

# How Do the Missouri and Arkansas Goat Producers Utilize Extension/Outreach Avenues?

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**Abstract** – This study uses multivariate statistical procedures to explore use of extension avenues by goat producers in Missouri and Arkansas. Our analysis finds that use of an avenue is influenced by a number of factors including nature of the issue, time and scale of the goat enterprise operation. The results show that professional avenues are deeply rooted in tradition and history as the main influence on the outreach avenue. Emerging as an important and increasingly utilized avenue by many goat producers is the Internet, while demonstrational, family based and specific client need based avenues rank low in use as shown by lower averages reported by the respondents.

**Keywords** – Extension Utilization, Goat Production, Small Scale Producers.

## I. INTRODUCTION AND STUDY OBJECTIVES

The history of cooperative extension is well known as evidenced by its wide ranging impacts on agricultural production in the US and globally (Hoag, 2005). While a significant proportion of US farms (71 percent) have annual gross sales of less than \$25,000, there is no evidence to suggest these farms get more of extension's resources and support. A number of researchers, for example Jones and Garforth 1998, have recognized the role of agricultural extension in delivering information and advice to the farming community. A plethora of literature exists on cooperative extension efforts on knowledge transference pertaining to large scale producers of crop and livestock, particularly beef and dairy (Trauger et al., 2008). Yet, more and more research and outreach efforts continue to be skewed towards large scale production of crops and livestock.

A sharp contrast begins to emerge with the status quo in such areas such as technology transfer to small scale producers, particularly small ruminant producers. To date programming from research stations to extension frontline personnel and ultimately to the farmer seem to have some disconnect in certain areas. Among the disconnect areas are issues specific to small scale famers, such as a lack of attention to the ever changing economic and technological developments that tend to increase uncertainty and risk in smallholder operations. Smallholders, particularly those producing sheep and goats, are a special clientele with unique needs compared, for example, to more established crop famers (Oliver 1997; Isikhuemhen and Basarir, 2009).

This research focuses primarily on the utilization of

outreach avenues on veterinarian services, a source of management information and technology transfer for goat producers. Extension services use a number of techniques and methods to deliver programming, including individual or group visits, organized meetings, use of model farmers, demonstration plots, information and communication technologies, and farmer field days schools (Chase, Ely, and Hutjens, 2006). To date extension/outreach is more amenable to established crop and livestock farmers. It is generally assumed that the plurality of modes of service delivery offer opportunity to reach various types of farmers with different needs in various settings. Albeit the understanding that small scale producers do have special issues and concerns that render the modes of delivery sometimes beyond reach. In an effort to provide greater opportunity for identifying effective mechanisms for ensuring that such farmers acquire the information they need to enhance their businesses, we attempt in this research to explore what adaptations, if any, to the current delivery mechanisms would enhance delivery efficiency, and create user friendly programming that is accessibly to those endowed with fewer resources and greater time and labor constraints such as smallholder producers.

It is now well established that goat production is one of the fastest growing agricultural production systems in the United States today (Ekanem et al., 2013; 2016; Onyango et al., 2015; Okpebholo and Kahan, 2007). To sustain the growth and tap into the ever growing demand, farmer friendly outreach efforts are pertinent in order to bridge the information gap in production, processing, and marketing. In so doing, it is hoped farmers will quickly get solutions to issues that impede the smooth running of their enterprises. While there are well established mechanisms for effective control of internal parasites, issues on marketing strategies for goat products, inadequate expert information, and capital availability continue to hinder the full potential of the goat industry (Kenyon et al., 2009).

According to Gipson, 1999, USDA started collecting structured data on goats as recent as 1997. It may therefore be a fair statement to say that use of extension avenues by small ruminant producers, particularly goat producers, may be an area not well researched. These producers are not only constrained by time, but also lack critical industry knowledge and capital to do well. In order to succeed in nurturing this growing small ruminant-goat industry, producers' special circumstances should be taken into consideration. The research question therefore is how effective and responsive are the outreach avenues with

respect to this segment of producers. What factors influence outreach avenue utilization? The study's main objective is to identify extension/outreach avenues targeting small scale producers, and their utilization in enhancing goat production. Specifically, (i) identify and estimate the relative importance of the factors underlying utilization of outreach avenues; (ii) develop a profile of each outreach avenue; and (iii) explore the relationship between producers' socio-economic characteristics and utilization of the outreach avenues. To examine the research question, the study uses survey data from Missouri and Arkansas collected in 2013.

