Structural Change in Agriculture: Privatization of Information and the Role of Extension

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Abstract

A complement to the structural change in agriculture has been an increased use of sophisticated information and knowledge-based technology. Large-scale farmers are aggressively looking to a wider range of public and private information sources. The purpose of this study is to examine the effect of the growing number of large-scale farmers, a frequently used proxy for structural change, on the perceived importance of different public and private sources, and utilization of private information and technical services (PITS). Over 10,200 Illinois farmers completed a mail survey, representing 14.3 percent of farmers. Respondents were divided into five categories according to their farm size.

The findings show that the growing number of large-scale farmers are younger, have more resources, and are increasingly looking to location-specific, timely, and digitally formatted information. They considered seed dealers, agricultural extension, and the Internet their top information sources. Over 55 percent of them utilized PITS, including Farm Dayta, GPS soil mapping, and marketing advisory services. On the other hand, small-scale farmers are older, had limited farm resources, and 99 percent have off-farm employment. Less than 10% of them utilized PITS with the exception of GPS and FBFM services. All farm-size groups ranked Extension Service as their second most important information source. However, the results reveal a negative relationship between farm-size and the importance of agricultural extension and utilization of PITS. If agricultural extension is to stay relevant, it needs to provide each farm-size group with appropriate technical, management, and marketing information.
Introduction

Agriculture has undergone significant changes over the past few decades. In many countries, technological development, availability of resources, and new agribusiness arrangements are forces that have produced these changes by increasing labor productivity and making agricultural production more concentrated and specialized. The change in the structure of agriculture has been complex, incremental, and pervasive (Strange, 1988). A complementary trend to structural change has been an increased use of more sophisticated information and knowledge-based technology. Gaining access to new and superior production and marketing information has become a priority for most farmers, especially those producing on a large commercial scale. These commercial farmers are not limiting themselves to the more traditional information providers, but are aggressively looking to a wider range of private sources to satisfy their information and technological needs. In recent years, these commercial farmers as well as other smaller-scale farmers have started to question the ability of public sources, including agricultural extension, to assist them in meeting their new information needs.

Theoretical Framework

The “structure of agriculture” is a broad concept, encompassing the number and size of farms, concentration and specialization of production, land tenure, farm organization, business arrangements and farmers’ characteristics. This concept underlies the efficiency and competitiveness of the farm sector as well as the well being of farmers (ERS, 2002). A number of developments have affected the structure of agriculture in many countries during the second half of the last century. Technological developments have significantly increased labor productivity, allowing farmers to farm more acres and to shift from small-scale, broad-based family farming to large-scale, more concentrated industrial type units (Mooney, 1988). Farm production has also become more concentrated and specialized. For example in the U.S., only 2 percent of farms produce more than 50 percent of agricultural products; and about half of the farms produce only one commodity (ERS, 2002). Furthermore, business arrangements have been changing rapidly, relying more on contracts and alliances.

Illinois’ agriculture, and other parts of the country, has been significantly affected by these developments during the last century. The impact of these developments can be measured by the decline number of farmers from 275,000 in 1900 to 71,000 in 2000; and at the same time, an increase in average farm size from 156 acres to 371 acres during the same period (U.S. Agricultural Census, 1997). In addition, this average farm size is heavily influenced by 50 percent of farmers in the state operating small farms less than 180 acres, while mainly involved in off-farm work. Another indicator of the structural change in Illinois agriculture has been toward greater concentration and specialization. This concentration is reflected on the sharp increase in the number of large-scale commercial-type farms with more than 2,000 acres, from 613 farms in 1987 to 1,323 farms in 1997 (U.S. Agricultural Census, 1997). Moreover, most of these farms are highly specialized, producing only corn and soybeans.

This transformation of Illinois agriculture has been accompanied by the demand for more sophisticated information and technology. As a once major provider of information to farmers, The Cooperative Extension Service is facing a new reality. Illinois agriculture is
significantly different from what it was almost a century ago when the Cooperative Extension Service was established. In 1914, the average farm size was 156 acres and most of the agricultural research was conducted by public institutions. Increasing farm size and the concentration and specialization of production in recent years have made location-specific and timely information increasingly valuable to farmers. Information is now an integral part of each farmer’s productivity and competitive advantage. Those with access to it will be more successful than those that do not have it (Boehlje, 1997).

These new standards for information, which have originated in the private sector, has led many farmers in both the developed and developing countries to expect the same information quality from public extension. In spite of these expectations, public funding for agricultural research and information dissemination has been declining for the past two decades (Wolf, 1998). As a result, agricultural extension is now playing a less active role in direct delivery of crop production information to farmers in the U.S. (NCR, 1996). Farmers who once received much of their technical information and management skills from extension are demanding more locality specific information to assist them with their farm management decisions. This includes digital and spatially referenced information rather than information in more traditional formats. These farmers are now questioning the ability of public information sources including extension to deliver appropriate, digital and timely information.

