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The Impact of Socioeconomic Factors on Selected Practices by Small Livestock Producers in Alabama

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Abstract
Socioeconomic factors are generally believed to affect practices of small livestock producers. Yet, there has been limited research on the issue, especially in Alabama. This study, therefore, focused on the impact of socioeconomic factors on practices of small livestock producers in Alabama. Data were obtained from a convenience sample of 121 producers from South Central Alabama, and were analyzed using descriptive statistics and logit analysis. The socioeconomic factors reflected a higher proportion of part-time farmers; many more middle-aged persons, with at most a two-year/technical degree or some college education; and a higher proportion with $40,000 or less annual household income. A majority practiced rotational grazing; had parasite problems; used veterinary services; kept records, and nearly half conducted soil tests regularly. In addition, several socioeconomic factors had significant effects on selected practices; farming status had a significant effect on rotational grazing; education and income had significant effects on parasite problems; age had a significant effect on veterinary services; and race/ethnicity and education had significant effects on record keeping. The findings suggest that socioeconomic factors are important and must be considered in program implementation.
Keywords: Socioeconomic Factors, Practices, Small Livestock Producers

1. Introduction

According to the FAO (2006a), the livestock sector generates 18% of greenhouse gas emissions, more than all vehicles, usually thought to be the largest cause of greenhouse gases. Furthermore, the FAO (2006b) emphasized that 70% of all agricultural land, and 30% of the earth's land surface are directly or indirectly involved in livestock production. As a result of the above, FAO (2006a) argued that the livestock sector is one of the top two or three most significant contributors to environmental problems, leading to land degradation, water pollution, and increased health problems. Ilea (2009) stressed that these problems will not go away if more farms shift from being traditional, extensive, decentralized family farms to more intensive and industrialized livestock production farms. Nierenberg (2006) observed that intensive livestock farms, which are common in Europe and North America, raise animals in confinement at high stocking density, using modern machinery, and biotechnology. According to her, while industrial and intensive farm animal production has benefits, it also brings with it growing concerns for public health, the environment, animal welfare, and impacts on rural communities.

Concerns generated from industrialized production have caused consumers to seek sustainable and healthy alternatives in the food system. Thus, consumers' demand for alternative foods with various attributes, such as local, natural, certified organic, and grass-fed, is growing nationwide (Mathews & Johnson, 2013). The local food system is one of the fastest growing, most promising markets in agriculture today, creating opportunities for small-scale producers and local communities. Delate, Martin-Schwarze, & DeWittlowa (2005) explained that local food is based on a central idea that when food is grown and sold locally, it is better for farmers, better for communities, better for the environment, and better for consumers in both taste and nutrition. Furthermore, the Food Marketing Institute (2009) argued that even though local food consumers are demographically diverse, they are very similar in their motivation for buying local. For example, Guptill & Wilkins (2002) assessed trends in food retailing, and found that there was a growing trend for locally grown or raised foods among consumers. They contended that consumer interest in local food derives from their preference for high quality fresh produce, and concern about the local economy, food safety, chemical use, and genetic engineering.

Small-scale producers across America are helping to meet the increased demand for local food, yet they face significant constraints. Shipman (2009) and Guptill & Wilkins (2002) reported that local food producers, who often run small-scale farm operations, find it difficult to meet intermediary demands for high volumes, consistent quality, timely deliveries, and out-of-season availability. Additionally, LeRoux, Schmit, Roth, & Streeter (2009) emphasized that farmers face marketing risks when selling in the local markets (low sale volumes), price competition from multiple sellers with same products, and rejection based on quality requirements and inability to meet specifications. According to Shipman (2009) and Tropp & Barham (2008), growers often need education and training at the local level to meet market requirements and expand access to local customers on issues related to risk management, appropriate post-harvest practices, record keeping, enterprise budgeting, good agricultural practices certification, and liability insurance requirements.

Although practices of producers are very important, there has been limited research on practices affecting small producers, let alone socioeconomic factors and their effects on small livestock producers in Alabama where there are many small livestock producers. The purpose of the study, therefore, was to assess the impact of socioeconomic factors on selected practices of small livestock producers in Alabama. Specific objectives were to (1) identify and describe socioeconomic factors, (2) describe and assess selected practices, (3) develop models for selected practices, and (4) estimate the extent to which socioeconomic factors influence selected practices.