The information generated by this study is useful not only to farmers but also to policy makers to improve effectiveness of the outreach provider-farmers' relationship. It may also contribute toward development of efficient and effective outreach strategies for the goat industry in particular, and other small ruminants in general. A unique contribution of this study is a better understanding of what underlies successful small ruminant's outreach/extension efforts.

## **II. METHODOLOGY: DATA, VARIABLE DEFINITIONS AND EMPIRICAL MODEL**

A survey instrument was developed by Missouri State University with collaborating investigators from Lincoln University and Arkansas State at Monticello. Before implementation, the survey instrument benefited from expert evaluation (veterinarians, university professors, extension personnel, and experienced goat producers), whose input helped improve quality and clarity of questions. The survey elicited information on personal demographics, farm characteristics, farm management protocols, product marketing, and information sources.

The target population was the dairy and meat goat producers in Missouri and Arkansas. Producer addresses and emails were obtained from national registry organizations and university extension services mailing lists. Duplication between species and resources was removed to prevent sending more than one survey to any one operation. A total of 1,087 producers made up the final email list. Missouri and Arkansas producers were sent the survey in November 2013 via a Survey Monkey® online questionnaire. Printed copies were prepared and mailed by Missouri State University to 37 producers with limited access to the internet. Printed copies were mailed with a cover letter and postage paid return envelope enclosed. A reminder email was sent to non-respondents two weeks later. Survey completion required approximately twenty minutes of the respondents' time. Approximately 73% of the email list consisted of Missouri producers and 27% were Arkansas producers. Fifteen surveys were returned by producers who no longer owned goats. Three surveys were returned from producers outside of the target area and 98 surveys were deemed undeliverable by Survey Monkey®. Of the web-based and mailed surveys, 206 were viable and are used in analysis, yielding a response rate of 21.2%.

The study analysis is based on responses to 21 questions relating extension/outreach avenues. Respondents were asked to rate on a scale of 1 through 4 the frequency of services from the veterinarian, how often they use sources of information for production management/animal husbandry and sources they contact when seeking for new technologies on goat production. Using a Likert scale rating=1 to indicate never gets service from the veterinarian; or never utilizes a source for information about health and management of the herd; or never consults a source for new goat production technologies. A rating =4to indicated the respondent often got service from the veterinarian; utilized a source for information about health and production management; or consulted a source for new technologies on goat production. An average score=2 denoted an indifferent or neutral response. A set of questions relating to the three areas; veterinarian service use; utilization of an information source for management of the goat enterprise and for acquisition of new goat production technology was posed to the respondent:

1. *“How often do you receive the following services from your veterinarian? (e.g., care for sick animals, veterinary supplies, etc.)*
2. *How often do you use the following sources to get information about your goat health and production management? (e.g., university extension system, family, fries, internet. Etc.)*
3. *How often do you consult the following sources to learn about ne goat practices? (e.g., university extension system, family, fries, internet. Etc.)*

Principal components factor analysis (PCA) was used to reduce the 21 questions exploring outreach avenues with respect to producer's use of veterinarian service; information sources for current animal health and production management, and source utilization for new goat production technologies to a smaller set of factors. A standard latent root equal to one and a Screen test were used to establish how many factors to retain, followed by a confirmatory analysis to ensure internal reliability of the factors. Next, a two-stage cluster analysis was employed to identify clusters of outreach avenues serving the particular aspect of a goat production enterprise. ANOVA tests were applied to examine inter-cluster heterogeneity. Finally, a regression analysis was applied on the standardized factor scores obtained from the PCA to explore the relationship between the identified outreach avenues and the socioeconomic attributes of the goat producers. The selection of the analytical methods used is based on the variable measures, all of which were ordinal; however, in the presence of continuous and ordinal measures, then alternative methods are called for. All the 21 variables used in the analysis were ordinal measures, and factor analysis was the logical analytical method to identify underlying factors that explain the pattern of correlations within a set of observed variables. The factor analysis was followed by clustering, whose strength lies in its ability to discover some or all of the hidden patterns.

