Article

Stakeholder’s Risk Perceptions of Wild Pigs: Is There a Gender Difference?

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Abstract: Substantial literature indicates that genders differ in terms of risk perception and values regarding wildlife management. Lack of equal stakeholder representation is also documented, which can also impact the effectiveness of human-wildlife conflict resolution interventions and education and outreach efforts. This paper investigates gender differences in perceptions about risks and potential adverse impacts on production, health, environment, safety, and population management posed by wild pigs. A survey was used to collect data from a random sample of adult residents (N = 1221) in Louisiana. We analyzed responses from 226 female and 832 male producers. We observed differences in how these groups perceive production risk and health risk. No distinct differences were found on how the two genders perceive wild pig impact on natural resources and safety. No difference is reported on how the two genders consider the management of the wild pig population.

Keywords: gender; human-wildlife conflicts; perceptions; wildlife; wild pigs; wildlife management

1. Introduction

Human-wildlife conflicts, when they do occur, pose risks to people and wildlife. We define from an anthropocentric perspective that human-wildlife conflicts occur when wildlife damage crops or property, harm or kill domestic and companion animals, or threaten, injure, or kill people [1]. From a stakeholder’s perspective, human-wildlife conflicts may result in injury, property damage, increased workload, and, to an extent, economic and financial hardships and vulnerability [2–4]. To wildlife, these conflicts can be associated with population suppression, range collapse, and eradication [2]. These conflicts have been examined from an ecological, economic, risk management, and social impact standpoint [5]. Due to their complexity and their multidimensionality, resolving these conflicts is often a synergy of diverse stakeholder groups including community, state and federal agencies, conservation organizations, and authorities [5]. These groups often differ in how they perceive risk, in risk attitudes, and how they value people and wildlife interactions, which may lead to disagreements on how to resolve human-wildlife conflicts [6]. In addition, studies document gender differences within the aforementioned groups (e.g., [7] on gender differences on mountain lion; [6] on agency conflict on brucellosis control; [8] on gender-oriented differences on forest management).

A significant strand of literature states that risk perception varies between genders [9]. However, women’s values and beliefs regarding risk in the context of wildlife management is understudied [10,11]. Risk perceptions and values vary by gender and these variations extend beyond the role of women in agricultural operations. Women account for 36% of US producers [12] and are involved in a range of operational decisions, including day to day
decisions, land use and production, financial management, estate planning, and succession planning [12]. Gender oriented differences in risk perception and attitudes of wildlife management are attributed to values towards animal welfare and rights [13], secondary and indirect impacts to their household, communities, and the environment [9,10,14]. Another strand of literature examines gender differences in communication needs and trust in information sources [10,15,16]. In addition, studies report on gender differences in social roles, power relations, and different levels of trust in authorities and institutions [17].

Here, we focus on social components about production, health and safety, environmental, and disease transmission by nuisance wildlife; we focus specifically on agricultural producers’ perception on wild pig impacts. Specifically, we are interested in examining stakeholder perceptions on wild pig activity, and in particular, whether these perceptions vary by gender.

From a policy perspective and program development, our work is relevant to address risk management response, and human-wildlife conflict resolution, as well as effective communication between agencies, communities, and producers. Studies have documented the importance of understanding the values of different stakeholders and how they influence decision-making in risk management programs for wildlife [7,13,18,19]. Neglecting or underrepresenting stakeholders can create bias towards the intervention, and, in sequence, its success. For the purposes of our analysis, documenting potential differences from female and male agricultural producers is a first step to understanding their involvement in such activities. In this manuscript, we use the terms male and female to allow respondents to identify based on sex assignment at birth or self-determination of gender identity. In addition, as studies have shown that men are more likely to contact public officials [20], be involved in decision-making, and are more likely to attend meetings, we shed more light in the potential effects of stakeholder composition on decision-making.

2. Materials and Methods

We used data from a statewide survey to examine economic, biological, social, and institutional aspects of wild pig activity in Louisiana administered in 2014–2015 in response to nationwide trends of increasing wild pig populations and potential economic and environmental impacts [21]. The survey included questions to compare with 2008 and 2009 evaluations of workshop participants comprised of Louisiana landowners providing wild pig education by LSU AgCenter personnel. This survey has already produced damage estimates from wild hogs ($76 million annually [22]), and the magnitude of those damages suggests that this group has experiences that should produce usable responses for our study. Moreover, this group has been subject to evaluation of wild pig activity and educational programs by the Louisiana Department of Wildlife and Fisheries and Department of Agriculture and Forestry, US Department of Agriculture Natural Resource Conservation Service, and LSU AgCenter.

