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VALUE ADDED - A NEW APPROACH TO MEASURING THE INCOME PRODUCED BY AGRICULTURE

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Abstract:

This paper proposes a framework for measuring agricultural value added and explores variations in value added creation among farm types. Results show that crop farms usually generate more value added per dollar of farm income than livestock operations. Grain farms had ratios of value added to farm income almost as great as farms specializing in higher priced commodities.

RESEARCH ON VALUE ADDED BY PRODUCTION AGRICULTURE IS SCANTY

Discussions of how to turn around declining rural economies often center on value added. As part of their efforts to stimulate rural economies, state governments and agricultural economists have researched ways to increase the value added by agriculture. Several states have set up value added centers in an attempt to promote value added enterprises in agricultural communities (Kraybill and Johnson).

Despite the current interest, research in the U.S. on value added creation by production agriculture lags efforts in countries such as those in the European Economic Community. Agricultural economists here have not discussed a standard methodology for calculating value added. Farm income indicators published by the USDA do not include a value added series. The present interest in value added by state and local governments increases the need for agricultural economists to produce consistent value added estimates. By proposing a value added measure for production agriculture and presenting some of the first national estimates of value added creation by different commodity groups, this paper will begin to address the issues surrounding value added calculation.

WHAT DOES VALUE ADDED MEASURE?

Value added is an income measure. In contrast to profit, the net income of the producer, value added is the income available for distribution to a broad group of persons that contribute to the production process. Accountants have called value added "the income of a production team" (Morley). Equations (1) and (2) point out the differences between profit and value added:

$$(1) \text{ profit} = \text{income} - \text{inputs} - \text{wages} - \text{interest} - \text{depreciation}$$

where: inputs = inputs consumed in the production process
such as fertilizer and fuel

$$(2) \text{ value added} = \text{income} - \text{inputs} - \text{depreciation} = \text{profit} + \text{wages} + \text{interest}$$

All expenses associated with producing a commodity are deducted from income when profit is calculated (equation 1). In a value added calculation, farm expenses that are payments to persons

that make up part of the production team are not deducted from farm income (equation 2). Wages and interest, for example, are payments to individuals that provide labor and capital for commodity production.

With its emphasis on the contribution agriculture makes to society's income, value added is a useful tool for policy analysis. Examination of how value added creation differs among commodity groups will benefit persons interested in the economic vitality of communities dependent on agriculture. They could, for example, use information about value added by commodity type to study the economic effects of declines in production of a particular crop.

A VALUE ADDED MEASURE FOR PRODUCTION AGRICULTURE

One goal of the research introduced by this paper was to design a value added measure that captures the economic contributions of commodity production. To be useful to decision makers in rural America, a value added measure must allow comparisons between crops. Controversial items that must be addressed in the design of a value added measure include government payments, depreciation, and the value of the service provided by farmer owned housing. Depending on the handling of these items, different pictures of the impact of commodity production on the economy arise.

Government Payments

Government influences the income of producers directly through payments to farmers and indirectly through trade policies and restrictions on the number of farmers that can grow some crops. If government payments to farmers are viewed as unearned subsidies, or transfer payments, they should not be included in the value added created by producing commodities. However, McLeay pointed out that, " Firms that receive subsidies in return for restraint on output prices in effect receive part of their revenue from government, thus creating value in the enterprise sector" (McLeay). The viewpoint of McLeay more nearly represents U.S. agriculture today.

If direct government payments are excluded from farm income in value added calculation, comparability of results is sacrificed. Consider an attempt to compare wealth creation by a wheat farmer and a sugarcane grower. Although sugarcane growers do not receive direct government payments, their income is enhanced by government policy limiting sugar imports. Direct payments from the government make up a portion of the income of wheat producers that participate in government farm programs. While direct government payments could be excluded from the income of the wheat farmer in the value added calculation, it would be difficult to adjust for the price increasing effect of restrictions on sugar imports. Estimates of the value added created by wheat and sugarcane producers would thus not be comparable if direct government payments are excluded from the income of wheat growers.

