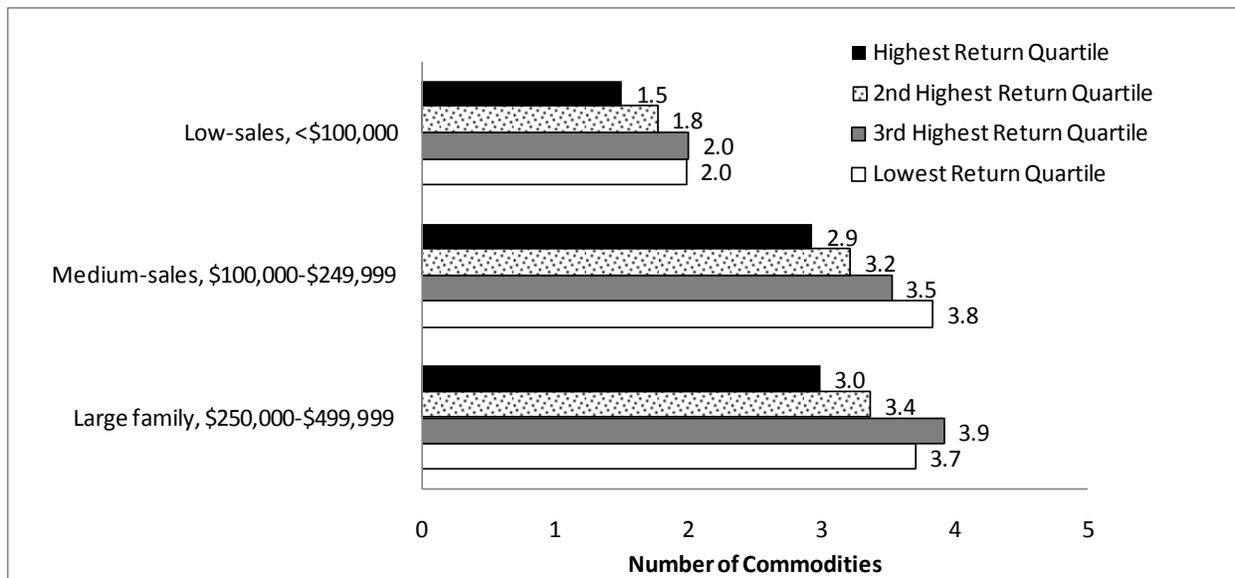


Figure 3. Average Number of Commodities Produced, by Farm Sales and Quartile.

Table 1. Production Specialty Based on Sales, by Farm Sales and Quartile.

Production Specialty	Low-sales <\$100,000		Medium-sales, \$100,000-\$249,999		Large family, \$250,000-\$499,999	
	Highest Return Quartile	Lowest Return Quartile	Highest Return Quartile	Lowest Return Quartile	Highest Return Quartile	Lowest Return Quartile
Grains and oilseeds	17.7	8.7	52.8	30.9	68.3	41.6
Tobacco	0.8	2.5	1.0	0.9	2.4	0.8
Cotton	0.4	0.2	0.6	1.4	3.1	2.3
Vegetables and melons	1.2	4.9	2.7	3.6	1.5	1.3
Fruit, tree nuts, and berries	3.7	3.6	5.0	2.2	2.8	2.3
Nursery, greenhouse, and floriculture	2.0	2.8	3.8	4.7	2.3	5.0
Other crops	23.6	7.6	6.8	3.7	2.7	1.6
Beef cattle	32.0	38.2	11.5	16.4	5.0	11.9
Dairy	2.0	5.1	9.8	26.3	4.8	20.7
Hogs	0.6	0.8	0.6	5.3	1.1	5.1
Sheep, goats, wool, and mohair	2.4	9.9	0.4	0.3	0.2	0.0
Equine	11.3	12.8	1.1	0.0	1.4	1.7
Poultry and eggs	0.8	1.1	2.4	4.2	3.8	5.4
Aquaculture	0.6	0.4	0.9	0.0	0.3	0.2
Other animals	0.9	1.7	0.6	0.3	0.5	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: Percentages may not sum to 100 percent due to rounding.

Input Acquisition and Management Practices – Managing input costs is important in determining profitability, and managers may have opportunities to reduce costs in the way they choose and price inputs.

Figure 4 shows the percentage of producers who report participation in at least one of the following: (1) lock in the price of inputs (forward purchases), (2) use farm management advice on purchases, (3) shop for best prices from multiple suppliers, (4) negotiate with suppliers for price discounts, and/or (5) participate in a buying club, alliance, etc. to purchase inputs. For the highest quartile of the low-sales, medium-sales, and large family farm sales classes, 17.6 percent, 30.5 percent, and 38.0 percent, respectively, of producers used one of the above input strategies. When comparing farm sales classes, the large family farms use the methods described above more frequently than medium-sales and low-sales farms when purchasing inputs.

