Journal of Extension
www.joe.org

October 2013
Volume 51
Number 5
Article # 5RIB1

Measuring Agricultural Paradigmatic Preferences: The Redevelopment of an Instrument to Determine Individual and Collective Preferences—A Pilot Study

Abstract

Sustainable agriculture is an area that is gaining momentum. Extension agents are expected to teach production methods that include sustainable agriculture, yet little is known regarding how Extension agents feel about this agricultural paradigm. The research reported here sought to further develop an instrument that could quantitatively measure Extension faculty members' agricultural paradigms and be used as a program-planning tool that serves to support the identification of educational program needs. The pilot study offers a valid and reliable instrument useful to both Extension agents and administration in measuring individuals' agricultural paradigms.

Laura Sanagorski
Assistant Professor
Department of Agricultural Education and Communication
University of Florida
Gainesville, Florida
lsanagorski@ufl.edu

Theresa Pesl Murphrey
Assistant Professor
Texas A&M University
Department of Agricultural Leadership, Education, and Communications
College Station, Texas
T-Murphrey@tamu.edu

David E. Lawver
Professor
Texas Tech University
Department of Agricultural Education and Communications
Lubbock, Texas
David.Lawver@ttu.edu

Matt Baker
Professor
Texas Tech University
Department of Agricultural Education and Communications
Lubbock, Texas
Matt.Baker@ttu.edu

James R. Lindner
Professor
Texas A&M University
Department of Agricultural Leadership, Education, and Communications
College Station, Texas
J-Lindner@tamu.edu

Introduction

Educational organizations continue to integrate sustainability into their goals (Doerfert, 2011; Osborne, n.d; University of Florida, 2008) as producers and consumers demand more sustainable agricultural systems (Gonzalez, 2011; H. Res. 2419, 2008). Extension agents have been identified as key facilitators of this paradigm (Allahyari, Chizari, & Mirdamadi, 2009; Alonge & Martin, 1995).

Definitions for conventional agriculture are broad and may include large-scale, uniform, high-yield

crops and extensive use of fertilizers, pesticides, and energy (USDA, 1999). Advocates for conventional agriculture feel that this system produces higher yields (Avery, 2005; UCS, 2007; USDA, 1999), or that claims advocating for sustainable agriculture are untrue (Avery, 2005). Some sustainable agriculture proponents describe it as a critical solution to current practices, which are said to be economically, environmentally, and socially devastating (Feenstra, 2002; Hanson & Hendrickson, 2009; Rodriguez, Molnar, Fazio, Sydnor, & Lowe, 2009). For the study reported here, sustainable agriculture was defined as "an agriculture that can evolve indefinitely toward greater human utility, greater efficiency of resource use, and a balance with the environment that is favorable both to humans and to most other species" (Harwood, 1990, p. 4). Given that multiple paradigms exist, educational objectives that accommodate alternative agriculture into conventional systems need to be included in Extension programming.

The authors suggested that a group, such as Extension agents or clients, would have an informal stance towards agriculture. An understanding of Florida Extension agents' attitudes is an ideal starting point for assessing this group's position and developing initiatives to prepare agents to teach about agriculture, given that only those who feel positively towards a sustainable paradigm will promote it (D'Silva, Samah, Uli, & Mohamed Shaffril, 2011).

Emphasizing the magnitude of understanding individual attitudes within organizations, Eveland (1986) stated that, "one cannot pay people enough, long enough, to get them to do things or use tools that do not have intrinsic worth and value to them" (p. 317). Agunga (1995) asserted that it was important to study "not whether there is or isn't information on sustainable agriculture but rather how Extension agents feel about the issue and why" (p. 184). The importance of knowing Extension agents' attitudes towards agriculture continues to increase as land-grant universities "struggle with issues such as changing clientele, agribusiness industry relations, and agricultural sustainability" (Beus & Dunlap, 1992, p. 365).

Because administration cannot assume that individuals accept organizational goals, an understanding of Extension agents' perspectives towards agriculture can be valuable. Relationships between agricultural production preferences and specific attitudes have been identified (Allen & Bernhardt, 1995; Beus & Dunlap, 1994); therefore, looking at Extension agents' attitudes towards any topic they teach is useful. Using this information, individuals' likelihood to teach toward one particular paradigm can be predicted, and training needs can be better understood.