A nine-page questionnaire was developed in 2014 to gauge producer perceptions of wild pigs, as well as their experience of wild pig activity and damage. Survey questions were developed based on input from two wild pig education workshops held in 2008 and 2009 in Louisiana. Survey questions explicitly targeted key areas of concern to stakeholders at the time including damage loss, local government action, and policy for wild pig management.

A sample list was purchased from a private firm, and through a stratified random sample, recipients were organized according to 33 (These include agronomic crops produced at the state and depict not only the production diversity at the state level but also allow for analysis by key production areas. The list of crops, in alphabetical order, included blackberries, blueberries, cabbage, cantaloupe, collards, corn, cotton, cucumbers, grain, hay, mayhaw, muscadine, navels, oats, okra, peaches, pecans, potatoes, rice, satsuma, sod, sorghum, southern pea, soybeans, squash, strawberries, sugar cane, corn, sweet potato, tomatoes, turnips, watermelons, and wheat.) crops as reported by the Louisiana State University Agricultural Summary (Louisiana State University AgCenter 2013), and properties
either over a 1000 acres (404.68 ha) or $1,000,000 in total revenue. We began the survey in November 18 of 2014 and followed Dillman’s modified Tailored Design Method [23]. Respondents first were mailed a pre-notification postcard, followed by a questionnaire, a postage-paid return envelope, and a cover letter explaining the study and requesting their participation. A reminder postcard, and a second mailing to first-mailing non-respondents were sent two months later. We opted to skip December, as that is a traditional holiday period in Louisiana and further requests during that period might deter people from completing the survey. Further mailings and postcard reminders were not conducted due to budget constraints and a high response rate for the first two mailings. No incentive was provided to the respondents to complete the survey.

**Measurement**

We examined responses to overall opinion on wild pigs captured by the question, “In general, what is your overall opinion on wild pigs?”, employing a generalized linear model with gender, education, race and ethnicity, income, land ownership status, and age as moderators. The question was scored on a 5-point Likert scale with options varying from 1 = Extremely Negative, 2 = Somewhat Negative, 3 = Neutral, 4 = Somewhat Positive, 5 = Extremely Positive.

Further, participants’ perceptions on risks associated with the presence of wild pigs were documented for five main areas: production activities, natural resource impact, health and safety, disease transmission, and population management. Within this paper, we used a multinomial generalized linear model to analyze our responses, considering the dependent variable as continuous. The areas of investigation and the respective statements are presented in Table 1. The responses to these statements were documented in 5-point Likert scales (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree).

**Table 1. Statements of Analysis.**

| Production Activities | Interfere with farming operations |
|-----------------------|----------------------------------|
|                       | Take time away from activities that would be spent in managing farm operations |
|                       | Have caused damage to my crops in the past year |
|                       | Reduce production of agricultural crops |

| Health and Safety | Have made me concerned for the safety for myself or a family member |
|-------------------|------------------------------------------------------------------|
|                   | Have made me concerned for the safety of my pets |
|                   | Have injured myself or a family member |

| Disease Transmission | Transmit diseases harmful to humans |
|----------------------|-------------------------------------|
|                      | Transmit diseases harmful to wildlife |
|                      | Transmit diseases harmful to farm animals |

| Resources            | Negatively impact wildlife |
|----------------------|-----------------------------|
|                      | Negatively impact air quality |
|                      | Negatively impact soil quality |
|                      | Negatively impact water quality |

| Management           | Are being properly managed by STATE wildlife officials |
|----------------------|--------------------------------------------------------|
|                      | Are being properly managed by FEDERAL wildlife officials |

Last, we created binary variables for each of the statements in each area of interest; 0 for “strongly disagree” and “somewhat disagree” and “neutral,” and 1 for “somewhat agree” and “strongly agree.” This analysis allowed us to aggregate information by area and determine possible effects on respondent perceptions.

Research has shown that late respondents typically respond similarly to non-respondents [24]. Accordingly, second mailing respondents were compared to first mailing respondents by acres lost and non-production related damage losses, with no
significant differences [22]. In addition to non-response bias, responses were analyzed for meeting the generalized linear statistical model assumptions, and we controlled for missing values.

