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Agricultural Input Market Segments: Who Is Buying What?

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For agribusiness managers and salespeople, understanding customers and their preferences and behaviors is crucial to success. This study uses cluster analysis to identify five distinct buyer segments for expendable input purchases for U.S. crop and livestock commercial producers. A multinomial logit model is used to predict segment membership based on demographic, behavioral, and business management factors. Results provide important information for agricultural input suppliers.

Key Words: cluster analysis, input suppliers, market segmentation, multinomial logit

Developing effective marketing strategies, and anticipating the needs of current and future customers is one of the most significant challenges faced by agribusiness firms. The drastic and rapid changes in the structure of the U.S. farm sector compel agribusiness firms to continually adapt their marketing strategies in order to remain competitive and to attract and retain customers. Due to the massive consolidation of production, input purchasing lies in the hands of fewer and fewer operators, many of them considered commercial producers. This research therefore focuses on the commercial producer, defined as a producer with annual sales of $100,000 or greater. Although this group represented only 16.1% of operations in 2002, it accounted for 77.4% of farm cash expenditures in the United States (USDA/Economic Research Service, 1998; USDA/National Agricultural Statistics Service, 2002). Commercial producers represent such a large portion of agricultural input expenditures that it is essential for input suppliers to serve them successfully. As firms are increasingly looking for ways to retain customers, increase repeat customer purchases, and capture and increase the customer lifetime value of purchases, understanding and successfully serving targeted commercial producers is critical to their success.

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Successfully serving targeted customers involves first segmenting the market into smaller, more homogeneous customer groups, profiling these groups, then deciding which customer segments to pursue, and then developing the marketing mix (products, pricing, promotion, and distribution) to best serve the chosen target customers. Market segmentation enables firms to better understand their customers' product, service, and information preferences. Each distinct market segment may differ in its requirements, and therefore each may respond differently to changes in a firm's marketing strategies—including price changes, product changes or introductions, distribution channel changes, promotional activities, or other relevant strategies. For example, one farm may have tight labor constraints and rely heavily on custom services, while another farm may have substantial agronomic or chemical expertise and doesn't need or want the supplier services that can increase the cost of the products.

Once market segments are identified, individual marketing programs can be tailored to the preferences of the targeted customers. Customers will buy from the firm that provides them the highest customer perceived value, which is the difference between perceived customer value of all benefits and the total customer cost of acquiring the product or service (Kotler, 1997). Tailoring programs to targeted segments increases the customer's perception of value, and consequently increases customer retention. Further, by better understanding the trends in their customers' buying preferences, input suppliers can position themselves strategically.

Traditionally, agribusiness managers and salespeople have thought of producers as belonging to one of three segments (Downey, Holschuh, and Jackson, 1999). First, there are "business buyers" who make purchases based on their value for their business. Second, are the "economic buyers" who make purchases following a cost-minimization strategy. Finally, there are "relationship buyers" who purchase their products from the salespeople they trust.

While other researchers have conducted market segmentation studies, only Gloy and Akridge (1999) have examined the commercial producer market. Using cluster analysis to segment the commercial producer market, their work identified four market segments: Balance, Price, Performance, and Convenience. Gloy and Akridge's four market segments refine the traditional three segments, where members of the Balance and Performance segments are characterized as business buyers, members of the Price segment are economic buyers, and members of the Convenience segment are relationship buyers. Clearly, given the rapidly changing marketplace and the importance of current information to agribusinesses, it is helpful to reexamine the market for the purpose of identifying today's commercial producer market segments.

For agribusiness managers and salespeople, while understanding their current customers' buying behaviors is valuable, this information becomes much more valuable if new or potential customers can be classified by buying behavior segment. Furthermore, the classification is most useful if it is based on characteristics agribusiness managers and salespeople can easily observe or elicit by asking a few key questions (Gupta and Chintangunta, 1994; Wyner, 2000; Mudambi, 2002). While

Gloy and Akridge (1999) previously segmented the market, their work does not provide any pragmatic predictors that could be used by agribusiness professionals.

Accordingly, the two objectives of this research are first to identify today's distinct market segments for expendable inputs such as seed, fertilizer, chemicals, etc., for U.S. crop and livestock commercial producers, and second to predict segment membership based on observable characteristics. Cluster analysis is used to segment the commercial producer market based on survey data describing producers' buying behavior. Findings of our analysis show the commercial producer market has changed, revealing there are now five segments instead of the four reported by Gloy and Akridge in the late 1990s. We identify a new market segment—Service buyers—who fall into the traditional relationship buyer segment along with the convenience buyers. Agribusiness professionals have been concerned with changes occurring in the relationship buyer segment during the last five years, and results of this study have important implications for businesses serving this group.

Further extending the work of Gloy and Akridge (1999), we use a multinomial logit model to predict segment membership based on demographic, behavioral, and business management factors that agribusiness professionals can observe. Baker and Burnham (2001) previously applied logit analysis to predict membership in market segments identified using cluster analysis. Once the market segments are identified, agribusiness professionals can use the multinomial logit model to choose which individual marketing program to offer a customer. Given the importance of successfully targeting and retaining customers, this work contributes to the literature by identifying today's commercial producer market segments, profiling these segments, profiling the changing traditional segments (especially the relationship buyer), and by providing a pragmatic segment predictor that agribusiness professionals can use.