2. Literature Review

Previous studies (e.g., Bukenya & Nettles, 2007; Pruitt, Gillespie, Nehring, & Qushim, 2012) have focused on livestock producers from different perspectives. In order to have a sense of socioeconomic factors and practices, this section provides a succinct description of germane previous studies. First, we focus on selected literature on socioeconomic factors and relatedness to livestock producers. Second, we deal with selected literature on practices by livestock producers.

2.1 Socioeconomic Factors

Percival (2002) assessed the economic characteristics of the meat goat industry in the southeastern U.S. He reported that 64% of respondents were males; 75% were Whites; nearly half (49%) were 41-60 years old. Also, 33% had at most an associate's degree; 43% had a bachelor's degree, and 38% were part-time farmers.

Leite-Browning, Buckenya, Correa, Batiste, & Browning (2006) examined the demographic characteristics of goat producers in Alabama. They reported that 45% of respondents completed high school and 37% had college degrees; 28% were 56-65 years old. Additionally, 42% earned less than $50,000 per year; 19% earned $50,000-$99,000, and 85% were part-time farmers.

Paul, Che, & Tinnon (2007) surveyed cattle producers in the High Plains, after the December 28-31, 2006, blizzard. The authors reported that 79% of the producers were males; 81% were 37-64 years. In addition, 11% had high school education or lower and 40% had some college education or a college degree; 27% earned below $40,000 in annual household income; 63% earned $40,000-$99,999 in annual household income, and 18% earned more than $99,999 in annual household income.

Ward, Vestal, Doye, & Lalman (2008) evaluated factors affecting adoption of cow-calf production practices. About 89% of the beef cattle producers interviewed were males; 91% were Whites; 60% were 50 years old or older; 80% had, at least, some college education. Also, 51% earned less than $60,000 in annual household income, and 70% were part-time farmers.

Mcbride & Mathews (2011) investigated the diverse structure and organization of U.S. beef cow-calf farms. They reported that, by region, 32% of cow-calf producers were in the Southeast; 27% were in the Southern Plains; 16% were in the North Central, and another 16% were in the Northern Plains. Considering cow-calf only operations (i.e., minus cow-calf/stocker operations and cow-calf/feedlot operations), 39% were in the Southeast; 33% were in the Southern Plains; 13% were in the North Central, and 9% were in the Northern Plains. In examining owner characteristics, McBride & Mathews reported the mean age for cow-calf producers as 60 years; 36% were more than 65 years; 36% had completed college, and another 36% had off-farm employment. Similarly, the mean age for cow-calf only producers was 61 years; 42% were more than 65 years; 23% had completed college, and 41% had off-farm employment.

Tackie, Ngandu, Allen, Baharanyi, & Ojumu (2012) examined the characteristics and status of small and limited resource meat goat farmers in the Alabama Black Belt Region. Exactly 55% of the farmers were 46-65 years of age; 80% were males; 70% were Blacks; 40% had high school education or lower and 30% had an associate's degree; and a little more than 50% were part-time farmers.

Joseph (2013) assessed the cultural production practices, factors leading to adoption of production practices and technologies, and preferences for receiving information on beef cattle. The author reported that about 44% were 41-60 years of age, and another 44% were above 60 years; 94% were males; 99% were Whites; a little over half (54%) had at least some college education. Also, 36% earned less than $30,000 in annual household income; 30% earned $30,000-$59,999 in annual household income and 34% earned more than $60,000 in annual household income; and 51% were part-time producers.

Quarcoo (2015) analyzed the educational program needs of small and limited resource meat goat producers. She found that 62% of the producers were males; 46% were Blacks and another 46% were Whites, and 65% were 45-64 years old. Additionally, 28% had high school diplomas; an identical proportion (28%) had a two-year college degree or some college education, and 41% had an annual household income of $30,000 or less.

2.2 Practices by Livestock Producers

Hanson (1995) examined the adoption of intensive grazing systems by producers (as opposed to typical farm practices). He reported that 60% of farmers were planning to increase reliance on pasture use relative to 19%

who stated that they would reduce reliance on grazing. Furthermore, it was found that typical farm practices were different from recommended practices; for example, farmers rotated their pasture 1-2 weeks (as opposed to days or less as recommended); had 31 acres per paddock (as opposed to 1-5 acres per paddock as recommended); had stocking density of 1-5 cows per paddock acre (as opposed to 10 or more average cows per paddock as recommended); had permanent fencing only (as opposed to mobile or movable fencing as needed, particularly for interior fencing, as recommended), and very few had mobile water source (as opposed to mobile water source being the norm as recommended). This implied that producers were partially following recommended practices.

