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**MILKING THE MOST FROM YOUR
PROMOTIONAL DOLLAR: AN
ANALYSIS OF AGRIBUSINESS FIRMS
SERVING U.S. AGRICULTURAL
PRODUCERS**

by

Maud Roucan-Kane, Whitney O. Peake

Working Paper #07-05

July 2007

Dept. of Agricultural Economics

Purdue University

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Abstract

Although the marketing mix has been covered in great detail in many veins of literature, very little information exists regarding the mix of marketing tools within the agriculture industry serving U.S. agricultural producers. Using a survey conducted by *AgriMarketing* magazine in June 2006, a two-fold analysis is undertaken. This study attempts to determine the differences in the use of marketing tools by industry and simple regression analysis is conducted to determine promotional factors that produce a significant impact on sales. Both mass media and other promotional tools were found to be the most consistently significant factor impacting sales of firms in the study.

Keywords: marketing mix, agribusiness, promotion, agriculture, marketing, mass media.

JEL Codes: Q13, C20

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1.Introduction and Background

Elements of the marketing mix have been visited time and again over several decades across numerous veins of literature, and although information regarding this subject has increased over time, relatively few solid generalizations can be made (Leone and Schultz, 1980). One thing is certain, however, regardless of industry, firms in competitive markets exercise strategy in selecting their marketing resource mix (Carpenter, 1979). Borden (1964) first brought to fruition the concept of the marketing mix when he defined four major elements associated with marketing: product, price, promotion, and place.

Much of the more current literature involving the marketing mix tends to focus on the promotion and price aspects, and even more specifically the relationship between advertising and price. One of the major findings of this focus is that firms adept at strategically coordinating price and advertising have been found to earn greater profits than those that are not (Farris and Reibstein, 1979). Their study found that consumer businesses with relatively higher prices and correspondingly higher advertising expenditures earned greater profits than those with relatively lower prices and high advertising expenditures. Other studies in the marketing, management, and economics literature have also focused on this relationship between advertising and price from both qualitative and empirical perspectives (Dorfman and Steiner, 1954; Lambin, Naert, and Bultz, 1975; Jagpal and Brick, 1982; Welam, 1982; Thompson and Teng, 1984; Carpenter, 1987; Chintagunta, Rao and Vilcassim, 1993, Logman, 1999).

Studies regarding advertising and the marketing mix are found within the agricultural economics literature as well. The focus within agricultural economics, however, has primarily been food industry-related. Connor, Rogers, Marian, and Mueller (1985) find within the food manufacturing industries, several published studies confirm that advertising intensity is positively related to both industry margins and profits. Chung and Kaiser (1999) examine the impact of alternative measures of advertising within generic advertising programs in the fluid milk market, and determine that alternative measures of advertising exposures could potentially lead to varying results regarding generic advertising programs. Kinnucan and Miao (1999) focus on mass media to examine the relative profitability of different advertising media outlets for a generic advertising campaign financed by the U.S. catfish industry. They contend that under the generic advertising situation, magazine and radio outlets are shown to be effective advertising measures, while newspapers and television demonstrate no reliable effect on demand.

Leone and Schultz (1980) generalize from past marketing studies that primary advertising has a direct and positive effect on sales in an industry, while selective advertising has a direct and positive effect on the sales of individual companies. In general, it is concluded that advertising does positively affect both the sales within industries and companies and is, therefore, an essential element of promotion.

Advertising is the most studied form of promotional strategy, both qualitatively and empirically, since data on advertising and sales tends to be more readily available than other promotional elements. However, other forms of promotional strategy have been identified by some. Connor and Schiek (1997) propose that within the realm of promotion, the selling effort encompasses all means by which firms communicate to buyers their available product line.