Depreciation

Gross value added is value added calculated without including depreciation among expenses. The measure of value added in equation (1), where depreciation is deducted as an expense, is called net value added (Meek). If depreciating equipment is not replaced, the ability of a farmer to produce will diminish. Since gross value added is not a sustainable level of value added creation, net value added is a superior measure of the impact of commodity production on the economy. Net value added measures inform decision makers about what farmers can contribute to the economy while replacing capital as it deteriorates.

Value added's role as a measure of the income of the group that makes farming possible suggests another reason why a net value added measure is preferable to gross value added.

Rearranging equation (2) to form a gross value added measure gives equation (3):

$$(3) \text{ value added} = \text{income} - \text{inputs} = \text{profit} + \text{wages} + \text{interest} + \text{depreciation}$$

The right hand side of equation (3) shows how the value added created through commodity production is distributed. For instance, lenders receive part of agricultural value added in the form of

interest. Gross value added has the disadvantage of including depreciation among the members of the production team. It is inconsistent to treat providers of durable inputs differently from providers of inputs that are immediately consumed.

Farmer Owned Housing

Earnings from producing crops and livestock can be used to provide housing for the farmer. Economists approximate the value of the service provided by farmer owned housing by calculating what the mortgage payment would be if the home were being purchased (United States Department of Agriculture). Net Farm Income, a traditional USDA measure of farm income, includes the service provided by farm homesteads among farm noncash incomes.

For a small farming operation, the value of the service provided by farmer owned housing can be larger than the value of all commodities produced. Even though their houses are often located on farms, producers with small operations may rely entirely on off-farm earnings to finance home purchases. The following example illustrates the problem that may arise when the value of farmer owned housing is counted as income in value added calculation. A farmer might use \$100 of inputs to produce \$500 of beef and own a home that would cost \$3,000 in annual mortgage payments if it were currently being purchased. Value added excluding the value of the home is \$400. Including the service provided by the farm home, value added is \$3,400. In this scenario, the imputed value of the farm home out shadows the contribution of production activities to the economy. Adding the value of farmer owned housing to farm income can thus distort the ability of value added to serve as a measure of the impact of agricultural production on the economy.

ESTIMATES OF VALUE ADDED CREATION BY PRODUCTION AGRICULTURE

Estimates of value added creation by different commodity groups are presented in the following sections. These are some of the first statistics from a national data source on how value added creation varies by farm type. Results presented incorporate conclusions from the previous section about an appropriate value added measure for agriculture, that is, government payments are included

in income, the value of the service provided by farmer owned housing is excluded from income, and depreciation is included among expenses.

WHERE THE DATA CAME FROM

Farm Costs and Returns Survey (FCRS) data from 1989 provided the information to calculate value added in this study. Since 1984, the FCRS has been the most exhaustive national data source available on the expenses and incomes associated with producing crops and livestock in the 48 contiguous states. Each farmer interviewed for the FCRS represents a statistically determined number of other farmers. A small cattle producer in Texas might represent 100 similar producers while a large corn/soybean farmer in the Midwest might represent 15 similar operations. The 11,836 farmers interviewed about their 1989 expenses and incomes represented over 1.7 million farms.

TYPES OF FARMS

Classification of agricultural operations into farm types is complicated when a farmer or rancher produces several commodities. In this research, survey observations were categorized into farm types by observing which commodity accounted for more than 50 percent of the total value of farm production. A farm producing \$500 of corn for sale and \$1000 dollars of milk for sale has a total value of production of \$1500. Corn the farmer uses for feed is excluded from the total value of farm production. This farm would be classified as a dairy operation since milk accounts for more than half the value of crops and livestock produced. Using this methodology, about 90 percent of the observations from the 1989 FCRS could be placed in one of the farm types used in this study.