Data

This research uses survey data collected during the 1998 and 2003 Commercial Producer Projects conducted by the Center for Food and Agricultural Business at Purdue University. The samples of commercial producers in both 1998 and 2003 were drawn from a database containing information on farm size, location, and enterprise. The sampling criteria included producers who were believed to have sales of $100,000 or greater in a single enterprise, and six enterprises were targeted: (*a*) corn/soybeans, (*b*) wheat/barley/canola, (*c*) cotton, (*d*) dairy, (*e*) hogs, and (*f*) beef cattle. A reminder card was mailed two weeks after the survey, followed by the mailing of a second survey instrument to the entire sample. Telephone follow-ups were used in both survey years, and e-mail follow-ups were used in 2003 to increase response rate.

In 1998, 10,500 surveys were mailed. Of these, 1,721 usable questionnaires were returned, for a response rate of 16.4%. Corn/soybean farms comprised the largest respondent group in 1998, with 27.5% of the sample, and wheat/barley farms made up the smallest percentage at 11.6%.

In 2003, 12,106 surveys were mailed, yielding 2,094 completed, usable surveys for a response rate of 17.3%. In 2003, corn/soybean farms were once again the largest group, with 36.5% of all responses. Likewise, wheat/barley farms again made up the smallest percentage, dropping to only 6.9% of responses. Seventy-six percent of the questions appearing on the 2003 survey were also on the 1998 survey. Additional details regarding the sampling procedure and the response rate can be found in Foley (2003).

Methods

Cluster analysis and multinomial logit regression analysis were used to identify the market segments and to determine the demographic and behavioral characteristics of these segments. Market segmentation variables can be classified into two broad categories—customer characteristics and customer responses (Kotler, 1997). Markets can be segmented based on customer characteristics including geographic, demographic, and/or psychographic variables. Alternatively, customer response variables can be used to segment markets by customer behavior, i.e., group buyers by their knowledge of, attitude toward, use of, or response to a product (Kotler). We use behavioral segmentation in this analysis. Behavioral segmentation is more informative than segmentation based on customer characteristics because the customer data are more closely aligned with the customers' basic reasons for purchase (Assael, 1995). Furthermore, Minhas and Jacobs (1996) contend that market segments based on customer characteristics are poor predictors of future buying behavior in the financial services market; they found that benefit segmentation, a form of behavioral segmentation, proved to have much better predictive power.

Cluster analysis involves selecting the variables on which to segment, selecting the clustering algorithm, and validating the solution. According to Rosenburg and Turvey (1991), one advantage of cluster analysis is that it "minimizes research bias by not specifying classes according to prespecified conceptions" (p. 203). Principal component analysis and factor analysis were used in this research to help identify the appropriate variables for segmenting. Specifically, principal component analysis and factor analysis were used to identify highly correlated or redundant variables, which were then grouped together into a single factor or principal component for the market segmentation. Proper variable selection is critical to identifying the data's true or natural structure. Since irrelevant variables can blur the true data structure, only those variables that help distinguish clusters in a meaningful way should be included in the analysis (Larson, 1993; Milligan, 1980). Preprocessing the data can help exclude irrelevant or redundant variables (Larson, 1993).

The clustering algorithm used in this research consisted of a two-step process. First, a hierarchical clustering step was performed using the minimum variance algorithm, commonly known as Ward's method. Ward's method was used to determine the correct number of clusters in the data and to identify the initial starting point or means for the second-step, non-hierarchical clustering algorithm. Second, the cluster results from Ward's method were used as the seed values to begin the non-hierarchical *k*-means algorithm. Larson (1993) suggests that this two-step clustering algorithm process is a better approach to cluster analysis than a single hierarchical algorithm. A hierarchical clustering algorithm makes only one pass through the data in determining the cluster results, whereas the non-hierarchical *k*-means algorithm passes through the data repeatedly, rearranging the observations until no observations change clusters, thereby providing more stable and reliable results than a hierarchical clustering algorithm.

Validating the clustering solutions was the final process in the cluster analysis. First, the pseudo-t^2 value and the pseudo F-statistic were used to identify the appropriate number of clusters in the data. The pseudo-t^2 value, the pseudo F-statistic, and general rules of thumb associated with these statistics have been very successful at recovering the true group structure of the data in Monte Carlo experiments (Gloy and Akridge, 1999; Milligan and Cooper, 1985). The appropriate number of clusters was identified using these statistics during the hierarchical clustering (Ward's method).

In addition to validating the appropriate number of clusters, it is important to validate the final clustering solution. Significant differences between the means of the clustering variables should be expected since the clustering algorithm maximizes the differences between clusters and minimizes the similarities within each cluster. An appropriate procedure for validating cluster solutions is to test for significant differences between the groups' responses to non-clustering variables (Gloy and Akridge, 1999). After potential clusters were identified, chi-square tests for significance were run on the non-clustering variables to determine whether or not there were significant differences between the clusters.

