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Data Needs for Analyzing the Management and Efficiency of Rural Businesses

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Introduction

The economic status of those in the agricultural sector and associated industries is the subject matter of most inquiries conducted by agricultural economists. Whether descriptive or prescriptive most analyses center on questions of relative wealth or well-being. Concern for the management and efficiency of rural businesses is rooted in concern for their viability and profitability, their ability to provide jobs and tax revenues, and their role in the production and distribution of quality food and fiber products at efficient prices.

Six areas of inquiry relate to the measurement, description and analysis of rural agricultural firms. These include:

i. The financial position and profitability of firms
ii. The measurement and comparison of productivity and technical change
iii. Estimation of supply and demand response
iv. Comparisons of costs of production and size issues
v. Optimal firm production and distribution strategies
vi. The relationship of farm firms to the rural community and off-farm employment opportunities.

Each of these types of analysis relates to firm well-being or the effects of firm performance on other economic entities.

Four types of data are useful in performing the types of analysis listed above. These are:

i. price data
ii. quantity data
ii. financial data
iv. demographic information

Data are not usually collected at the lowest levels of disaggregation and so two key issues arise in the collection and use of the data described above. The first issue has to do with the proper aggregation of data series over firms and over time and how the aggregation methods used affect the method of analysis. The second issue relates to the allocation of quantities across different entities such as inputs across crop enterprises or labor across farm and non-farm employment.

This paper will discuss the types of data needed to perform the types of analysis discussed above, appropriate techniques for economic analysis of the data and the preliminary results of a survey on data needs. The next section will discuss the data needed for each type of analysis and some of the problems that

#6747

occur in analyzing such data. The third section will give a brief description of the survey and relate responses to the issues raised in the second section. The fourth section will discuss the empirical problems associated with using aggregated data.

Data Needs for Analyzing Rural Businesses

Analysis of agricultural firms can proceed at the firm, county, state or sector level. With non-homogeneous firms, the distribution of assets, sales, education etc. across the aggregate groups is very important. For example, state farm income statistics may mask the financial position of many firms in the state. Therefore, firm and appropriate aggregate data is always necessary to create a correct picture of sector well being.

Financial Position of Firms and the Agricultural Sector Both income and expense data is needed to compute an income statement. Prices and quantities are not strictly essential but could be used to construct revenue and expenditure categories. Asset and liability data is essential to compute a balance sheet. The distribution of balance sheet data is especially important in understanding the financial health of the industry.

Productivity and Technical Change While productivity is interesting at aggregated levels, its measurement is most useful between industries or at the firm level. In order to measure productivity, data on inputs and outputs is necessary. This data should be quantity and price as opposed to expenditure data when possible. The allocation of inputs to enterprises allows for more straightforward calculation of enterprise productivity though input allocations can be inferred given appropriate parameterizations of technology. Multi-input and multi-output productivity measures are also useful in some contexts. In order to estimate technical relationships on non-experimental data at the firm level the collection of quantity data in addition to expenditure data could be useful since expenditure share data implies particular functional forms and objective functions.

Estimation of supply and demand response Supply and demand analysis forms the backbone of most forecasting and welfare comparisons. Proper estimation requires complete price and quantity data. This data should be collected at the most disaggregated level possible so as to properly reflect producer and consumer behavior. The aggregations should be made by the individual researcher whenever possible. Current price-aggregation practices by USDA and other data reporting and gathering agencies presuppose the existence of very specific technologies at the firm-level for which there is little if any empirical support. Moreover, price-aggregation procedures for state season average prices and U.S. season average prices imply different state-level technologies which are mutually inconsistent (see below). New and more flexible price-aggregation and quantity-aggregation procedures

are needed. Data on input allocations would allow the estimation of non-joint supply functions without complete systems procedures. Where jointness is implied by the nature of technology and/or allocated fixed inputs alternative estimation techniques are necessary.

Comparisons of costs of production and size issues Of great importance to individual producers and regions is their competitiveness vis-a-vis other producing entities. In order to compare costs of production, data is needed on prices of inputs, the technology used, and optimal input output combinations. While comparisons can be made by computing cost per bushel, or cost per pound of gain using expenditure data, the more accurate representation of cost structures requires output, input, and input price data. This data is also more useful if available in allocation form but can be used by assuming optimal allocation behavior and parametric technology representations. However, this requires the presumption of a particular optimization paradigm (e.g. profit vs. expected utility maximization). Methods are not generally robust to alternative paradigms. There is a need for accurate cost data on a state and sub-state level and also across firm sizes and types. State and local governments, in particular, are interested in disaggregated cost data.