Chi-square analysis was the most appropriate way to test for gender differences in Likert-type scale questions. The analysis asks if the percent distributions for males and females are significantly different from one another. T-test was the preferred method of analysis when we combined the Likert-type scale questions into indexes creating Likert-scale questions for the aggregated variables “Production Activities,” “Health and Safety,” “Disease Transmission,” “Resources,” and “Management.” We used R studio (Version 2.1; RStudio Team, 2020) to conduct the statistical analysis.

3. Results

Response Rate and Sample Characteristics

A total of 4035 questionnaires were sent in the initial mailing to Louisiana agricultural producers. After the second mailing, a total of 1221 (1058 were usable for the present analysis) completed questionnaires were returned, with a response rate of 30.2%. We analyzed responses from 226 (18%) females and 832 (68%) males. Based on the 2017 Census of Agriculture, 65% of the state’s producers are men, 91% are white, and 33% are 65 years or older. Looking closer to the female producers, 93% are white, and the majority of them are 45 years and above: 45–54 (20%), 55 to 64 (29%), and 65 years or older (30%). Similar is the age-composition of the female principal producers, 20%, 30%, and 32%, respectively. Additional information about our sample is provided in the Appendix A. Table 2 presents sociodemographic characteristics of respondents by gender. Ninety-five percent of respondents in the two gender groups were white. We saw significant differences with regards to age (about 80% of the female respondents are 65 years old and older versus about 54% of the male respondents), household income with females reporting lower household income levels than males, farm size (the majority of the female respondents own, manage, or rent less than 80 acres whereas we see more dispersion in male respondents), and number of years in farming. The two groups were similar in regards to educational attainment.

Table 2. Sociodemographic characteristics of respondents by gender (in percentages).

| Description | Male Respondents | Female Respondents | Test for Gender Differences |
|-------------|------------------|--------------------|---------------------------|
| Age         |                  |                    |                           |
| 25–34       | 1.35             | 0.00               | $\chi^2(5) = 62.2112$    |
| 35–44       | 4.77             | 2.23               | $p = 0.000$               |
| 45–54       | 12.85            | 3.57               |                           |
| 55–64       | 27.29            | 13.84              |                           |
| 65–74       | 27.78            | 32.14              |                           |
| 75 and older| 25.95            | 48.21              |                           |
| Race        |                  |                    |                           |
| White       | 94.70            | 95.91              | $\chi^2(5) = 2.0341$     |
| Hispanic    | 0.25             | 0.45               | $p = 0.844$               |
| Asian or Pacific Islander | 0.37 | 0.00 |
| Native American | 0.99 | 0.45 |
| African American | 2.83 | 2.73 |
| Other       | 0.86             | 0.45               |                           |
Table 2. Cont.

| Description                  | Male Respondents | Female Respondents | Test for Gender Differences |
|------------------------------|------------------|--------------------|-----------------------------|
| **Annual household income**  |                  |                    |                             |
| Less than $20,000            | 6.96             | 27.33              | $p = 0.000                  |
| $20,000–$39,999              | 12.52            | 20.35              |                             |
| $40,000–$59,999              | 14.99            | 14.53              |                             |
| $60,000–$79,999              | 15.61            | 10.47              |                             |
| $80,000–$99,999              | 10.51            | 8.72               |                             |
| $100,000–$124,999            | 10.97            | 9.30               |                             |
| $125,000–$150,000            | 7.88             | 2.91               |                             |
| Great than $150,000          | 20.56            | 6.40               |                             |
| **Highest level of education** |                  |                    |                             |
| Some high school or less     | 4.39             | 8.18               | $p = 0.013                  |
| High school graduate         | 32.32            | 36.36              |                             |
| Some college                 | 25.12            | 23.64              |                             |
| College graduate             | 25.85            | 16.82              |                             |
| Graduate degree              | 12.32            | 15.00              |                             |
| **Farm size**                |                  |                    |                             |
| 1–29 acres                   | 10.81            | 23.32              | $p = 0.000                  |
| 30–79 acres                  | 17.62            | 26.46              |                             |
| 80–139 acres                 | 12.88            | 17.49              |                             |
| 140–249 acres                | 13.37            | 13.45              |                             |
| 250–349 acres                | 8.38             | 5.38               |                             |
| 350–499 acres                | 5.95             | 3.59               |                             |
| 500–699 acres                | 6.32             | 2.69               |                             |
| 700–999 acres                | 6.20             | 2.69               |                             |
| 1000 or more acres           | 18.47            | 4.93               |                             |
| **Number of years in farming** |                  |                    |                             |
| 0–9 years                    | 5.39             | 5.45               | $p = 0.003                  |
| 10–19 years                  | 16.42            | 13.64              |                             |
| 20–29 years                  | 15.69            | 20.91              |                             |
| 30–39 years                  | 20.10            | 14.55              |                             |
| 40–49 years                  | 18.87            | 11.82              |                             |
| 50 or more years             | 23.53            | 33.64              |                             |