VALUE ADDED BY COMMODITY TYPE

Farmers represented by the 1989 Farm Costs and Returns Survey created \$66 billion of value added. Cow-calf producers, the largest farm type, generated 15 percent of agricultural value added in 1989 (Table 1). The percentage of farms of a given farm type is often much different than the percent of value added generated by that farm type. In 1989, vegetable growers made up only 1.2 percent of

Table 1. Value Added Is Not Always Proportional to Farm Numbers

farm type	Percent of Farms	Percent of VA
wheat	3.2	3.0
corn	4.9	8.4
soybeans	3.7	2.3
tobacco	3.1	1.6
cotton	*	3.2
sugar	*	1.0
fruit	3.4	4.6
vegetables	1.2	6.9
greenhouse, nursery	1.4	4.7
hay, forage	6.0	1.3
cow-calf	28.6	15.0
cattle finishing	3.8	2.9
hogs	4.3	2.7
poultry	1.9	8.4
dairy	8.1	14.1
sheep, wool	1.6	*

source: 1989 Farm Costs and Returns Survey

* = cell with less than 1 percent

note: columns do not add up to 100% since not all farm types are included

farms yet they accounted for almost 7 percent of the value added created by production agriculture.

Differences in average farm size and value added created per dollar of production are partial explanations of these gaps.

A MEASURE OF THE INTENSITY OF VALUE ADDED CREATION

The ratio of value added to gross farm income can serve as an indicator of the intensity of value added creation by different farm types (Figure 1). Comparing this ratio for farms specializing in cow-calf production and farms specializing in cattle finishing illustrates the usefulness of this measure. Cow-calf operations produce \$50 of value added for each \$100 of gross income while cattle finishing operations produce \$16 of value added per \$100 of gross income. Because they depend on outside

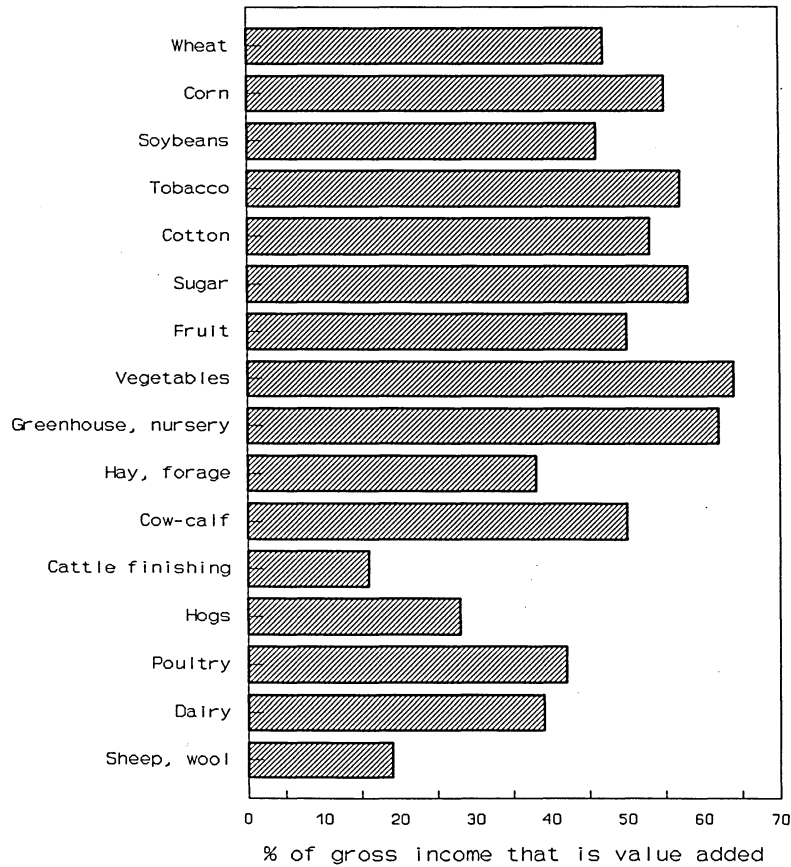


Figure 1. Crop producers create the most value added per dollar of income

suppliers for feeder animals and feed, cattle finishers generate less new value added per dollar of income than cow-calf producers. This comparison demonstrates that measures of size such as gross income or sales volume are inadequate for describing the impact of a farming operation on the economy. Although a cow-calf operation and a cattle finishing operation might have the same gross income, the cow-calf operation makes a greater contribution to the incomes of the "production team."