Multinomial logit regression analysis was used to predict segment membership based on characteristics that a salesperson can observe about a potential customer, or can easily elicit through straightforward questions. Each producer can belong to only one segment, and each buying behavior segment is distinct and unordered. The multinomial logit model for unordered choice sets is motivated by the random utility model; this model assumes each producer exhibits the buying behavior that maximizes his/her utility. The multinomial logit model is expressed as:

$$(1) \qquad \Pr(Y_i = j) = \frac{e^{\beta_j' \mathbf{x}_i}}{\sum_{k=1}^{5} e^{\beta_k' \mathbf{x}_i}}, \quad \text{for } j = 1, 2, ..., 5,$$

where Y_i is the segment membership for the ith producer (j = segment membership), and $\mathbf{x}_i$ is a vector of observable characteristics (see Greene, 1997, pp. 914–917 for further discussion of the multinomial logit model).

Results

The key survey question used in the segmentation analysis asked the respondents to weight the influence of six factors they may use to choose an input supplier. The influence of these factors was measured on a forced-sum scale using the following question:

> *When you choose a supplier for either capital items like equipment or expendable items like pesticides or feed, how is your decision influenced by the following factors? Assign a percentage value to each factor based on its importance in the decision. The percentages should add to 100 in each column.*

The six response categories included convenience/location, customer service/information, personal factors, price, product performance, and support services.

Principal component analysis indicated that the customer service/information variable and the personal factors variable were highly correlated and contained redundant information. To minimize redundancy, a new variable was created by summing the percentage values for the customer service/information and the personal factors variables. Consequently, the cluster analysis was based on five buying behavior variables arising from the survey data that reflect the survey respondents' differing attitudes regarding the benefits the input suppliers can provide: (*a*) convenience/location, (*b*) customer service/information/personal factors, (*c*) price, (*d*) product performance, and (*e*) support services. For the 1998 data, these same five buying behavior variables were used in order to compare the size and composition of the 1998 and 2003 segments.

Next, the hierarchical clustering step was performed, and both the pseudo-t^2 value and the pseudo F-statistic indicated the presence of five natural clusters for the 2003 sample. For comparison purposes, clusters for the 1998 sample were also computed using five clusters.[1] Table 1 presents the sample means for the expendable input clustering variables and the names of each cluster based on the most influential factor in the choice of an expendable input supplier. As will be shown in the following section, these results meet the validation criteria suggested by Gloy and Akridge (1999), i.e., that members of the segments differ in the non-clustering variables such as their demographics, general business characteristics, management practices, and attitudes.

Characteristics of Segments

The distribution of farmers across the segments remained fairly stable between 1998 and 2003, with almost no change in the size of the Balance segment. The most notable change was a reduction in the size of the Convenience segment, declining from 16.8% in 1998 to 13.8% in 2003. Both the Performance and Price segments experienced increases of 1.5%, and a small increase of 0.5% was observed in the Service segment. These demographic trends will fundamentally alter the distribution

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[1] The purpose of the comparison was to directly examine trends in the segments over time. The results for 1998 suggest four clusters. Our 2003 results indicate a new, fifth segment—the Service segment. The four clusters found in the1998 data are described in detail by Gloy and Akridge (1999).

Table 1. Mean Percent Importance of Each Factor in the Expendable Input Supplier Decision, by Segment, 1998 and 2003

	Producer Segment				
Factor	Balance	Performance	Price	Convenience	Service
	— Survey Year 1998 —				
Convenience/Location	15	6	10	57	17
Service/Information & Personal Factors	27	13	11	13	50
Price	22	19	59	17	15
Product Performance	19	56	13	7	9
Support Services	17	6	7	6	9
% of Sample	34.5	14.8	17.0	16.8	16.8
	— Survey Year 2003 —				
Convenience/Location	18	6	9	57	13
Service/Information & Personal Factors	21	9	10	13	47
Price	25	26	62	19	17
Product Performance	20	51	13	8	13
Support Services	17	7	7	5	11
% of Sample	34.2	16.3	18.5	13.8	17.3

of buying behaviors, especially with respect to relationship buyers. For instance, members of the Convenience segment are older; as they retire, this segment will decrease in size and there will be corresponding increases in the buying segments comprising younger farmers, such as the Service segment. The combined decrease in the Convenience segment and increase in the Service segment suggests that relationship buyers will increasingly behave like the Service segment. The demographics and general business characteristics for each of the 1998 and 2003 segments are reported in table 2.

In both 1998 and 2003, the Balance segment is the largest segment, with approximately 34% of the respondents (table 1). Buyers in the Balance segment consider all of the input supplier criteria to be equally important. Members of the Balance segment look for an expendable input supplier who can provide a wide array of benefits including service and information, convenience, competitive prices, and products that perform well.

The Performance segment grew by 1.5%, from 14.8% in 1998 to 16.3% in 2003 (table 1). Members of the Performance segment look for an input supplier who can provide high quality products that are reasonably priced; on average, these members placed over 50% of their emphasis on product performance and over 20% on price. The Performance segment contained the largest proportion of younger (age 54 and under) producers (table 2).