Labor – Labor is a key input in the production process, but it is not expected that all sales classes will use the same amount of labor in their operations or that quartiles will be as efficient as one another in using labor to generate revenues. The USDA ARMS survey asks operators to estimate their hours of work to help assess total contributions to the farm. The charge for operator is estimated by multiplying the reported hours of work by the wage rate for farm labor. In Figure 5, large family and medium-sales farms report the greatest amounts of principal operator labor regardless of quartile, as

one might expect given the greater scale of operations. Note the consistent relationship between quartiles within each sales class. Interestingly, the highest quartiles within each sales class report the lowest amounts of principal operator charges, which could be explained in several ways. It is possible that the most profitable operations are less labor intensive, or it may be labor is required and operators are profitable enough to hire the labor needed.

Other questions in the survey gather the amount of management effort invested by managers in their operations. If we consider the percent charged to principal operator labor as a share of charges to principal operator and management, it may show whether the operators supply mostly operational efforts (labor) or managerial oversight to their farms. The large family farms appear to have the lowest share dedicated to labor, followed by medium-sales and low-sales farms (Figure 6). This could be directly related to off-farm employment, (i.e., the smaller operations may not have the ability to hire the labor they need for operations), leading them to invest more of themselves or the large-family (or highest-quartile) operations have higher net value of production.⁶ As seen in Thilmany et al. (2011), the off-farm income is higher in low-sales and medium-sales farms when compared to large family farms. Thus, it is not surprising to see the low-sales and medium-sales farms have higher percentages invested in labor (i.e., lower management charges) when compared to large family farms. With respect to returns, the producers with the highest

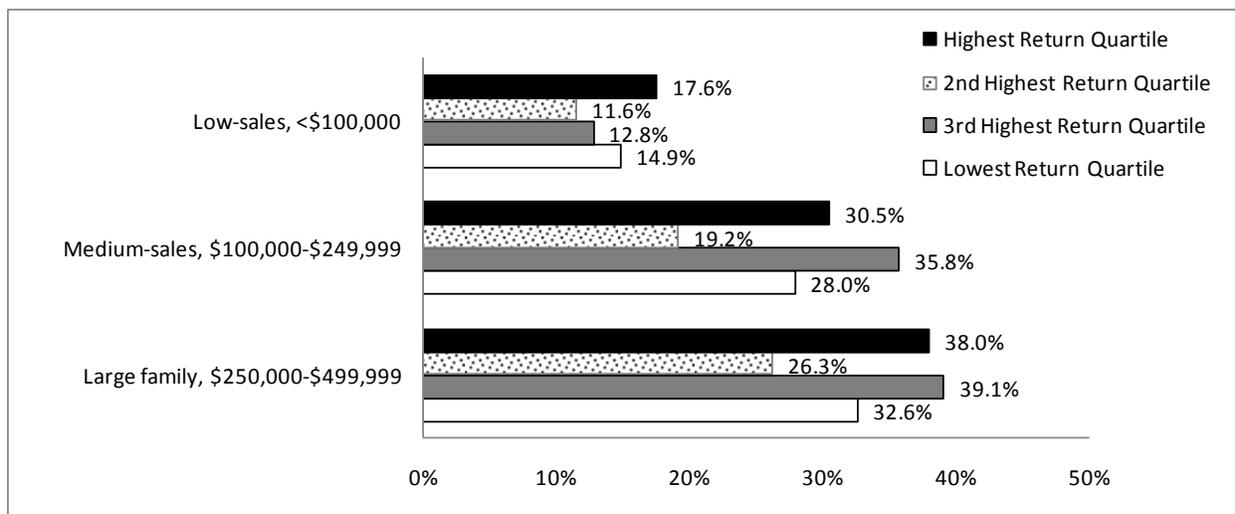


Figure 4. Percent of Operations Acquiring Inputs using 5 Methods, by Farm Sales and Quartile.

⁶ Charge to management is calculated as a 5 percent of the net value of production.

