An Examination of the Extent of Innovation Discontinuance, the Motivations of Farmers Who Discontinue an Innovation, and Implications for Extension

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Abstract

Farmers in Illinois are gradually shifting from production of bulk commodities to more specialized agricultural products. Value-enhanced grain production is an agricultural innovation, requiring new types and sources of information, different handling and storage practices, accessing new markets, paying greater attention to quality and identity-preservation, and negotiating contracts. Social scientists and extension educators have viewed agricultural innovations from the perspective of the traditional adoption-diffusion paradigm, with its emphasis on promoting adoption. One gap in this paradigm is its difficulty understanding “de-adoption,” or the discontinuation of an innovation. This paper addresses questions related to the extent of discontinuation and the reasons behind it. The research concentrates, in one area of Illinois, on 785 farmers who reported on their adoption of value-enhanced grain over a four-year period. The objectives are to determine the extent of farmers’ continuation and discontinuation, and to examine the reasons why 140 producers discontinued production of value-enhanced corn and soybeans. Results illustrate an increase in producers adopting value-enhanced grains, and they are dedicating larger acreages to them. However, 18 percent discontinued the innovation during the time period studied. Income was a major reason, but not the whole explanation. The reasons farmers cited suggest ways in which extension staff might be involved in this particular innovation, and the difficulties attendant upon their greater involvement. Given some of the trends underway in agriculture, and the pressure facing extension, extension crop specialists may find it difficult adapting to the value-enhanced grain production trends.

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INTRODUCTION

There is now a robust body of research on the adoption-diffusion process. The paucity of research over the past decade or two may thus reflect a paradigm that is “exhausted,” but not without having made significant contributions to our understanding of agricultural innovations (Ruttan, 1996). Others argue, however, that gaps in knowledge and understanding persist, and that the focus of diffusion research should shift from agriculture into new directions with greater emphases on political and global contexts of innovations, the growing importance of social networks, and the emergence of newer sources of information (Wejnert, 2002). One of the gaps in adoption research has been the discontinuation of innovations. There is little understanding of how prevalent it is, or of the reasons why some individuals stop utilizing innovations. Rogers (1995) has hypothesized reasons for discontinuation, but the research base is meager.

This paper is a step toward addressing questions related to the extent of discontinuation and the underlying reasons. The focus is on adoption of value-enhanced (VE) grains, a recent innovation among farmers in Illinois who are attempting to shift production to user-driven and niche markets in order to increase their incomes beyond what markets are paying for standard commodities.

This research concentrates on 785 farmers in a five-county area of Illinois who answered detailed questions about their adoption, non-adoption, and discontinuation of VE grains for each of four years, 1998/99-2002. Those who discontinued production were asked their reasons. These 785 farmers are from a subset of counties that were surveyed in an earlier study (1998/99) of VE grain production in the state. Thus, while the present research focuses on producers who responded to the 2002 survey, data will also be used from the earlier state survey for comparative purposes.

PURPOSE AND OBJECTIVES

Two goals underlie this research. The first is to draw attention to a neglected aspect of adoption behavior, i.e., the sub-set of producers who try and then stop using an innovation. The second is to try to provide suggestions for interventions which might decrease discontinuation. It is possible that some of the farmers who stop are simply “trying out” VE grains, with no particular desire to continue, but others discontinue because of obstacles which might be addressed by extension.

The more specific objectives of the research are to provide a better understanding of the dimensions of discontinuation of a particular innovation and the reasons why some quit after producing VE grains. There are two basic research objectives:

(1) To determine, for each of three years, what proportions of adopters of VE grains continue and discontinue production.