The Price segment was the second largest segment, with 17% of the respondents in 1998 and 18.5% in 2003 (table 1). Members in this segment placed a large

Table 2. Demographics and General Business Characteristics, 1998 and 2003

Demographic Characteristics	Producer Segment					Prob. of No Assoc.
	Balance	Performance	Price	Convenience	Service	
— Survey Year 1998 —						
% of College Graduates	36	40	41	35	33	0.3055
Age < 35	13	12	16	11	8	0.0121**
Age 35 to 44	27	25	21	21	20	0.0121**
Age 45 to 54	28	30	31	32	35	0.0121**
Age 55 to 64	21	23	26	22	21	0.0121**
Age > 64	10	10	6	13	16	0.0121**
Growth Expectations [a]	26	28	26	28	41	0.0438**
— Survey Year 2003 —						
% of College Graduates	41	43	46	40	31	0.0038**
Age < 35	16	16	16	13	16	0.2000
Age 35 to 44	21	24	21	19	21	0.2000
Age 45 to 54	32	34	34	27	33	0.2000
Age 55 to 64	21	16	20	25	20	0.2000
Age > 64	11	11	9	17	11	0.2000
Age (years)	49	48	49	52	49	
Contract Crop Production	34%	28%	28%	32%	31%	
Contract Livestock Production	43%	42%	42%	45%	38%	
Total Sales ($100,000s)	14.1	15.1	15.7	9.9	19.0	
Livestock	71%	72%	65%	68%	70%	
Growth Expectations [a]	25	24	28	19	26	0.1264

Notes: Double asterisks (**) denote statistical significance at 95%. Variables appearing in italics are used in the multinomial logit model.

[a] Expected percent growth in size of operations from 2003 to 2008.

emphasis, roughly 60% of their weight, on price when selecting an input supplier. Product performance was the second most important factor to this segment, at 13%, in both 1998 and 2003. This segment has the highest percentage of college graduates at 41% in 1998 and 46% in 2003, and these producers had the most ambitious growth plans (table 2).

The Convenience segment was the smallest group in 2003, and it was the only segment to decline in size between 1998 and 2003, from 16.8 to 14.8% (table 1). In both years, 57% of the average weight was placed on the convenience and location provided by an input supplier. As with the Performance and Price segments, price was the second most important factor to the Convenience segment in both 1998 and 2003. In 2003, the Convenience segment contained the largest proportion of older (age 55 and over) producers, contained the smallest operations in terms of gross sales, and had the least ambitious growth plans (table 2).

The Service segment accounted for 16.8% of the respondents in 1998 and 17.3% in 2003 (table 1). Members of the Service segment placed the most weight, close to 50%, on service/information and personal factors when choosing an input supplier.

Price was also an important factor to this segment at 15% and 17% in 1998 and 2003, respectively. This segment had the lowest percentage of college graduates—33% in 1998 and 31% in 2003. These producers operated the largest proportion of operations with sales exceeding $100,000 in 2003 (table 2).

Loyalty

Customers can be analyzed based on their degree of brand or product loyalty. The loyalty spectrum ranges from customers who are exclusively loyal to one brand to those who exhibit no loyalty, either by always purchasing something different or purchasing whatever is on sale. Input suppliers need to be aware of the loyalty status of their customers in order to target appropriate customers and to develop a suitable marketing mix for each of these target markets. Using a five-point Likert scale (with 1 = strongly disagree and 5 = strongly agree), mean responses to attitudinal statements related to brand loyalty are presented in table 3 for each producer segment. Although the results for 2003 indicate no statistically significant differences between brand and loyalty attitudes of the five commercial producer market segments, mean results are similar to those for 1998 which were statistically significant. Nevertheless, given the importance of loyalty to input suppliers, these differences can matter pragmatically.

As shown in table 3, the 2003 results indicate the Price segment exhibits the least product loyalty of all the segments on average. In contrast, the Service segment is the most loyal segment on average. Results confirm that producers in the Price segment are on average the most price elastic, and therefore suppliers need to have a low-cost strategy in order to be able to profitably supply these customers. Alternatively, producers in the Service and Convenience segments are less price elastic.

Information Sources

Input suppliers can tailor their information delivery strategies based on which information sources are important to their customers, including how their customers use computers. Table 4 reports data on producer computer usage in 1998 and 2003. Computer usage increased for all segments from 1998 to 2003, with specific market segments being particularly computer savvy; over 90% of the Balance, Performance, and Price segments used computers in 2003. These large commercial producer market segments are much more likely to use computers than producers overall. In a review of the literature on computer adoption and usage by producers, Doye (2004) found 58% of all farm households have computer access, while 75% of farms with sales over $100,000 have computer access. As expected, with the increasing popularity of the internet, there was a substantial increase between 1998 and 2003 in the use of computers for communication purposes and information gathering. This finding is consistent with Doye (2004) who notes that information gathering is cited as the dominant use of the internet by producers.

