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Economic Impact of Supervised Agricultural Experiences: Returns from SAE Investment Costs in Texas, 2007–2008

Roger D. Hanagriff, Associate Professor
Texas A&M University, Kingsville
Tim H. Murphy, Professor
Texas A&M University
T. Grady Roberts, Associate Professor
University of Florida
Gary E. Briers, Professor
James R. Lindner, Professor
Texas A&M University

Experiential learning, commonly called supervised agricultural experience (SAE), is a well documented, valuable, and integral part of agricultural education (Bryant, 2003; Cheek, Arrington, Carter, & Randall, 1994; Deyoe, 1953; Dyer & Osborne, 1996; Moore, 1988; Roberts & Harlin, 2007). Measuring the cost and economic benefits of SAEs would provide valuable information in communicating additional benefits of SAE programs (Cole and Connell, 1993). Results from the study presented here found that Texas entrepreneurship SAEs contributed $103 million in direct spending to the Texas economy during the 2007–2008 school year. A common measure of economic impacts is the IMPLAN Model, which provides estimates of additional economic benefits from direct spending. When the IMPLAN Model was applied to direct spending of $103 million, results indicated $189 million in total economic value from SAE related spending. The 189 million dollar economic impact is an important value and should be communicated to school stakeholders. Methods of assessment should be improved to provide more accurate estimates of value.

Keywords: supervised agricultural experiences, economic value, sae, student experiential learning, value of agriculture education

Introduction

Previous research has linked the educational value of Supervised Agricultural Experience (SAE) to student achievement and knowledge (Cheek, Arrington, Carter, & Randall 1994; Dyer & Osborne, 1996). The educational purposes and objectives built into the SAE benefit students by challenging them to gain new skills and experiences (Bryant, 2003). SAE requires investment cost such as travel and for an entrepreneurship SAE costs for supplies and capital purchases. This research reviews the educational intent and value of SAEs along with previously completed research in measuring the economic value of agriculture education. This research also produces the first measure of the economic value of SAEs in Texas, which defines SAE's economic value Texas receives for students' involved in agriculture education.

Review of Literature

Experiential learning has been an integral component of agricultural education since passage of the Smith–Hughes Act in 1917, which required students to have a supervised farm project (Moore, 2003). The act required that farm projects be an integral part of all agricultural education programs (Deyoe, 1953; Moore, 1988). Over time, the terminology of these projects evolved from supervised farm projects to Supervised Occupational Experience (SOE), to Supervised Agricultural Experience (SAE). Although historically narrow in focus, projects have been a central component of secondary agricultural education for almost 100 years. The current view on projects was broadened and modernized when The Committee on Agricultural Education in Secondary Schools released a report in 1988, often called the *Green Book*, in which the committee recommended that "emphasis should be placed on the experience and entrepreneurship, not only on the occupation" (p. 41).

The educational value of SAE has long been documented in agricultural education literature (Roberts & Harlin, 2007). Over time, "the purposes of projects in agricultural education have expanded beyond skill acquisition and proficiency to include personal development for diverse career preparation beyond agriculture" (Roberts & Harlin, 2007, p. 53). Although many types of projects are embraced, projects that focus on entrepreneurship have been central to agricultural education. Roberts (2006), for example, in his examination of experiential learning theory pointed to a statement made by Stimson (1919), which identified potential value of entrepreneurship SAEs. Stimson wrote that

> Neither skill nor business ability can be learned from books alone, nor merely from observation of the work and management of others. Both require active participation, during the learning period, in productive farming operations of real economic or commercial importance. (p. 32)

Newcomb, McCracken, Warmbrod, and Whittington (2004) noted that SAEs allow students to apply practices and principles learned in the classroom and develop new skills and abilities while being involved in these projects. Likewise, Newcomb et al. (2004) concluded that supervised experiences also improve learning, student personal development, and occupational development. Case and Stewart (1985) indicated that students with both ownership and placement SAE projects came from schools with stronger programs. In other words, strong SAE student involvement is linked to strong programs.

Extensive evidence of the educational value of SAE exists in the literature; however, the value of SAEs from an economic standpoint is less understood. Borg (as cited in Cole & Connell, 1993), at the Western Region of the American Association for Agricultural Education (AAAE) meeting presented that a study focusing on SAE related spending would meet the objectives of an impact study. Cole and Connell (1993) found that studies were completed in the Region on leadership and advancement of educational progress, but none related to economic assessment even though it was identified in 1985 as one of the areas for research.