Kotler (1991) presents what he calls the “promotion mix,” which as he describes, consists of four key areas: advertising, sales promotion, public relations, and personal selling. He then categorizes specific items within these elements of the promotion mix. Advertising media consists of such outlets as television, radio, newspaper, internet and magazine outlets, billboards and direct mailings of brochures and other collateral materials. Sales promotions include incentive merchandise, free trials, and other forms of gifts and premiums. Public relations encompass costs including personnel, distribution, and higher profile expenses, such as sponsorships, lobbying, etc. Personal selling occurs at many levels, two of which are trade shows and fairs. As mentioned previously advertising has been considered in a great deal of studies, while the remaining elements of the promotion mix, most of them described below, have been covered in much less detail. Connor and Weimer (1986) contend that a major limitation of literature contemporary to their article is lack of data on selling effort beyond media advertising. They assert that both unmeasured media and nonmedia advertising are likely complementary to the available data regarding measured-media. A modest number of studies, described in more detail to follow, have examined other selling costs beyond media advertising.

With data from the industrial products manufacturing industry, Farris and Buzzell (1979) alter the conventional advertising to sales ratio to include other promotional expenses. They determine differences in promotional intensity related to product, market, customer, and strategy variables. Their analysis includes the following outlets as elements of advertising and promotion expenditures: media advertising, catalogs, exhibits/displays, premiums, coupons, samples, and temporary price reductions for promotional purposes as elements. Their findings suggest that across the industrial products industry, several attributes positively affect the advertising and promotion to sales ratio, such as standardized products, many end users, etc. A component Farrell and Buzzell (1979) did not study, however, was the impact of advertising and promotion on sales within this particular industry.

Weiss, Pascoe, and Martin (1983) also study determinants of selling cost intensity using the Federal Trade Commission’s line of business survey from 1975. Rather than combining advertising and promotional expenses like Farrell and Buzzell (1979), Weiss et al. provide estimates for two types of selling costs, advertising to sales and “other selling” expenses to sales. The Federal Trade Commission (FTC) does not define “Other Selling Expense” within the data. After six informal interviews, however, the authors found that this category generally describes salesmen, point of sale displays, coupons, samples, advertising allowances to retailers and trade allowances to retailers. They then apply this information to estimate factors believed to impact both advertising and other selling costs across 85 consumer-goods lines of business.

In their study regarding the intensity of advertising and other selling expenses in food and tobacco manufacturing, Connor and Weimer (1986) also use the FTC’s Line of Business Reporting Program. They attempt to improve upon the earlier analysis of Weiss et al. (1983) through further refining of the model. To do this, they compute averages for three years and limit the analysis to 30 food and tobacco manufacturing lines. In addition, Connor and Weimer test the effect of several interesting new variables, i.e., perishability of product and number of business brands, to estimate factors hypothesized to impact advertising and promotion.

The studies detailed above do consider promotional outlets beyond the standard advertising media. They do not, however, attempt to measure the direct impact of these and other promotional tools on sales. In addition, no studies have been found which strictly target industries serving U.S. agricultural producers. To our knowledge an analysis involving the structure of the promotional mix of agribusinesses, and/or the impact of both advertising and other promotional tools on sales of agribusinesses serving U.S. producers has not yet been conducted.

The objectives of this study are twofold. First, we attempt to determine whether there are differences in promotional mix selection across agricultural industry categories. Then we examine sales effectiveness of alternative promotional strategies for firms serving U.S. agricultural producers. For the purposes of this study, alternative promotional strategies are divided into two distinct categories: mass media and other promotional tools. Mass media includes print, radio, television, and online advertising, while other promotional strategies include: public relations, direct marketing, collateral materials, company web sites, incentive merchandise, farm/trade shows, and market research.

In our attempt to fill the gap in the literature, we describe and examine the promotional strategies of agribusiness firms serving U.S. agricultural producers from both a descriptive statistics and a regression analysis perspective, using a survey conducted by *AgriMarketing* magazine. From the data supplied by seventy-five survey respondents, descriptive statistics are compiled and reported. Comparisons are made across industry by promotional outlet. Regression techniques are then employed to determine factors of the promotion mix which significantly impact sales for these agribusiness firms. Through these analyses, two primary insights are gained: (1) the similarities and differences in the promotional mix of agribusiness industries serving U.S. agricultural producers are identified, and (2) the significant factors influencing sales are determined via the regression analysis.

