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THE IMPACT OF SOCIOECONOMIC FACTORS ON SELECTED PRACTICES BY SMALL LIVESTOCK PRODUCERS IN GEORGIA

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Abstract

Socioeconomic factors may influence practices of small livestock producers. However, there is limited research on the issue in the Southeastern U.S., such as in Georgia. This study, therefore, examined the impact of socioeconomic factors on the practices of small livestock producers in Georgia. Data were obtained from a sample of 40 producers from several counties in Georgia, and were analyzed using descriptive statistics and binary logistic regression analysis. The socioeconomic factors revealed that there were slightly many more full-time producers, with mid to high educational levels, and more producers with an annual household income of over $40,000. A majority practiced rotational grazing; conducted soil tests regularly; had parasite problems; used veterinary services, and kept records. Additionally, the binary logistic regression analyses revealed that selected socioeconomic factors had statistically significant effects on selected practices; gender and race/ethnicity had statistically significant effects on the use of veterinary services; with manipulation of data, income had statistically significant effects on soil testing and record keeping. The results imply that socioeconomic factors are important relative to producers engaging in a practice, and should be taken into consideration when assisting producers.

Keywords: Socioeconomic Factors, Selected Practices, Small Livestock Producers, Georgia, Southeastern US

INTRODUCTION

Livestock production has had its share of criticisms when it comes to its impact on other sectors. For example, Steinfeld et al. (2006) stated that livestock production and its effect on the environment has been receiving increased attention over the last several years. Indeed, they argued that the sector has severe impact on air, water, and soil quality. In line with that, Carlsson-Kanyama (1998), Rejinders & Soret (2003), and Baroni, Cenci, Tettamanti, & Berati (2007) stressed that changes in production practices, or non-consumption of meat are often seen as a possible solution to reducing the impact of the livestock sector on the environment.

As a result of the preceding, Dentoni, Tonsor, Calantone, & Peterson (2009) explained that organic and local foods have become very popular in recent years. The popularity of these foods has been influenced by issues such as nutrition, health, sustainability, and food safety. Dentoni et al. emphasized that consumers have become increasingly concerned with the quality, safety, and production methodologies of food, and demand foods with credence attributes. These attributes include, but not limited to, terms such as “origin”, “organic”, “locally grown", and "environment-friendly" on product labels. According to the Organic Trade Association [OTA] (2018), the demand for alternative foods, such as organic and local products, is increasing dramatically in the U.S. For instance, organic sales in the U.S. was $20.4 billion in 2008; $22.9 billion in 2010; $39.1 billion in 2015; $42.5 billion in 2016, and $45.2 billion in 2017, reflecting a growth rate of 121.7% between 2008 and 2017, a growth rate of 13.7% from 2015 to 2017, and a growth rate of 6.4% from 2016 to 2017. Organic food now accounts for more than 5% of total food sales in the U.S.

Iles (2005) also pointed out that many consumers have turned to local foods as a more holistic and authentic substitute for organic. They stated that for some, "food miles away" rather than organic labels are the representation of sustainability. Further, Zepeda & Leviten-Reid (2004) contended that a major trend associated with the fresh produce industry is "locally grown" foods. Similarly, Tilman et al. (2001) indicated the growing interest nation-wide in sustainable agriculture and local foods, and were of the opinion that opportunities exist for those interested in small-scale agriculture. According to them, there are several benefits to raising both crops and livestock on a small-scale. A major benefit of such an operation is that it allows diversification of enterprises and income streams. Consequently, they stressed that agricultural practices can influence food production practices. Additionally, Tilman, Cassman, Matson, Naylor, & Polasky (2002) also observed that recent agricultural practices that have greatly increased food production have had inadvertent and detrimental effects on the environment underscoring the need for more sustainable agricultural methods.

According to the USDA National Agricultural Statistics [NASS] (2014), small-scale farms dominated "the less than $50,000 in total farm sales" category; 75% of these farms had sales of less than $50,000, and 25% had sales of $50,000 or more. This is an indication that small-scale farmers are helping to meet the demand for local foods. However, NASS argues that these small-scale farms encounter barriers to local food market expansion, including lack of distribution systems for moving local food into mainstream markets; limited research, education, and training for marketing local food; and uncertainties related to regulations that may affect local food production. Gale (1997) and Brown (2002) also mentioned that small farms are more likely to market their products through direct-to-consumer outlets, because small farms cannot generate enough volume for distributors and institutions that demand high volumes of local food.