In 1993, Cole and Connell completed a study to measure the economic impact of Oregon agriculture science and technology programs by examining teacher salaries and money earned and spent by students. They found the average program value from teacher salaries was $45,920 with an additional average value from student project spending of $97,843. In Oregon, these two values combine for a total value of $143,763, which is a total economic impact of value of $245,022. Cole and Connell recommended conducting additional research using Cost/Benefit analysis to compare the cost associated with the educational program to economic benefits from the program. They also recommended that teachers collect this type of data and place it in a form suitable to report to school administration.

Christiansen (1999), in a critique of a Georgia SAE, indicated that it is timely to research economic values in today's depressed times of lower funding. West and Iverson (1999) evaluated 174 agricultural education programs and determined that the local economic impact per SAE program in Georgia was $71,344. Additionally, they extrapolated an overall economic impact of more than $12 million to the State of Georgia.

In Missouri, data were collected from 1988 to 1997 to analyze the change in student labor income over the ten year period (Graham & Birkenholz, 1999). Total SAE labor income had increased approximately $16.1 million over the period of the study. In the final year of the study, 1997, agricultural education students in

Missouri reported a total SAE labor income of $31.8 million (Graham & Birkenholz, 1999).

Retallick and Martin (2005) published the results of a study (1991–2001) to identify the economic impact of placement SAEs in Iowa. Comparable to the Missouri study, the Iowa study focused on earned student SAE Placement income. In 2001, the Iowa study accounted for a total of $18.6 million in earned SAE income with an average annual total program with students earning $75,266.

A method to measure economic value is the Impact Analysis for Planning (IMPLAN), an input–output database and modeling system that producers multiplier values from economic models to estimate the economic impacts of spending on a region's economy (Mulkey and Hodges, 2003). This model was created in 1993 from a University of Minnesota research team that originally used the model to measure the economic impact of the forestry industry, but now is a product of MIG, Inc. This model is used in many sectors to measure the value of expenditures and their extended value as the expenses ripple through the economy causing other increases in spending. There are many levels of IMPLAN economic impact. According to Mulkey and Hodges (2003), Type II economic value is a commonly used estimate that includes values of consumable spending, salaries and use of raw materials used in manufacturing.

Blackwell, Cobb, and Weinberg (2002) identified that research in higher education as sources of economic growth are emerging. They used IMPLAN in their research and encouraged additional research. Arik and Penn (2007) measured the economic impact of Middle Tennessee State University and identified that the direct effect consists of the initial change in expenditures. The indirect effect is the sum of the round–by–round increases in business spending for inputs. Also, the University of New Mexico concluded that IMPLAN is a widely used tool for measuring expenditure impacts to the local economy and used the model in their measurement of economic value (Norton, 2004).

The available research illustrates a variety of approaches to determine the economic value of agricultural education programs. Previous studies have utilized a theoretical framework of using Placement SAE income or teacher salary as values, but a new framework would be to consider the costs of entrepreneurship SAEs since they are an educational focus and have common types across all chapters. This theoretical framework also addresses the recommendations of Cole and Connell (1993), who suggested a Cost/Benefit approach to measuring programmatic value.

Purpose

The purpose of this study was to address the recommendations of Cole and Connell (1993) and determine the economic benefit of SAE programs. Economic benefits were calculated following the IMPLAN Model for economic value, which is a set of multiplier values derived from spending within certain sectors. This model is utilized in business, education and tourism by identifying economic benefits from spending money in a certain sector. IMPLAN economic benefits have several levels of multipliers, but the most comprehensive and conservative is the Type II multiplier value. The economic values of student spending to complete entrepreneurship SAE projects are $1.80 and additional travel values associated to SAEs are $2.09. Economic values of agricultural education need to be communicated to school administration, state leaders, and potential funding sources that support agricultural education. Specific objectives of the study were:

1. Define the common types of entrepreneurship SAE projects and associated investment cost.
2. Define other expenses of agriculture education programs such as travel costs for SAE exhibits and FFA events.
3. Develop the average cost for a program's SAE projects.
4. Estimate the total investment value for all SAE projects and travel cost in Texas, and their associated economic impact.
5. Determine the total economic impact per student in agricultural education and FFA.