At the same time when the usefulness of information from extension is being questioned, multi-national private sector firms are, increasingly, doing their own agricultural research and expanding their role as information providers (Wolf, 1998). As the value of information increases, there are greater incentives for the private sector to capture more value by improving the quality of information and its applications, including location-specific, time, and formats, and helping farmers apply this information to their operations (Boehlje, 1997). Biotechnology, precision farming and the Internet are examples of tools that utilize location-specific, timely and/or digital information. These technical innovations are being packaged and sold as production inputs in the forms of private consultants, paid Internet websites, farm management services, marketing advisory services, private technical consultants, and precision farming.

The farmer's goal in utilizing new information, and related technical services, is to achieve a better match between inputs tailored to localized conditions in and to the ever expanding and more concentrated farm operation (Fortin & Pierce, 1997). And while the rate of information acquisition by farmers is rapidly increasing, the level of location-specific detail is becoming ever more complex. In other words, as the level of detail and complexity of information increase, there are greater incentives for the private sector to process, simplify and provide information and technology in a user-friendly format to farmers, and then capture a larger portion of that value. For example, precision farming technology is collecting location-specific data at a level of detail and quality never before attempted; and it is provided to farmers in a user-friendly format.

Several studies document a shift away from traditional sources of information, and a recognition that new types of information are needed for making better farming decisions. For example, Mississippi greenhouse tomato growers indicated their reliance on a broad range of sources to satisfy their information needs in order to successfully carry out an integrated pest management (IPM) program (Chou, et al. 1995). Iowa “beginning farmers” considered transfer of value-enhanced crop information and technology to be important
elements in current and future educational programs (Whitaker & Trede, 1998). Moreover, Ohio cash grain farmers pointed out that access to more detailed marketing information is a substantial help in facing risky decisions (Batte et al., 1990).

A number of studies point out that this recognition of the need for new types of information is not scale neutral, and is significantly influenced by farmers’ resources and socio-economic characteristics. A study of Virginia dairy farmers indicates that farm size and storage facilities were the more important factors in determining the use of private technical services (Halstead and Kramer, 1997). In North Carolina, farmers’ use of public and private professional services was positively influenced by farm size, age and educational level (Amponsah, 1997). In addition, Gamon & Scofield (1996), in their study of young Iowa farmers, pointed out that the younger farmers tend to rate the importance of seed, fertilizer, and chemical dealers more highly than older farmers do. To summarize, information needs of both a quantitative and qualitative nature are being driven by a changing farm structure, the characteristics of a growing number of large-scale farmers and the decline in public funded research and extension.

**Purpose and Objectives**

The main purpose of this study is to examine the effect of farm-size (a frequently used proxy for structural change in agriculture) on the perceived importance and utilization of different public and private fee-based sources of information and technical services. The specific objectives of this research were as follows:

1. To identify specific socio-economic characteristics of large-scale farmers in comparison with the characteristics of operators of other size farm;
2. To identify farmers’ perception of the importance of different public and private information sources, including the extension service; and
3. To examine the extent to which utilization of private information and technical services is influenced by farm size.

**Methods and Procedures**

The research findings presented in this paper are part of a broader research and extension project to *improve farm incomes and rural communities through value-added agriculture in Illinois*. A mail survey was used to collect data from farmers in all Illinois 102 counties during November 1998 through June 2001. Over 10,200 farmers completed survey questionnaires, representing about 14.3 percent of Illinois farmers (see table 1). The survey instrument included questions covering the following topics: (a) farmer socio-economic characteristics, including age, education, income and farm resources; (b) the importance of different public and private sources of information, including extension, input suppliers, private consultants, farm publications, and the Internet in learning about new technologies; and (c) utilization of private information and technical services (PITS), including marketing advisory services, consultants, GPS soil testing and fertility maps (precision farming), and paid Internet subscriptions. Data were coded, summarized, and descriptive statistics were calculated for each variable. Regression analysis has used to examine the relationship between the utilization of PITS, as a dependent variable, and a set of socio-economic predictor variables.
Farmers in the study were divided into five categories based on their farm size. These farm size categories are presented in Table 1. It is noteworthy to mention that the response rate for the survey was positively related to farm size. As presented in Table 1, only 7.38% of the farmers with less than 180 acres—who represent nearly 50% of all Illinois farmers—completed the survey, while 32% of those with large farms (1,000 to 1,999 acres) completed their surveys. In addition, of all farmers with 2,000 or more acres, nearly 40% responded to the survey. The survey reflects a much higher response rate for larger, commercial farmers than for smaller producers, especially those with less than 180 acres. As a result, small farmers tend to be under-represented in the survey relative to their number in the state.

