

Information Systems in Agriculture

by

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Some farmers must rely upon a complicated web of both public and private sources in order to obtain the information necessary to manage their farms. A recent survey analyzes the inadequacies of the information currently being generated and suggests possible solutions for a more efficient process. È

Farming is a knowledge-intensive industry. Growers need to obtain and process financial, climatic, technical and regulatory information to manage their farms. Both public and private institutions have emerged to supply farmers with information and analysis. However, inadequacies in this agricultural information system, such as the inability to consistently provide accurate, timely and easily accessible information, present several challenges to farmers.

One of the roles of government is the provision of information to increase efficiency and improve the performance of the economy, but government activities are constrained by budget. Information is also provided by members of the private sector, and effective policy design needs to identify where investment in public information is most effective. Therefore, our research aims to understand networks of information and, in particular, who is the provider and who is the user of certain types of information.

Types of Information, Providers and Users

It is useful to distinguish between formal and informal information. Formal information is typically written and may be divided into data (numbers and other raw information) and processed information that is based on interpretation and analysis of the raw data. Informal information consists of information obtained through conversation and business transactions. Gossip is an important source of informal information.

Sources of formal information include public agencies such as the USDA and Cooperative Extension, commodity groups, and a wide array of private providers including commercial vendors, agricultural and non-agricultural media and, in some cases, in-house analysis in which large farms hire professionals to interpret information. The information users can be divided into two groups:

end-users of information (e.g., farmers) and intermediaries, for example, consultants, who serve as the main suppliers of information to the end-user. To understand information-use patterns, we conducted a national survey.

Understanding the Network of Information

Data was collected through face-to-face and mail surveys in four commodity systems: Washington potatoes, Washington wheat, Iowa hogs and California fresh tomatoes. To capture some of the tremendous diversity in agriculture, we selected contrasting commodity cases in terms of market size and geography, export intensity, perishability and use of contracting. We obtained 684 observations of data used by various participants in the farm community including farmers, shippers, input suppliers, bankers and consultants.

Priorities of Information Providers

We investigated which sources of information play the most important roles in various decisions. For example, we distinguish between production, marketing and regulatory compliance decisions. We found that the public sector through the USDA, the land grant system and Extension are especially effective in providing information on prices, market conditions, general production practices and technologies. The public sector emphasizes provisional information that has public good properties and can be useful to a large audience. The USDA, for example, emphasizes information for crops that are grown in many states, i.e., major commodities such as corn, soybeans and wheat, while state agencies provide information on crops that are specific to the state. Thus, there is a relationship of complementarity between federal and state agencies. In our survey, hogs are a major commodity that is supported more substantially by USDA. Wheat, in general, is a major crop but

we surveyed wheat growers from Washington who receive less USDA information than other wheat growers. Potato is a major crop in terms of its volume and value, but it is grown in a small number of states and thus, may receive less USDA coverage than, perhaps, corn. While tomatoes are a major California crop, it is not grown much elsewhere in the U.S. and is not a major target for USDA information.

Wholesalers and Retailers of Information

We found that the extent and detail of information provided by the USDA and states affects the activities of other information providers. Commodity groups provide information that is needed by growers in their industry and is not provided by the public sector. For example, they specialize in providing interpretation and analyses of regulation as well as specific information on market condition or technological issues that are specific to the industry. Private sector consultants provide information that is more personalized and meets the needs of the specific customer. Many of the consultants, and other intermediaries, are quite heavily reliant on USDA information and data, and process it to meet the needs of the specific customer. Thus, the USDA is to a large extent a wholesaler of information while consultants and other private-sector information providers are the retailers.

Media, especially industry magazines, is another vehicle for dissemination of analysis. It also relies upon USDA data information appropriate to the target audience, it disseminates analysis of extension personnel and other experts, and it is an especially valuable source of information about new technological innovation and major trends.

The American Agricultural Economics Association data task force suggests that the network of information provision in agriculture is quite efficient and operates in a way that aims to minimize the cost of delivery of the information. Our findings, to a large extent, are consistent with this perspective. For example, we find that informal sources are used in situations where formal sources do not exist. In some cases informal sources provide up-to-date information about prices. In other cases, informal information is used to assess and evaluate the performance of new technology or important new regulations. New formal sources of information are established when there is constant and continuous demand for certain information that

is provided informally. For example, a newspaper assessing a certain type of information or providing market news is established when the size of a group of users is sufficient to cover the newspaper's costs. Large farmers may hire an expert to provide in-house analysis of production or market conditions when existing sources are insufficient and the gain from the new information exceeds its cost.

What Farmers Need

Our analysis found that farmers recognized that information has various attributes and appreciate the timeliness, accuracy and reliability of information. They treasure USDA for its relative accuracy, impartiality and reliability, but they give it low scores on timeliness. Many USDA publications may appear quarterly and thus, the information may not be sufficient for decisions on a daily basis. Some respondents commented that the value of USDA information has improved as it has become available on the web and is updated more frequently. Many users found USDA information to be too general and not addressing their specific needs. Information provided by consultants has the drawback of being costly, but its main appeal is that it is tailored to an end-user's needs. Our respondents were well aware of biases associated with information in the media and information provided by intermediaries, especially dealers and commodity buyers. Respondents find informal information to be very timely in most case, but they recognize that it may be inaccurate as well as biased. Our interviews suggest that information users recognize differences in quality of information among different sources and adjust their reliance on this information.