Table 3. Average Agreement with Attitudinal Statements Related to Brand Loyalty, by Segment, 1998 and 2003

	Producer Segment[a]					
Statement	Balance	Performance	Price	Convenience	Service	Prob. of No Assoc.
			— Survey Year 1998 —			
Expendable brands are more or less the same	2.6	2.5	2.8	2.9	2.7	0.0050**
Generics offer a good tradeoff between price and quality	3.6	3.5	3.5	3.4	3.5	0.1792
I will increase use of generics in next five years	3.3	3.2	3.5	3.4	3.2	0.0066**
I usually purchase lowest priced expendables	2.9	2.8	3.3	2.9	2.8	< 0.0001**
			— Survey Year 2003 —			
Expendable brands are more or less the same	2.6	2.6	2.7	2.8	2.7	0.5496
Generics offer a good tradeoff between price and quality	3.1	3.2	3.3	3.2	3.0	0.3798
I will increase use of generics in next five years	3.2	3.2	3.4	3.3	3.1	0.4985
I usually purchase lowest priced expendables	2.8	2.7	3.2	2.8	2.7	0.8057

Notes: Double asterisks (**) denote statistical significance at 95%.

[a] Values are mean responses using a five-point Likert scale (1 = strongly disagree and 5 = strongly agree).

The results for 2003 show strong significant differences between the segments in the use of a computer, the use for keeping farm financial records, the use for farm communications, and the use for information gathering. The Performance segment was the most information intensive, and was the heaviest user of computers and the internet. At the other end of the spectrum, producers in the Convenience segment were the least likely to own a computer. Likewise, the Performance segment was the most likely to use the computer to keep farm financial records, for farm communications, and for information gathering purposes, while the Convenience segment was the least likely to use the computer for all of these purposes. Nearly 60% of the Balance, Performance, and Price segments use the computer to gather information, while only 43% and 52% of the Convenience and Service segments, respectively, do so.

These results underscore that input suppliers who serve Performance, Balance, and Price buyers must have an internet presence for information delivery, and should tailor the information content of their websites to attract these buyers. In contrast, input suppliers who serve Convenience and Service segments will need to focus more on other methods of information delivery.

Table 4. Percent of Producers Who Use Computers, by Segment, 1998 and 2003

	Producer Segment					Prob. of
Practice	Balance	Performance	Price	Convenience	Service	No Assoc.
	— Survey Year 1998 —					
Do not own or use a computer	13	18	13	20	22	0.0076**
Own a computer, but not for farm business	11	8	11	9	7	0.5050
Use a computer for keeping farm financial records	69	66	67	65	63	0.4416
Use a computer for farm communications	42	31	42	33	39	0.0128**
Hire a computer farm records service	11	10	14	13	12	0.5547
	— Survey Year 2003 —					
Do not own or use a computer	8	6	9	15	12	0.0011**
Use a computer for keeping farm financial records	72	76	64	63	69	0.0010**
Use a computer for farm communications	60	66	54	50	52	0.0001**
Use a computer for information gathering[a]	59	60	57	43	52	< 0.0001**
Own a computer and use the internet[a]	78	81	81	79	76	0.7099
Order agricultural products on the internet	14%	20%	19%	10%	13%	

Notes: Double asterisks (**) denote statistical significance at 95%. Variables appearing in italics are used in the multinomial logit model.

[a] This question was not asked in the 1998 Commercial Producer Survey.

Consultants and Custom Services

Consultants and custom service providers offer valuable information and services to many commercial producers. More importantly, input suppliers can generate an additional revenue stream through these activities, as well as perhaps increase customer loyalty. From 1998 to 2003, the use of consultants generally increased for all segments, with the Balance and Performance segments experiencing the largest increases (table 5). Results further indicate significant differences in 2003 among the segments in the use of each consultant practice, while in 1998 only the use of a management consultant significantly differed among the five segments. Results for 2003 show the Balance segment is the most likely to use crop, environmental, and marketing consultants; and the Performance segment is the most likely to use an independent nutritionist. Producers in the Service segment are the least likely to have a college degree (table 2), and thus they depend on management consultants

Table 5. Percent of Producers Who Use Consultants, by Segment, 1998 and 2003

Practice	Producer Segment: Balance	Performance	Price	Convenience	Service	Prob. of No Assoc.
			— Survey Year 1998 —			
Independent crop consultant	33	33	34	32	32	0.9694
Environmental consultant	6	8	5	6	5	0.6586
Marketing consultant	24	18	22	23	20	0.4297
Management consultant	13	6	8	10	14	0.0112**
Independent nutritionist	24	21	23	22	27	0.6995
			— Survey Year 2003 —			
Independent crop consultant[a]	44	34	34	32	38	0.0014**
Environmental consultant	16	14	11	6	14	0.0037**
Marketing consultant	32	31	23	23	30	0.0072**
Management consultant	12	13	9	5	14	0.0021**
Independent nutritionist[b]	26	28	23	15	25	0.0026**
No consultants used[c]	34	37	42	48	39	0.0024**
Mean Number of Consultants	1.3	1.2	0.9	0.7	1.2	

Notes: Double asterisks (**) denote statistical significance at 95%. Variables appearing in italics are used in the multinomial logit model.

[a] Only farms growing crops are included.

[b] Only farms raising livestock are included.