Table 3 presents respondents’ overall opinion on wild pigs by gender. The majority of the respondents were negatively inclined towards wild pigs, and there were statistically significant differences by gender (Table 3). A generalized linear model indicated that gender is significant at 10%, education at 5%, race and ethnicity at 1%, and income at 5% (Table 4).
Table 3. Overall opinion on wild pigs by gender.

| Description                  | Male Respondents n = 681 | Female Respondents n = 162 | Test on Gender Differences |
|------------------------------|--------------------------|----------------------------|-----------------------------|
| Extremely Negative (1)       | 55.65%                   | 48.77%                     | \( \chi^2(4) = 11.0629 \)   |
| Somewhat Negative (2)        | 21.44%                   | 16.05%                     | \( p = 0.026 \)             |
| Neutral (3)                  | 16.59%                   | 26.54%                     |                             |
| Somewhat Positive (4)        | 3.23%                    | 4.32%                      |                             |
| Extremely Positive (5)       | 3.08%                    | 4.32%                      |                             |

Note: The question asked was “In general, what is your overall opinion on wild pigs?” was scored on a 5-point Likert scale.

Table 4. Generalized linear model results on overall opinion of wild pigs.

| Moderators               | Degrees of Freedom | Sum Sq. | Mean Sq. | F Value | Pr (>F)  |
|--------------------------|--------------------|---------|----------|---------|----------|
| Gender                   | 1                  | 6.6     | 6.557    | 6.247   | 0.01250 * |
| Education                | 1                  | 9.0     | 8.956    | 8.569   | 0.00354 **|
| Race/Ethnicity           | 1                  | 17.4    | 17.395   | 16.642  | 5.09 \times 10^{-5} *** |
| Income                   | 1                  | 7.5     | 7.461    | 7.138   | 0.00744 **|
| Ownership Status         | 1                  | 1.9     | 1.855    | 1.775   | 0.18327 |
| Age                      | 1                  | 0.1     | 0.122    | 0.116   | 0.73315 |
| Residuals                | 638                | 666.9   | 1.045    |         |          |

Note: Analysis was based on a 5-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5) and was treated as a continuous variable. The purpose of this regression is to examine potential relations with respondent characteristics, *** significant at 1%, ** significant at 5%, * significant at 10%.

We further examined participant perceptions on the five areas of investigation, namely production activities, natural resource impact, health and safety, disease transmission, and population management. Table 5A,B depicts the responses for each statement by area. For each statement, we provide the number of respondents, the respective percentage, and the mean.

Table 5. (A) Perceptions on wild pig issues from male participants. (B) Perceptions on wild pig issues from female participants.
Table 5. Cont.

| | 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|-----|
| **A** | Strongly Disagree | Somewhat Disagree | Neither Disagree nor Agree | Somewhat Agree | Strongly Agree |
| Reduce production of agricultural crops. *n* = 554 | 4.69% | 1.44% | 11.73% | 23.29% | 58.84% | 4.30 |
| **Health and Safety** | | | | | | |
| Have made me concerned for the safety for myself or a family member. *n* = 552 | 15.40% | 9.60% | 31.70% | 24.26% | 18.84% | 3.22 |
| Have made me concerned for the safety of my pets. *n* = 537 | 16.39% | 10.24% | 38.92% | 18.81% | 15.64% | 3.07 |
| Have injured myself or a family member. *n* = 512 | 47.07% | 8.01% | 40.82% | 1.95% | 2.15% | 2.04 |
| **Disease Transmission** | | | | | | |
| Transmit diseases harmful to humans. *n* = 560 | 4.64% | 5.18% | 35.54% | 27.32% | 27.32% | 3.68 |
| Transmit diseases harmful to wildlife. *n* = 562 | 4.80% | 3.91% | 32.56% | 28.11% | 30.60% | 3.76 |
| Transmit disease harmful to farm animals. *n* = 564 | 4.79% | 4.08% | 31.91% | 29.43% | 29.79% | 3.75 |
| **Resources** | | | | | | |
| Negatively impact wildlife habitat. *n* = 564 | 7.80% | 4.08% | 13.65% | 20.74% | 53.72% | 4.08 |
| Negatively impact air quality. *n* = 523 | 12.24% | 8.60% | 47.80% | 17.59% | 13.77% | 3.12 |
| Negatively impacts soil quality. *n* = 540 | 9.63% | 5.37% | 29.26% | 26.67% | 29.07% | 3.60 |
| Negatively impact water quality. *n* = 527 | 8.16% | 3.98% | 28.84% | 26.19% | 32.83% | 3.72 |
| **Management** | | | | | | |
| Are being properly managed by STATE wildlife officials. *n* = 574 | 39.72% | 18.47% | 28.40% | 8.71% | 4.70% | 2.20 |
| Are being properly managed by FEDERAL wildlife officials. *n* = 571 | 42.03% | 18.04% | 29.25% | 6.30% | 4.38% | 2.13 |