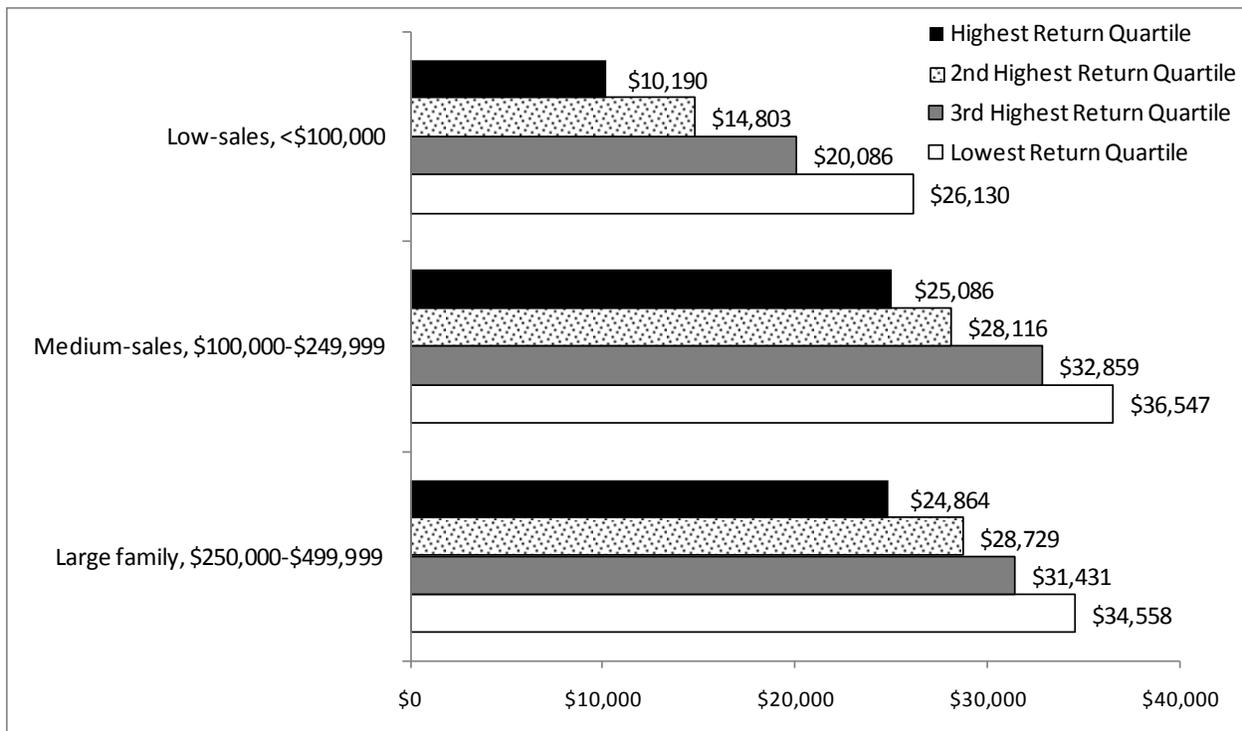


Figure 5. Charge to Principal Operator Labor, by Farm Sales and Quartile.

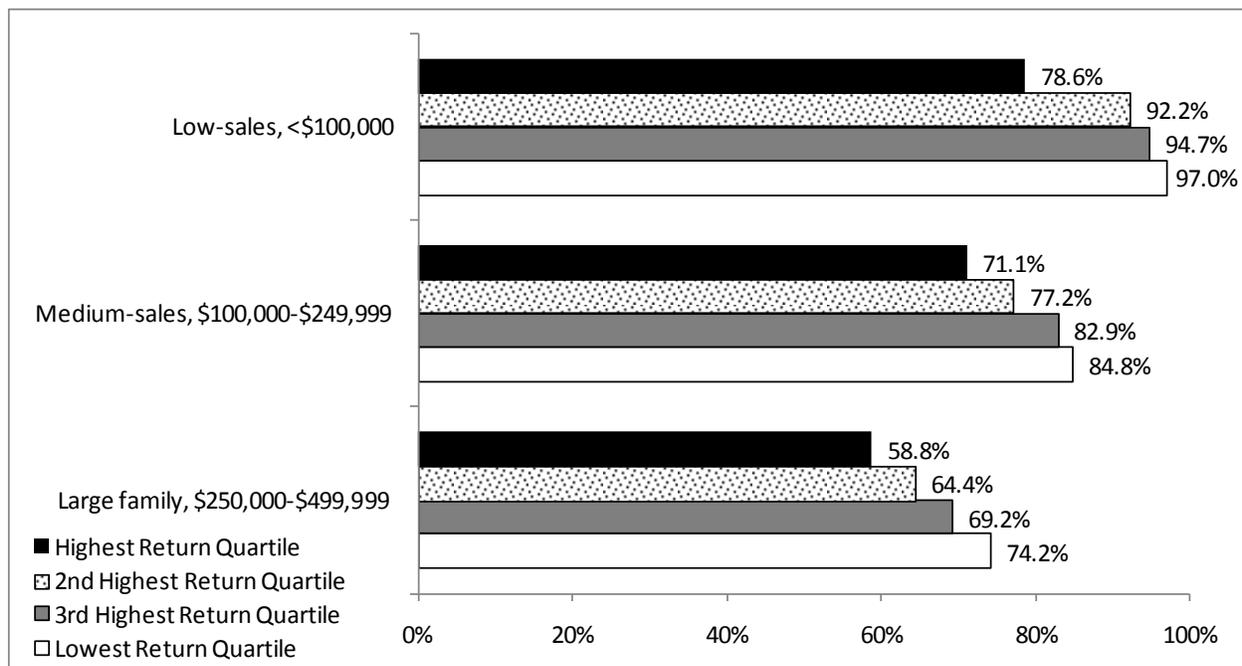


Figure 6. Percent Principal Operator Labor Charge as a Share of Charges to Principal Operator Labor and Management, by Farm Sales and Quartile.