[c] This question was not asked in the 1998 Commercial Producer Survey.

and others for information and advice. In contrast, the Convenience segment is the least likely to use all of these consultants, and 48% of this segment do not use any consultants. These results suggest that offering consulting services will be most critical to those input suppliers who serve the Balance, Performance, and Service segments.

The use of custom services is important; at least 88% of members of each producer segment reported using some kind of custom service in 2003 (table 6). Based on these results, offering custom services will be most critical to those input suppliers who serve the Balance and Performance segments. Balance buyers are the heaviest users of consultants and custom services, indicating they are willing to pay for high quality information and service. Price buyers have the lowest overall use of custom services and relatively low use of consultants, indicating they are unwilling to pay others to do what they can do themselves.

Salespeople

Salespeople are critical to the success of input suppliers, and they have traditionally sold the majority of products. While products are also sold through stores, and increasingly through the internet, the salesperson is still an essential channel for

Table 6. Percent of Producers Who Use Custom Services, by Segment, 1998 and 2003

	Producer Segment					Prob. of
Practice	Balance	Performance	Price	Convenience	Service	No Assoc.
			— Survey Year 1998 —			
Custom fertilizer application	66	62	56	62	63	0.1452
Custom pesticide application	61	55	51	56	58	0.1456
Custom seeding	14	7	10	9	10	0.0564
			— Survey Year 2003 —			
Use custom services	91%	91%	88%	89%	91%	
Custom fertilizer application	61	64	57	59	62	0.3895
Custom pesticide application	57	53	46	55	57	0.0090**
Custom seeding	15	14	12	14	16	0.5359
Harvesting [a]	32	27	30	23	33	0.0332**
Row crop tillage [a]	5	5	4	6	6	0.7667
Livestock waste handling [a]	20	21	15	12	16	0.0118**
Livestock finishing [a]	12	11	12	10	11	0.9540
Raise breeding stock replacements [a]	14	14	10	7	13	0.0414**

Notes: Double asterisks (**) denote statistical significance at 95%. Variables appearing in italics are used in the multinomial logit model.

[a] This question was not asked in the 1998 Commercial Producer Survey.

selling products. The most important salesperson characteristic was honesty in both 1998 and 2003, with roughly 60% of members of all segments rating it as important in 2003 (table 7). The other two very important characteristics for all segments were that salespersons have a high level of technical competence, and that salespersons provide good follow-up service.

As expected, there are certain salesperson characteristics preferred by one producer segment that another segment does not consider as important. Results for 2003 indicate significant differences among the segments for the following characteristics: "provides relevant/timely information," "brings me the best price," "is a consultant to my operation," "is a good communicator," and "calls on me frequently."

Predicting Segment Membership

Once market segments have been identified, and agribusiness managers develop marketing programs tailored to each segment, managers and salespeople face the challenge of identifying whom to target with each program. In working with producers, salespeople can easily observe a range of farm and operator characteristics, and the salespeople can also collect additional information about the farm and operator through straightforward questions. Using the information that is observable by salespeople, this research employs a multinomial logit analysis (using the Stata

Table 7. Percent of Producers Selecting Each Characteristic as One of the Three Most Important Characteristics of a Sales Representative, by Segment, 1998 and 2003

	Producer Segment					
Characteristic	Balance	Performance	Price	Convenience	Service	Prob. of No Assoc.
			— Survey Year 1998 —			
Is honest	47	48	45	43	55	0.0542
Has a high level of technical competence	34	43	34	26	30	0.0010**
Provides good follow-up service	35	34	30	33	32	0.7895
Provides relevant/timely information	28	35	27	27	25	0.1512
Provides access to supplier resources	26	28	28	27	23	0.7117
Brings me the best price	21	24	39	20	18	< 0.0001**
Knows my operation well	19	14	10	12	18	0.0051**
Is fair	11	10	9	14	15	0.1225
Is a consultant to my operation	9	7	10	7	8	0.8486
Brings me innovative ideas	24	27	23	21	22	0.6002
Is a good communicator	10	11	9	12	12	0.6907
Calls on me frequently	5	5	7	8	9	0.1087
Is a friend	8	4	6	8	8	0.3621
			— Survey Year 2003 —			
Is honest	61	64	58	59	56	0.3300
Has a high level of technical competence	51	53	45	45	46	0.1281
Provides good follow-up service	36	32	29	38	36	0.0965
Provides relevant/timely information	25	29	23	16	27	0.0052**
Provides access to supplier resources	7	6	10	7	7	0.2516
Brings me the best price	24	21	36	19	16	< 0.0001**
Knows my operation well	20	17	21	22	16	0.3798
Is fair	17	17	14	17	16	0.8317
Is a consultant to my operation	8	13	6	11	14	0.0015**
Brings me innovative ideas	12	12	9	9	11	0.4019
Is a good communicator	10	8	9	16	9	0.0124**
Calls on me frequently	7	4	7	6	11	0.0068**
Is a friend	6	6	6	6	8	0.5846

Note: Double asterisks (**) denote statistical significance at 95%.