Roberts, Spurgeon, & Fowler (2007) analyzed characteristics of the U.S organic beef industry. They found that 93% of producers fed their cattle grass; 87% fed hay, and 68% fed grains. Also, 50% vaccinated their cattle; 43% used antibiotics at least once to treat a sick animal; diatomaceous earth was generally used to treat internal and external parasites, and many practiced rotational grazing to decrease parasites.

Ward et al. (2008) assessed factors affecting adoption of cow-calf production practices. They identified 17 practices, namely, implant usage in steers; length of hay feeding season; soil testing; testing of raised and purchased forages; stockpiling grasses and introduced forages; calf vaccination; cow and calf identification; cow and replacement heifer pregnancy exams; bull breeding soundness exams; breeding season length; existence of a long-term plan; record keeping methods, and cash flow planning. Moreover, they examined the influence of 7 factors (number of breeding females/herd size; percent of household net income from operation/dependency on cattle; operator's age; operator's education; extent of off-farm employment; importance of reducing labor use, and importance of generating farm income to avoid off-farm employment) on the aforementioned practices.

Ward et al. reported that, overall, 6 of 7 factors (i.e., all but off-farm employment) significantly affected the practices in varying degrees. Specifically, importance of reducing labor use was significant in 10 of the 17 practices; dependency on cattle was significant in 9 of the 17 practices; age was significant in 6 of the 17 practices; herd size was significant in 5 of the 17 practices; education was significant in 3 of the 17 practices, and importance of generating farm income was significant in 2 of the 17 practices. Taking reducing labor and age as examples, the following results were obtained: as the importance of reducing labor use increased, producers were more likely to conduct soil tests, vaccinate calves, individually identify cow and calves, conduct pregnancy exams on cows and replacement heifers, conduct bull soundness exams, keep records, have long-term business plans, and conduct cash flow analysis. Similarly, for age, as age increased producers were more likely to conduct soil tests; however, as age increased, producers were less likely use designated breeding seasons, conduct pregnancy exams on cows and replacement heifers, have long-term business plans, and conduct cash flow analysis.

Coetzee, Nutsch, Barbur, & Bradburn (2010) conducted a study on castration methods and associated livestock management practices performed by bovine veterinarians in the U.S. The authors reported that over 83% of the veterinarians indicated that producers were primarily responsible for performing castrations on calves. However, 90% of the veterinarians indicated that they (not the producers) vaccinated cattle at the time of castration. Also, the respondents indicated that the following practices were done at the time of castration by the producers: weaning (4%), hormone implanting (35%), tagging (51%), freeze branding (2%), and hot iron branding (24%).

Eaton et al. (2011) assessed rotational grazing of native pasturelands in Pantanal, Brazil as an effective conservation tool. They found that the producers mostly practiced rotational grazing, and that rotational grazing increased forage production and grazing efficiency. It also allowed increased pasture capacity by two to six fold compared to continuous grazing.

Mcbride & Mathews (2011) examined the diverse structure and organization of U.S. beef cow-calf farms. They reported on adoption of production practices based on type of farm, region, and size. For type of farm, they reported that cow-calf only producers were less likely than other cow-calf producers (i.e., minus cow-calf/stocker operations and cow-calf/feedlot operations) to use production technologies and practices such as defined calving season (54% vs. 66%, 79%); artificial insemination (4% vs. 11%, 19%); growth-promoting implants (9% vs. 17%, 25%); veterinary services (17% vs. 26%, 32%); nutritionist services (4% vs. 8%, 18%); computerized record keeping (17% vs. 22%, 29%), and Internet (29% vs. 38%, 42%). Looking at region of operation, they reported producers in the North Central, Northern Plains and West generally used certain production technologies and practices more than producers in the Southeast or Southern Plains. These practices included defined calving season; growth-promoting implants; veterinary services; nutritionist services; computerized record keeping, and Internet. On the contrary, producers in the Southeast and Southern Plains rotated grazing acres more than the producers in the other regions, but tested forage quality less. On the issue of size of farm, larger producers generally used production technologies and practices more often than smaller producers. The practices were defined calving season; artificial insemination; growth-promoting implants; veterinary services; nutritionist services; forage testing; computerized record keeping, and Internet.