returns have the lowest share committed to labor while the producers with the lowest returns have the lowest share committed to management charges. It is hard to evaluate causality, but it is plausible that cash flow concerns keep the poor performing operations from hiring sufficient labor (requiring them to provide it to the operations themselves). For strong performing farms, the higher charge for management may be one of the reasons they perform so well financially. Each of these issues is worth further exploration.

As expected, the large family and medium-sales farms report the highest number of annual hours worked by the principal operator, spouse, and other operators (Figure 7). Interestingly, producers with the highest returns have the lowest total annual hours worked while the lowest returns producers report the highest total annual hours worked, consistently within each sales class. In future studies, one should include hired labor and hours of contract labor. Additionally, it would be interesting to examine the relationship between the amounts of hours worked and the proportion of assets held as machinery and equipment –

perhaps, the highest performing operations substitute machinery and equipment for labor, and in doing so receive an advantage in cost efficiency.

Figure 8 displays the gross sales per annual person equivalent (i.e., gross sales / 2,000 hours).⁷ This tells us how efficient the farms are at converting labor to gross sales. The large family farms' gross sales per annual person equivalent are approximately six to twelve times larger when compared to medium-sales and low-sales farms. Little variation exists within the farm sales class as the quartiles are similar. Within all farms the highest gross sales per annual person equivalent is the highest quartile, although there is little difference between the highest and the lowest quartiles.

Livestock and Feed Expenses – In Figure 9, producers with the highest returns have the smallest percentage of purchased feed expense as a share of total expenses while producers with the lowest returns tend to have feed expense as a larger share of total expenses. When comparing across sales classes by quartile, the percentage of purchased feed expense as a share of total

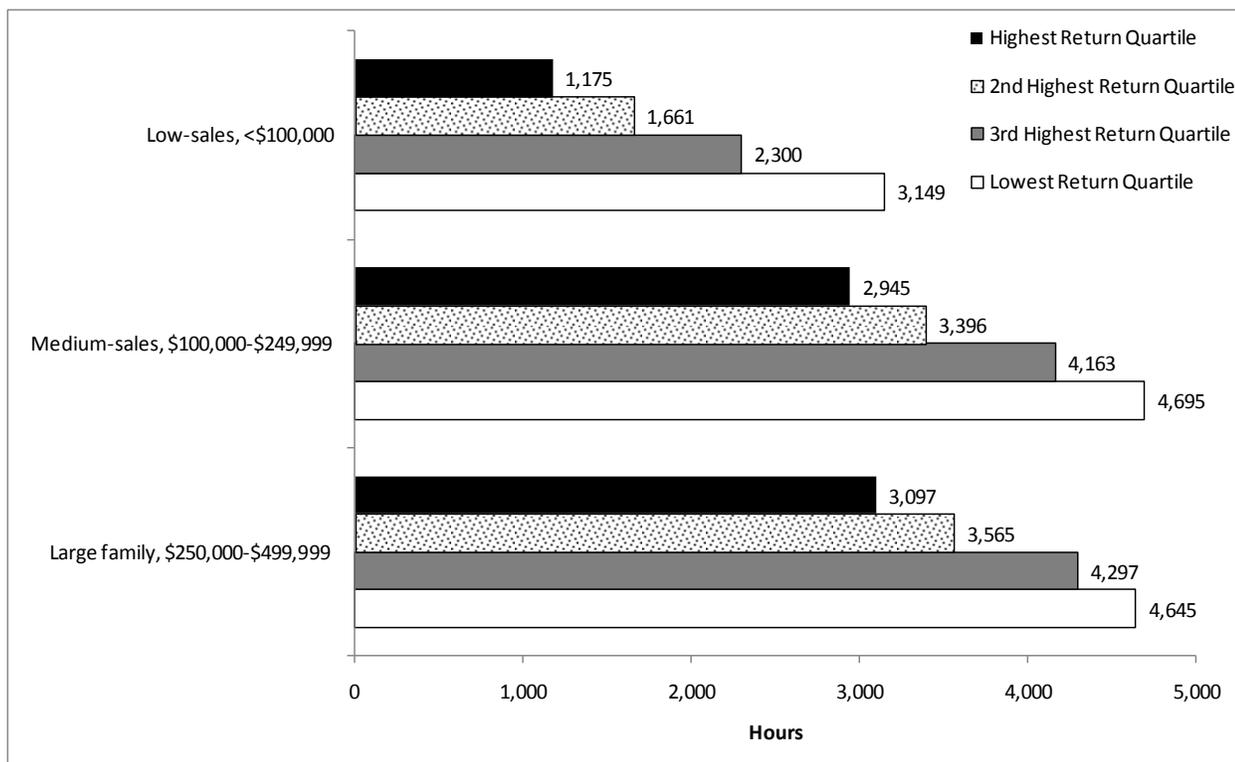


Figure 7. Average Annual Hours Worked by Farm Sales and Quartile.