Socioeconomical Factors

Our study also finds that socioeconomic variables significantly affect various patterns of use of information. Information intermediaries and growers with a graduate education have a higher tendency to use public information as well as raw data than other groups. Similarly, we find that education is positively related to the use of formal information and an individual who has a high school education or higher is more likely to use formal information.

End-users and Intermediaries

Some of our findings are summarized in Table 1. The first column identifies the percentage of informal

information use by various groups of end-users and intermediaries. The second column presents the percentage use of private information and the third column, of public information. But some of the private information used by the end-users originated with public sector sources, so the fourth column provides an estimate of total public information used both directly and indirectly by the different groups. For example, 46 percent of the information used by wheat farmers is informal. Out of the 54 percent of formal information they use, 33 percent is private and 21 percent is public. However, the share of the public information increases significantly to 31 percent if one takes into account both the direct and indirect contribution of the public sector. As Table 1 illustrates, there is vast reliance by the end-user in the farm sector upon informal information, and intermediaries rely much more upon formal information (approximately 70 percent). One reason for the larger reliance upon informal information among end-users is that they may need informal information of pricing, etc. that is not available from formal sources while intermediaries spend much of their time analyzing and then refining formal information to meet the client's needs.

Table 1. Information Sources for End-users and Intermediaries

End-user	% Informal Information	Formal Information		% Total Public Information (Direct + Indirect)
		% Private Information	% Public Information	
Wheat farmers	46	33	21	31
Wheat elevators	45	39	17	35
Wheat exporters	55	38	7	34
Potato grower/packer/ shippers	74	18	8	20
Potato processors	64	26	10	24
Hog farmers	22	57	21	60
Hog processors	60	26	14	30
Hog input suppliers	60	22	18	36
Tomato growers	65	33	2	4
Tomato grower/packer/shippers	69	22	9	10
Tomato input suppliers	50	31	20	22
Banks	40	40	20	43
Miscellaneous end-users	32	42	26	48
Total end-users	52	34	14	28
Intermediaries				
Brokers	21	52	27	48
Commodity associations	31	39	30	57
Agricultural media	23	44	33	77
Non-agricultural media	53	23	24	-
Commercial info. vendor	30	41	29	57
Extension	28	27	45	59
In-house analysts	22	55	23	-
Miscellaneous intermediaries	12	37	51	-
Total intermediaries	28	40	32	58

The Importance of Public Information

The table also shows that end-users are more likely to rely upon private information than do intermediaries. End-users perceive that only 14 percent of their information is provided by public research and Extension and attribute most of their formal information to intermediaries, but intermediaries rely heavily upon public-sector data information. End-users may be unaware of the impact of public sector information on the

intermediary output, and the correct accounting of the contribution of the private sector to the end-user information combines both the direct and indirect contributions. Thus, the overall contribution of the public sector, both directly and indirectly to the end-user is about 28 percent as conveyed in the last column of Table 1. Thus, the importance of public provision of information to end-users is significantly underestimated.

Variability of Information Used

The analysis shows significant differences in use of information categories among commodities. Hog farmers receive almost 80 percent of their information from formal sources. This is a major crop covered by USDA publications with an intensive network of intermediaries who provide detailed production and economic analysis. End-users of white wheat are the second most intensive user of formal information, even though significantly below that of hogs. Perhaps, this is the case because this crop is not the main variety of wheat in the U.S. The crops that are concentrated in specific regions, processing tomatoes and especially potatoes, are the least intensive users of formal information. Perhaps this is because USDA puts relatively more effort on providing information to commodities that are grown nationwide. The surprisingly low reliance of Washington potato growers upon formal information may reflect that the major potato-growing region is in Idaho, and the scale of potato production in Washington is not sufficient to support formal information outlets by private vendors or grower associations.

There is much less variability in the use of formal information among intermediaries than among end users. Non-agricultural media mostly relies on informal information because they provide the farm sector with news and commentary from policy-makers. Commodity associations and Extension rely relatively more upon informal information than in-house analysts or brokers because they integrate input from farm leaders and experts with USDA and other sources of written information. Extension relies the least upon private, formal information—a natural result given its mission to link research at the university and the USDA with the farm community. Brokers and commercial vendors heavily rely upon private, formal information because of their link to large agribusiness organizations.

Summary and Conclusion

We were surprised about the extent to which USDA information does not go directly to end-users but, instead, is intensively processed by intermediaries. We also recognize significant differences in information availability among end-users. Large farmers, for example, are able to have their own in-house information processing capacity and subscribe to expensive private consultants, while smaller growers who may not have the tools with which to interpret raw data and general analysis provided by the USDA, must rely upon media and informal sources. The disparity of information available provides an incredible challenge for Extension specialists and farm advisors. Perhaps the new means available will lead to a generation of information that will bridge the information gap in agriculture, especially now that the use of the Internet in agriculture is growing and more than 60 percent of farmers have access to the Internet.

We also conclude that the complexity of the agricultural information system leads to an underestimation among end-users of the importance of publicly provided information that, to a large extent, provides the raw material for many of the intermediaries. This lack of knowledge of the role of public information may weaken the support for public information funding as a major priority in agriculture. An increase in funding for public information should allow for an increase in the accessibility of public information to farmers. Because of the specialized nature of many of the crops grown in California, these crops are likely to be de-emphasized by the USDA's information and analysis effort. This may lead to an over-reliance upon formal information, and suggests an avenue for a more intensive public-sector information provision effort by the state and the university.

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