A paradigm can be described as "an example that serves as pattern" and a "framework that permits the explanation and investigation of phenomena" (Paradigm, 1997, p. 989). An individual's paradigm is expected to fall at some point between a strong conventional and a strong sustainable agricultural preference (Beus & Dunlap, 1991). For the purpose of our research, individuals' agricultural paradigms were defined as their preferred model of agricultural practices.

Beus and Dunlap (1991) developed the original paired Likert-type Alternative-Conventional Agricultural Paradigm (ACAP) scale instrument to measure paradigmatic views towards agriculture and found the instrument to significantly discriminate between the two perspectives. The scale contained 24 paired statements "that portray the respective positions of the two paradigms as anchor points on a multi-point scale" (Beus & Dunlap, 1991, p. 438). Researchers confirmed that the

scale was "appropriate and useful in studies of the agricultural intelligentsia" (Jackson-Smith & Buttel, 2003, p. 513) and "a suitable method for quantitative assessment of attitudes to agriculture" (Rasmussen & Kaltoft, 2003, p. 2). However, the instrument was found to have outdated language and double-barreled statements and has not been updated in some time.

Purpose

The purpose of the study was to revise and pilot test a new version of Beus and Dunlap's ACAP instrument (1991) to generate a tool that can be used to measure agricultural paradigms. The authors suggested that an instrument that identifies Extension agents' perceptions can facilitate the development of educational programming and can help to establish a frame for discussions about Extension policy and goals. Second, an understanding of Extension agents' and Extension audiences' attitudes about agriculture provides opportunities to focus in-service training on areas of greatest importance. In addition, an instrument that gauges agricultural paradigms could serve as a useful tool for Extension educators to better understand their audience when planning programs. Ultimately, the authors suggested that the measurement of individual agricultural paradigms within an organization would enable decision-makers to determine whether their goals are reflected or rejected by their constituents.

Methods

The instrument used in the pilot study was a revised version of the original ACAP scale. Dr. Curtis Beus granted the researchers permission to further develop this tool (personal communication, July 25, 2011). The researchers clarified items, modernized statements, and converted the revised ACAP scale into an electronic instrument through Qualtrics (Qualtrics Labs Inc., 2009). The paired statements were lettered alphabetically, which was consistent with Beus and Dunlap's design.

Content validity of the revised scale was confirmed through an expert panel of individuals with extensive knowledge of current agricultural issues and agricultural and Extension education. Language was modernized, with wording changed to apply to a broader group of respondents. For example, the panel agreed that the word "farmer" was no longer under regular use for all individuals and substituted "grower," "landowner," and "producer." The panel included four faculty members from two land-grant universities. All panelists specialized in Extension education; two were selected because of their proficiency and substantial research in program development and evaluation; one panelist was identified because of significant contribution to research evaluation methodology and survey error reduction; one was selected based upon specialization in sustainable agricultural systems. Experts' recommendations were incorporated into the pilot version of the instrument. With no instances of disagreement between panel members, all proposed changes were incorporated into the pilot instrument. Half of the scale items were reversed to reduce response set bias (Weijtersa, Geuensa, & Schillewaerta, 2009). Table 1 presents a summary of the paired scale items.

Table 1.

Summarized Scale Items and Cronbach's Alpha if Item Deleted on Revised ACAP Scale in a Pilot Study to Determine Reliability and Validity of a Revised ACAP Scale Instrument

	Summarized Scale Item	Cronbach's Alpha If Item Deleted
A	Meeting food needs with fewer farmers is positive versus negative	.936
B	Cropland should be managed for profits versus long-term capacity	.937
C	Dependence on high inputs of energy makes agriculture secure versus vulnerable	.936
D	The primary goal of profitability versus long-term condition of land	.937
E	The amount of agricultural land owned should not versus should be limited	.939
F	Science & policy should develop more technologies versus recognize production limits	.939
G	Success depends on modern technology versus experience & local knowledge	.933
H	Agricultural success will not versus will be affected by decline of small communities	.935
I	Less diverse, larger operations versus diverse, smaller operations meet agricultural needs best	.932
J	Farm traditions and culture are outdated versus essential to modern agriculture	.937
K	Farming is a business versus a way of life	.937
L	Growers should primarily use synthetic versus natural fertilizers and methods	.937
M	Less versus more people should participate in food production	.937
N	Modern agriculture is a cause of minor versus major environmental problems	.932
O	Landowners should farm as much as they can profitably versus personally	.934
P	Agricultural operations should specialize in few crops versus variety of crops	.938
Q	Soil and water should be used as needed. versus	.936