The above notwithstanding, practices by producers, especially small producers, who produce and sell locally or regionally are crucial to their sustainability. These practices may be influenced by socioeconomic factors. However, there is limited research on socioeconomic factors and their effects on practices by small livestock producers in the Southeastern U.S., for example, Georgia, where many small producers reside. The only identified study by the authors in the region is one conducted by Tackie, Bartlett, Adu-Gyamfi, Quarcoo, & Jahan (2016) in Alabama. The purpose of this study, therefore, was to assess the impact of socioeconomic factors on selected practices of small livestock producers in Georgia. Specific objectives were to (1) identify and describe socioeconomic factors, (2) describe and assess selected practices, and (3) estimate the extent to which socioeconomic factors affect specific practices. This study adopts the Tackie et al. (2016) study format.

LITERATURE REVIEW

Past literature have examined livestock producers from varied perspectives. Thus, to have an insight into the said perspectives, this section gives a brief description of relevant past studies. Based on this, first, the literature review deals with selected literature on socioeconomic factors vis-à-vis livestock producers. Second, it deals with selected literature focusing on practices by livestock producers, sequentially.

Socioeconomic Factors

Tambi, Mukhebi, Maina, & Solomon (1999) analyzed livestock producers' demand for private veterinary services in the high potential agricultural areas of Kenya. They found that 62% of the producers were males and 38% were females; the mean age was 46 years, and the average household size was 6. In addition, the mean number of years of formal education was 8; 46% had completed primary school, and 36% had either a secondary school education (but did not complete) or had completed secondary school. The mean annual farm income was 175,000 Kenyan Shillings [KSh] (equivalent of $1,743), and 93% were married.

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

Basarir (2002) assessed the multidimensional goals of farmers in the beef cattle and dairy industries in Louisiana. The author found that 57% of beef cattle farmers were part-time farmers; 93% were males; they were in the age range of 28 to 95 years, with an average age of 58; 49% were high school graduates, and 34% had college degrees. About 42% earned less than $40,000 in annual household net income, and 34% earned over $40,000 in annual household net income.

Adesehinwa, Okunola, & Adewumi (2004) evaluated the socioeconomic characteristics of ruminant livestock farmers and their production constraints in some parts of South-western

Nigeria. Their results indicated that 90% of the producers were full-time farmers; 68% were 41-60 years old; 70% were males; 23% had formal education, while 77% did not have any formal education.

Leite-Browning, Bukenya, Correa, Batiste, & Browning (2006) assessed the demographic characteristics of goat producers in Alabama. They reported that 85% of the respondents were part-time farmers; 45% had completed high school, and 37% had a college degree. Further, 28% were 56-65 years old; 42% earned less than $50,000 annually, and nearly 10% earned $50,000-$99,000 annually.

Bartlett, Tackie, Jahan, & Adu-Gyamfi (2015) examined the characteristics and practices of selected Alabama small livestock producers, with a focus on economics and marketing. Their results revealed that 69% of participants were part-time farmers; 83% were males, and 81% were Blacks. In addition, 51% were 45-64 years old; 65% had at most a two-year/technical degree or some college education. The results also revealed that 51% had an annual household income of $40,000 or less, and 39% had an annual household income of more than $40,000.

Bartlett, Tackie, Reid, Adu-Gyamfi, & McKenzie-Jakes (2018) assessed the characteristics and practices of selected Florida small livestock producers, with a focus on production and processing. The authors found that 60% of the respondents were part-time farmers; equal proportions (50% each) were males and females, and 47% were Whites. Additionally, 52% were 45-64 years old; 39% were 65 years or older; 3% had at most a two-year/technical degree or some college education, and 60% had an annual household income of $40,000 or less.