Joseph (2013) assessed the cultural production practices, factors leading to adoption of production practices and technologies, and preferences for receiving information on beef cattle. The author reported that

treating calves for internal parasites and individually identifying cows were frequently or almost always used; respectively, rated 4.16 and 4.02 out of 5. Keeping records and conducting soil tests were frequently or sometimes used; respectively, rated 3.98 and 3.42. The use of breeding technologies, for example, artificial insemination and estrus synchronization, were occasionally or hardly ever used; respectively, rated 1.61 for heifers and 1.55 for cows, and 1.50 for heifers and 1.46 for cows. In addition, Joseph reported key reasons for adopting a practice or otherwise. The main reasons given for adopting a practice were higher profits (30%); fits with goals of operation (19%), and can be tried on a small scale (19%). On the flip side, the main reasons given for not adopting a practice were the practice being too expensive (20%); too time consuming to implement (18%), and does not fit with goals of operation. Also reported, was the fact that, education and household income were positively and significantly related to the adoption of a practice or an innovation, meaning the higher the educational level or the higher the household income of the producer, the more likely he/she is to adopt the practice or innovation. However, years of farming experience was negatively and significantly associated with adopting a practice or an innovation. This implies that the more the years of experience the producer has, the less likely the producer is to adopt the practice or innovation.

Bartlett, Tackie, Jahan, & Adu-Gyamfi (2015) analyzed the characteristics and practices of selected Alabama small livestock producers, focusing on economics and marketing. They reported that about three-fifths (62%) kept records, and keeping records was significantly impacted by farming status, gender, race/ethnicity, age, education, and annual household income. In other words, more full-time producers than part-time producers; more male producers than female producers; more White producers than Black producers; older producers than younger producers; more educated producers than less educated producers, and producers with higher annual household incomes than those with lower annual household incomes are more likely to keep records than otherwise.

3. Methodology

3.1 Data Collection

A questionnaire was developed for the study, and it had three sections, namely, production, processing, and demographic information. It was submitted to the Institutional Review Board, Human Subjects Committee of the Institution, and approved before being administered. The questionnaire was administered to a convenience sample of livestock producers. Convenience sampling was used to select subjects, because of a lack of a known sampling frame from which subjects could be drawn.

The data were obtained through interviews of small beef cattle and meat goat producers at several program sites in South Central Alabama, and the producers came mostly from 22 Alabama counties: Autauga, Barbour, Bullock, Butler, Chilton, Dallas, Greene, Hale, Henry, Lowndes, Macon, Montgomery, Marengo, Perry, Pickens, Russell, Sumter, and Wilcox (South Central Alabama counties), Dekalb, Randolph, Talladega, and Tuscaloosa (Non-South Central Alabama counties). The data were collected from summer of 2013 to spring of 2014. Extension agents and other personnel in the various counties, as well as graduate students assisted with collecting the data. The total sample was 121, and this was considered adequate for the study.

3.2 Data Analysis

The data were analyzed by using descriptive statistics and logit regression analysis. The general model used is stated as follows:

$$Y_i = \ln(P_i/1\text{-}P_i) = \beta_0 + \beta_j X_{ij} + \varepsilon \quad (1)$$

Where:

$Y_i = \ln(P_i/1\text{-}P_i)$ = the natural log (or the log odds) of the probability of the i^{th} observation for the dependent variable belonging to a particular group to the probability of the observation not belonging to that particular group

β_0 = constant

β_i = coefficients

i = number of observations

j = number of independent variables

X_i = independent variables

ε = error term

Five models were developed for five practices used in livestock production. The estimation model for Model 1 is stated as:

$$\ln(P_{ROG}/1\text{-}P_{ROG}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI \quad (2)$$

Where:

$\ln(P_{ROG}/1\text{-}P_{ROG})$ = the natural log (or the log odds) of the probability that a producer practices rotational grazing to the probability that a producer does not practicing rotational grazing