The results of this analysis will assist agribusiness managers, practitioners, and academics alike, through providing values by which firms in the industry can benchmark themselves in terms of promotional mix selection strategies, and by detailing how agricultural industries differ from one another in terms of promotional expenditures. In addition, advertising agencies serving these industries will find the results useful in terms of the promotional elements that appear to be most effective for leading agribusinesses. Managers of mass media and promotional tool outlets may also gain value from this study through better understanding their target markets.

2.Data and Methods

2.1 Data

In June 2006, *AgriMarketing* magazine conducted a survey of the largest agribusiness firms serving U.S. agricultural producers in an attempt to provide some idea of the marketing investments made annually by the industry. A survey questionnaire was made available online to a selected representative within each of the 146 largest agribusinesses serving U.S. agricultural producers. A total of 53 (36%) usable surveys were returned. In addition, data was gathered via telephone interview from 23 of the agribusinesses that did not initially respond, to

give a total response rate of approximately 51%. The only incentive used to encourage response was a promise that basic study results would be shared with participants.

The survey, which is found in Appendix I, requested information related to the firm's industry, number of employees, estimated dollars of sales, and marketing expenses related to print, radio, television, website space, public relations, direct marketing, collateral materials, websites, gifts, shows and fairs, and market research. Respondents were also asked to compare the current year's marketing expenditures to the previous year. The final question of the survey requested information regarding the firm's percentage of marketing communications/projects that were implemented by external agencies versus internal staff.

Questions regarding sales and advertising mix expenditures were asked in category form. For example, sales had the following ranges¹: less than \$10 million, \$10 million to \$49 million, \$50 million to \$99 million, \$100 million to \$499 million, \$500 million to \$999 million, and over \$1 billion. Categories such as the example above only provide ordinal rankings for analysis, and do not allow for a great deal of interpretation on behalf of the researcher. To mitigate this problem, categories within the survey were transformed to cardinal numbers in order to provide increased power of interpretation. For all categories except the upper bound, the midpoint was determined and substituted into the analysis². For the upper bound (i.e., over \$1 billion for the sales example), no midpoint could be calculated from the given survey data. To find an appropriate average upper bound on sales, Standard and Poor's (S & P, 2005) ranking of the top 13 agribusinesses by sales values for 2005 was used since the survey targeted the top 146 agribusinesses in the industry (Table 1). The S & P ranking contained four years of revenue values for these 13 companies. To provide a conservative estimate of average sales for this analysis, the four year average was calculated, and was determined to be \$15.8 billion.

Table 1. Leading Agribusiness Companies' Ranked by 2005 Revenues

¹ Each of the ranges to follow in this example actually extend to \$49,999,999; 99,999,999; 499,999,999; and 999,999,999 for \$49 million, \$99 million, \$499 million and \$999 million respectively.

² For example, for the sales' ranges, "less than \$10 million" was replaced by "\$5million", "\$10 million to \$49 million" was replaced by "\$30 million", "\$50 million to \$99 million" was replaced by "\$75 million", "\$100 million to \$499 million" was replaced by "\$300 million", and "\$500 million to \$999 million" was replaced by "\$750 million".

COMPANY	REVENUES (Mil \$)			
	2002	2003	2004	2005
Cargill	50,398	54,390	62,907	71,066
Archer Daniels Midland	23,454	30,708	36,151	35,944
Tyson Foods	23,367	24,549	26,441	26,014
Bunge Ltd.	14,074	22,165	25,168	24,275
ConAgra Foods	27,630	19,839	14,522	14,566
CHS Inc.	7,156	9,271	10,909	11,769
Smithfield Foods	7,356	7,905	9,267	11,354
Dean Foods	8,991	9,185	10,822	10,505
Land O'Lakes	5,847	6,320	7,676	7,557
Pilgrim's Pride	2,534	2,619	5,364	5,666
Hormel Foods	3,910	4,200	4,780	5,413
Corn Products International	1,871	2,102	2,284	2,360
Gold Kist	1,864	1,855	2,261	2,304
Annual Mean	13,727	15,008	16,812	17,599

Source: S&P 2005

Information regarding expenditures related to eleven marketing tools was requested within the survey. These marketing tool variables were grouped into two variables for analysis: mass media and other expenditures. Mass media includes basic marketing tools, such as print, radio, television, and website advertising. The other promotional tools variable includes public relations, direct marketing, collateral materials, company websites, gifts and incentive merchandise, farm/trade shows, and market research. Web site-related expenditures do enter both the mass media and other promotional tools categories. Web site advertising (mass media) refers to online advertising paid for by the firm, while company web site expenditures (other promotional tools) refer to web sites created and maintained by the firm.