Table 8. Results of Multinomial Logit Model Predicting Segment Membership in 2003: Marginal Effects (with standard errors in parentheses)

	Producer Segment				
Variable	Balance	Performance	Price	Convenience	Service
Total sales ($100,000s)	!0.0004 (0.0006)	0.0002 (0.0003)	0.0005 (0.0003)	!0.001 (0.001)	0.0006** (0.0003)
Livestock	0.043 (0.033)	0.017 (0.025)	!0.061** (0.029)	0.028 (0.020)	!0.027 (0.027)
Age	!0.0005 (0.001)	!0.00009 (0.0008)	!0.0007 (0.0008)	0.001** (0.0007)	!0.00005 (0.0008)
College degree	0.006 (0.025)	0.022 (0.020)	0.040** (0.020)	0.006 (0.017)	!0.075*** (0.019)
No. of consultants	0.035*** (0.010)	0.004 (0.007)	!0.017** (0.008)	!0.027*** (0.009)	0.006 (0.008)
Use custom services	0.025 (0.039)	0.008 (0.030)	!0.067* (0.034)	0.0004 (0.025)	0.032 (0.028)
Contract crop production	0.050* (0.028)	!0.038* (0.021)	!0.023 (0.022)	0.014 (0.020)	!0.002 (0.021)
Contract livestock production	0.026 (0.029)	0.028 (0.024)	!0.017 (0.023)	0.012 (0.022)	!0.048** (0.020)
Order agricultural products on internet	!0.037 (0.036)	0.058* (0.031)	0.038 (0.030)	!0.011 (0.025)	!0.048* (0.048)
Use computers to gather information	0.045* (0.026)	0.019 (0.020)	0.004 (0.021)	!0.044** (0.018)	!0.023 (0.020)
Predicted Share	35.4%	17.1%	18.1%	12.5%	16.9%
Actual Share	34.2%	16.3%	18.5%	13.8%	17.3%
$\chi^2 = 106.29$*** [40 d.f.]; Prob > $\chi^2 = 0.000$					

Note: Single, double, and triple asterisks (*) denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

8.0 mlogit procedure) to predict segment membership for the 2003 respondents. The descriptive statistics for the regression variables are provided in tables 2–7, with the names of these variables appearing in italics.

Table 8 reports the marginal effects evaluated at the means, which indicate the impact of each observable characteristic on the probability that a customer will be a member of a specific buying behavior segment. The marginal effect of the dummy variables is calculated as the discrete change in the expected value of the dependent variable as the dummy variable changes from 0 to 1. The model χ^2 statistic (106.29 with 40 degrees of freedom) is significant at the 1% level of probability. In addition, the predicted shares for each segment are consistent with the actual shares. For all segments except Performance (which has only two statistically significant observable characteristics), there are three or four observable characteristics that provide statistically significant predictive power for segment membership.

Overall, the two variables providing the most predictive power are whether the producer has a college degree, and the number of consultants hired by the producer. If the producer has a college degree, he/she is 4% more likely to be a member of the Price segment, and 7.5% less likely to be a member of the Service segment. For each consultant hired, he/she is 3.5% more likely to be in the Balance segment, 1.7% less likely to be in the Price segment, and 2.7% less likely to be in the Convenience segment. Consistent with the data presented in table 2, older producers are significantly more likely to be in the Convenience segment, and farms with higher total sales are significantly more likely to be in the Service segment.

Computer use by commercial producers and input purchases on the internet provide substantial information about their input buying behavior, but these factors may be more difficult for a supplier to observe. However, a salesperson could easily ask a producer if he/she uses the computer to gather information, and if he/she has ordered an agricultural product on the internet. If the producer has ordered an agricultural product on the internet, then he/she is 5.8% more likely to be in the Performance segment and 4.8% less likely to be in the Service segment. If the producer uses the computer to gather information, then he/she is 4.5% more likely to be in the Balance segment and 4.4% less likely to be in the Convenience segment.

Once these relationships between observable characteristics and segment membership are known by a salesperson or marketing department, the probability that the producer is a member of a particular segment can then be identified. To make this prediction, the sales manager would use the regression coefficients and the information about the producer (Greene, 1997, p. 915).[2] This approach is best illustrated by a couple of examples. For instance, Mr. Smith is 35 years old and has a college degree. His crop operation grosses $1.6 million annually, he hires five consultants, uses custom services, and uses the computer to gather information. Given this information, a salesperson would know that this customer has the following probabilities of being in a segment: 51% for Balance, 20% for Price, 20% for Performance, 8% for Convenience, and 1% for Service. Thus, the salesperson could conclude that Mr. Smith is most likely a Balance buyer (a 17% higher probability than the unconditional guess) or may be a Price or Performance buyer, but is unlikely to be a Convenience or Service buyer. In contrast, Mr. Jones is 69 years old and has a college degree. His crop operation grosses $600,000 annually, he uses custom services, has ordered an agricultural product on the internet, but does not use consultants or use the internet to gather information. Mr. Jones has the following probabilities of being in each segment: 21% for Balance, 12% for Price, 19% for Performance, 18% for Convenience, and 30% for Service. Mr. Jones is most likely a Service buyer (a 13% higher probability than the unconditional guess), or possibly a Balance, Performance, or Convenience buyer, but is unlikely to be a Price buyer.