⁷ Person equivalent is defined as 50 weeks per year times 40 hours per week or 2,000 hours.

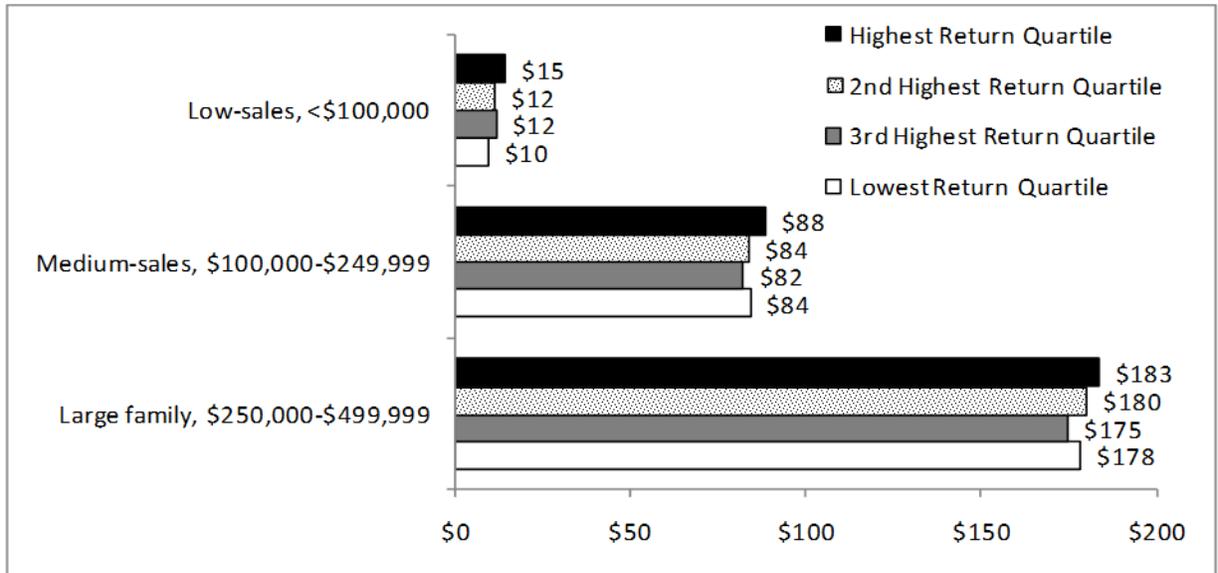


Figure 8. Average Gross Sales per Annual Person Equivalent, by Farm Sales and Quartile.