Note: The number of people responding to each statement is documented by *n*. The numbers and percentages reported are based only on the respondents.
| B | 1 | 2 | 3 | 4 | 5 | Mean |
|---|---|---|---|---|---|------|
| **Production Activities** | | | | | | |
| Interfere with my farming operations. \( n = 92 \) | 26.09% | 3.26% | 31.52% | 13.04% | 26.09% | 3.09 |
| Take time away from activities that would be spent in managing farm operations. \( n = 95 \) | 28.42% | 1.05% | 34.74% | 11.58% | 24.21% | 3.02 |
| Have caused damage to my crops in the past year. \( n = 93 \) | 29.03% | 9.68% | 34.41% | 7.53% | 19.35% | 2.78 |
| Reduce production of agricultural crops. \( n = 101 \) | 10.89% | 2.97% | 16.83% | 18.81% | 50.50% | 3.95 |
| **Health and Safety** | | | | | | |
| Have made me concerned for the safety for myself or a family member. \( n = 99 \) | 19.19% | 6.06% | 34.34% | 22.22% | 18.18% | 3.14 |
| Have made me concerned for the safety of my pets. \( n = 99 \) | 20.20% | 5.05% | 40.40% | 17.17% | 17.17% | 3.06 |
| Have injured myself or a family member. \( n = 92 \) | 46.74% | 6.52% | 42.39% | 1.09% | 3.26% | 2.07 |
| **Disease Transmission** | | | | | | |
| Transmit diseases harmful to humans. \( n = 101 \) | 11.88% | 6.93% | 38.61% | 15.84% | 16.73% | 3.39 |
| Transmit diseases harmful to wildlife. \( n = 100 \) | 13% | 3% | 39% | 17% | 28% | 3.44 |
| Transmit disease harmful to farm animals. \( n = 101 \) | 12.87% | 3.96% | 38.61% | 18.81% | 25.74% | 3.41 |
| **Resources** | | | | | | |
| Negatively impact wildlife habitat. \( n = 103 \) | 13.59% | 0.97% | 18.45% | 20.39% | 46.60% | 3.85 |
| Negatively impact air quality. \( n = 95 \) | 12.63% | 4.21% | 50.53% | 15.79% | 16.84% | 3.2 |
| Negatively impacts soil quality. \( n = 102 \) | 14.71% | 4.90% | 29.41% | 18.63% | 32.35% | 3.49 |
| Negatively impact water quality. \( n = 105 \) | 13.33% | 2.86% | 29.52% | 15.24% | 39.05% | 3.64 |
| **Management** | | | | | | |
| Are being properly managed by STATE wildlife officials. \( n = 104 \) | 30.77% | 13.46% | 49.04% | 3.85% | 2.88% | 2.34 |
| Are being properly managed by FEDERAL wildlife officials. \( n = 103 \) | 34.95% | 12.62% | 47.57% | 1.94% | 2.91% | 2.25 |

Note: The number of people responding to each statement is documented by \( n \). The numbers and percentages reported are based only on the respondents.
Panel A presents the responses on production activities. The highest percentage of responses from male participants indicated that wild pigs negatively impact production activities. Particularly, male respondents strongly agreed that wild pigs reduce production of agricultural crops. For female respondents, we saw a more neutral stance, except for their perception on losses on crop production caused by wild pigs. The analysis revealed statistically significant differences by gender on production activities statements.

Panel B presents information on respondents’ perceptions on wild pigs’ impact on health and safety concerns. Both groups were neutral regarding safety concerns for themselves, family members, and pets. A small percent, 4.1% male and 4.35% female, somewhat or strongly agreed that they or a family member had been injured by wild pigs and about 40% were neutral. No differences by gender were found on respondent perceptions on safety and health.