As we did for the sales ranges, categorical responses regarding mass media outlays were replaced with the midpoint value for questions. An upper bound value could not be obtained from an alternative source for the category "over \$1million," since data regarding agricultural companies' expenditures on individual marketing tools is unavailable. We attempt to create a solution to mitigate this problem. First, the expenditures within the mass media category were summed to determine a total mass media expenditure outlay called TOTAL A. If any of the expenditures on a particular item of mass media was over \$1 million, the total was first calculated as if the value of the uppermost category was in fact \$1 million for those items with expenditures in the category "over \$1 million". Second, advertising to sales (A/S) ratios were determined for the companies with an expenditure of a particular item of mass media over \$1 million. If the industry of the company was chemical-related, then the A/S ratio was assumed to be 1.6%, and if the company's industry was farm machinery, the A/S ratio was assumed to be 0.8% (Advertising Age, 2006). If the industry of the firm under consideration was neither of the two mentioned previously, then an average value of 1.2% was used for the A/S ratio value. Once the ratio value was determined, the sales figure reported by that company was multiplied by the ratio corresponding to its respective industry to create TOTAL B. Finally, the value for TOTAL A for each respondent was compared to TOTAL B. If the value of TOTAL A was smaller than that of TOTALB, then TOTAL B was used in the analysis and vice versa. If none of the expenditures on a particular item of mass media was over \$1 million, then TOTAL B was not calculated and TOTAL A was used within the analysis.

In the other promotional tools category, a similar approach was taken, with the only difference being that rather than using the A/S ratio, the selling expenses to sales ratio (SE/S) was used. General and administrative selling expenses were found for twelve of the largest agribusinesses listed above through their SEC filings (Table 2).

Table 2. General and Administrative Selling Expenses for Leading Agribusiness Companies Ranked by 2005 Revenues³

COMPANY	Selling Expenses (Mil \$)		
	2005	2004	2003
Archer Daniels Midland	1080.811	1401.833	947.694
Tyson Foods	928	880	831
Bunge Ltd.	956	871	691
ConAgra Foods	1834.7	1818	1901.1
CHS Inc.	191.246	195.639	169.298
Smithfield Foods	656.4	570.8	497.9
Dean Foods	1934.438	1783.659	1595.15
Land O'Lakes	494.9	501	464.6
Pilgrim's Pride	311.6451	257.4587	136.2059
Hormel Foods	172.242	146.488	124.665
Corn Products International	158	158	149
Gold Kist	112.177	108.772	81.859
Annual Mean	735.8799	724.3875	632.456
3 Year Average	697.5745		
Selling Expenses/Sales Ratio	0.044188		

Using the selling expenses of the 12 companies reported in the table, an average sales expense of approximately \$698 million was calculated. This value was then divided by the average sales figure for the upper bound of \$15.8 billion (Table 1), which yielded an average SE/S ratio of approximately 4.4%.

If any of the expenditures on a particular item of other promotional tools was over \$1 million, the sales figure reported by each company was multiplied by the SE/S ratio of 4.4% to determine the "total advertising expenses". The total of mass media expenses, calculated with the method described in the previous two paragraphs was then subtracted from the total advertising expenses to obtain an estimated total of expenses in other promotional tools (aka TOTAL B2). TOTAL A2 was calculated the same way as TOTAL A. The expenditures within the other promotional tools category were summed to determine a total other promotional tools expenditure outlay called TOTAL A2. If any of the expenditures on a particular item of other promotional tools was over \$1 million, TOTAL A2 was calculated as if the value of the uppermost category was in fact \$1 million for those items with expenditures in the category "over \$1 million". Finally, as for the mass media total, if TOTAL A2 was smaller than TOTAL B2, then TOTAL B2 was used in the analysis and vice versa. If none of the expenditures on a particular item of other promotional tools was over \$1 million, then TOTAL B2 was not calculated and TOTAL A2 was used in the analysis.