Practices by Livestock Producers

Hanson (1995) evaluated the adoption of intensive grazing systems by producers. He reported that 60% of the producers planned to increase reliance on pasture; whereas, 19% planned to reduce their reliance on pasture. He also reported that typical farm practices were different from recommended practices; producers partially followed recommended practices. For instance, they rotated animals on pasture every 1-2 weeks (compared to the days or less recommended); they had 31 acres per paddock (compared to the 1-5 acres per paddock recommended); they had stocking density of 1-5 cows per paddock acre (compared to the 10 or more cows per paddock recommended), and they had permanent fencing only (compared to the mobile or movable fencing recommended).

Rahelizatoro & Gillespie (2004) assessed the adoption of best management practices by Louisiana diary producers. The authors reported that the most frequently adopted best management practice was waste management systems, with an 83% adoption rate. Grazing management practices also had relatively high adoption rates, with fencing used for keeping animals out of erodible areas adopted at 80%, and prescribed grazing adopted at 72%. Conservation tillage practices were also highly adopted at 77%. However, practices that had relatively low adoption rates included filter strips, heavy use area protection, riparian forest buffers, stream-bank, and roof run off management.

Kim, Gillespie, & Poudel (2004) analyzed the effect of economic factors on the adoption of best management practices in beef cattle production. They found that for erosion and sediment control practices, the adoption rate ranged from 19 to 31%; for grazing management practices, the adoption rates ranged from 57 to 75%; for mortality, nutrient, and pesticide management practices, the adoption rates ranged from 53 to 65%. They also found that the most common reasons for non-adoption were “not familiar with practices” and “not applicable to the operation.”

Roberts, Spurgeon, & Fowler (2007) examined the characteristics of the U.S organic beef industry. The authors reported that 93% of producers fed their cattle grass; 87% fed hay, and 68% fed grains. Additionally, 50% vaccinated their cattle; 43% used antibiotics at least once to treat a sick animal. The treatment of choice for internal and external parasites was diatomaceous earth, and many practiced rotational grazing to decrease the effect of parasites on their cattle.

Beam et al. (2013) assessed the factors affecting use of veterinarians by small-scale food animal operations. Their results indicated that 65% of the respondents used a veterinarian for various reasons, such as treatment of farm animals, consultation, or preparation of health certificates during the previous 12 months. They also found that dairy cattle operators were more likely to use veterinary services compared to beef cattle operators. Also, operators that raised two or more types of animal were more likely use veterinary services compared to operators who raised only one type of animal. Of the operators who did not use veterinary services, 66% stated that their animals did not have any diseases, and 13% stated that it was too expensive.

Tackie et al. (2016) investigated the impact of socioeconomic factors on selected practices by small livestock producers in Alabama. They found that 68% of respondents practiced rotational grazing; 48% practiced soil testing regularly; 59% reported they had parasite problems; 77% used veterinary services, and 62% practiced record keeping. Furthermore, the authors found that farming status (part-time or full-time) had a statistically significant effect on rotational grazing; education and household income had statistically significant effects on parasite problem; age had a statistically significant effect on use of veterinary services, and race/ethnicity and education had statistically significant effects on record keeping.

Bartlett et al. (2018) analyzed the characteristics and practices of selected Florida small livestock producers focusing on production and processing. The results showed that 63% of the producers practiced rotational grazing and another 63% fed a combination of forage (non-hay), hay, and concentrate; 40% conducted soil tests regularly; however, 59% did not do so. Further, 54% had parasite problems and treated mainly with anthelmintics; 60% dewormed their animals monthly or quarterly; 47% used veterinary services, and 83% quarantined newly purchased animals before introducing them into their herds.

METHODOLOGY

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 collected through in-person interviews of small beef cattle and meat goat producers at several program sites in Georgia and the producers came from fourteen Georgia counties: Carroll, Fulton, Hall, Madison, Polk (North), Bibb, Crawford, Macon, Peach, (Central), Brooks, Colquitt, Lanier, Lowndes, and Tattnall (South). The data were collected from the summer of 2013 to the spring of 2016. Extension agents and other personnel in the various counties, as well as graduate students assisted with the process. The total sample size was 40. The Cronbach's alpha was 0.79, which is relatively good (Goforth, 2015).