	conserved	
R	Growers should purchase versus produce most of their goods and services	.939
S	The key to agricultural success lies in overcoming nature versus harmonizing with nature	.935
T	Producers should specialize in either versus both crops or livestock	.938
U	Production of food should take place at local versus national levels	.935
V	The successful grower has an above average standard of living versus enjoys growing crops	.937
W	Technology should replace versus enhance agricultural labor	.939
X	The availability of food is evidence that agriculture is successful versus environmental consequences are evidence that it is not successful	.932
Mean inter-item correlation		.388
Cronbach's Alpha		.939

The authors' selection of pilot study participants was based on the recommendations of Johanson and Brooks (2010); they sought 24 to 30 total respondents, with 12 to15 originating from each group. The expert panel assisted in identifying 12 strongly conventional and 16 strongly sustainable respondents. Individuals were assigned to groups based on the authors' and subject experts' identification of conventional or sustainable traits and practices. Participants were not informed why they were selected to participate or that there were different groups. Scale items were coded so that strongly conventional responses corresponded with "1" and most alternative responses corresponded with "5." The sum of each individual's 24 responses was identified as the Sustainability Score variable, which could range from 24 (most conventional) to 120 (most sustainable).

Results

The instrument was piloted with 12 individuals known to adhere to a conventional agricultural paradigm and 16 individuals known to adhere to an alternative agricultural paradigm, in May and June of 2012. The authors collected descriptive data for the study group responding as a whole (n=28). The mean age was 50.3. Just over half (59.3%, n=16) were male, and just over half (59.3%, n= 16) had attended a land-grant college. Landowners who produce agricultural products to sell made up 25.9% (n = 7) of the group . The majority held either a bachelor's degree (28.6%, n=8) or a master's degree (25.9%, n=7). Some (7.4%, n=2) had completed high school only; some (11.1%, n=3) held associate's degrees; and approximately one-fourth (25.9%, n=7) had achieved either doctoral or post-doctoral degrees (e.g., DVM).

The conventional group (n=12) had a Sustainability Score mean of 67.25 (*SD*= 12.35), while the sustainable group (n=16) had a mean of 93.38 (*SD*= 19.31). Levene's test was calculated to determine homogeneity of variance between the groups in Sustainability Score, and the results demonstrated statistically significant variances at an alpha level of .05 (FLevene's= 4.407, df= 26, p= 0.046). An independent t-test for equality of Sustainability Score means was computed, and the results demonstrated that the alternative group was significantly more sustainably oriented than the conventional group at an alpha level of .01 (t=4.091, p<.001). The Cohen's d measure of effect size for this analysis was 1.60 between known groups on Sustainability Score. Based on Cohen's recommendations (1988), this value was interpreted to mean a large magnitude of relationship. Effect size measures the strength of relationship and is independent of sample size. Based on the significant difference between means and effect size resulting from this independent t-test, the authors concluded that the revised ACAP scale effectively discriminates between known groups.

Reliability was measured at .939 using Cronbach's alpha coefficient. Cronbach's alpha is an excellent measure of reliability when using scales for research (Santos, 1999) and when measuring tests that are not "scored right versus wrong" (Fraenkel & Wallen, 2008, p. 158). On a scale from 0.00-1.00, with 1.00 being the greatest level of reliability, this coefficient is considered quite reliable, for a reliability coefficient greater than 0.70 is acceptable for use (Fraenkel & Wallen, 2008). As reported in Table 1, the removal of any individual item would not result in a substantially higher reliability, and therefore, no items were removed (Radhakrishna, 2007).