Crop producers generally create more value added per dollar of gross income than livestock producers (Figure 1). Though they have an image of being low intensity operations that produce an inexpensive bulk product, farms specializing in grain production had among the highest ratios of value

added to gross income. Cow-calf operations were the only farm type specializing in livestock that had a ratio of value added to gross income as high as 50 percent.

Knowledge of the ratio of value added to gross farm income can be used by local governments and others interested in rural areas to gauge the impact of commodity production on rural economies. If production of a particular commodity declines, local governments would know how much less income would be distributed among individuals that participate in the production process. Previous studies have pointed out, however, that part of the value added produced in a community may leak over into other regions (Nakamoto, Ferguson, and Halloran). Interest payments for farmland might go to financial institutions located far from where commodities are produced. Since the ratios in Figure 1 are national averages, the level of intensity of value added creation by farm types may differ in some regions.

WHO BENEFITS FROM THE VALUE ADDED AGRICULTURE CREATES?

Ratios describing the intensity of value added creation are an incomplete portrayal of how different farm types contribute to the economy. Persons concerned with the economic health of rural areas will also ask, "Who benefits from the value added produced by crop and livestock production?" In this research, the "production team" included farmers, local government, landowners, lenders, labor, and contractors. Table 2 shows how the value added created by all farms and 3 specific types of farms is shared among those groups.

Overall, farmers received 34.9 percent of agricultural value added in 1989, the largest share of any group (Table 2). Local governments received property taxes and license fees totaling 6.9 percent of the value added created on farms. The income received by local governments illustrates why value added is a good indicator of the economic impact of commodity production. Common measures of the economic importance of agricultural operations, such as sales volume or gross income, ignore incomes accruing to government and other groups.

Table 2. The Largest Proportion of Value Added Is Not Always Received by Farmers

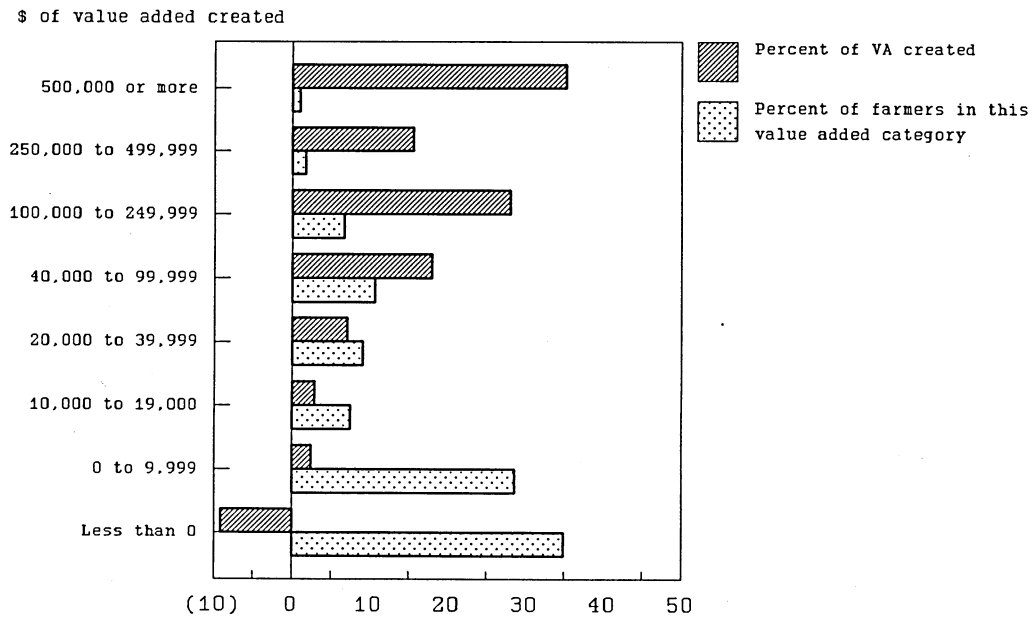
Percent of VA created by:	Farm Type			
	all farms	corn	cow-calf	vegetables
government	6.9	9.3	7.5	2.7
farmers	34.9	35.2	30.9	26.5
landowners	15.0	36.8	7.6	7.7
lenders	13.0	13.4	12.6	4.5
labor	14.8	4.4	10.1	17.3
contractors	17.0	1.9	34.0	41.7