STA = Farming status

GEN = Gender
RAC = Race/ethnicity
AGE = Age
EDU = Education
HHI = Household income
In brief, the estimation model hypothesizes that the natural log of the probability that a producer practices rotational grazing to the probability that a producer does not practice rotational grazing is influenced by farming status, gender, race/ethnicity, age, education, and household income. It was assumed that the expected signs of the independent variables were not known a priori.
Identical models, 2 to 5, were set up for:
Soil test (SOT)
Parasite problem (PAP)
Veterinary services (VES)
Record keeping (REC)
Specifically,
Model 2:

$$\ln(P_{SOT}/1\text{-}P_{SOT}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI \quad (3)$$

Where:
$\ln(P_{SOT}/1\text{-}P_{SOT})$ = the natural log (or the log odds) of the probability that a producer regularly conducts soil test to the probability that a producer does not regularly conduct soil tests
Dependent variables = as previously described
Model 3:

$$\ln(P_{PAP}/1\text{-}P_{PAP}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI \quad (4)$$

Where:
$\ln(P_{PAP}/1\text{-}P_{PAP})$ = the natural log (or the log odds) of the probability that a producer has a parasite problem to the probability that a producer does not have a parasite problem
Dependent variables = as previously described
Model 4:

$$\ln(P_{VES}/1\text{-}P_{VES}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI \quad (5)$$

Where:
$\ln(P_{VES}/1\text{-}P_{VES})$ = the natural log (or the log odds) of the probability that a producer uses veterinary services to the probability that a producer does not use veterinary services
Dependent variables = as previously described
Model 5:

$$\ln(P_{REC}/1\text{-}P_{REC}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI \quad (6)$$

Where:
$\ln(P_{REC}/1\text{-}P_{REC})$ = the natural log (or the log odds) of the probability that a producer practices record keeping to the probability that a producer does not practice record keeping
Dependent variables = as previously described
The details of the independent variable names and descriptions used for the models are shown in the Appendix, Tables 1-5. The logistic regression analysis was run for the various models using SPSS 12.0© (MapInfo Corporation, Troy, NY). The criteria used to assess the models were the model chi-squares, beta coefficients, *p* values, and odd ratios.

4. Results and Discussion

Table 1 shows the socioeconomic characteristics. Most of the respondents (69%) were part-time farmers; nearly 83% were males; 81% were Blacks and 16% were Whites. Moreover, 51% were 45-64 years and 30% were 65 years or older; also, 65% had at most a two-year/technical degree or some college education. Almost 51% had an annual household income of $40,000 or less, and 39% had an annual household income of more than $40,000. The results are consistent with Leite-Browning et al. (2006), Tackie et al. (2012), and Quarcoo (2015) who also found more part-time farmers than full-time farmers, more male producers than female producers, more producers who were middle-aged or older, more producers who earned less than $50,000 in annual household income, and a majority of producers with some college education or an associate's degree or lower educational level.

Table 1. Socioeconomic Characteristics (N = 121)

Variable	Frequency	Percentage
Farming Status		
Full-time	36	29.8
Part-time	83	68.6
No Response	2	1.7
Gender		
Male	100	82.6
Female	17	14.0
No Response	4	3.3
Race/Ethnicity		
Black	98	81.0
White	19	15.7
Other	1	0.8
No Response	3	2.5
Age		
20-24 years	3	2.5
25-34 years	1	0.8
35-44 years	1	9.1
45-54 years	25	20.7
55-64 years	37	30.6
65 years or older	36	29.8
No Response	8	6.6
Educational Level		
High School Graduate or Below	41	33.9
Two-Year/Technical Degree	19	15.7
Some College	19	15.7
College Degree	19	15.7
Post-Graduate/Professional Degree	17	14.0
No Response	6	5.0
Annual Household Income		
$10,000 or less	1	0.8
$10,001-20,000	16	13.2
$20,001-30,000	22	18.2
$30,001-40,000	23	19.0
$40,001-50,000	14	11.6
$50,001-60,000	19	15.7
Over $60,000	14	11.6
No Response	12	9.9

Table 2 shows selected practices by the producers. About 68% indicated they practiced rotational grazing; 48% conducted soil tests regularly, and 59% had parasite problems. In addition, nearly 77% indicated that they use veterinary services; exactly 62% of respondents affirmed that they kept records, an encouraging finding as record keeping is one of the keys to successful farming. These findings are in agreement with Hanson (1995), Roberts et al. (2007), and Eaton et al. (2011) in terms of practicing rotational grazing; Coetzee et al. (2010) in terms of using veterinary services; McBride and Mathews (2011) in terms of rotational grazing, using veterinary services, and practicing record keeping; Joseph (2013) in terms of conducting soil tests and practicing record keeping, and Bartlett et al. (2015) in terms of practicing record keeping.