Conclusions and Discussion

No adjustments to the instrument were determined to be necessary as a result of the pilot study. The data supports this instrument's use in measuring Extension agents' attitudes towards agricultural practices. Based on the reliability of the revised ACAP instrument and its ability to effectively discriminate between the two known groups, this tool can be used to collect data on populations of Extension agents and other educators as well as local Extension audiences. From an organizational perspective, Extension administration now has the opportunity to measure their educators' paradigms. Extension faculty will only teach towards and adopt agricultural paradigms that they see as having fundamental value; the revised ACAP scale can measure that value.

The revised ACAP scale could be used locally by Extension educators to better understand their audiences. For example, an Extension agent could measure agricultural paradigmatic preferences prior to conducting a workshop on some component of sustainable agriculture, such as integrated pest management. If the class strongly favored sustainable agriculture, an introduction as to the value of sustainable methods might not be necessary. If the class favored a conventional paradigm, the Extension agent might need to approach his or her programming in a different manner. Extension faculty may also find the scale useful for measuring pre- and post- program agricultural paradigms. The tool can serve Extension agents by generating quantitative data about agricultural paradigmatic changes that result from programs. Such data is valuable for reporting and quantifying one's impact in the community.

Further study should be conducted about agricultural paradigms. Descriptive data of future samples, including gender, age, Extension discipline, education attained, land-grant versus non-land-grant

education, location, and farm versus non-farm backgrounds should be collected and correlated with Sustainability Scores. This could enable factors that can predict an individual's agricultural paradigm to be identified. Correlations identified between individual factors could greatly increase Extension's understanding about their agents. This is important because it would allow for an understanding of Extension faculty in an area where little research has been conducted.

An identification of agricultural paradigms can allow administration, stakeholders, and Extension faculty to identify disparities between objectives and individual preferences within an Extension organization or a local Extension program. The data collected with this revised ACAP scale can be used to develop benchmarks and trainings based on educators' and audiences' paradigms. Ultimately, the authors anticipate that this instrument can increase the body of knowledge currently held about Extension educators and provide a tool to enable effective development of educational programming that encourages the objectives of the Extension organization and its individual, local programs.

References

Agunga, R. A. (1995). What Ohio Extension agents say about sustainable agriculture. *Journal of Sustainable Agriculture*, 5(3), 69-178. doi: 10.1300/J064v05n03_13

Allahyari, M., Chizari, M., & Mirdamadi, S. (2009). Extension-education methods to facilitate learning in sustainable agriculture. *Journal of Agriculture & Social Sciences* , 5(1), 27-30.

Allen, J. C., & Bernhardt, K. (1995). Farming practices and adherence to an alternative-conventional agricultural paradigm. *Rural Sociology*, 60(1), 297–309. doi: 10.1111/j.1549-0831.1995.tb00574.x

Alonge, A. J., & Martin, R. A. (1995). Assessment of the adoption of sustainable agriculture practices: Implications for agricultural education. *Journal of Agricultural Education*, 36(3), 34-42. doi: 10.5032/jae.1995.03034

Avery, A. (2005). Organic and conventional agriculture reconsidered. *BioScience*, 55(10), 820-821. doi: 10.1641/0006-3568(2005)055[0820:OACAR]2.0.CO;2

Beus, C. E., & Dunlap, R. E. (1991). Measuring adherence to alternative vs. conventional agricultural paradigms: a proposed scale. *Rural Sociology*, 56, 432–460. doi: 10.1111/j.1549-0831.1991.tb00442.x

Beus, C. E., & Dunlap, R. E. (1992). The alternative-conventional agriculture debate: Where do agricultural faculty stand? *Rural Sociology* 57(3), 363–380. doi: 10.1111/j.1549-0831.1992.tb00470.x

Beus, C. E., & Dunlap, R. E. (1994). Agricultural paradigms and the practice of agriculture. *Rural Sociology*, 59(4), 620–635. doi: 10.1111/j.1549-0831.1992.tb00470.x

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Doerfert, D. L. (Ed.) (2011). *National research agenda: American Association for Agricultural*

Education's research priority areas for 2011-2015 . Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications.