We report respondent perceptions toward disease transmission in Panel C. The majority of the respondents from both genders were neutral as to whether wild pigs transmit diseases to humans, wildlife, and farm animals. Looking closer at the response rates for “somewhat agree” and “strongly agree” versus “somewhat disagree” and “strongly disagree” for male and female respondents, we see that both groups consider the wild pig as a carrier of diseases that can affect humans, wildlife, and farm animals, with a larger percentage of male respondents answering “somewhat agree” and “strongly agree” than female respondents. The two groups differed in terms of disease transmission perceptions.

Table 5A,B, Panel D reports responses on wildlife habitat, air quality, soil quality, and water quality. Both groups indicated that wild pigs have a negative impact on all four resources, with wildlife habitat, soil, and water quality receiving the most “strongly agree” responses. The two groups were aligned in terms of perceptions on wild pig activity, and no statistical significance was identified.

The last panel presents information on wild pig population management, with both groups indicating that wild pig populations are not properly managed at the federal and at the state level with more male respondents selecting negative responses than female responses. There are significant differences between perceptions on wild pig population management by gender.

Table 6 reports on the tests performed to capture potential gender differences as it pertains to perceptions on the five categories. Both chi-square and t-tests are presented. Both tests showed gender differences with regards to wild pig activities and perceptions of activity in the production and disease transmission areas. Using the chi-square test, we observe gender differences in the management area as well. In Table 7, we combined the responses by area aggregating the participants’ responses. The results indicated that males and females do not have significantly different opinions for the statements in the area of natural resource impact, health and safety, and population management. Significantly different opinions by gender were reported on wild pig impact on production activities and disease transmission.

Table 6. Tests on gender differences.

| Production Activities                          | Chi-Square $p$-Value | T-Test $p$-Value |
|-----------------------------------------------|----------------------|-----------------|
| Interfere with my farming operations.         | $2.905 \times 10^{-3}$ *** | $2.072 \times 10^{-3}$ *** |
| Take time away from activities that would be spent in managing farm operations. | $6.968 \times 10^{-4}$ *** | $6.14 \times 10^{-3}$ *** |
| Have caused damage to my crops in the past year. | $1.084 \times 10^{-5}$ *** | $3.47 \times 10^{-5}$ *** |
| Reduce production of agricultural crops.      | $3.199 \times 10^{-2}$ *** | 0.014 ** |
Table 6. Cont.

| Health and Safety | Chi-Square $p$-Value | T-Test $p$-Value |
|-------------------|----------------------|-----------------|
| Have made me concerned for the safety for myself or a family member. | 0.682 | 0.601 |
| Have made me concerned for the safety of my pets. | 0.494 | 0.943 |
| Have injured myself or a family member. | 0.909 | 0.779 |

| Disease Transmission | | |
|----------------------|----------------------|-----------------|
| Transmit diseases harmful to humans. | $1.164 \times 10^{-2}$ *** | 0.035 ** |
| Transmit diseases harmful to wildlife. | $5.063 \times 10^{-3}$ *** | 0.022 ** |
| Transmit disease harmful to farm animals. | $6.040 \times 10^{-3}$ *** | 0.011 ** |

| Resources | | |
|------------|----------------------|-----------------|
| Negatively impact wildlife habitat. | 0.0941 | 0.116 |
| Negatively impact air quality. | 0.596 | 0.539 |
| Negatively impacts soil quality. | 0.325 | 0.446 |
| Negatively impact water quality. | 0.0841 | 0.592 |

| Management | | |
|------------|----------------------|-----------------|
| Are being properly managed by STATE wildlife officials. | $1.105 \times 10^{-3}$ *** | 0.209 |
| Are being properly managed by FEDERAL wildlife officials. | $4.503 \times 10^{-3}$ *** | 0.286 |

Note: $p$-values from chi-square test between the nominal scoring categories for females and males are the preferred method for examining gender differences. *** significant at 1%, ** significant at 5%. Analysis was based on a 5-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5).

Table 7. T-test results between gender for the aggregated variables.

| Description | $p$-Value |
|-------------|-----------|
| Production Activities | $5.17 \times 10^{-4}$ *** |
| Health and Safety | 0.807 |
| Disease Transmission | 0.017 ** |
| Resources | 0.449 |
| Management | 0.231 |

Note: Analysis was based on a 5-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5). *** significant at 1%, ** significant at 5%.