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[2] Note (from table 8) that the sales manager's unconditional predictions about the customer's type would be as follows: a 34% probability of the producer being a Balance buyer, a 16% probability of being a Performance buyer, a 19% probability of being a Price buyer, a 14% probability of being a Convenience buyer, and a 17% probability of being a Service buyer. We are indebted to an anonymous reviewer for making this point.

The salesperson can now use this information about Mr. Smith and Mr. Jones, combined with the information about the preferences of buyers in each segment (summarized in table 9), to offer each of these customers a tailored marketing mix.

Using the multinomial logit model to predict segment membership benefits the company if the customer classification is correct. The customer will be offered a tailored marketing mix matching his or her needs and wants, and the marketing literature has demonstrated that this tailored marketing approach builds customer loyalty and increases customer retention (Kotler, 1997). Of course, this model may also incorrectly classify customers, and the cost of this misclassification depends on the flexibility of the marketing program. If the customer is offered only one program, then misclassification could prompt the customer to switch input dealers. However, if the customer is offered several marketing programs, then the cost of misclassification will be much lower. For instance, while Mr. Jones is most likely a Service buyer, there is a relatively high probability that he may also be a Balance, Performance, or Convenience buyer. The salesperson working with Mr. Jones could offer him the Service program first, but also make him aware of the Balance, Performance, and Convenience programs.

Conclusion

For agribusiness managers and salespeople, understanding customers and their preferences and behaviors is crucial to success. Using cluster analysis, this research has identified five distinct market segments for expendable inputs for U.S. crop and livestock commercial producers that can be related to the three traditional market segments (business buyers, economic buyers, and relationship buyers). Specifically, producers in the Balance and Performance segments can be categorized as business buyers. Producers in the Price segment can be categorized as economic buyers. Finally, producers in the Convenience and Service segments can be categorized as relationship buyers.

Agribusinesses have been concerned about the recent decline in the proportion of relationship buyers because they tend to be the most profitable customers for local dealerships (Downey, 2004). Due to their concern about the future profitability of local dealerships, many agricultural input supply firms are investing in other ways to sell their products, such as the internet (Henderson, Dooley, and Akridge, 2004). This study confirms that one group of relationship buyers, the Convenience segment, is rapidly declining in size. However, one significant contribution of this research is the identification of a second group of relationship buyers—the Service segment—which is growing in size.[3] While members of the Service segment share characteristics with the Convenience segment, they also have their own distinct characteristics. Notably, both Convenience and Service buyers value their relationship

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[3] In their earlier work using cluster analysis to segment the commercial producer market, Gloy and Akridge (1999) found four market segments: Balance, Price, Performance, and Convenience. As noted in footnote 1, identification of a fifth market segment (the Service segment) is unique to the current investigation.

Table 9. Summary of Important Tendencies, by Segment

	PRODUCER SEGMENT				
Description/Trait	Balance	Price	Performance	Convenience	Service
Demographics, Business Characteristics, Important Factors	▸ Largest segment ▸ Weight all decision factors equally	▸ 2nd largest segment ▸ Relatively young ▸ Highest percentage of college graduates ▸ Price and product performance are important	▸ Largest percentage of young producers ▸ High quality product and information, and reasonable price are important	▸ Smallest segment ▸ Largest percentage of older producers ▸ Smallest percentage of large operations ▸ Location and service are important	▸ Lowest percentage of college graduates ▸ Largest percentage of large operations ▸ Service and information are important
Price		▸ The most price-sensitive segment	▸ Somewhat price-sensitive		
Brand Loyalty	▸ Likely to continue purchasing branded products	▸ The least brand loyal segment	▸ Sensitive to quality differences		▸ The most brand loyal segment ▸ Low generics use
Information Sources	▸ Heavy computer use ▸ Most likely to use crop, environmental, and marketing consultants	▸ Heavy computer use ▸ Relatively low use of consultants	▸ Heavy computer use ▸ Most likely to use computer for records, communications, and information ▸ Most likely to use nutritionists	▸ Least likely to own and use a computer ▸ Least likely to use any consultant	▸ Relatively low computer use ▸ Most likely to use management consultants
Custom Services	▸ High use of livestock custom services	▸ Least likely to use custom services	▸ High use of livestock custom services	▸ Least likely to use custom services	
Salespeople	▸ High level of technical competence	▸ Offer the best price	▸ High level of technical competence ▸ Provide relevant/timely information	▸ Provide good follow-up service ▸ Good communicator	▸ Provide good follow-up service ▸ Is a consultant to my operation ▸ Calls on me frequently

with the salesperson. For the Convenience buyers this relationship has intrinsic value, while for the Service buyers this relationship is valued for the technical information and expertise offered by the salesperson. Agribusinesses wishing to market to relationship buyers need to identify those individuals who belong to the Service segment and match these producers with salespeople who have technical expertise. This study introduces one method for identifying these producers, using a multinomial logit model to predict segment membership based on observable demographic, behavioral, and business management factors.

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