Source: 1989 Farm Costs and Returns Survey, USDA

The importance of production agriculture in producing income for persons other than farmers and ranchers is highlighted by the results for corn farms, cow-calf operations, and vegetable farms (Table 2). For those farm types, farmers did not receive the largest percentage of agricultural value added. Cash and share rent received by landlords made up the largest share of value added created on corn farms. Contractors pay farmers a fee to produce crops or livestock and often provide many of the inputs used. The net income earned by contractors was the largest share of the value added by cow-calf production and vegetable farming.

MOST VALUE ADDED CREATED BY A SMALL PERCENTAGE OF FARMERS

One of the important uses of estimates of agricultural value added is to measure the impact of commodity production on the economy. Most of the contribution of production agriculture to society's income can be attributed to a small group of producers (Figure 2). Less than 10 percent of farmers created more than \$100,000 of value added in 1989, however those farmers accounted for almost 80



Source: 1989 FCRS data

Figure 2. Most value added is created by a small percentage of producers

percent of the value added created through commodity production. In the "less than 0" category of value added creation, the largest group of farmers used inputs worth more than the incomes they generated by commodity production.

VALUE ADDED GIVES A DIFFERENT PICTURE OF FARM SIZE

Compared to using gross farm income, use of value added as a size measure gives a different interpretation of the economic importance of many farms. Value added assigns more farms to lower size categories than gross farm income (Table 3). Twenty percent of farms were included in size categories of \$40,000 or above when value added was used as the size measure compared with 33

Table 3. Value Added Assigns More Farms to Smaller Size Categories

size (\$)	% of farmers when size is measured with:	
	value added	gross farm income
500,000 OR MORE	1.0	2.8
250,000 to 499,999	1.7	5.0
100,000 to 249,999	6.7	12.0
40,000 to 99,999	10.6	13.3
20,000 to 39,999	9.1	10.3
10,000 to 19,999	7.5	11.1
0 to 9,999	28.6	42.6
Less than 0	34.9	2.9

Source: 1989 FCRS data

percent when gross income was used. With its emphasis on the income of a broad group, value added is the preferable farm size measure for persons interested in how commodity production affects economic conditions in rural areas.

CONCLUSIONS

When policy makers call on agricultural economists for information about how farming and ranching influence rural and national economies, a consistent set of value added estimates will be a useful analysis tool. Persons who wish to estimate agricultural value added with state or local data can review the suggestions laid out in this paper about the appropriate way to measure value added generated by crop and livestock production. Moreover, the national estimates introduced by this paper provide the most comprehensive view to date of how value added creation varies among different farm types.

Many opportunities exist to increase knowledge of value added creation by production agriculture. Although complicated by the sample design used in the Farm Costs and Returns Survey,

analysis of variance techniques could be used to look at statistical differences in value added creation by farm size. Where there is enough data, coefficients that relate value added creation to region and farm type can be developed.

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