Methodology

Data were collected by developing an instrument in Survey Monkey, a web–based tool that assists in developing an online survey and manages email distribution lists. A survey instrument was developed that included demographic information and a list of common entrepreneurship SAE projects. The list of projects included major areas that involve common unit of measure values, such as head, acre or pen. The project list was developed from interactions with Instructional Materials Service staff and correspondence with agricultural education teachers that served as a pilot test group. Service entrepreneurship SAEs such as businesses (i.e. feed store or hay cutting business) are very different in their investment cost and were not included in the survey list. Examples of included SAE projects are animal, horticulture and crop SAEs. To measure size and value of each SAE area, teachers responded to the numbers of students involved in each area and the typical cost invested to complete each project area.

This survey instrument was pilot–tested in 2006 to Texas agriscience teachers and reviewed by the director of agriculture at Texas Education Agency; they made recommendations to the format and questions. Changes were incorporated to create the final survey instrument. Instrument reliability was established by using 22 SAE involvement questions from the pilot study. These questions and responses resulted in a Cronbach's alpha value of .80, which established instrument reliability.

Respondents were asked to reply to questions regarding demographics, years of teaching experience, FFA Area, student enrollment in the agricultural education program, and student membership in the FFA. Additionally, respondents described each SAE enterprise in their program with: (a) an estimate of the average expense to raise one unit for each SAE enterprise, (b) the total number of enterprises in their chapter during a 12–month period, and (c) the total number of students in the chapter who had each SAE enterprise. Respondents were also asked to estimate their annual travel miles associated with SAE–related FFA activities, as well as their annual hotel room usage. This study used teacher's perceived value of cost for each SAE as the most informed person involved in SAEs since they annually provide estimates of cost to parents with students involved in the program and review student's record books in preparation for FFA awards.

The survey instrument was distributed to agricultural science teachers in Texas via email following Dillman's (2000) recommendations. The sampling frame was a census drawn from the population of Texas teachers listed in the state agricultural science teacher's directory. On May 16, 2008, emails were sent to 1,426 teachers throughout Texas representing 975 FFA chapters. Only one response was requested per chapter, and the chapter FFA number was used as a control value. The initial request with two reminder emails resulted in 316 chapters completing the survey. A late series of follow–up emails was sent on June 11, 2008, with 30 additional chapters responding through June 30, 2008. The 346 usable responses represented 35% of the agricultural education programs and FFA chapters in Texas.

Economic values are represented by teachers estimated values required to complete an SAE. These values are then totaled and multiplied to the production agriculture IMPLAN economic impact value ($1.80) to determine economic impact to Texas. The IMPLAN model for estimating additional values beyond direct spending is an input–output model used to measure economic value of particular industry related financial transactions for a particular region. According to Mulkey and Hodges (2003), policymakers, industry officials, and others often need information on the total economic impacts of specific local economic sectors or on the impacts of various changes in the local economy, and these values can be determined using the IMPLAN model. In this study, the related IMPLAN values used were $1.80 for agriculture and $2.09 for travel cost in Texas. These would indicate that additional spending of $1.00 in the agriculture industry or travel industry would result in a total change in local output of $1.80 for agriculture and $2.09 for travel related values in Texas.

Handling non–responses and threats to external validity followed suggestions outlined in Lindner, Murphy, and Briers (2001). In this study, their method 1 procedure for handling non–responses was used. They recommended that if late respondents did not differ from early respondents, then results could be extrapolated to the population. The final attempt to collect responses involved a final "wave" of 30 respondents who were identified as late respondents and used as a comparison group to the 317 early respondents. In an analysis of variance, no significant differences existed between the early and late respondents in key demographic variables such as years of experience, numbers of students in agricultural education, annual hotel rooms used, miles traveled, and economic impact from SAE investments. Because no significant differences were found, results from this sample were extrapolated to represent the population of Texas agriscience programs (*N* = 975).

Results / Findings

The 347 programs included in the data reported 2007–2008 school year enrollments of 51,108 students. Of these, 28,197 were FFA members. According to the Texas FFA, 2007 membership in Texas was approximately 62,000, so chapters responding to this survey represent 45% of Texas FFA membership. Teachers had an average of 13 years of teaching experience, traveled more than 15,000 miles, and utilized 43 hotel rooms.