D'Silva, J. L., Samah, B. A., Uli, J., & Mohamed Shaffril, H. A. (2011). Towards developing a framework on acceptance of sustainable agriculture among contract farming entrepreneurs. *African Journal of Business Management*, 5(20), 8110-8116. doi: 10.5897/AJBM11.034

Eveland, J. D. (1986). Diffusion, technology transfer and implications: Thinking and talking about change. *Knowledge: Creation. Diffusion. Utilization*, 8(2), 303-322. Retrieved from: http://www.jdeveland.com/Papers%20for%20Website/diffusion.htm

Feenstra, G. (2002). Creating space for sustainable food systems: lessons from the field. *Agriculture and Human Values*, 19, 99-106. doi:10.1023/A:1016095421310

Fraenkel, J. R., & Wallen, N. E. (2008). *How to design and evaluate research in education* (7th ed., pp. 146-164). New York: McGraw-Hill.

Gonzalez, C. (2011). Climate change, food security, and agrobiodiversity: toward a just, resilient, and sustainable food system. *Fordham Environmental Law Review*, 22, 493-521.

H. Res. 2419, 110th Cong., 122 Stat. 923-1551 (2008) (enacted).

Hanson, J. D., & Hendrickson, J. R. (2009). Toward a sustainable agriculture. In A.J. Franzluebbers (Ed.) *Farming with grass: Achieving sustainable mixed agricultural landscapes*. Ankeny, IA: Soil and Water Conservation Society.

Harwood, R. (1990). A history of sustainable agriculture. In C.A. Edwards, R. Lal, P. Madden, R.H. Miller, & G. House (Eds.), *Sustainable agricultural systems*. United States: Soil and Water Conservation Society.

Jackson-Smith, D. B., & Buttel, F. H. (2003). Social and ecological dimensions of the alternative-conventional agricultural paradigm scale. *Rural Sociology*, 68(4), 513-530. doi: 10.1111/j.1549-0831.2003.tb00149.x

Johanson, G. A., & Brooks, G. P. (2010). Initial scale development: sample size for pilot studies. *Educational and Psychological Measurement*, 70(3), 394-400. doi: 10.1177/0013164409355692

Osborne, E. W. (Ed.) (n.d.). *National research agenda: Agricultural education and communication, 2007-2010*. Gainesville: University of Florida, Department of Agricultural Education and Communication.

Paradigm. (1997). In R.B. Costello (Ed.), *American heritage college dictionary* (p. 989, 3rd ed). Boston, MA: Houghton Mifflin Company.

Qualtrics. (2009). Qualtrics Labs, Inc.: Provo, Utah.

Radhakrishna, R.B. (2007). Tips for developing and testing questionnaires/instruments. *Journal of Extension* [On-line], 45(1) Article 1TOT2. Available at: http://www.joe.org/joe/2007february/tt2.php

Rasmussen, J., & Kaltoft, P. (2003). Alternative versus conventional values and attitudes in higher

agricultural education. *Biological Agriculture & Horticulture* , 20(4), 347-363. doi: 10.1080/01448765.2003.9754978

Rodriguez, J. M., Molnar, J. J., Fazio, R. A., Sydnor, E., & Lowe, M. J. (2009). Barriers to adoption of sustainable agriculture practices: Change agent perspectives. *Renewable Agriculture and Food Systems*, 24(1), 60-71. doi: 10.1017/S1742170508002421

Santos, J. R. A. (1999). Cronbach's Alpha: A tool for assessing the reliability of scales. *Journal of Extension* [On-line], 37(2) Article 2TOT3. Available at: http://www.joe.org/joe/1999april/tt3.php

Union of Concerned Scientists [UCS]. (2007). Sustainable agriculture FAQ. Cambridge, Massachusetts. Retrieved from: http://ucsusa.org/food_and_agriculture/science_and_impacts/science/sustainable-agriculture-faq.http

United States Department of Agriculture [USDA]. (1999). *Sustainable agriculture: Definitions and terms*. USDA-ARS, Beltsville, Maryland. Retrieved from: http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml

University of Florida. (2008). *UF/IFAS Extension Statewide Goals and Focus Areas for 2008-2012* . Gainesville, FL.

Weijtersa, B, Geuensa, M., & Schillewaerta, N. (2009). The proximity effect: The role of inter-item distance on reverse-item bias. *International Journal of Research in Marketing* 26(1), 2-12. doi:10.1016/j.ijresmar.2008.09.003.