Table 2. Selected Practices (N = 121)

Variable	Frequency	Percentage
Rotational Grazing		
Yes	82	67.8
No	38	31.4
No Response	1	0.8
Soil Tests for Pasture Regularly		
Yes	58	47.9
No	61	50.4
No Response	2	1.7
Parasite Problem		
Yes	71	58.7
No	49	40.5
No Response	1	0.8
Veterinary Services		
Yes	93	76.9
No	26	21.5
No Response	2	1.7
Record-Keeping		
Yes	75	62.0
No	38	31.4
No Response	8	6.6

Table 3 reflects the estimates of the socioeconomic factors affecting whether or not producers embark on various practices. The model chi-square (which relates to the overall significance of the model) for the rotational grazing model was significant ($p = 0.056$). This implies a strong fit between the socioeconomic factors and whether or not a producer practiced rotational grazing. The Nagelkerke R^2 was 0.159; this means the socioeconomic variables explain 16% of the variation in whether or not respondents practiced rotational grazing. This is acceptable for cross-sectional data (Pindyck & Rubinfeld, 1997), where obtaining high R^2 is not the goal. The coefficient of farming status (whether a producer was full-time or part-time) was significant ($p = 0.025$). This suggests that farming status contributed greatly to whether or not a producer practiced rotational grazing. Furthermore, it suggests that part-time farmers were less likely to practice rotational grazing relative to full-time farmers. However, gender, race/ethnicity, age, education, and household income were all statistically insignificant. The odds ratio for farming status of 0.266, for example, means that if farming status changes from full-time to part-time the chances of practicing rotational grazing decreases by nearly 0.30.

The model chi-square for the soil test was not significant ($p = 0.508$). This implies a very weak fit between the socioeconomic factors and whether or not a producer conducted soil tests regularly. The Nagelkerke R^2 was 0.068; this means the socioeconomic variables explain 7% of the variation in whether or not a producer conducted soil tests regularly. None of the coefficients was significant. In this case, it may be that the producers did not appear to consider conducting regular soil tests as very important. The findings here are in opposition to those by Wade et al. (2008) who found that age was significantly affected by soil testing.

The model chi-square for the parasite problem model was significant ($p = 0.078$). This means a fairly strong fit between the socioeconomic factors and whether or not a producer had parasite problems. The Nagelkerke R^2 was 0.141; this means the socioeconomic variables explain 14% of the variation in whether or not a producer had parasite problems. The coefficients of education and household income were significant ($p = 0.031$ and $p = 0.008$, respectively). This implies that education and household income contributed greatly to whether or not a producer had parasite problems. Furthermore, it means that highly educated producers were more likely to have parasite problems, and producers with higher incomes were less likely to have parasite problems. The results appear to be an anomaly as one would expect highly

Table 3. Estimates for Various Models on Socioeconomic Factors on Selected Practices

	ROG			SOT		
Variable	β	*p*	OR	β	*p*	OR
STA	-1.326**	0.025	0.266	-0.226	0.622	0.798
GEN	-0.738	0.310	0.478	0.245	0.678	1.277
RAC	0.418	0.521	1.519	-0.219	0.645	0.803
AGE	-0.238	0.263	0.788	-0.124	0.497	0.883
EDU	0.008	0.963	1.008	0.264	0.116	1.302
HHI	0.217	0.204	1.242	-0.164	0.280	0.849
Chi-square	12.265* ($p = 0.056$)			5.287 ($p = 0.508$)		
Nagelkerke R^2	0.159			0.068		

Table 3 Continued.

	PAP			VES		
Variable	β	*p*	OR	β	*p*	OR
STA	0.528	0.265	1.696	0.254	0.647	1.289
GEN	-0.105	0.861	0.900	0.021	0.978	1.021
RAC	-0.391	0.416	0.676	0.795	0.287	2.214
AGE	0.256	0.186	1.292	-0.492*	0.071	0.611
EDU	0.386**	0.031	1.472	0.289	0.185	1.335
HHI	-0.427***	0.008	0.653	0.172	0.351	1.188
Chi-square	11.355* ($p = 0.078$)			13.009** ($p = 0.041$)		
Nagelkerke R^2	0.141			0.181		

Table 3 Continued.