Responding teachers represented all FFA Areas in Texas, with the highest numbers relating to the highest concentration of teachers in the population—Area III. The population of programs in FFA areas, the percentage of total programs, and the number of programs responding by FFA area, and the percentage of the respondents from each area are reported in Table 1. Sample size is a concern of this research, but table 1 illustrates that the study is a representation of programs within Texas.

Table 1
Total Numbers of Programs and Responding Teachers/Programs by FFA Area

	Population		Sample	
FFA Area	*N*	%	*N*	%
Area I	90	9.74	22	6.34
Area II	79	8.10	12	3.46
Area III	153	15.69	62	17.87
Area IV	72	7.38	27	7.78
Area V	124	12.72	54	15.56
Area VI	82	9.13	34	9.80
Area VII	100	10.26	40	11.53
Area VIII	96	9.85	37	10.66
Area IX	84	8.62	29	8.36
Area X	95	9.74	30	8.65
TOTAL	975		347	

The first objective of this study was to measure the expenses associated with student involvement in entrepreneurship SAEs, or referred to in this study as "investment cost." These costs are the student or family investment in the experiential learning process. Investment costs could include initial purchase of inputs for sale or associated cost for raising animals such as feed, medications, rent, seed, fertilizer, chemicals, supplies, and rent.

These costs are economically valuable to the local community as they support agricultural producers, feed stores, and other supply/service businesses. As activities in these SAE project areas decrease, so would the corresponding industries providing products. The economic investment values of corresponding SAE enterprises on a Chapter level are listed in Table 2.

Animal SAEs are based on values per head, horticulture/aquaculture SAEs represent units, and crop/forage SAEs are represented in acres. Table 2 contains the frequency of SAEs and illustrates that the most frequently recognized SAE enterprises in Texas are market swine (93%), market goats (86%), and show steers (80%). Animal projects dominate the most common SAEs, but agriculture mechanics was reported by 55% of the sample as an SAE with investment cost. The less frequently recognized

SAE enterprises are equine and crop forage production, but these SAEs represent over $2,000 in SAE investment cost.

Table 2
2007–08 School Year SAE Entrepreneurship Investment Cost

SAE Name / Unit	Percent of Programs with SAE	Average Number of SAEs per Program	2007–08 Ave. Investment Per Unit *(M)*	*SD*
Market Swine / hd	93.49	34	$666.10	$406.00
Market Goats / hd	86.64	19	$515.28	$329.93
Market Beef Steers / hd	80.00	10	$2,874.06	$2,164.90
Market Sheep / hd	72.60	12	$653.22	$668.98
Reg. Show Heifers / hd	66.78	7	$2,921.47	$2,052.78
Show Broilers / pen	56.85	8	$291.81	$187.51
Ag Mechanics / each	55.48	11	$1,277.28	$1,696.58
Breeding Swine / hd	32.53	11	$644.20	$428.70
Show Heifers / hd	25.68	6	$1,576.63	$1,794.99
Breeding Beef / hd	22.60	8	$3,677.57	$4,911.49
Equine / hd	22.26	6	$2,549.38	$3,057.56
Breeding Goats / hd	18.84	15	$651.82	$740.26
Horticulture / each	18.15	55	$218.75	$678.78
Turkeys / pen	18.15	55	$218.75	$421.93
Floriculture / each	8.22	13	$95.71	$112.98
Crops/Forages / acre	7.19	11	$2,385.64	$3,882.61
Dairy Production / hd	5.14	5	$1,384.78	$1,725.05
Breeding Poultry / pen	4.45	6	$167.50	$287.20
Aquaculture / each	2.74	1	$366.00	$600.54

A second objective was to measure the associated cost of teacher travel to attend SAE–related FFA events. Travel costs are associated with active agricultural education programs and are activities that add to experiential student learning with an average cost of $12,654 per reporting program. Table 3 illustrates the average travel cost of reporting Texas programs using a standard mileage reimbursement rate and average state hotel room cost.

Table 3
Agriculture Chapter Travel Cost Associated to SAE–related FFA Events

	Average Reported Values per Program	Average Cost Value ($ per Unit)	Annual Budget Cost
Average Annual Miles Traveled	15,040	$ .585[1]	$ 8,798
Average Annually Used Hotel Room Nights	43	$ 88.92[2]	$ 3,856
Total Budget Cost			$ 12,654

[1] Texas reimbursement cost
[2] Using Texas Travel Institute 2007 Annual Hotel Rate

The third and fourth objectives were to measure the average investment cost per chapter and calculate estimated total economic value to local and state economies. The costs are associated cost of experiential learning with entrepreneurship SAEs as well associated travel cost as reported by Texas teachers.