Data Analysis

The data were analyzed by using descriptive statistics and binary logistic regression analysis. The descriptive statistics used were frequencies and percentages. The general model of the logistic regression used is stated as follows:

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

Where:

$Y_i = \ln (P_i/1-P_i)$ = the natural log (or the log odds) of the probability that the i^{th} observation of the dependent variable belongs to a particular group to the probability that it does not belong 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 selected practices used in livestock production, just as in the Tackie et al. (2016) study for Alabama. The estimation model for Model 1 is stated as:

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

$\ln (P_{SOT}/1\text{-}P_{SOT}) = \beta_0 + \beta_1 STA + \beta_2 GEN + \beta_3 RAC + \beta_4 AGE + \beta_5 EDU + \beta_6 HHI + \varepsilon$ (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 tests to the probability that a producer does not regularly conduct soil tests

Dependent variables = as previously described

Model 3:

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

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

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

RESULTS AND DISCUSSION

Table 1 shows the socioeconomic characteristics of the respondents. A sizeable proportion (48%) of the respondents were part-time producers; however, slightly more (50%) were full-time producers; 55% were females, and 58% were Whites. Additionally, 38% were between 45-64 years and 40% were 65 years or older. With regards to education, 75% had at least a two-year/technical degree; whereas, 23% were high school graduates or had a lower educational level. Twenty-five percent had an annual household income of over $40,000 but not more than $60,000, and 38% had an annual household income of over $60,000. The results, in terms of farming status, are not consistent with Bartlett et al. (2018) and Bartlett et al. (2015), who found more part-time producers than full-time producers. Further, they are in agreement with Bartlett et al. (2018) and Bartlett et al. (2015), in terms of age and education; they found more producers over 45 years than otherwise, and more producers with, at least, an associate's or a two-year degree than other educational levels.

Table 1. Socioeconomic Characteristics of Respondents (N = 40)

Variable	Frequency	Percent
Farming Status		
Full-time	20	50.0
Part-time	19	47.5
No Response	1	2.5
Gender		
Male	17	42.5
Female	22	55.0
No Response	1	2.5
Race/Ethnicity		
Black	14	35.0
White	23	57.5
Other	1	2.5
No Response	2	5.0
Age		
20-24 years	0	0.0
25-34 years	1	2.5
35-44 years	5	12.5
45-54 years	6	15.0
55-64 years	9	22.5
65 years or older	16	40.0
No Response	3	7.5
Educational Level		
High School Graduate or Below	9	22.5
Two-Year/Technical Degree	7	17.5
Some College	5	12.5
College Degree	7	17.5
Post-Graduate/Professional Degree	11	27.5
No Response	1	2.5
Annual Household Income		
$10,000 or less	0	0.0
$10,001-20,000	1	2.5
$20,001-30,000	2	5.0
$30,001-40,000	3	7.5
$40,001-50,000	6	15.0
$50,001-60,000	4	10.0
Over $60,000	15	37.5
No Response	9	22.5

Table 2 shows selected practices by the producers. About 78% indicated they practiced rotational grazing; whereas 20% did not; 73% conducted soil tests regularly and 28% did not;

65% had parasite problems and 35% did not have such problems. Furthermore, about 73% indicated that they used veterinary services as opposed to 25% who did not; 75% of the producers indicated that they kept records, and only 15% stated that they did not keep records. These findings are identical as Tackie et al. (2016) for Alabama in terms of rotational grazing, parasite problem, veterinary services, and record keeping, where there were more “yeses” than “nos.” In the case of soil tests, the result was different compared to Tackie et al. (2016), where slightly more producers reported not testing soil regularly. In addition, the results compare partially well with Bartlett (2018) for Florida, where more producers reported “yeses” than “nos” for rotational grazing and parasite problem. However, the opposite was true for regular soil testing and use of veterinary services.