### III. EMPIRICAL RESULTS: EXTENSION/OUTREACH AVENUES

Table 1 presents the mean, standard deviation and factor loadings from the PCA, obtained after a Varimax rotation of consumer responses to the 21 questions, exploring utilization of outreach/extension avenues. Factors are ranked in order of the proportion of variance explained, and are labeled to reflect the latent stimuli underlying outreach avenue utilizations. Means on questions relating to veterinarian services use, sources utilization of management and new technology information in goat production suggest relevance of the variables in defining the latent dimensions on the bundle of factors underlying the extension avenue utilization. The mean scores and factor loadings from factor analysis are used concurrently for meaningful interpretation. Factor loadings of  $>.49$  as in this study is an excellent indication of a solid factor (Costello and Osborne, 2005; Jensen et al., 2014). As reported in Table 1, the analysis identified six factors important in outreach avenue utilization by goat farmers on technology transfer and management of goat enterprises. Together, these factors accounted for 64% of the variance, and are summarized in the discussion below.

#### *Professional Informational Avenues (Factor 1)*

This factor accounts for 16% of the error variance, and may be described as the major avenue used by goat producers. The factor brings together university cooperative extension, group meetings, industry/association meetings, farm field days and farm magazines. The factor loadings and mean of each of the variables is quite high suggesting the relevance of banding together those avenues. This grouping reflects use of those goat producers seeking to get expert knowledge on certain subjects.

#### *Specific Need Based Avenues (Factor 2)*

This factor groups together essential services that can only be provided by a veterinarian. For example, care for sick animals cannot be done by just anybody, nor can veterinarian supplies such drugs syringes and needles be obtained by a lay person. Once faced by issues beyond which producers can find a solution, they may pay a consultant to diagnose and provide an appropriate remedy. While goat producers seek services of specialist in some areas, they appear less worried about the vet providing herd health management and reproductive assistance as reflected by means below 2 on the scale of 1-4, suggesting producers will direct their resources elsewhere unless it is absolutely necessary. This factor accounted for 13% of the variability.

#### *Management Training Educational (Factor 3)*

Although these were low priority need areas as reflected by means below 2 for all of the variables (questions), explain 11% of the variability. Producers need good records not only to know how profitable their enterprises are, but also to provide accurate and good records for their tax returns every year. They will need training on overall management for efficiency and profitability to produce quality records.

#### *Demonstrational Outreach (Factor 4)*

Use of videos and farm visit are critical experiential learning activities for some producers. This factor may reflect a producer who is time pressed and can quickly benefit from this avenue by making quick reference or by the extension agent or specialist who visit the farm to provide advice. This factor also explains about 11% variability.

#### *Consultation/Symbiotic Approach (Factor 5)*

We call it so as it brings together and uses families and friends as an effective way of sharing information on the goat industry. Additionally, farmers can use computer programs such as accounting spreadsheets, and feed rations for running their enterprises. This factor also explains about 7% variability.

#### *Technology Based Approach (Factor 6)*

This factor though standalone it reflects the practical reality that as computers and other gadgets for accessing internet become more readily available to farmers, more of them will turn to the internet and Google various topics related to their enterprise. There is plenty of information to be gathered from this avenue and is definitely cost effective as one can in real time, depending on the issues, get some resolution that it could have taken a long time to get a consultant/veterinarian to respond. This factor also explains about 6% variability.

### IV. CLUSTER ANALYSIS

The means and standard deviations of the standardized factor scores and the number of respondents in each cluster are reported in Table 2. The analysis identified four clusters based on the importance respondents placed on each outreach avenue. The results were obtained by subjecting individual cases to non-hierarchical clustering. The number of clusters was determined based on interpretability and external validity using the criteria of increases in cluster coefficients as clusters merge. The ANOVA tests suggest significant heterogeneity on the importance Missouri and Arkansas goat producers placed on each of the six factors. Respondents chose one of four clustered avenues as preferred given the state of their goat enterprise (Table 2). For example, respondents in cluster one, "Web based users," are significantly different from the other clusters in that they were more likely use Internet to resolve their outreach needs ( $F [3, 1,202] = 34.31, p < 0.05$ ), as shown by a relatively higher mean score on internet use compared to the other clusters. The four groups (clusters) of respondents are described below and are named to reflect the dominant outreach avenue used in their production system as reflected by the mean factor scores.