Table 4 is a complete list of the results. Market swine are the most common type of entrepreneurship SAE, with an average chapter investment of $17,772, and the most contributing SAE with over $17 million in direct expenses to the Texas economy. In comparison, some lower frequency SAEs, such as show steers and heifers actually have a higher total value than some higher frequency SAE programs. Show steer SAEs represented over $17 million, and registered show heifers represented $13.6 million in state SAE direct expenses. Agricultural mechanics SAE frequency was slight over 50% of programs, and these programs represented SAE statewide spending of over $5.7 million.

Table 4
Average SAE Investment Values and Economic Impact to Texas Economy

	Average Chapter Investment Value[1]	Average SAE Investment Value to Texas Economy (975 Programs)[2]	Economic Impact of SAE Programs (IMPLAN Mult)[3]
Market Swine	$ 17,772	$17,327,562	$ 31,189,611
Market Goat	$6,681	$ 6,514,437	$ 11,725,987
Market Beef (show steer)	$17,657	$ 17,215,428	$ 30,987,771
Commercial Show Steer	$6,991	$6,816,285	$ 12,269,313
Market Sheep	$4,656	$ 4,539,208	$ 8,170,574
Reg. Show Heifer	$14,028	$13,677,447	$ 24,619,404
Broilers	$ 1,220	$ 1,189,547	$ 2,141,184
Ag Mechanics	$5,926	$5,778,130	$ 10,400,635
Breeding Swine	$2,105	$2,052,502	$ 3,694,504
Commercial Show Heifer	$2,587	$2,522,378	$ 4,540,281
Breeding Beef	$3,926	$3,827,459	$ 6,889,427
Equine	$3,463	$3,376,338	$ 6,077,409
Breeding Goat	$1,667	$1,625,292	$ 2,925,525
Horticulture	$729	$ 710,565	$ 1,279,016
Turkeys	$499	$486,144	$ 875,060
Breeding Sheep	$597	$582,282	$ 1,048,108
Floriculture	$94	$ 91,807	$ 165,252
Crop / Forage Production	$1,570	$1,531,020	$ 2,755,837
Dairy	$ 960	$ 936,100	$ 1,684,980
Breeding Poultry	$68	$ 65,879	$ 118,583
Aquaculture	$27	$25,898	$ 46,616
Total SAE Values	$ 93,222	$ 90,891,709	$ 163,605,076
Travel Reported Value	$ 12,654	$ 12,338,115	$ 25,786,661
Total Value	$ 105,877	$ 103,229,824	$ 189,391,737

[1]Represents the average value of all responding chapters
[2] SAE Investment values for all 975 programs in Texas
[3] IMPLAN Economic Impact values for all 975 programs using $1.80 IMPLAN–Ag & $2.09 for Travel Cost

Table 4 also illustrates economic impacts using the IMPLAN multiplier type II (1.80 for agriculture products). Greater average chapter spending versus frequency in a specific SAE area is also equal to that SAE are representing the highest economic impact, which is evident in the market swine SAE representing over $31 million in economic values to Texas economy and show steers representing almost $31 million. Agricultural mechanics SAE projects represent a statewide economic value of over $10 million with others listed in table 4.

Table 4 combines previously reported travel expense values, as reported in table 3 and represent $12,654 per SAE program. Travel values add over $12 million in total SAE directed spending and an economic value of over $25 million (using IPLAN model value of $2.09).

The total SAE value for an average agriscience program in Texas is $93,222 in direct SAE annual investment cost, $12,654 in associated travel, and a total of $105,877 in average direct spending. Extrapolating to all Texas programs, there is an estimated $103 million in direct spending. This value of direct spending represents $189 million in economic impacts that include the ripple effects of spending to the entire Texas economy. The fifth objective was to measure the economic impact per student. Comparing values for the 62,000 FFA members in Texas, the average FFA student represents $1,665 in direct spending value, and $3,055 in economic impact value, to the Texas economy.

Conclusions

The purpose of this study was to create a new methodology of research that defines the total economic value agricultural SAE program and related expenses that support experiential learning. This approach offers a new assessment model to determine economic values of experiential learning, which considering previous research is a valuable educational tool.