Optimal firm production and distribution strategies Economists often play the role of management scientists in prescribing optimal strategies to individual firms or generic groups of firms. Examples are optimal nitrogen recommendations, optimal leverage ratios, or normative farm planning problems. Data needed for this effort are often internal to the firm. In many instances, however, such prescriptions are based on "average" data. There is a need, therefore, for data on average input-output coefficients, marginal products, and prices. This requires good price data on a county basis and useful county or sub-state level technical production data.

Farm firms, the rural community and off-farm employment As the agricultural sector loses absolute numbers of workers in primary agricultural jobs there is an increased need for data on rural employment patterns and the distribution of farm labor between farm and non-farm work. Data on hours devoted to individual farm operations and enterprises would be useful in measuring labor requirements and productivity. Data on the hours worked off the farm and the type of employment is necessary in order to understand and predict optimal labor allocations and farm enterprise combinations.

The data needs discussed in this section can be summarized in five key points.

i. Quantity data along with expenditure data is important

ii. Price and expenditure data should be collected and reported in a disaggregated fashion.
iii. Allocation data should be collected and reported when possible.
iv. Cost of production data is valuable on a disaggregated level.
v. Data on off-farm activities is becoming more important

Survey on Data Priorities

A survey was conducted in the spring of 1989 related to use and usefulness of various data sources. The demographics of respon-dents are discussed elsewhere. The modal respondent was an agricultural economist working at a university in a research/ teaching position. This paper will discuss general responses and those who identified themselves as in the production and farm management area. The responses will be discussed as they relate to the above types of analysis.

In the first section of the survey respondents were asked whether they had used a particular data set and whether they felt it would be important in the future. One interesting category of response are those who have used a data set and feel it will be very important in the future. The discussion here will concentrate on those answers. In a second section respondents were asked to rank the ten most important data sets. In a third section, respondents were asked to comment on potential changes in data collection and reporting procedures. The data surveyed can be categorized in many ways. For this section the most useful categorization involves six groups: census and current aggregate economy data, farm costs and returns data including financial statistics, prices received and paid, acreages and production, productivity, and other series.

The data series most often used and viewed as important were the agricultural census, the general census, the current population survey, and series on consumer expenditures and prices. This result is not surprising given the broad use of these series and their baseline importance. These series also ranked at the top among the most important series. These basic data are essential to good research and their need is obvious so they will not be discussed further.

Data related to farm costs and returns whether in raw or summary form were valued highly by all respondents and especially so by those in production. While the two censuses were the top priorities, many respondents ranked the cost and returns survey as their number one data priority. It was ranked in the top three by a large number of respondents. It was ranked higher than the general census by those in production. The ERS summaries based on cost and return data were also highly ranked. They were in the top five for a large number of respondents and especially valued

by those in production. These data relate directly to many types of analysis discussed above. They are essential for analyzing firm financial status, costs of production and regional level productivity. They could be useful for analyzing individual firm productivity and optimal firms decisions if individual observations were more generally accessible for use.

The series on prices received and paid were viewed as very important by many respondents. They tended to cluster around fourth or fifth in the list of important series. They were more highly regarded by those in the production area. These series form the basis for all supply and demand data. They are also important in properly understanding and using expenditure data.

Only the series on field crop acreage and production received broad support amount the quantity time series. This series was viewed among the top four series by production economists. The series on livestock production were valued but were never among the high counts. This is probably due to the fact that crop acreages are concentrated in one report while livestock series are spread across several species and product reports. This quantity data is essential for supply and demand work, state and regional productivity estimates, and yield comparisons.

The ERS publication on productivity was valued highly by many respondents. A number of respondents ranked it among the top five data publications. This data is important for comparisons among crops, regions and over time.

Other series ranked highly were the Survey of Current Business, most BLS series, and the Fish and Wildlife Survey. The general usefulness of these series is probably the reason for their high ranking.