4. Discussion

Interestingly, several perceptions on biological and resource impacts did not show differences between genders, a finding counter to prior literature [7,8,13,25,26]. Wild pigs have profound effects on the landscape, in terms of water quality degradation, competition for resources with other wildlife and domestic animals, and predation of wildlife and domestic animals. For health and safety perceptions, both genders appeared to be uncertain on the threat to the safety to humans and pets, despite popular media reports of negative interactions between wild pigs with people and domesticated animals. It is possible that perceptions are similar, since these effects might not be seen as proximate threats to agricultural producers directly. Strong perceptions do not exist because the producers...
simply are not seeing the effects on their farming operations, or the effects are difficult to quantify.

While differences did not exist for health and safety/natural resource impact perceptions, gender-based differences in production activities and disease transmission perceptions could be the result of perceived increased cost or lost income being more important to a particular gender, as compared to a biological/ecological motivation. These differences between gender are more in line with pre-existing literature, but still require explanation in light of the lack of differences in the above-mentioned areas. Potentially, given the lower incomes reported by female respondents, these respondents are more attuned to more concrete and immediate threats than male respondents, who largely agreed that wild hogs were threats to production.

Additionally, where differences occurred between male and female responses, the difference was often a stronger negative response among males. Generally, with respect to wildlife, greater proportions of positive and negative responses reflect strong specificity and salience, based on personal experiences [26–28], direct risks to the individual [29], or are intertwined with beliefs about the relevant resource management agencies [30]. Both genders agreed that resource agencies were not properly managing wild hogs. Our survey did not ask about personal experiences, such as recreational hunting or general encounters with wild hogs on the property (e.g., wild pigs chasing them or injuring them). Male hunters greatly outnumber female hunters nationwide [30] and in Louisiana [31], and engagement in recreational hunting and the hunting community could be an influence in male response. We did ask about risks to person and property with no gender differences in personal health and safety but greater concern about disease among male respondents. We may infer, therefore, that the extensive reporting of wild pig damage [22] could be the direct personal experience that may be influential in the greater salience and specificity among male respondents, where they answered more definitively. Yet, we cannot rule out the influence of their recreational interests aiding their ability to detect or predisposing them to look for wild pig damage.

The lack of differences in other perceptions is less readily explained. Potentially, as noted by Needham and Vaske [32], some responses may reflect shared opinions about the actions or inactions of management agencies. Certainly, respondents may not have had experiences or information necessary to formulate responses; however, given negative responses in other wild pig surveys [33,34] and considering extension and education efforts by local, state, and federal agencies and universities, it is hard to rationalize widespread lack of opinion. Rather, it could be that wild pigs: (1) Are a large enough concern in these perceptions that gender differences are overwhelmed, as in risks to resources; (2) Not a sufficiently large concern compared with other challenges, as in the equivocal responses; or (3) The stakeholders are too divided in opinion, as in female response to questions regarding production activities. Yet, further investigation can shed more light to this topic with regards to delivery of information considering potential gender differences [35,36].

Despite not knowing why differences exist in responses between gender regarding transmission of disease and management actions, it is indeed important for policy and management prescriptions as well as extension education to discover why these differences exist. In the case of production risks, the literature indicates that the roles in agricultural production (i.e., direct on-site management versus indirect management through a farm manager) may drive these differences, and likewise for disease transmission. Potentially, as previously noted, male respondents could have more direct experiences with wild hogs during agricultural production activities and/or recreational hunting, and have received more information through extension, state and federal educational efforts, or communication within their community, or these results could reflect inherent gender differences in risk perception, as observed in other literature.

Whether one or more of the above questions is the root cause, the need to educate stakeholders with regards to their differences in perceptions seems clear. In order to achieve policy goals, focusing educational efforts on different aspects of wild pig related problems
(depending on the audiences’ gender) could lead to better adoption of management and policy recommendations. We identified gender differences that suggest additional efforts could elaborate on neighbor effects (i.e., role of adjacent property management) and magnitude of differences in perception. Focus groups and outreach methods specifically targeting female stakeholders could elucidate the magnitude of differences and whether these differences manifest in a targeted sample in the same way as a broad survey.

Male respondents in our sample outnumbered female more than 3 to 1 (see Table 2). This imbalance could be attributed to the survey design, which required the respondent to either own, manage, or rent agricultural land in Louisiana. In Louisiana, the percentage of male landowners and land-operators relative to women landowners and land-operators has been previously reported to be male dominated (>90%; [37,38]). However, we cannot rule out potentially greater listings for males in the purchased list, or the possibility that more male respondents completed the survey due to a greater propensity for men to complete wildlife related surveys [7]. Although the gender imbalance is large, the sample population is indicative of Louisiana and, therefore, we judged the number of males and females responding to the survey adequate to test for differences in risk perceptions. A classification of respondents by land ownership is presented in Table A1 of the Appendix A. Land ownership and gender is a relation that begs more investigation. Some relevant research includes [39–41]. Additional information on wild pig experiences is presented in Table A2 of the Appendix A.