The first objective was to measure the different types of SAE Entrepreneurship projects and associated investment cost. Based on the data gathered in this study, it is concluded that market swine, market goats, and market beef animals are the most prevalent SAE projects in Texas. Although many have called for a diversification of SAE projects, it would appear that programs in Texas still embrace more traditional entrepreneurial animal projects. These projects are also the most economically valuable SAEs.

The second objective was to measure other expenses paid by chapters such as travel cost for SAE exhibits and FFA events. Based on values reported by teachers, it was concluded that each FFA chapter paid $ 12,654 in travel–related expenses. Comparison data from other states could not be found. This is the investment cost, but likely not all state supported as teachers travel accounts are not likely to be supported at $12,000 per year.

The third objective was to develop the average cost for a school's SAE projects. Data reported by teachers led the researchers to conclude that each school had a total investment in SAE projects of $ 93,222. This exceeds the most current average economic value by Retallick and Martin (2005) who found $75,888 per program when using placement SAE income. A conclusion is that SAE investment cost versus placement incomes are a higher measure of economic value.

The fourth objective was to estimate the total investment value for all SAE projects and travel cost in Texas and associated economic impacts. Based on the data collected, it was concluded that total value for all programs in Texas cause an estimated $103 million in SAE investment cost. This direct spending for SAE projects then represents $189 million in economic impact to Texas, which is a significant value to the state's economy. These values also relate to the fifth objective to determine the SAE and other cost per student in agricultural education. As additional students enter agriculture education programs and are involved in SAE projects, there is likely an increase in total economic values.

Expense values translate into local and state business income, which encourage jobs and economic growth. These are then potentially the economic benefits suggested by Cole and Connell (1993) as an approach to measuring economic value of SAE programs.

Recommendations/Limitations

The actual cost of each student's SAE projects from a student perspective remains difficult to determine and is a limitation of this study. However, research relating to the investment cost of student SAEs is largely unknown and this study provides a methodology and estimation of value. A statewide, or perhaps national, system should be developed to track SAE investment, expenditures, and receipts from the students themselves. FFA record books are potentially a tool, but sometimes lack consistency in the way these values are collected and lack of distribution to all students enrolled in agriculture education.

An additional limitation is sample size, but potentially is addressed by the study following the alignment of FFA areas in Texas. However, sample size is a concern, but will be addressed in future studies by increasing opportunity for involvement, greater sharing of results with stakeholders and potentially developed a random sample approach to increase validity.

As mentioned by other researchers, the economic values derived from this study offer enormous opportunity to promote the positive economic contributions of SAEs. Further research should be conducted to establish the local and state economic value of agriscience programs. Recommendation could be including other SAE areas and improving the use of record books to all students in agriculture education. Combining these data with known educational values would improve the overall assessment model of program quality and value.

One targeted result of this study is the value of these results related with weighted funding that Texas schools receive for students in career and technical programs, including agricultural education. These values are increasingly scrutinized during state budget meetings, so a recommendation to compare economic values to funding may result in measurement of value. In general, there is a growing effort to increase the fiscal accountability across the state budget. Improved assessment of SAE programs will provide solid evidence in support of continued state investment.

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ROGER D. HANAGRIFF is an Associate Professor in the Department of Agriculture and Resource Science at Texas A&M University – Kingsville. MSC 228 University Drive, Kingsville, Texas 78363, roger.hanagriff@tamuk.edu

TIM H. MURPHY is a Professor in the Department of Agricultural Leadership, Education and Communications at Texas A&M University. 107 Scoates Hall, Texas A&M University College Station, TX 77843-2116, t-murpy@tamu.edu.

T. GRADY ROBERTS is an Associate Professor in the Department of Agricultural Education and Communication at the University of Florida. PO Box 110540, Gainesville, FL 32611, groberts@ufl.edu.

GARY E. BRIERS is a Professor in the Department of Agricultural Leadership, Education and Communications at Texas A&M University. 107 Scoates Hall, Texas A&M University College Station, TX 77843-2116, g-briers@tamu.edu

JAMES R. LINDNER is a Professor in the Department of Agricultural Leadership, Education and Communications at Texas A&M University. 107 Scoates Hall, Texas A&M University College Station, TX 77843-2116, j-lindner@tamu.edu