The third section of the survey asked about potential changes in data available or how it is reported. Among all respondents the highest priorities were for off-farm labor data, better definitions and measurement of farm and rural populations, data on costs of production by farm type and size, and the reporting of sample statistics such as standard errors. The highest priorities among production economists were cost data by size and type of firm, quantity data in physical units, reliable state level cost of production and return estimates, and better definitions of the farm population. The responses to this set of questions clearly point out the need for expanded micro-level data collection and dissemination.

The responses to the survey are generally in line with the data needs identified in the first part of the paper. There was not substantial direct support for better quantity data but no questions of this type were asked. Respondents did value the acreage data very highly. There was little mention in the survey

of input series. These series are very important for supply and demand estimation and should be collected. There was substantial support for the collection of price and expenditure data disaggregated by state and type of enterprise. This support was among the strongest in the survey. There were no questions on allocation data and so no responses were generated. This issue needs to be addressed in future work. The strongest support in the survey was probably for the continuation and expansion of data collection in the cost and returns area. Disaggregated data in this area is a high priority. There was good support for better data on off-farm employment and rural residents by survey respondents. This will continue to be an important area in the future.

Appropriate Methods for Use in Data Analysis

Much current empirical research in production, consumer demand, supply response, and input demand is carried out at high levels of aggregation (county, state, even national). Most of this research is couched in the guise of an application of microeconomic theory to a particular data set. But as we all know, microeconomic theory is a theory of individual and not aggregate behavior. Concepts thought to be useful at the individual level are simply assumed to apply at the aggregate level. For example, numerous studies have estimated U.S. wheat supply response. The truism, "all wheat is not wheat", gives the lie to this procedure because it involves aggregating over vastly different geographic and climatic regions producing very different types of wheat. We are not simply summing to get individual wheat supplies to get an industry wheat supply, we are summing hard-red winter wheats (with distinct prices) and soft-white wheats to get U.S. wheat supply. If one had used apples and oranges in the previous sentence, first-grade memories would illustrate the logical inconsistency involved.

These procedures and their manifestations in currently reported official statistics like the U.S. season average wheat price make logical sense only for the most limiting versions of the technology. Therefore, these procedures have to be revised in forming aggregates and a renewed thrust has to be given to the collection of disaggregated data series which allows us to proceed about aggregation and aggregate studies in a logically consistent fashion. Aggregation is a reality for agricultural economists. If it is not dealt with correctly, empirical research in agricultural economics will proceed yet another step down the path it has already well trodden: applying the latest exotic econometric technique to an agricultural data set regardless of whether the data or the application make sense.

A correct procedure to follow in this regard is to first recognize the use to which aggregate or disaggregate data is going to be used. (Consumer demand and producer derived demand studies have very different data requirements and aggregation procedures.) Second, the logical paradigm within which chooses to work (profit

vs. expected utility maximization) should be clearly chosen and specified according to what reality dictates. Aggregation should then be carried out in a fashion consistent with arithmetic logic (not adding apples and oranges) and the chosen paradigm. This applies regardless of whether one has disaggregated data or not because resolving most of the issues involved in the six areas of inquiry eventually requires aggregation beyond the firm level either pre or post estimation.

Summary

This paper has made several points about current data collection and dissemination efforts. Each is mentioned briefly below followed by a concluding statement.

i. There is a general need for more micro-level data collection and distribution. Cost and return data should be of sufficient quality and quantity to use at the state level and on a disaggregated basis to allow more regional,state and enterprise comparisons.

ii. Prices should be collected in a consistent disaggregated fashion along with the corresponding quantities. Specific aggregation formulas would be most helpful to the analyst. Input price and quantity data is particularly lacking.

iii. Input allocation data is necessary for many interesting analyses. Although there are ways to proceed in the absence of such data, they all have specific shortcomings. Changes in collection techniques are needed to remedy this problem.

iv. Appropriate techniques consistent with the data collected and aggregated should be used in production and supply and demand studies.

In addition to the points above two additional points are important. Long term panel data sets on farm firms would be very useful. While individual states have farm management association farms these are not true randomized panels. A variety of policy issues such as adoption of technology, use of inputs, characteristics of successful firms, and the effects of demographics on the firm can best be studied with such data sets. Secondly, current micro-level data sets need to be removed from the collar of confidentiality so that more general use can be made. Current government personnel are cooperative as far as the law allows but the rules regarding confidentiality need to be loosened. Many questions can only be answered by appeal to the original observations.