**Web based users:** This is largest grouping of the goat producers surveyed representing 43 percent of the farmers. They predominantly use internet to resolve farm needs. This group of farmers care less about farm visits and on farm demonstrations. In addition, they make little use of established outreach mechanisms such as university extension services. They may use services of a friend or family to consult on matters relating to their farms. The

result may suggest that the internet is an increasing avenue of information dissemination for goat producers. As to why this is happening further research is required.

**Traditional users 1:** This is the smallest cluster with 8 percent of the respondents. Basically these farmers rely on the traditional approaches to extension. The factor scores suggest producers in this group prefer on farm demonstrations and farm visits. They will learn more from university extension staff, group meetings, industry association meetings, farm field day and use farm magazines and newsletters. . They may consults with family and friends and are not generally opposed to the use veterinarian services for example in caring of animals or administering drugs.

**Traditional users 2:** This group of farmers are almost similar to the previous group, but the distinguishing feature is they heavily rely on Professionals Avenue for their advice, for example use of the university extension staff and/or industry/association meetings. As seen from factor scores, they are opposed to using family or friends for advice. The group comprises about 25 percent of the producers.

**Veterinarian users:** About 25 percent of the respondents belong to this group. This group predominantly will seek the services of a veterinarian for animal care, supplies such as drugs, advice on nutrition and reproduction assistance. They sometimes are ready to consult family members or friends on certain farming issues. Interestingly they would rather have all their farming issues be resolved by the veterinarian than switching on the internet to provide answers to what is at stake in their farming practice.

Table 3 reports the personal attributes of respondents to various clusters. The Chi-square tests reject the null that there is no association between respondent's views on avenue use and their social economic characteristics. Significant results rejecting the null hypothesis were those relating to enterprise type, education, income and farming experience. On the other hand there was failure to reject the null in relating the cluster/famer groupings on basis of age, gender and state.

## V. CONCLUSIONS

Although cooperative extension has been in existence for quite some time, its use and impact has been largely on established crop and livestock enterprises. Given the increasing demand for goat products in the recent past, research interest is picking up in a sustainable manner. This study explored goat producer's utilization of extension/outreach avenues in Missouri and Arkansas. Results indicate outreach avenues utilized for services, production management information sources and sources for new technology by goat falls into six factors. The avenues range from the traditional approaches relying on land grant university cooperative extension in both the 1863 and 1890s institutions, to the internet route to transfer and share information, as well as obtaining new technologies in the goat industry. Goat farmers utilize specialized or need based approaches whenever they are dealing with the health and reproductive issues on their animals. As in beef, dairy, and crop farming, goat famers obtain information from other famers (friends and family). Additionally, they use demonstration based approaches through farm visits and on farm demonstrations on certain aspects of goat production. Though the frequency was below average, goat farmers used management approach on issues relating to kid disbudding, tattooing, record keeping and nutrition education. The results of cluster analysis suggest that different groups of goat producers place varying importance on the different outreach delivery mechanisms. Some expressed strong sentiments to use internet as their tool for getting information, resolving animal health issues or obtain new technologies on goat production. Others are more attuned to using the traditional approaches while some will prefer to with resolve their farming issues with the services of a veterinarian. Significant results rejecting the null hypothesis were those relating to enterprise type, education, income and farming experience. On the other hand, there was failure to reject the null in relating the cluster/famer groupings on basis of age, gender and state.

**Table 1: Varimax Rotated Factor Loadings Goat Producers Utilization of Extension/outreach Avenues**

	Mean	SD	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
<b>Factor 1: Professional informational outreach</b>								
Extension/University Staff	2.02	0.91	.753					
Group Meetings	2.21	0.93	.740					
Industry/Association meetings	2.25	0.95	.703					
Magazine/Newsletter	2.80	0.77	.631					
Farm field day	1.78	0.81	.574					
Farm magazines	2.65	0.88	.505					
<b>Factor 2: Specific need based outreach</b>								
Care for sick animals	2.57	0.71		.801				
Vet Supplies (e.g. drugs, needles, syringes)	2.57	0.96		.781				
Herd Health Management	1.93	0.88		.708				
Veterinarian, nutritionist, or other paid consultant	2.36	0.93		.602				
Reproduction assistance	1.57	0.72		.508				
<b>Factor 3: Management Training educational</b>								
Kid management (e.g. disbudding, tattooing)	1.36	0.72			.779			
Hoof trimming	1.42	0.67			.601			