Table 2. Selected Practices (N = 40)

Variable	Frequency	Percent
Rotational Grazing		
Yes	31	77.5
No	8	20.0
No Response	1	2.5
Soil Tests for Pasture Regularly		
Yes	29	72.5
No	11	27.5
Parasite Problem		
Yes	26	65.0
No	14	35.0
Veterinary Services		
Yes	29	72.5
No	10	25.0
No Response	1	2.5
Record Keeping		
Yes	30	75.0
No	6	15.0
No Response	4	10.0

Table 3 reflects the estimates of the effects of socioeconomic factors on selected practices. The model chi-square (which relates to the overall significance of the model) for the rotational grazing model was not statistically significant (p = 0.432). This implies a weak fit between the socioeconomic factors and whether or not a producer practiced rotational grazing. The Nagelkerke R^2 was 0.307; this means the socioeconomic variables explain 31% of the variation in whether or not respondents practiced rotational grazing. Not surprisingly, none of the coefficients of the socioeconomic factors was statistically significant. The results are contrary to those obtained by Tackie et al. (2016) for Alabama, who found that farming status had a statistically significant effect on rotational grazing.

The model chi-square for the soil test was statistically significant (*p* = 0.000). This implies a strong fit between the socioeconomic factors and whether or not a producer conducted soil tests regularly. The Nagelkerke R^2 was 0.930; this means the socioeconomic variables together explain 93% of the variation in whether or not a producer conducted soil tests regularly.

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

	ROG			SOT		
Variable	β	*p*	OR	β	*p*	OR
STA	0.938	0.539	2.556	28.480	1.000	2.34E+12
GEN	-0.454	0.756	0.635	-74.193	1.000	0.000
RAC	-1.786	0.232	0.168	-48.065	0.997	0.000
AGE	0.290	0.726	1.337	-15.371	0.999	0.000
EDU	-0.472	0.261	0.624	32.434	0.995	1.22E+14
HHI	0.284	0.601	1.328	-49.598	0.993	0.000
Chi-square	5.923 (*p* = 0.432)			28.235*** (*p* = 0.000)		
Nagelkerke R^2	0.307			0.930		

	PAP			VES		
Variable	β	*p*	OR	β	*p*	OR
STA	-0.876	0.362	0.416	1.765	0.416	5.842
GEN	-0.128	0.894	0.880	-3.847*	0.074	0.021
RAC	-0.424	0.667	0.655	-3.456*	0.097	0.032
AGE	-0.001	0.998	0.999	0.736	0.642	2.088
EDU	-0.333	0.257	0.717	-0.847	0.226	0.429
HHI	-0.120	0.681	0.887	1.741	0.151	5.703
Chi-square	3.016 (*p* = 0.807)			21.238*** (*p* = 0.002)		
Nagelkerke R^2	0.136			0.730		

	REC		
Variable	β	*p*	OR
STA	-154.582	0.989	0.000
GEN	-276.009	0.988	0.000
RAC	-274.691	0.988	0.000
AGE	44.719	0.988	2.64E+19
EDU	-37.067	0.988	0.000
HHI	25.923	0.989	1.81E+11
Chi-square	22.648*** (*p* = 0.001)		
Nagelkerke R^2	0.932		

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

However, none of the coefficients of the factors was statistically significant. Based on the overall model result, it was surmised that there was the likelihood that a factor was "impeding" a possible significance. Therefore, additional analyses were done by dropping factors, one at a time and two at a time. When education was dropped, household income was statistically significant (p = 0.096) with β = -2.199 and OR = 0.111; the model chi-square was 21.082 and significant (p = 0.001), and the Nagelkerke R^2 was 0.772 (not shown in Table). What is more, when farming status and gender were dropped, household income was statistically significant (p = 0.047) with β = -1.848 and OR = 0.158; the model chi-square was 14.738 and statistically significant (p = 0.005), and the Nagelkerke R^2 was 0.596 (not shown in Table). It is likely that income is very crucial in soil testing, and that those with higher incomes will more likely conduct soil tests regularly, all things equal, compared with those with lower incomes. These findings are in opposition to those by Tackie et al. (2016) for Alabama, who found that none of the socioeconomic factors had a statistically significant effect on soil testing.

The model chi-square for the parasite problem model was not statistically significant (p = 0.807). This means a weak fit between the socioeconomic factors and whether or not a producer had parasite problems. The Nagelkerke R^2 was 0.136; this means the socioeconomic variables explain 14% of the variation in whether or not a producer had parasite problems. Again, not surprisingly, none of the coefficients of the socioeconomic factors was statistically significant. The results in this case are in disagreement with those found by Tackie et al. (2016) for Alabama, who found that education and household income had statistically significant effects on parasite problem.