(2) To address the question of why discontinuation occurs, by examining farmers stated reasons.
THEORETICAL BASE

The Innovation: Value Enhanced Grains:

While the food production system in the Midwest is still relatively diverse there has been a long-term structural transformation of agriculture. A key element of this transformation is the presence of greater linkages and negotiated relationships among input-suppliers, farmers, and end-users of agricultural products (Castle, 1998). This involves the concentration of production, integration of each step in the system, and higher levels of market differentiation (Drabenstott, 1999 and 2001; The Economist, 2000). One aspect of this trend has been a shift to smaller, “niche” or “specialty” markets for grains that are more closely tailored to processors’ needs, or embody attributes that consumers and specific users desire. It is market differentiation which “represents a means of adding value to a product through separating oneself from the larger number of producers… its an entrance into a market with fewer producers and therefore greater opportunity to set prices or benefit form higher prices” (Wolf, 1998: 3-14). Many farmers clearly view these more differentiated markets as economic opportunities, since they involve fewer producers and often entail capturing a premium that can boost farm income while also improving market security and access. In Boehlje and Doering’s (2000:57) words, “it is a matter of manufacturing food products vs producing commodities.”

VE grain production is an agricultural innovation requiring new types and sources of reliable information. It brings producers into a more articulated system with different and more demanding rules and regulations than those experienced by typical commercial producers. Farmers are required to comply with specifications set by input suppliers and buyers for producing, handling, and marketing of VE grains (News Gazette, 2003). As a result, farmers have less control over production decisions and, in turn, become more dependent on externally provided expertise and information and the demands of specialized markets. For most specialty crops there are requirements regarding variety, quality, traceability, segregation of grain, and timeliness of delivery. The added imperatives of contract production may incorporate farmers into a more industrial mode of production, one quite different from that of non-contract producers who operate more or less independently with greater decision-making autonomy.

Adoption-Diffusion Research

Adoption/diffusion research has, historically, located explanations for farmers’ different propensities to utilize innovations in a variety of personal and social circumstances (Fliegel and van Es, 1983). Early attempts to understand variability in farmers’ adoption behavior focused on farmer and farm characteristics, and discovered that the younger, better educated, larger and higher income farmers were the “innovators” and “early adopters.” This was understandable since they had more resources, greater access to technology, contact with extension and media, and they could afford to take greater risks.

Research also concentrated on the “attributes” of innovations, which stemmed from the fact that innovations themselves differ; that is, possess different attributes or
characteristics which make them more or less readily accepted by farmers. Research by Rogers (1995), Fliegel and Kivlin (1966) and others document the greater acceptance of agricultural practices and technologies which possess certain perceived attributes, such as compatibility, relative advantage, simplicity, cultural fit, observability, trialability (Rogers, 1995). Research revealed that potential adopters’ perceptions of an innovation’s attributes along these dimensions were crucial in making adoption decisions. Clearly, not all farmers viewed innovations similarly or made their decisions on the basis of the same complex of attributes. The important point of research on the attributes of innovations was that it provided clues into the appropriate approaches that could be developed within different contexts.

An alternative adoption/diffusion perspective then emerged which located failure to adopt within the agricultural environment. Brown (1981) refers to this as the “market and infrastructure perspective,” which shifted the focus to “diffusion agencies,” both public and private, that were responsible for promoting, packaging, marketing and servicing innovations, and on the placement of infrastructure (Audriac and Beaulieu, 1986).

More recently, substantial discussion has centered on the conjunction of both physical and social factors in understanding and explaining adoption of agricultural innovations, and on the importance of farmers’ networks in promoting and sustaining particular innovations (Coughenour, 2003). The discussion of innovative agricultural behavior from an “agro-ecological” perspective maintained that the interdependence and interaction between physical and social environmental factors created an agriculture that was distinctive of a particular region, and shaped farmers’ perceptions and decision making. This approach was illustrated in Ashby’s (1985) study of farmers’ innovation behavior in Nepal where, she argued, natural physical parameters were constraints, including weather, topography, soil type and other physical factors. Coughenour’s (2003) recent analysis of farmers’ adoption of conservation tillage revealed a radically different production system that involved adopting a “new culture of agriculture,” along with new local knowledge, techniques and social relationships/networks which provided new channels of information, influence, and support.