While our analysis did not address which gender has a stronger (magnitude of negative/positive response) perception, differences do exist that are attributable to gender. This is due to the nature of question construction and selected statistical analysis. However, Table 3 does provide some evidence that the more negative views are generally held by men on the subjects covered in the survey. We offered some rationale and literature support for those findings, but alternative rationale may be more suitable and worth investigating. We do caution for any extrapolation of our findings.

This work provides a foundation for future research as it raises many questions. First, we identified gender differences that suggest additional efforts could elaborate on neighbor effects (i.e., role of adjacent property management) and magnitude of differences in perception. Focus groups and outreach methods specifically targeting female stakeholders could elucidate the magnitude of differences and whether these differences manifest in a targeted sample in the same way as a broad survey. Additional lines of inquiry should also focus on temporal-spatial aspects of wild pig related damage. For instance, a question broached among the authors was “do state and federal public land policy have a negative externality effect on nearby farmers?” In order to control wild pig populations effectively, policy formulation must account for the fact that pigs respond to environmental pressures, in this case, localized eradication efforts by humans, and are likely to seek locations where these pressures either are not as intense or do not exist at all.

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**Informed Consent Statement:** This was a self-participatory survey and no incentive was offered. The informed consent process is a basic ethical obligation for researchers. Standard IRB protocols were followed, and a written informed consent was not required. In the cover letter it was detailed that data from the survey will be confidential and summary information will be reported in study results.
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Appendix A

Table A1. Classification of ownership by gender.

| Description       | Men \( n = 827 \) | Women \( n = 225 \) | Test for Gender Differences |
|-------------------|-------------------|--------------------|-----------------------------|
| Landlord          | 33.01%            | 54.22%             | \( \chi^2(3) = 41.8563 \)  |
| Tenant Farmer     | 8.59%             | 1.33%              | \( p = 0.000 \)             |
| Owner/Operator    | 54.90%            | 43.11%             |                             |
| Land Manager      | 3.51%             | 1.33%              |                             |

Table A2. Wild pig experiences by gender.

| Description                 | Men \( n = 822 \) | Women \( n = 226 \) | Test for Gender Differences |
|-----------------------------|-------------------|--------------------|-----------------------------|
| Hogs currently present      |                   |                    |                             |
| No                          | 52.07%            | 65.49%             | \( \chi^2(2) = 36.6238 \)  |
| Yes                         | 37.96%            | 17.26%             | \( p = 0.000 \)             |
| Unsure                      | 9.98%             | 17.26%             |                             |
| Past presence               |                   |                    |                             |
| No                          | 59.21%            | 60.36%             | \( \chi^2(2) = 33.1789 \)  |
| Yes                         | 28.97%            | 14.86%             | \( p = 0.000 \)             |
| Unsure                      | 11.82%            | 14.67%             |                             |
| Hog damage                  |                   |                    |                             |
| No                          | 48.66%            | 64.13%             | \( \chi^2(2) = 63.8351 \)  |
| Yes                         | 45.24%            | 18.83%             | \( p = 0.000 \)             |
| Unsure                      | 6.10%             | 17.04%             |                             |
| Hog damage past 3 years     |                   |                    |                             |
| Declined                   | 17.91%            | 19.26%             | \( \chi^2(2) = 10.8166 \)  |
| The same                   | 50.40%            | 62.96%             | \( p = 0.004 \)             |
| Increased                  | 31.70%            | 17.78%             |                             |
Table A2. Cont.

| Description | Men | Women | Test for Gender Differences |
|-------------|-----|-------|-----------------------------|
| Loss in land/lease value n = 619 | n = 128 | | |
| No | 60.42% | 70.31% | $\chi^2(2) = 15.5517$ |
| Yes | 23.10% | 7.81% | $p = 0.000$ |
| Unsure | 16.48% | 21.88% | |
| Number of hogs past 3 years n = 605 | n = 109 | | |
| Declined | 17.52% | 17.43% | $\chi^2(2) = 11.8973$ |
| The same | 41.49% | 57.80% | $p = 0.003$ |
| Increased | 40.99% | 24.77% | |

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