Table 1: Response rates of farmers in the study by farm size

<table>
<thead>
<tr>
<th>Farm Size (acres)</th>
<th>Number of farmers in Illinois*</th>
<th>Number of farmers in the survey</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Less than 180</td>
<td>34794</td>
<td>2567</td>
<td>7.38</td>
</tr>
<tr>
<td>2 180-499</td>
<td>18231</td>
<td>2809</td>
<td>15.41</td>
</tr>
<tr>
<td>3 500-999</td>
<td>11619</td>
<td>2561</td>
<td>22.04</td>
</tr>
<tr>
<td>4 1000 -1,999</td>
<td>5414</td>
<td>1749</td>
<td>32.31</td>
</tr>
<tr>
<td>5 2000 and more</td>
<td>1323</td>
<td>527</td>
<td>39.83</td>
</tr>
<tr>
<td>Total</td>
<td>71381</td>
<td>10213</td>
<td>14.31</td>
</tr>
</tbody>
</table>


In spite of the fact that the average farm size in Illinois is 371 acres (Ag census, 2000), the average farm-size for the respondents in this study was 650 acres. Because the larger farmers were more likely to respond to the survey, the proportion of the cropland represented by these producers is greater than their response rate. For example, while the actual overall response rate was 14.3%, the land in the survey represents more than 30% of the cropland in Illinois.

The Findings

The findings of this study present the impact of changes in Illinois agriculture on farmers’ characteristics, their perception of the importance of different public and private information sources. In addition, the findings examine the relationship between farm size as proxy for agricultural structural change and the utilization of PITS.

Socio-economic characteristics of farmers:

In the survey, farmers were asked a number of questions which helped characterize and differentiate the farmer population. Table 2 provides data on farmers’ socio-economic characteristics differentiated by farm-size. Important differences are seen among the five groups. First, farmer’s age is negatively related to their farm-size; while the difference in education among these five groups seems very small. Second, on-farm storage capacity and percentage of income derived from farming are both positively related to farm size. Third, off-farm work is negatively related to farm size. Table 2 also reveals that very large-scale farmers (with 2,000 acres or more) are younger, have a slightly higher level of education, have more farm resources as indicated by their larger on-farm storage capacity, receive more than 80 percent of their income from farming, and 77 percent of them are full-time farmers. On the other hand, and in spite of the fact they represent about 50 percent of Illinois farmers,
small-scale farmers with less than 180 acres are older, have a lower level of education, have limited farm resources, earn less than 30% of their income from farming, and almost all (99 percent) have off-farm employment.

Table 2: Socio-Economic Characteristics of Illinois Farmers Differentiated by their Farm Size

<table>
<thead>
<tr>
<th>Farm Size (acres)</th>
<th>Number of respondents</th>
<th>Age (years)</th>
<th>Education (years)</th>
<th>On-farm storage (1,000 bushels)</th>
<th>Income from farming (%)</th>
<th>Off-farm work (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Less than 180</td>
<td>2567</td>
<td>58.8</td>
<td>13.0</td>
<td>3,838</td>
<td>29.6</td>
<td>99</td>
</tr>
<tr>
<td>2 180-499</td>
<td>2809</td>
<td>57.0</td>
<td>13.0</td>
<td>19,115</td>
<td>54.0</td>
<td>76</td>
</tr>
<tr>
<td>3 500-999</td>
<td>2561</td>
<td>53.9</td>
<td>13.4</td>
<td>39,294</td>
<td>69.4</td>
<td>49</td>
</tr>
<tr>
<td>4 1,000 or more</td>
<td>1749</td>
<td>51.5</td>
<td>13.6</td>
<td>71,429</td>
<td>77.0</td>
<td>31</td>
</tr>
<tr>
<td>5 2,000 or more</td>
<td>527</td>
<td>50.8</td>
<td>13.9</td>
<td>150,170</td>
<td>82.5</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>10213</td>
<td>55.4</td>
<td>13.3</td>
<td>36,500</td>
<td>58.2</td>
<td>65</td>
</tr>
</tbody>
</table>

Sources of information and new technology:

To assess the importance of different public and private sources of information, every farmer in the study was asked whether they considered each of eight different public and private information sources as “very important,” “somewhat important,” or “not important” in helping learn about new agricultural technology. Figure 1 presents the percent of farmers in each farm-size category indicating that they consider a particular information source to be “very important.” All five groups of farmers reported that seed dealers and University of Illinois Extension Service come in the first and second place, respectively. About 58% of the very large-scale farmers (2,000 acres or more) considered seed dealers as “very important” sources of information compared to 46% of small-scale farmers (less than 180 acres). An opposite trend is depicted in the case of the Extension Service. About 43% of small-scale farmers indicated that the Extension Service is a “very important” source of information to them, while only 34% of the large-scale farmers thought it was “very important.”