Across this wide range of adoption research, discontinuation, or de-adoption, occupied a very small niche on the research agenda (cf. Mason and Haiter, 1980). Rogers (1995) explicitly discussed discontinuation, which he defined as the decision to reject an innovation after having adopted it. And, as he points out, it was not uncommon due to the fact that disenchantment/dissatisfaction with an innovation’s performance may arise, or newer innovations may be substituted for earlier ones. In the case of VE grains, the innovation examined in this paper, discontinuation may result from farmers not obtaining the promised/expected results. A less than expected profit could, in turn, stem from difficulty producers have in finding markets or in dealing with different management practices associated with new VE grains. And, particularly in the case of VE grains, discontinuation may easily result from the impact of later adopters whose output dampens prices, and thus makes the innovation less attractive.
DATA AND METHODS

The research in this paper is based on two sets of survey data, one from 1998/1999 and the other from 2002. The 2002 survey was part of an evaluation of a state-wide VE grain project initiated in 1998/99. The evaluation focused on all farmers in five representative counties, with 785 (17%) responding. The main purpose of the evaluation was to determine if producer involvement and interest in VE grain production had increased, whether earnings were higher from VE grains, and whether farmers in these counties had altered their views and/or behavior with respect to VE grain between 1998/99 and 2002. Those five counties were representative counties in an area of the state which had VE grain production opportunities.

Names and addresses of farm operators in the five counties were taken from USDA’s Farm Service Agency (FSA) lists of active farmers. Landlords and retirees who were not actively farming were excluded. In each county the survey went out with a cover letter from the relevant extension office, which took charge of mailing and answering questions about the survey. Although most of the questions dealt with farmers’ knowledge and experiences with VE crops, as well as their problems and access to information about them, several questions were asked about the economic performance of VE crops.

Variables

The main variables used in the analysis are:

Adoption Status: Farmers were asked if they had planted a VE corn or soybean variety in each of three years (1999, 2001, 2002). If they had, questions were asked about the specific type of grain, the number of acres planted, and their assessment of whether the VE crop(s) was more profitable than their regular corn/soybean crop that year. With this information we were able to determine, for each year, the proportions of farmers producing VE grains, as well as the proportion who were “newcomers,” that is, began growing a VE crop for the first time in a particular year, and those who were “continuing adopters.” For those who discontinued production, an additional question was asked about their reasons.

Value-Enhanced Grain: “Value-enhanced-grains” are seed varieties that are differentiated from the conventional varieties which most producers plant and sell on the open market. Our research has identified 20 varieties that can be described as “value-enhanced” and bring higher prices. This information was used to produce a set of “fact sheets” on 20 different types of VE corn and soybeans. The “fact sheets” included information on crop traits, recommended management practices, economic results of producers’ experiences, and identification of the factors deemed to be critical to the grains’ profitability. This information was widely distributed through conferences, extension meetings, commodity associations, grain handlers, and a website. Several VE corn and soybean types predominate, based on the needs of particular end-users and on what export markets accept (see VE types in figures 1 and 2).
RESULTS

Data (not presented) for the five counties document the proportions of farmers who have adopted VE grains at two time periods. There was a dramatic jump between 1998/99 and 2002, from 20% to 38%. By 2002 more than a third of the farmers were producing some type of VE corn and/or soybean crop. A little more than half (52%) of those producing VE grain were producing both. While the proportion of farmers adopting VE grains has gone up to 38%, the “new adopters” have come mainly out of the pool of those who, three years earlier, said they were “interested” in (but not growing) VE grains. The data also shows that most (62%) of the farmers in the five counties reported they were not producing VE grains, although a large fraction (22%) indicated an “interest.” By way of comparison, the 1998/99 survey of farmers in the state indicated (data not presented) that, at that time, 24% of all of them had some land in VE grains. With regard to the five-county study, not only are more farmers involved with VE grains, the acreages devoted to them have also increased, from an average of 260 acres in 1998-99 to 375 acres in 2002. This represents a 44% increase.