³ Cargill served as the exception, since its detailed financial information is not available to the public. Its selling expenses are therefore not reported in this table.

Using the questions regarding information about the current year's expenditures compared to the expenditures of the previous year, we attempted to investigate the carryover effect by capturing the firm's optimism in its marketing selections from one year to the next. We created two variables, "mass media change" and "other promotional tools change." If the majority of boxes for the mass media category (print, radio, television and web site space) were checked "increase," then a "1" was assigned to mass media change. Otherwise, a "0" was assigned to "mass media change" to represent no change or a decrease in advertising media and other expenditures. The same method was used to populate "other promotional tools change" when the responses from the other promotional expenditures were considered.

In order to capture the sales force investment, a sales employee to total employee ratio was calculated using answers to the questions regarding total employees and total sales employees of the firm. Using a ratio instead of the actual values yielded the opportunity to accurately compare sales force investment (relative to total employees) of companies differing in size.

2.2 Segmentation of Respondents

From the data, three industries were identified, and five sub-industries were further defined within those industries (Table 3).

Table 3. Description, Number of Observations and Details Regarding Each Industry and Sub-industry

Industry	n	Details
Equipment	20	Supply equipment and accessories associated with crop and livestock production.
Input	40	Supply products related to crop protection, fertilizers, seed/traits, and livestock production.
Service	11	Provide agricultural financial services, insurance, or belong to trade association or check-off programs. <i>This industry is not considered for analysis, since the number of respondents is less than 20.</i>
Sub-Industry		
Crop Equipment	13	Supply equipment and accessories for field crop production. <i>This sub-industry is not considered for analysis, since the number of respondents is less than 20.</i>
Crop Input	28	Offer plant and soil nutrients, crop protection products, and seed and traits products.
Crop Protection	11	Provide crop protection products. <i>This sub-industry is not considered for analysis, since the number of respondents is less than 20.</i>
Seed	14	Supply seeds and traits. <i>Although the number of observations is below 20, the seed industry is a high volume sales industry and is considered for analysis.</i>
Livestock Input	12	Supply inputs for livestock production: animal Health/Feed/Genetics, and equipment/structures. <i>This sub-industry is not considered for analysis, since the number of respondents is less than 20.</i>

2.3 Comparative Analysis

In determining whether differences existed within the 75 survey respondents, comparative analysis was conducted using the unpaired two-sample t-statistic, which is illustrated in the following equation.

$$(1) \quad t = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{SE_{\bar{x}_1} + SE_{\bar{x}_2}}} \quad \text{with } n_1+n_2-2 \text{ degrees of freedom.}$$

Each industry and sub-industry was compared first to the entire sample, and then to one another using the unpaired two-sample t-statistic. These latter comparisons were made after ensuring each industry and sub-industry's sales dollars were not significantly different from the others, which after testing proved to be the case.

2.4 Regression Analysis

Simple ordinary least squares regression analysis was also conducted in SAS (2006) to identify the marketing tools that significantly affect sales, as well as the impact with which they do so. Several models were tested, since the dataset holds many potentially interesting variables. The general form of the model is found in equation (2):

$$(2) \quad Sales = \beta_0 + \sum \beta_i x_i$$

where *Sales* represents the dependent sales value, β_0 represents the constant, and β_i represents the coefficients on the x_i independent variables.

3.Results

3.1 Results of Comparative Analysis

Several two-tailed unpaired t-tests were conducted at different levels to determine significant differences among industries in their advertising expenses. Industries were first viewed at the industry level (defined in Table 3), and were then broken into branded versus unbranded, crop versus livestock, and capital versus expendable sub-categories (defined in Table 5) for additional analysis. Table 4 illustrates the significant differences among all industries in terms of expenditure on the marketing tools under consideration.