	REC		
Variable	β	*p*	OR
STA	-0.840	0.186	0.432
GEN	-1.403	0.120	0.246
RAC	2.243**	0.048	9.422
AGE	-0.147	0.534	0.863
EDU	0.651***	0.005	1.917
HHI	-0.036	0.854	0.965
Chi-square	31.134*** ($p = 0.000$)		
Nagelkerke R^2	0.370		

***Significant at 1%; **Significant at 5%; *Significant at 10%; OR = Odds Ratio

educated producers to have fewer parasites because they would be willing to adopt parasite-adverse methods. What's more, highly educated persons generally have higher incomes. Nonetheless, the argument can be made that highly educated producers could over-combat parasites to the extent that the parasites become resistant to treatment. Farming status, gender, race/ethnicity, and age were all statistically insignificant. The odds ratio for household income of 0.653 means that if household income increases from one category to a higher category, the chances of having parasite problems decreases by nearly 0.70.

The model chi-square for the veterinary services model was significant ($p = 0.041$). This is interpreted to mean a very strong fit between the socioeconomic factors and whether or not a producer used veterinary

services. The Nagelkerke R^2 was 0.181; this means the socioeconomic factors explain 18% of the variation in whether or not respondents used veterinary services. The coefficient of age was significant ($p = 0.071$). This may mean that age contributed to whether or not a producer used veterinary services. Moreover, it may mean that older producers were less likely to use veterinary services. A plausible explanation for this may be that older producers may be depending on their experience in dealing animal health issues. However, farming status, gender, race/ethnicity, education, and household income were all statistically insignificant. The odds ratio for age of 0.611 means that if age changes from one category to a higher category, the chances of using veterinary services decreases by 0.61.

The model chi-square for the record keeping model was significant ($p = 0.000$). The result is translated as a very strong fit between the socioeconomic factors and whether or not a producer practiced record keeping. The Nagelkerke R^2 was 0.370; this means the socioeconomic variables explain 37% of the variation in whether or not a producer practiced record keeping. The coefficients of race/ethnicity and education were significant ($p = 0.048$ and $p = 0.005$, respectively). This suggests that race/ethnicity and education contributed greatly to whether or not a producer practiced record keeping. Plausibly, it could mean that White producers were more likely to practice record keeping than Black producers, and also, producers with higher educational levels were more likely to practice record keeping. However, farming status, gender, age, and household income were all statistically insignificant. The odds ratio for education of 1.917, for example, means that if educational level increases from one category to a higher category, the chances of practicing record keeping increases nearly 2 times.

5. Conclusion

The study assessed the impact of socioeconomic factors on selected practices of small livestock producers in Alabama. Specifically, it identified and described socioeconomic factors; described and assessed selected practices; develop models for selected practices; and estimated the extent to which socioeconomic factors influenced selected practices. The results revealed that there were more part-time farmers (69%) than full-time farmers; more males (83%) than females; more Blacks (81%) than Whites; more middle-aged producers (51%) than otherwise; more producers with at most a two-year/technical degree or some college education (65%) than otherwise; and more producers with an annual household income of $40,000 or less (51%) than above $40,000. A majority practiced rotational grazing (68%); had parasite problems (59%); used veterinary services (77%); and practiced record keeping (62%); also, nearly half (48%) conducted soil tests regularly. The logit analyses showed that several socioeconomic factors (5 out of 6) had significant effects on selected practices; farming status had a significant effect on rotational grazing; education and income had significant effects on parasite problems; age had a significant effect on veterinary services; and race/ethnicity and education had significant effects on record keeping.

From the foregoing, it is clear that the practices are important, and socioeconomic factors impinge on adopting practices. Therefore, there is a need consider socioeconomic factors in program planning and implementation. It is also critical to encourage producers to adopt practices since the afore-mentioned selected practices if done correctly could become “best practices.” In fact, there are obvious benefits to implementing these practices; for example, conducting soil tests regularly would help producers to know the condition of their soils, and practicing organized record keeping would make the producers’ “life easy” in terms of providing accurate information when required. This study has contributed an insight into how socioeconomic factors impact practices by livestock producers, especially small beef cattle and goat meat producers. Its major contribution is the indication that farming status, race/ethnicity, age, education, and annual household income affect practices by small livestock producers, in particular in the study area. Future studies may include replicating the study and/or covering a larger area. Replicating the study would confirm the results. Also, covering a larger area would increase the sample size, and this could affect the results in a positive way, and thus validate the findings.