There have also been shifts over time in the specific VE grains being grown (Figures 1 and 2). At the time of the first survey the three major types of corn were “non-GMO,” “high oil,” and “yellow food-grade.” The biggest change in the 2002 survey illustrates the large shift to production of “non-GMO” corn, mainly to accommodate the export markets in Europe and parts of Asia. In 2002, two-thirds of all VE producers were growing “non-GMO” corn, compared with 41% in 1998. Due to the demand for non-GMO grains, they became, in effect, a VE grain which paid a premium. With respect to soybeans, the top three VE grains in the first survey were “STS,” “non-GMO,” and “clear hilum.” In 2002 the proportion in non-GMO soybeans went to 60%, up from 38%, followed by “STS” beans (16%). These results show that more farmers are finding VE corn and soybeans to be profitable because of premiums being paid for delivery into certain markets. Farmers are also getting better information on the location of markets, and they are acquiring experience with VE grain production and its management requirements. Since 1999, annual grain handler surveys have been undertaken to track changing markets for VE corn and soybeans. They have identified those (along with their location) that accept, or contract for, different types of VE grains, and the premiums paid for each type. This information has been widely disseminated by extension and has been a major contributing factor in the spread of VE grain production.

Figure 1. Types of Value-Enhanced Corn Produced in 1998/99 and 2002.
Adoption and Discontinuation of Value-Enhanced Grain Production

This part of the analysis breaks down, year by year, the trend in adoption and discontinuation of VE grains. It also provides insight into adoption behavior which is masked by simply looking at the change between two time periods. Figure 3 provides a year-by-year look at adoption trends, with specific data on how many farmers were “new adopters” each year and how many were carry-over, or “continuing producers.” It also shows the number of farmers who have discontinued value-enhanced production, again by year.

Adoption/Discontinuation Levels:

In the first year (1999), we see that 109 (15%) farmers in the five counties had adopted a VE crop. Of those, 98 (90%) continued producing a VE grain in 2000, while the remaining 10% discontinued VE crop production after the 1999 crop year (figure 3). In 2000, there were 43 new (first-year) producers of VE grains in the five-county area, bringing the total number of farmers growing a VE grain (corn, soybeans, or both) up to 141, or 18% of all farmers in the five counties. Of the 141 who were engaged in VE production in 2000, 120 (85%) continued into 2001, and 21 (15%) stopped. The same trend was detected in 2001, when there were 75 new producers, plus the 120 continuing producers for a total of 195 (or 25% of all farmers) VE crop producers. Of this number, 34 farmers (17%) discontinued producing VE crops in 2002, but 161 farmers (83%) continued producing VE crops into 2002. In addition, there were 135 new adopters in 2002, for a total of 296 (38%) VE producers in the study area. It could not be determined during the summer of 2002 how many of these farmers would continue or discontinue VE grain production in 2003.

Figure 4 reports data identical to what is shown in Figure 3, but with the addition of the proportions of the continuing adopters and discontinuing farmers reporting whether VE grains were or were not profitable in that particular year. Taken together, Figures 3 and 4 shed new light on an important dimension of VE corn and soybean adoption; that is, in any given year, the adoption level reflects a combination of both “new adopters” as well
as “continuing adopters.” The data also tends to illustrate that reported profitability was an important, but not sufficient, factor in determining whether a farmer continued or discontinued producing VE grains. This can be seen in figure 4, where more than 40% of the farmers who stopped growing VE grains in 2000 and 2001 still found them to be profitable. But, as will be shown below, there were other important reasons for farmers discontinuing the production of VE grains.

Reasons for Discontinuation:

Farmers’ discontinuation of VE grains is, undoubtedly, linked to income. In some cases income is less than they expected, given the additional time, attention and work associated with VE grain production. In some cases, income was actually less than they could have got from planting conventional grains. Income, however, is not the whole justification for growing VE grains. The earlier (1998/99) survey of the state’s farmers
showed that a majority (81%) of them who planted VE grains did so to increase their profit. But, in addition, 51% said that growing VE grains was only a “trial” to see how they performed; others (39%) were simply trying to diversify their farm operation, get some firsthand experience with them (37%), or simply because they were encouraged by input suppliers (19%) to try them. Questions producing the above results permitted more than one response, but the evidence still illustrates a variety of motives underlying the decision to grow VE grains.