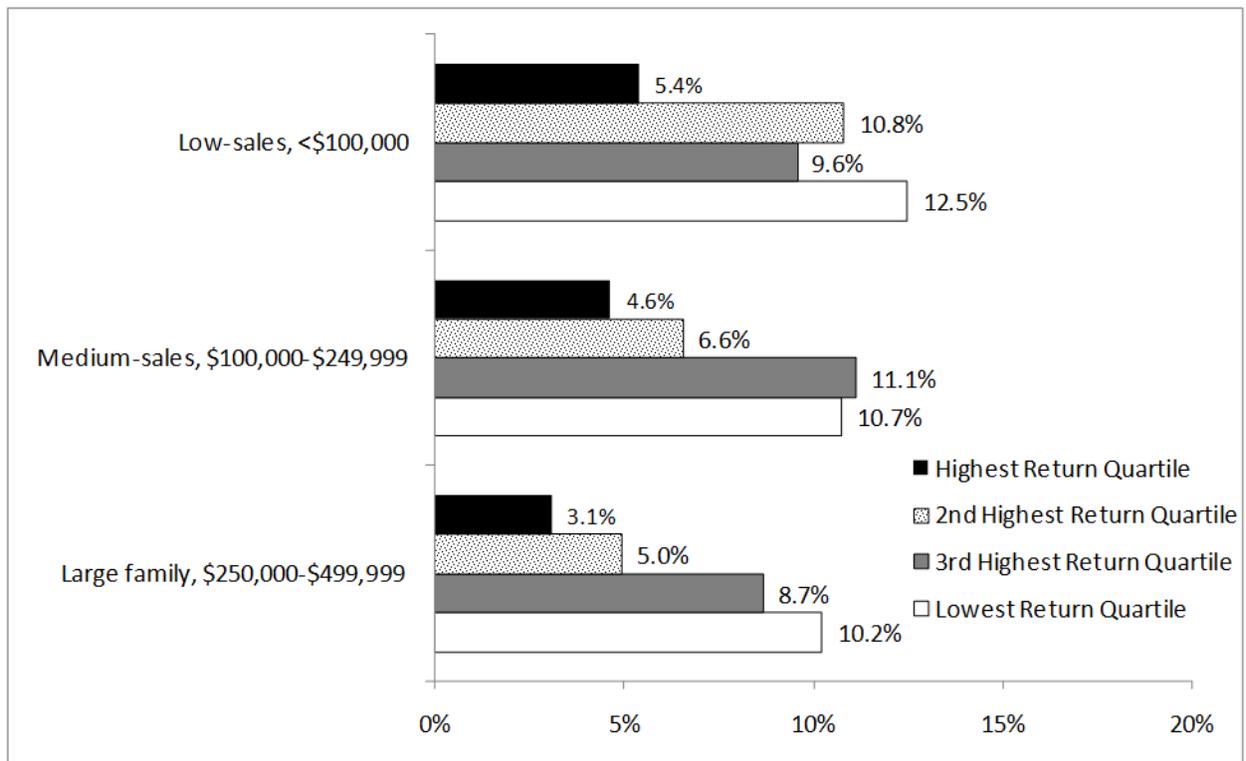


Figure 9. Percent Purchased Feed Expense as a Share of Total Expenses, by Farm Sales and Quartile.

expenses decreases as farm sales increases. In a future study, one might investigate how much feed is raised and used on the operation compared to purchased feed. Although a small share of the total production is used as feed on the operation, most of the feed used is purchased.

Contracting – The aggregate data in Figure 10 show large family farms contract a higher percentage of their combined crop and livestock production while the low-sales farms contract about half as much. This finding is consistent with past research (e.g., Hoppe and Banker, 2010; MacDonald and Korb, 2011) and our expectations. Producers with higher gross sales, who guarantee more uniform supply, use contracts as one way to reduce risk – a guaranteed outlet for their output with a known compensation across sales classes. The producers with the highest returns contract a higher percentage of their production while the 2nd highest returns contract the lowest percentage of their production.

Figures 11 and 12 show the share of value of livestock production and crop production using marketing and production contracts, respectively. Large family and medium-sales farms have a higher percentage of livestock production under contract (Figure 11). Furthermore, producers achieving the highest returns tend to have a higher share of value of livestock production under contract, especially for large family farms.

Figure 12 demonstrates that there is little difference across the three farm sales classes in regards to the

percentage of crop production under contract; this is different from that shown for the value of livestock production. Across the farm sales classes, producers with the highest returns in most cases have a higher share of their crop under contracts. As the size of farms decreases, the variation between quartiles is larger.

Marketing Management – Figure 13 lists the percentage of producers who use at least one of the following marketing channels: (1) direct sales to consumers, (2) sales to retail outlets, (3) branding of farm products, (4) options contracts, and/or (5) futures contracts. Although there is little variation within farm sales classes, large family and medium-sales farms, use of marketing practices increases two to three times more than low-sales farms.

Conclusion – Differences in cost efficiency and labor productivity are evident when examining performance of farms within sales classes and across sales classes. It appears that large family farms may take advantage of a division of labor within their operations when purchasing inputs and using selected marketing channels – large family farms are more likely to contract inputs in the production process and the sale of their farm products. More diverse use of marketing channels may enhance labor productivity – larger farms generally have greater sales per labor full time equivalent when compared to the smaller sales classes. Future research may uncover whether the larger farms tend to replace labor with investment in equipment/machinery relative to smaller operations.