The model chi-square for the veterinary services model was statistically significant (p = 0.002). This implies a strong fit between the socioeconomic factors and whether or not a producer used veterinary services. The Nagelkerke R^2 was 0.730; this means the socioeconomic factors explain 73% of the variation in whether or not respondents used veterinary services. The coefficient of gender and race/ethnicity were statistically significant (respectively, p = 0.074 and p = 0.097). This may mean that gender and race/ethnicity contributed to whether or not a producer used veterinary services. For gender, it may mean that female producers were more likely to use veterinary services, because they may not want to take the chance of treating the animals themselves. For race/ethnicity, it is likely that White producers were more likely to use veterinary services, because, all things equal, they usually have the resources compared to Black producers. However, farming status, age, education, and household income were not statistically significant. The odds ratio of 0.021, for gender means that if gender changes from female to male, the chances of using veterinary services decreases by 0.021. Similarly, the odds ratio of 0.032 for race/ethnicity means that if race changes from

White to Black, the chances of using veterinary services decreases by 0.032. The findings are contrary to the ones obtained by Tackie et al. (2016); they found age to be statistically significant vis-à-vis veterinary services.

The model chi-square for the record keeping model was statistically significant (p = 0.001). This implies a strong fit between the socioeconomic factors and whether or not a producer practiced record keeping. The Nagelkerke R^2 was 0.932; this means the socioeconomic variables explain 93% of the variation in whether or not a producer practiced record keeping. Yet, none of the coefficients was statistically significant. In this case, also, there is the likelihood that a factor was "impeding" a possible significance. Therefore, additional analyses were performed, by dropping factors one at a time. When gender was dropped, household income was statistically significant (p = 0.088) with β = -1.029, and OR = 0.357; the model chi-square was 16.470 and statistically significant (p = 0.006), and the Nagelkerke R^2 was 0.752 (not shown in Table). It is plausible that income is critical for record keeping, and that those with higher incomes will more likely than not keep records, all things equal. Again, these findings do not agree with Tackie et al. (2016) for Alabama, who found that race and education had statistically significant effects on record keeping.

CONCLUSION

The study assessed the impact of socioeconomic factors on selected practices of small livestock producers in Georgia. Specifically, it identified and described socioeconomic factors; described and assessed selected practices; and estimated the extent to which socioeconomic factors influenced selected practices. The data were collected using a questionnaire and were analyzed by descriptive statistics and binary logistic regression analysis. The results showed that there were: slightly more full-time producers than part-time producers (50 v. 48%); more female producers than male producers (55 v. 43%); more White producers than Black producers (58 v. 35%); more producers 45 years or older than younger producers (88 v. 15%); more producers with at least a two-year/technical degree than lower educational levels (75 v. 23%), and more producers with an annual household income of over $40,000 than those with an annual household income of $40,000 or lower (63 v. 15%). A majority of the producers practiced rotational grazing (78%); tested soil regularly (73%); had parasite problem (65%); used veterinary services (73%), and practiced record keeping (75%). The binary logistic regression analyses showed that selected socioeconomic factors had statistically significant effects on selected practices; gender and race/ethnicity had statistically significant effects on use of veterinary services; with manipulation of data, household income had statistically significant effects on soil testing and record keeping.

Based on the results, it is obvious that practices are important, and socioeconomic factors do affect practices. Thus, consideration should be given to socioeconomic factors when helping producers with technical assistance. It may be necessary to gently encourage producers to adopt requisite practices since the practices are needed to facilitate operations. There are benefits to implementing these practices. For example, first, conducting soil tests regularly would let producers know the condition of their soils, and whether or not they should add amendments to the soil. Second, judicious use of veterinary services would help producers to effectively manage health situations with their herds. Third, practicing effective record keeping would let producers rest easy, because they would be able to manage their affairs in a better way, and also be able to provide more accurate information when required to do so. This study has contributed an insight into how socioeconomic factors affect practices by livestock producers, particularly small beef cattle and goat meat producers. Its major contribution is the indication that gender, race/ethnicity, and annual household income affect practices by small livestock producers, in particular, in the study area. Future studies are suggested, the scope of which may include, replicating the study *in toto*, replicating the study with a larger sample size, and/or replicating the study over a wider geographical area. A limitation of the study is that its relatively small sample size may have affected some of the results.