Table 4. Significant Expenditure Differences across Industry for Individual Marketing Tools

	Building Equipment	Input	Crop Input Sub-industry	Seed Sub-industry	Entire Sample
Mass Media					
Print					
Radio					
Television		> building equipment			> building equipment
Web Advertising					
Others					
Public Relations					
Direct Marketing		> building equipment			
Collateral Materials					
Company Websites					
Gifts					
Farm/Trade Shows		> crop inputs			
Market Research		> building equipment	> building equipment	> building equipment	> building equipment

As can be seen in Table 4, the building equipment industry tends to spend significantly less than the other industries for television and market research.

Changes in expenditures on marketing tools from the previous year to the current year and outsourcing of marketing activities were also measured. Results indicate there were no significant changes from the previous year to the current year in print and radio expenditures. In television, the decrease for the entire sample and each industry (except the seed industry) was significantly different than the lack of change experienced by the seed industry. The increase in building equipment expenditures in market research was found to be significantly lower than the increase experienced by the input industry. No significant differences were found for the remaining tools under consideration. Also no significant differences were found across industries for the outsourcing of marketing activities.

Several other ways exist in which the industries involved in this study can be separated. We looked at three such separations: branded products industries versus unbranded products industries, crop products industries versus livestock products industries, and capital products industries versus expendable products industries (Table 5).

Table 5. Description, Number of Observations and Details by Industry Category

Industry	n	Details
Branded	50	Includes firms associated with the following products or services: animal health/feed/genetics, crop protection, seed traits, and field equipment/accessories.
Unbranded	25	Includes firms associated with the following products or services: plant/soil nutrients, crop protection, farmstead/grain handling/water management, livestock equipment/structures, agricultural financial services, insurance, and trade association/checkoff.
<hr/>		
Crop	41	Includes firms associated with the following products or services: field equipment/accessories, plant/soil nutrients, crop protection, and seed/traits.
Livestock	19	Includes firms associated with the following products or services: animal health/feed/genetics, farmstead/grain handling/water management, and livestock equipment/structure.
<hr/>		
Capital	20	Includes firms associated with the following products or services: field equipment/accessories, farmstead/grain handling/water management, and livestock equipment/structures.
Expendable	48	Includes firms associated with the following products or services: plant/soil nutrients, crop protection, seed/traits, animal health/feed/genetics, agricultural financial services, insurance, and trade association/checkoff.

When the industries were separated into branded versus unbranded categories, we first tested whether the categories were significantly different in sales amounts. If sales were significantly different, then no further comparison was possible. Since no significant difference was detected between the sales amounts of these two categories, we proceeded to compare them in the analyses. Branded industries were found to have significantly greater expenditures than unbranded in the case of every marketing tool under consideration. In general, this is not an entirely surprising result. Branded industries attempt to differentiate their product from others, and one of the most common tools of differentiation is through the marketing of the product, particularly through advertising (Connor and Weimer, 1983). Since crop industries were found to have significantly higher sales than livestock industries, these two categories could not be compared.

Analysis of the industries separated into capital and expendable categories reveals that some significant differences do exist. No significant differences existed between their sales amounts, indicating the two categories are comparable. Results indicated that firms in expendable product industries spend significantly more than capital product industries in both television advertising and market research. No significant differences existed between the expendable and capital firms regarding the remaining marketing tools.

3.2 Results of Regression Analysis

Simple regression analysis was conducted for seven models to determine the impact of several independent variables on sales. The results of the regression analysis are displayed in Table 6.