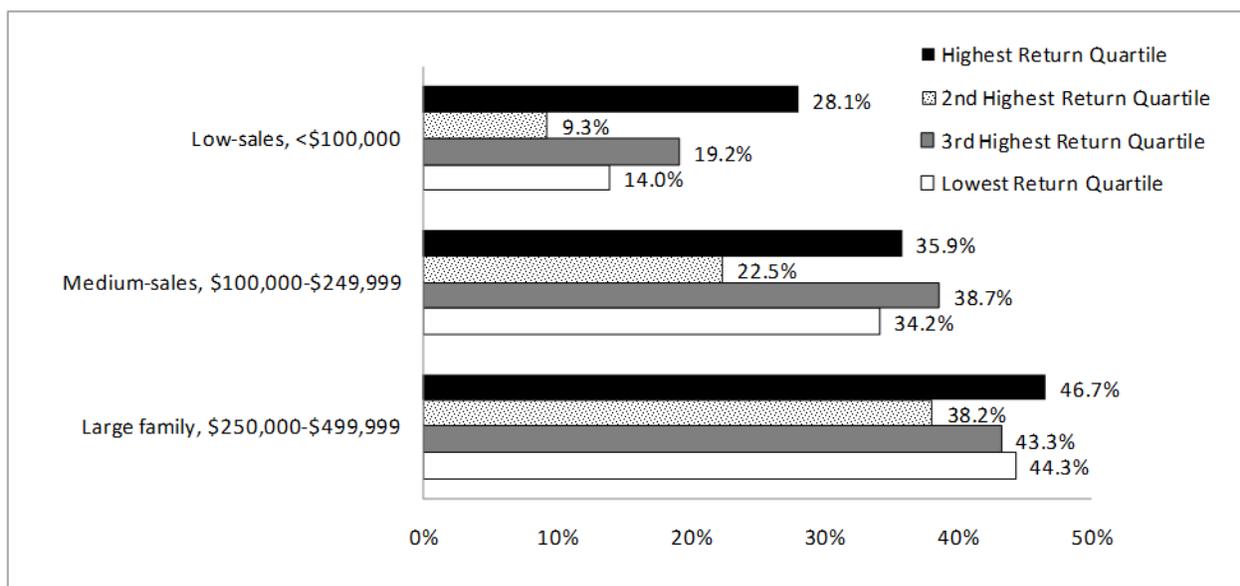


Figure 10. Percent of Crop and Livestock Production under Contract, by Farm Sales and Quartile.

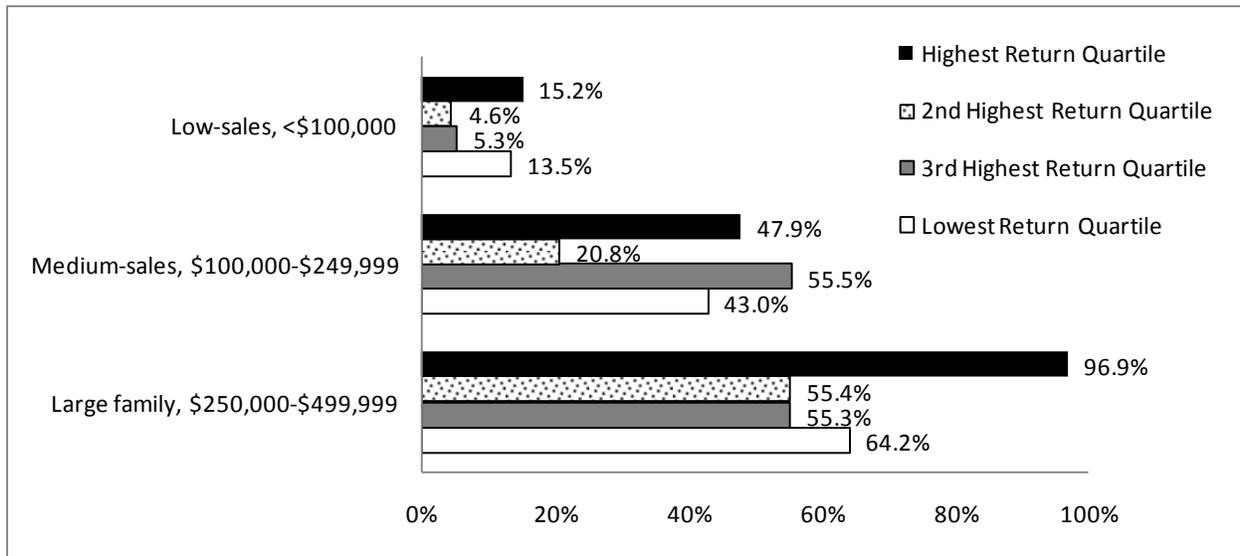


Figure 11. Percent Value of Livestock Production under Contract, by Farm Sales and Quartile.