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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 (N = 29)

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time	1.52	0.51
	2 = part-time		
Gender	1 = male	0.38	0.49
	0 = female		
Race/ethnicity	1 = Black	1.59	0.50
	2 = White		
Age	1 = 20-24	5.07	1.13
	2 = 25-34		
	3 = 35-44		
	4 = 45-54		
	5 = 55-64		
	6 = 65 or above		
Education	1 = high school or less	3.17	1.65
	2 = two-year/technical		
	3 = some college		
	4 = college degree		
	5 = post-graduate/professional		
Household income	1 = $10,000 or less	5.83	1.42
	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		
Rotational grazing	1 = yes	0.83	0.38
	0 = no		

Table 2. Variable Definitions and Description of Data for the Soil Test Model (N = 29)

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time	1.51	0.51
	2 = part-time		
Gender	1 = male	0.38	0.49
	0 = female		
Race/ethnicity	1 = Black	1.59	0.50
	2 = White		
Age	1 = 20-24	5.07	1.13
	2 = 25-34		
	3 = 35-44		
	4 = 45-54		
	5 = 55-64		
	6 = 65 or above		
Education	1 = high school or less	3.17	1.65
	2 = two-year/technical		
	3 = some college		
	4 = college degree		
	5 = post-graduate/professional		
Household income	1 = $10,000 or less	5.83	1.42
	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 $60,000s		
Soil testing	1 = yes	0.76	0.44
	0 = no		

Table 3. Variable Definitions and Description of Data for the Parasite Problem Model (N = 29)

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time	1.52	0.51
	2 = part-time		
Gender	1 = male	0.38	0.49
	0 = female		
Race/ethnicity	1 = Black	1.59	0.50
	2 = White		
Age	1 = 20-24	5.07	1.13
	2 = 25-34		
	3 = 35-44		
	4 = 45-54		
	5 = 55-64		
	6 = 65 or above		
Education	1 = high school or less	3.17	1.65
	2 = two-year/technical		
	3 = some college		
	4 = college degree		
	5 = post-graduate/professional		
Household income	1 = $10,000 or less	5.83	1.42
	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		
Parasite Problem	1 = yes	0.66	0.48
	0 = no		

Table 4. Variable Definitions and Description of Data for the Veterinary Services Model (N = 28)

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time	1.54	0.51
	2 = part-time		
Gender	1 = male	0.38	0.49
	0 = female		
Race/ethnicity	1 = Black	1.57	0.50
	2 = White		
Age	1 = 20-24	5.14	1.08
	2 = 25-34		
	3 = 35-44		
	4 = 45-54		
	5 = 55-64		
	6 = 65 or above		
Education	1 = high school or less	3.18	1.68
	2 = two-year/technical		
	3 = some college		
	4 = college degree		
	5 = post-graduate/professional		
Household income	1 = $10,000 or less	5.79	1.42
	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		
Veterinary Services	1 = yes	0.64	0.49
	0 = no		

Table 5. Variable Definitions and Description of Data for the Record Keeping Model (N = 26)

Variable	Description	Mean	Standard Deviation
Farming status	1 = full-time	1.54	0.51
	2 = part-time		
Gender	1 = male	0.35	0.49
	0 = female		
Race/ethnicity	1 = Black	1.58	0.50
	2 = White		
Age	1 = 20-24	5.19	1.02
	2 = 25-34		
	3 = 35-44		
	4 = 45-54		
	5 = 55-64		
	6 = 65 or above		
Education	1 = high school or less	3.19	1.65
	2 = two-year/technical		
	3 = some college		
	4 = college degree		
	5 = post-graduate/professional		
Household income	1 = $10,000 or less	5.77	1.45
	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		
Record keeping	1 = yes	0.81	0.40
	0 = no		