Table 6: Regression Results Demonstrating Independent Variables' Effect on Sales

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	1669493162.00 (0.63)	4075077268.00 (1.54)	6100306958.00 (1.69)*	12813039662.00 (2.70)**	265480177056.00 (1.05)	2713171047.00 (1.01)
Industry	463168784.00 (1.13)					
Sales Employees/ Total Employees Ratio	-2626771384.00 (-0.36)	-3147265390.00 (-0.41)	-4117462607.00 (-0.54)	-7266337232.00 (-1.01)	-950330126.00 (-0.13)	13025153676.00 (2.98)**
Mass Media	57.76 (2.22)**	54.89 (2.06)**	59.16 (2.25)**	62.89 (2.59)**	49.70 (1.97)*	55.85 (2.24)**
Other Promotional Expenses	15.19 (1.70)*	15.72 (1.85)*	14.67 (1.69)*	8.85 (1.04)	8.32 (2.28)**	9.06 (1.04)
Mass Media Change	-4255323072.00 (-1.10)	-436166976.00 (-1.10)	-3838372043.00 (-0.94)	-3167568660.00 (-0.85)	-4188690251.00 (-1.07)	
Other Promotional Tools Change	-1239304490.00 (-0.44)	-2039081209.00 (-0.74)	-1814397422.00 (-0.66)	-57271770.00 (-0.22)	-2229313448.00 (-0.82)	
Outsourcing	-7633241.00 (-0.21)	21408821.00 (0.54)	4417317.00 (0.10)	-40544927.00 (-0.88)	4281325.00 (0.12)	
Building Equipment		-3462447230.00 (-1.34)	-4296183844.00 (-1.52)	-7827656976.00 (-2.48)**		-3285855286.00 (-1.20)
Input				-8471800373.00 (-2.30)**		-3537745256.00 (-1.40)
Crop Input			-3248988499.00 (-1.07)			
Seed		-3156289039.00 (-1.08)				
Services						
n	31	31	31	31	31	31
R squared	0.44	0.47	0.47	0.55	0.41	0.35
Adjusted R squared	0.27	0.27	0.27	0.38	0.26	0.28

* Indicates Significance at the 10% level

** Indicates Significance at the 5% level

Seven models were analyzed to test multiple independent variables' effect on sales. The following three independent variables were used across all models: sales employees to total employees ratio, mass media, and other promotional tools. The sales employees to total employees ratio variable was included across all models to capture the sales force investment made by the firm. Mass media and the other promotional tool variables were also included in all models to indicate in particular the effect of marketing tools on sales.

We expected the respective industry of the respondent companies to have an effect on sales, since sales dollars values vary among industries. The ratio of sales employees to total employees, mass media, other promotional expenses, mass media change, and other promotional tools change were expected to positively affect sales. We were uncertain as to what the results of the outsourcing variable would reveal. Some would likely argue that an advertising agency has more expertise, training, and experiences in advertising and would outperform the internal staff. Others could argue, however, that this benefit may be outweighed by the increased knowledge of the companies' target customers by an internal staff.

Multicollinearity was tested for within all models and only models unaffected by multicollinearity are reported in the table and presented below. Model 1 tested the effect of industry via an ordinal variable, as opposed to breaking the industries into dummy variables for building equipment, input, and services. Within Model 2 the ordinal industry effect variable was removed to examine the effect of the addition of the building equipment industry and seed sub-industry variables to the model. Model 3 observed the result of replacing the seed sub-industry with the crop input sub-industry category, since the crop input sub-industry encompasses the seed sub-industry. Within Model 4 the input industry was tested. Model 5 observed the effect of removing the industry categories altogether. In Model 6, the variables indicating changes in expenditures from the previous to the current year were removed as well as the outsourcing variable since they were not statistically significant across the other models. The results were then compared to model 4.

Two variables maintain statistical significance across several of the models: mass media and other promotional tools. The mass media variable is significant at the 5% level in 5 of the 6 models. In Model 5, mass media is significant at the 10% level. The other promotional expenses variable maintains significance across four models. In Models 1 through 3 it is significant at the 5% level, while in Model 5 it is significant at the 10% level. This fairly consistent significance across models indicates that promotional expenses do indeed positively affect sales levels for agribusiness companies serving U.S. producers. Unfortunately, the remaining variables do not provide a great deal of insight, since their results are much less consistent across models. Model 4 appears to have the best fit overall, and a better fit than model 6.

Models were also tested for all marketing tools, as opposed to aggregating them into the two categories, mass media and other promotional tools. Fewer observations were available under this situation, since only in the aggregate could the advertising to sales and selling expenses to sales ratios be used to determine values in excess of \$1 million. The results in this section were much poorer than those reported in the regression results of Table 9 and are therefore not presented.

In addition to those described above, models were also tested for the categories branded versus unbranded products, crop versus livestock products, and capital versus expendable products. Once again, the results from this portion of the analysis did not possess sufficient explanatory power for presentation in the results. It is likely the relatively small number of observations is at fault.