In addition, Figure 1 reveals that very large-scale farmers (2,000 acres or more) ranked the Internet and grain elevator managers in third and fourth places as “very important” sources of information. Traditional sources of information such as other farmers, farm magazines and newspapers, and radio and television farm programs are losing their importance to large-scale farmers (1,000 acres or more), while they are still considered important to small-scale farmers with less than 500 acres.

Utilization of Private Information and Technical Services:

A major concern of this study is to identify farmers’ utilization of different types of PITS; and factors affecting their utilization. Therefore, farmers in the study were asked whether they utilized any of eight different private services. These PITS include farm data services, marketing advisory services, private consultants, farm management services, paid Internet websites, farm record keeping service (FBFM), GPS grid soil testing, and crop scouting. Figure 2 shows the utilization of these PITS by different farm-size categories.
More than 70 percent of the very large-scale farmers (with 2,000 acres) utilized Farm Dayta, which is an agricultural database that provides a wide selection of information and advice, while 67 percent and 55 percent utilized GPS (precision farming) and marketing services, respectively. In addition, farmers, who farm 1,000 acres or more, ranked the same three services as their top utilized PITS, but the level of utilization was about 10 percent less than the previous group of farmers (with 2,000) acres. These three services provide

Figure 2: Utilization of Private Information and Technical Services by Farm Size
location-specific timely information in digital formats. On the other hand, fewer than 10% of the small-scale farmers utilized these three technical services or any other technical services, with the exception of GPS (27%) services and FBFM (15%).

To examine the relationship between farm size and farmers’ utilization of PITS, an aggregate measure of utilization was developed. Each PITS use was coded as “Yes” (coded "1"), or “No”, (coded "0"). The responses to these eight private technical services were then summed to form an aggregated measure for “utilization of PITS”. The scores ranged from 0 to 8. There is a positive correlation between farm-size and utilization of private information and technical services, $r = 0.45$ at (0.01) level. Large-scale farmers with 2,000 or more acres utilized 3.2 services, while an average small-scale farmer with 180 or less utilized about 0.8 services (see Figure 3).

Figure 3: Average Utilization of Private Information and Technical Services by Farm Size

Conclusions and Recommendations

As Illinois agriculture moves toward greater consolidation of farmland, higher level of production concentration and specialization, and increasing global competition farmers’ needs for quality information increase. Location-specific and timely production and marketing information has become an integral part of the decision-making process which can add to farmer’s productivity and income. In this environment, private information firms have greater incentives to provide farmers with quality, user-friendly information and technical services. While privately produced, information is affordable to and utilized by a growing number of high-resource, large-scale farmers. Low-resource small-scale farmers have relatively limited access to the same quality of information. These small-scale farmers account for significant shares of farm production and farm assets, particularly land. With the exception of GPS and FBFM, only 10 percent of these small-scale farmers utilize any type of private information and technical services. However, these farmers are in critical need of
relevant, high quality information in order to efficiently manage their resources and to compete effectively in farming. Public information providers, particularly agricultural extension, are affected by structural changes in Illinois agriculture and are facing a new reality. Specifically, public funding are declining, new standards for information quality are emerging, there is increasing competition with private firms, and there is increasing public concern regarding the efficient use of small-scale farmers’ collective resources.

The results of this study show that farmers in all farm-size categories still view public agricultural extension as an important source of information. This reflects the credibility that agricultural extension still enjoys among all groups of farmers. However, the results reveal that there is a negative relationship between farm-size and the perceived importance of agricultural extension. In other words, assuming that the number of large-scale farmers will continue to increase, agricultural extension will gradually lose its importance as an information provider.

This is mainly due to the move toward large-scale, more concentrated industrial type farms on which farmers will increasingly depend on private providers to satisfy their future information needs. In spite of this, agricultural extension can provide these farmers with information in areas that are not attractive to private providers. These areas can include natural resource management, value-enhanced marketing opportunities and leadership development.

Furthermore, the results show that small and middle-scale farmers, who represent the majority of the state’s farmers have relied on a mix of traditional public and private information sources, including agricultural extension and seed dealers to learn about new technology. For these farmers, agricultural extension still plays an important role in providing affordable quality information in areas of production technology, farm management, and domestic and international marketing. To the extend possible, this information should be location-specific, timely, and in digital formats to enable these farmers to increase their productivity and to manage efficiently their resources.

If agricultural extension is to stay a relevant and credible source of information it has to provide each farm-size group of farmers with appropriate, high quality information. Availability of timely, location specific information is a critical input to farm management decisions including, digital and spatially referenced information. Public extension needs to utilize the Internet and other types of electronic communications to deliver technical, farm and natural resource management, and marketing information to different farm-size farmers.
References