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Appendix

Variable Definitions and Description of Data for the Various Models

Table 1. Variable Definitions and Description of Data for the Rotational Grazing Model

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time 2 = part-time	1.68	0.49
Gender	1 = male 0 = female	0.85	0.36
Race/ethnicity	1 = Black 2 = White	1.19	0.48
Age	1 = 20-24 2 = 25-34 3 = 35-44 4 = 45-54 5 = 55-64 6 = 65 or above	4.77	1.22
Education	1 = high school or less 2 = two-year/technical 3 = some college 4 = college degree 5 = post-graduate/professional	2.64	1.50
Household income	1 = $10,000 or less 2 = $10,001-20,000 3 = $20,001-30,000 4 = $30,001-40,000 5 = $40,001-50,000 6 = $50,001-60,000 7 = more than $60,000	4.44	1.63
Rotational grazing	1 = yes 0 = no	0.67	0.47

Table 2. Variable Definitions and Description of Data for the Soil Test Model

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time 2 = part-time	1.67	0.49
Gender	1 = male 0 = female	0.85	0.36
Race/ethnicity	1 = Black 2 = White	1.20	0.47
Age	1 = 20-24 2 = 25-34 3 = 35-44 4 = 45-54 5 = 55-64 6 = 65 or above	4.82	1.19
Education	1 = high school or less 2 = two-year/technical 3 = some college 4 = college degree 5 = post-graduate/professional	2.57	1.49
Household income	1 = $10,000 or less 2 = $10,001-20,000 3 = $20,001-30,000 4 = $30,001-40,000 5 = $40,001-50,000 6 = $50,001-60,000 7 = more than $60,000	5.34	9.55
Soil test	1 = yes 0 = no	0.49	0.50

Table 3. Variable Definitions and Description of Data for the Parasite Problem Model

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time 2 = part-time	1.68	0.49
Gender	1 = male 0 = female	0.84	0.37
Race/ethnicity	1 = Black 2 = White	1.20	0.47
Age	1 = 20-24 2 = 25-34 3 = 35-44 4 = 45-54 5 = 55-64 6 = 65 or above	4.80	1.20
Education	1 = high school or less 2 = two-year/technical 3 = some college 4 = college degree 5 = post-graduate/professional	2.57	1.48
Household income	1 = $10,000 or less 2 = $10,001-20,000 3 = $20,001-30,000 4 = $30,001-40,000 5 = $40,001-50,000 6 = $50,001-60,000 7 = more than $60,000	4.44	1.64
Parasite Problem	1 = yes 0 = no	0.56	0.49

Table 4. Variable Definitions and Description of Data for the Veterinary Services Model

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time 2 = part-time	1.68	0.49
Gender	1 = male 0 = female	0.84	0.37
Race/ethnicity	1 = Black 2 = White	1.20	0.47
Age	1 = 20-24 2 = 25-34 3 = 35-44 4 = 45-54 5 = 55-64 6 = 65 or above	4.79	1.20
Education	1 = high school or less 2 = two-year/technical 3 = some college 4 = college degree 5 = post-graduate/professional	2.54	1.47
Household income	1 = $10,000 or less 2 = $10,001-20,000 3 = $20,001-30,000 4 = $30,001-40,000 5 = $40,001-50,000 6 = $50,001-60,000 7 = more than $60,000	4.38	1.62
Veterinary Services	1 = yes 0 = no	0.75	0.43

Table 5. Variable Definitions and Description of Data for the Record Keeping Model

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time 2 = part-time	1.68	0.49
Gender	1 = male 0 = female	0.84	0.37
Race/ethnicity	1 = Black 2 = White	1.21	0.48
Age	1 = 20-24 2 = 25-34 3 = 35-44 4 = 45-54 5 = 55-64 6 = 65 or above	4.83	1.20
Education	1 = high school or less 2 = two-year/technical 3 = some college 4 = college degree 5 = post-graduate/professional	2.60	1.48
Household income	1 = $10,000 or less 2 = $10,001-20,000 3 = $20,001-30,000 4 = $30,001-40,000 5 = $40,001-50,000 6 = $50,001-60,000 7 = more than $60,000	4.41	1.65
Record keeping	1 = yes 0 = no	0.66	0.48