5. Limitations, Discussion and Conclusions

The data used in the analysis does hold several limitations. The survey written for *AgriMarketing* is constructed in a categorical format, which does not lend itself to a great deal of solid numbers interpretation from an academic standpoint. This leads to some difficulty in determining the accuracy of our estimates in the regression analysis. In addition, the ranges presented in categorical questions were not homogeneous. For example, the first and second lowest categorical responses (“less than 50” and “50-99”) for the second question of the survey have a range of 49 employees, while the third categorical response (“100-199”) has a range of 99 employees.

The sample size of the study is fairly small, although the number of observations is always greater than 20 and often greater than 30. We also do not know the characteristics of the non-respondent firms. *AgriMarketing* attempted to gain some insight into the non-respondents through the telephone survey. However, they only phoned a selection of the non-respondents and the first respondents were so few that a comparison of the first respondents with the phone respondents would not have led to any significant insights. Our conclusions are therefore limited to the respondents of this study and to large agribusinesses (*AgriMarketing* targeted respondents), and we cannot generalize to the entire population. An analysis of non-respondents uncovering whether the non-respondents are significantly different from the respondents would be needed for such a generalization to be made. Despite the limitations associated with the data and analysis, the analyses detailed above do reveal interesting results and implications.

Our objectives in this analysis were to determine differences in advertising expenses, both mass media and other promotional tools, across industry categories and to examine the sales effectiveness of both mass media advertising and other promotional tools. Our contribution through this paper is twofold. We study the differences and effectiveness of both media and other promotional tools used by agribusiness industries serving U.S. producers, which to our knowledge has not been done previously, and we are able to examine the carryover effect of advertising by capturing the firm’s optimism in its marketing selections from one year to the next. In addition, our findings confirm the assumption of earlier studies, in using the advertising to sales ratio and the other selling expenses to sales ratio, that both mass media and other promotional tools positively affect sales.

Through the t-test analysis, several interesting results were obtained. It was determined that the building equipment industry spends less than the entire sample in television and market research outlets. In addition, the building equipment industry was found to spend significantly less than the input industry in public relations. When industries were separated into branded

and unbranded industry categories, the branded industries were found to have greater expenditures for every marketing tool under consideration. This is not entirely surprising, given that promotion is often the means by which brands are differentiated both from one other and from generic products. When the industries were separated into capital and expendable categories, it was found that expendable product industries spend significantly more than capital product industries in television and market research outlets.

Regression results revealed that mass media and other promotional tools do tend to have a positive and significant effect on sales. In fact, mass media and other promotional expenses were the only variables that exhibited consistent positive effects on sales across all models tested. Changes in mass media and other promotional tools expenses from the previous year to the current year did not have a significant effect.

From an applied standpoint, the results obtained will provide useful benchmarking values for agribusiness managers beyond the traditional mass media measurements, since benchmarking is an efficient and necessary step for agribusiness managers to tailor a marketing strategy that best fits their company, audience, and products. In addition, advertising agencies and managers of promotional outlets serving agribusinesses can gain increased insight into the current situation of the individual industries and the differences between them, which may lead to better selection in terms of the industries they should target in priority.

To our knowledge this study is one of the first to consider the effect of other promotional tools on sales. More research is needed in that area to confirm or disprove our results, or to find new ways in which to evaluate the effect of mass media and other promotional tools on sales. In addition, the agribusiness industries serving agricultural producers have often been neglected and merit increased attention due to their importance to producers. A time-series analysis would also have been of interest, but was not possible with the data at hand. Implementing a survey in which promotional expenses are investigated over several years would certainly yield increased insight regarding the carryover effect.

Due to the limitations of the survey pointed out previously, we contend the interesting and significant results from the *AgriMarketing* survey data have been extracted in this study. One additional area of research, which we attempted, was to explore promotional mix differences within each industry. The characteristics of the survey did not allow for consistent and meaningful results regarding the advertising mix of each industry. There is future potential in the use of the *AgriMarketing* survey as a framework for the creation of a new survey in which the limitations mentioned previously are corrected.

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