Figure 5 provides information on the reasons 140 discontinuing farmers gave for their decisions to stop producing VE corn and soybeans. Since such decisions often reflect more than a single factor, multiple responses were permitted on this question. According to the findings in Figure 5, profitability was the most important (58%), but only one of several reasons farmers gave for discontinuing production. This was followed by their inability to locate markets for their VE crops, lack of adequate on-farm storage for segregating grain, and lack of technical information about VE grain production. Other data also show, for the four-year period, that discontinuation is permanent. Less than one percent of the farmers who stopped producing in a specific year returned to the production of VE crops in a later year. Whether they return to VE grains at some point beyond the years examined here is an important future research question.

Figure 5. Producers’ Reasons for Discontinuing Value-Enhanced Crop Production.

SUMMARY AND IMPLICATIONS

It is expected that both domestic and global markets will progressively source a growing array of differentiated agricultural products from those producers who can most efficiently meet industry specifications and consumer demand. Over the past decade the commercial planting of VE crops has spread to more farms and covered more acres. This research documented these increases in one area of Illinois. In addition, many more farmers have expressed an interest in growing VE grains, but reported that they lacked information on markets, the required production and storage practices, the idiosyncrasies of VE grains, and on economic returns.
Historically, these types of trends have been the bedrock of adoption-diffusion research, and the focus of extension activity. To date, the adoption of VE grains has not been driven much by extension’s assistance. There are, undoubtedly, factors associated with these types of innovations which cast them in a different context than the innovations which have, over the years, been studied by social scientists and disseminated by extension staff. The supporting transfer environment, especially that of extension, is quite different now than it has been in the past.

In the dramatically changed extension environment, it is trying to identify new audiences, search out new ways of delivering programs, locate different sources of funding for new programs, and develop new partnerships and ways of delivering programs. The traditional audiences of extension, mainly rural people, farmers, and individuals linked to agriculture are receding in importance, while the role of extension staff has shifted to other problem areas.

Research on VE grains has centered not in Land-Grant universities but in input suppliers. Information now resides in seed suppliers and grain buyers. Even more complicating for extension, the comparative advantage of planting VE grains varies by time and location. Early adopters stand to benefit more than later adopters, and VE grains are more profitable in certain areas of the state. As a result, farmers are faced with the burden of scouting out and evaluating VE opportunities on their own. They may have to be prepared to discontinue growing VE grains that are supplanted by newer grains, and in light of price changes resulting from additional producers.

Findings from this research show that VE grains are being produced by a growing number of farmers. However, even though most producers of VE grains claim that they are profitable, a majority of the surveyed farmers still continue to resist producing them. And some discontinue production after a season or two. The level of discontinuation is sizeable, and primarily because of the problems related to growing specialty grains in general. The reasons farmers give for discontinuation reflect the fact that a variety of elements have to merge for a successful crop. Markets, research data, and information on VE crops are critical elements. Given the large number of different types of VE grains that are currently available, and which will be in the future, the questions which arise are how farmers will learn about new and emerging VE opportunities; in particular, which seeds are available, where the markets are, which VE grains perform best in which eco-regions, and with which specific management practices? What makes VE grains an innovation, and somewhat different from past innovations, are their idiosyncrasies and dynamic nature. Markets for some are likely to be small, irregular and, perhaps, ephemeral. Other grains may emerge from research and development with little independent research evaluation. The VE markets are likely to be fluid, with the number and mix of crops varying from year to year depending on their relative economic advantage, farmer satisfaction with output levels, and the appearance of newer grains which outperform the older ones. In this environment discontinuation of a particular innovation may be a well conceived strategy rather than an anomaly. In any event, the role of extension in this activity is likely to be more problematic than its current concentration on cropping systems.
REFERENCES