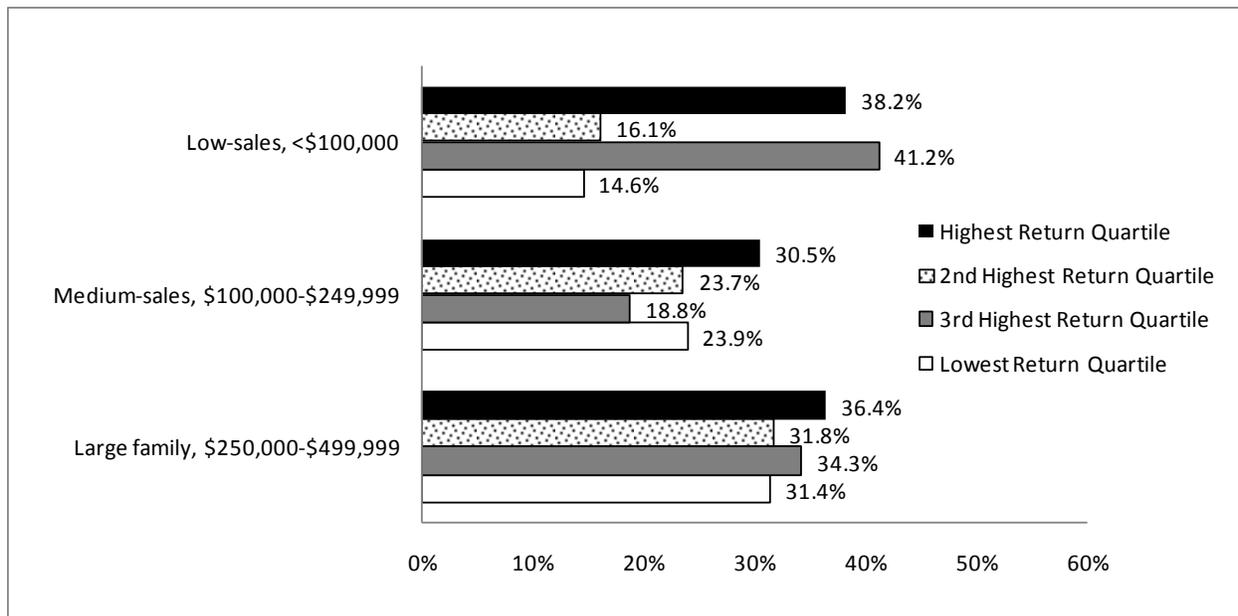


Figure 12. Percent Value of Crop Production under Contract, by Farm Sales and Quartile.

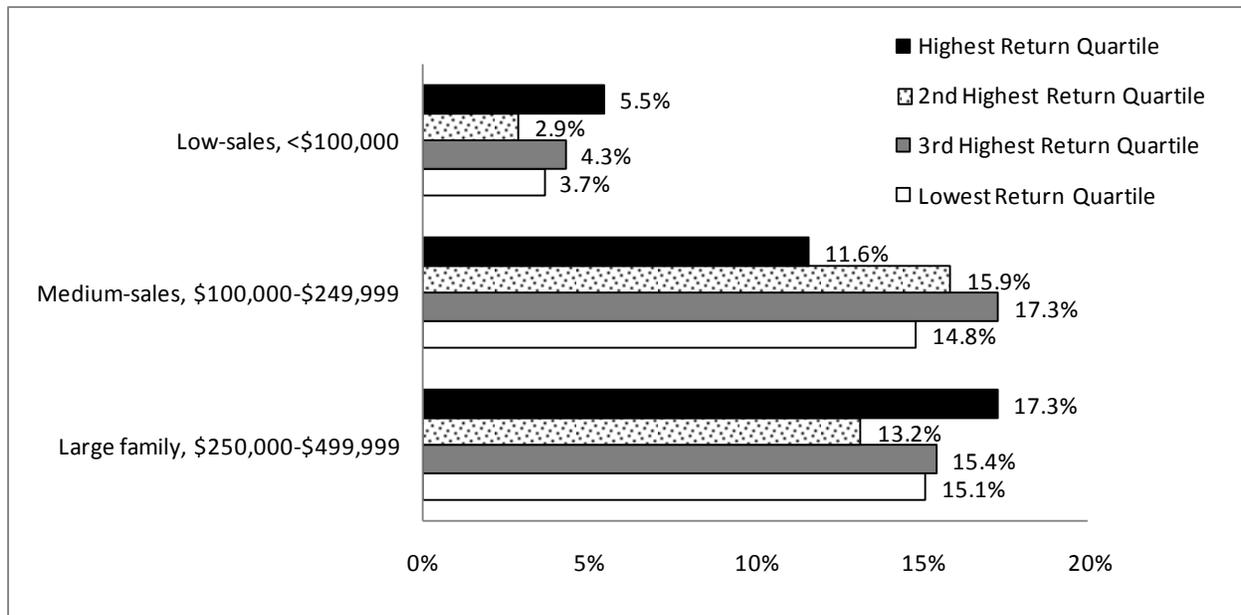


Figure 13. Percent of Operations using 5 Marketing Methods, by Farm Sales and Quartile.

Interesting variation occurs within sales classes as well. Within all sales classes, it is more difficult to argue that farms with the largest scale of operations are the best performers as high return quartiles do not control the largest share of acres or have the most live-stock. Yet, high performers do tend to focus their effort on fewer enterprises, perhaps revealing a certain amount of benefits to specialization. These operations also tend to make greater use of contracts in input and output markets, while working proportionally less on the operation relative to lower performing peers.

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