Record keeping	1.14	0.44			.576			
Nutrition assistance	1.42	0.67			.557			
<b>Factor 4: Demonstrational outreach</b>								
Video/DVD	1.62	0.72						
Farm visits	2.11	0.87				.869		
On-Farm demonstrations	1.89	0.86				.789		
<b>Factor 5: Consultation approach</b>								
Family and friends	2.64	0.97					.767	
Computer programs	1.82	0.89					.490	
<b>Factor 6: Technology based approach</b>								
Internet	3.26	0.80						.864
Percent variability explained (Total=64%)			15.69	13.20	10.98	10.74	7.21	6.43
Note: The mean is the average of raw scores of each question reported on 1-4 scale with 1=Rare and 4=often. Factor loading of less than .49 are not reported								

Dimension of Extension Avenue	Web based users	Traditional users1	Traditional users 2	Services based users	F-Statistics
Number of Observations	91	17	49	49	
Professional informational outreach(Factor 1)	-.061 (.80)	<b>.495</b> (.94)	<b>.511</b> (.90)	-.570 (.90)	14.90*
Specific need based outreach (Factor 2)	.026 (.69)	.393 (.87)	-.582 (.98)	<b>.397</b> (1.08)	11.68*
Management Training educational (Factor 3)	-.214 (.51)	2.352 (.90)	-.100 (.71)	-.318 (.64)	87.95*
Demonstrational outreach (Factor 4)	-.456 (.70)	<b>.538</b> (1.10)	<b>.439</b> (.95)	.221 (.92)	16.31*
Consultation approach (Factor 5)	.238 (.76)	.421 (1.01)	-.904 (.87)	<b>.316</b> (.73)	27.52*
Technological approach (Factor 6)	<b>.458</b> (.66)	.182 (.98)	.013 (.66)	-.927 (.97)	34.31*

Note: Values are Mean of standardized factor scores with standard deviation in parentheses. F-statistic is from ANOVA analysis of Inter-cluster differences. Asterisk(\*) denotes significance of .05 level or better

	Web Based Users	Traditional users 1	Traditional users 1	Need based users
<b>State</b>	<b>Chi Square =5.056</b>			
Arkansas	55.6%	7.9%	19.0%	17.5%
Missouri	39.2%	8.4%	25.9%	26.6%
<b>Age</b>	<b>Chi Square =12.855</b>			
18-40	34.8%	6.5%	23.9%	34.8%
41-50	52.7%	3.6%	23.6%	20.0%
51-60	42.6%	9.8%	31.1%	16.4%
over 60	42.9%	14.3%	14.3%	28.6%
<b>Enterprise Type</b>	<b>Chi Square =19.201*</b>			
Mixed	25.0%	14.6%	29.2%	31.3%
Dairy	48.1%	8.6%	13.6%	29.6%
Meat	43.1%	4.6%	36.9%	15.4%
<b>Gender</b>	<b>Chi Square =4.310</b>			
Female	48.0%	7.2%	24.8%	20.0%
Male	37.2%	10.3%	21.8%	30.8%
<b>Education</b>	<b>Chi Square =27.759*</b>			
Less than high school	23.1%	0.0%	15.4%	61.5%
High school Diploma	53.8%	12.8%	12.8%	20.5%
Vocational	54.8%	3.2%	22.6%	19.4%
Associate Degree	52.6%	5.3%	21.1%	21.1%
some college	37.0%	7.4%	22.2%	33.3%
Bachelor's Degree	33.3%	6.7%	35.6%	24.4%
Graduate	41.4%	17.2%	31.0%	10.3%
<b>Income</b>	<b>Chi Square =32.618*</b>			
Less than 15K	51.4%	4.3%	26.4%	17.9%
15-32,499	22.6%	12.9%	16.1%	48.4%
32500-59,999	23.5%	23.5%	29.4%	23.5%
60K-99,999	55.6%	11.1%	0.0%	33.3%
Over 100K	33.3%	33.3%	33.3%	0.0%
<b>Goat Farming Experience</b>	<b>Chi Square =7.134*</b>			
less than 10 years	40.2%	13.8%	24.1%	21.8%
More than 10 years	39.5%	5.3%	13.2%	42.1%

Note: The Chi square Statistics tests the null hypothesis of no association between each variable and the cluster memberships. Asterisks denote significance at .05 level.



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